Title: Encyclopaedia Britannica, 11th Edition, "Arundel, Thomas" to "Athens"

Author: Various

Release Date: November 4, 2010 [EBook #34209]

Language: English

Credits: Produced by Marius Masi, Don Kretz and the Online Distributed Proofreading Team at https://www.pgdp.net

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THE ENCYCLOPÆDIA BRITANNICA

A DICTIONARY OF ARTS, SCIENCES, LITERATURE AND GENERAL INFORMATION

ELEVENTH EDITION

VOLUME II SLICE VII

Arundel, Thomas to Athens

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ATHENODORUS

ARUNDEL, THOMAS (1353-1414), archbishop of Canterbury, was the third son of Richard Fitzalan, earl of Arundel and Warenne, by his second wife, Eleanor, daughter of Henry Plantagenet, earl of Lancaster. His family was an old and influential one, and when Thomas entered the church his preferment was rapid. In 1373 he became archdeacon of Taunton, and in April 1374 was consecrated bishop of Ely. During the early years of the reign of King Richard II. he was associated with the party led by Thomas, duke of Gloucester, Henry, earl of Derby, afterwards King Henry IV., and his own brother Richard, earl of Arundel, and in 1386 he was sent with Gloucester to Eltham to persuade Richard to return to parliament. This mission was successful, and Arundel was made lord chancellor in place of Michael de la Pole, duke of Suffolk, and assisted to make peace between the king and the supporters of the commission of regency. In April 1388 he was made archbishop of York, and, when Richard declared himself of age in 1389, he gave up the office of chancellor, to which, however, he returned in 1391. During his second tenure of this office he removed the courts of justice from London to York, but they were soon brought back to the metropolis. In September 1396 he was translated from York to Canterbury, and again resigned the office of chancellor. He began his new rule by a vigorous attempt to assert his rights, warned the citizens of London not to withhold tithes, and decided appeals from the judgments of his suffragans during a thorough visitation of his province. In November 1396 he had officiated at the marriage of Richard and Isabella, daughter of Charles VI., king of France, and his fall was the sequel of the king's sudden attack upon the lords appellant in 1397. After the arrest of Gloucester, Warwick and Arundel, the archbishop was impeached by the Commons with the king's consent, although Richard, who had not yet revealed his hostility, held out hopes of safety to him. He was charged with assisting to procure the commission of regency in derogation of the royal authority, and sentence of banishment was passed, forty days being given him during which to leave the realm. Towards the end of 1397 he started for Rome, and Pope Boniface IX., at the urgent request of the king, translated him to the see of St Andrews, a step which the pope afterwards confessed he repented bitterly. This translation virtually deprived Arundel of all authority, as St Andrews did not acknowledge Boniface. He then became associated with Henry of Lancaster, but did not return to England before 1399, and the account which Froissart gives telling how he was sent by the Londoners to urge Henry to come and assume the crown is thought to refer to his nephew and namesake, Thomas, earl of Arundel. Landing with Henry at Ravenspur, he accompanied him to the west. He took his place at once as archbishop of Canterbury, witnessed the abdication of Richard in the Tower of London, led the new king, Henry IV., to his throne in presence of the peers, and crowned him on the 13th of October 1399. 709

The main work of his later years was the defence of the church, and the suppression of heresy. To put down the Lollards, he called a meeting of the clergy, pressed on the statute *de haeretico comburendo*, and passed sentence of degradation upon William Sawtrey. He resisted the attempt of the parliament of 1404 to disendow the church, but failed to induce Henry to pardon Archbishop Scrope in 1405. In 1407 he became chancellor for the fourth time, and in 1408 summoned a council at Oxford, which drew up constitutions against the Lollards. These he published in January 1409, and among them was one forbidding the translation of the Bible into English without the consent of the bishop of the diocese, or of a provincial synod. In 1411 he went on an embassy abroad, and in 1412 became chancellor again, his return to power being accompanied by a change in the foreign policy of Henry IV. In 1397 he had sought to vindicate his right of visitation over the university of Oxford, but the dispute remained unsettled until 1411 when a bull was issued by Pope John XXIII. recalling one issued by Pope Boniface IX., which had exempted the university from the archbishop's authority. In 1413 he took a leading part in the proceedings against Sir John Oldcastle, Lord Cobham, and in the following year he died on the 19th of February, and was buried at Canterbury. A legend of a later age tells how, just before his death, he was struck dumb for preventing the preaching of the word of God.

The chief authorities are T. Walsingham, *Historia Anglicana*, ed. by H.T. Riley (London, 1863-1864); *Eulogium historiarum sive temporis*, ed. by F.S. Haydon (London, 1858-1863); the Monk of Evesham, *Historia vitae et regni Ricardi II.*, ed. by T. Hearne (Oxford, 1729); W.F. Hook, *Lives of the Archbishops of Canterbury*, vol. iv. (London, 1860-1876).

ARUNDEL, a market town and municipal borough in the Chichester parliamentary division of Sussex, England, 58 m. S.S.W. from London by the London, Brighton & South Coast railway. Pop. (1901) 2739. It is pleasantly situated on the slope of a hill above the river Arun, which is navigable for small vessels to Littlehampton at the mouth, 6 m. south. From the summit of the hill rises Arundel Castle, which guarded the passage along the river through the hills. For its connexion with the title of earl of Arundel see ARUNDEL, EARLDOM OF. A castle existed in the time of King Alfred, and at the time of the Conquest it was rebuilt by Roger de Montgomerie, but it was taken from his son, who rebelled against the reigning monarch, Henry I. In 1397 it was the scene of a conspiracy organized by the earl of Arundel, archbishop of Canterbury and duke of Gloucester, to dethrone Richard II. and murder the lords of his council, a plot which was discovered before it could be carried into execution. During the civil wars of the 17th century, the stronghold was frequently assaulted by the contending parties, and consequently greatly damaged; but it was restored by Charles, 11th duke of Norfolk (d. 1815), who made it what it now is, one of the most splendid baronial mansions in England. Extensive reconstruction, in the style of the 13th century, was undertaken towards the close of the 19th century. The town, according to the whimsical etymology shown on the corporation seal, takes its name from *hirondelle* (a swallow). The town hall is a castellated building, presented to the corporation by the duke of Norfolk. The church of St Nicholas, founded about 1375, is Perpendicular with a low tower rising from the centre. In the north aisle of the chancel there are several ancient monuments of the earls of Arundel. The church is otherwise remarkable for its reredos and iron work. The chancel is the property of the duke of Norfolk and is screened from the rest of the building, although in 1880 this exercise of right by the owner was made the subject of an action at law and subsequent appeal. The Roman Catholic church of St Philip Neri was built by the duke of Norfolk (1873). Some remains of a *Maison Dieu*, or hospital, erected in the time of Richard II., still exist. The borough is under a mayor, 4 aldermen and 12 councillors. Area, 2053 acres. 710

The first mention of Arundel (Harundell) comes as early as 877, when it was left by King Alfred in his will to his nephew Æthelm. In the time of Edward the Confessor the town seems to have consisted of the mill and a fortification or earthwork which was probably thrown up by Alfred as a defence against the Danes; but it had increased in importance before the Conquest, and appears in Domesday as a thriving borough and port. It was granted by the Conqueror to Roger de Montgomery, who built the castle on the site of the ancient earthwork. From very early times markets were held within the borough on Thursday and Saturday, and in 1285 Richard Fitzalan, earl of Arundel, obtained a grant of two annual fairs on the 14th of May and the 17th of December. The borough returned two members to parliament from 1302 to 1832 when the Reform Act reduced the membership to one; in 1868 it was disfranchised altogether. There are no early charters extant, but in 1586 Elizabeth acknowledged the right of the mayor and burgesses to be a body corporate and to hold a court for pleas under forty shillings, two weekly markets and four annual fairs—which rights they claimed to have exercised from time immemorial. James II. confirmed in 1688 a charter given two years before, and incorporated the borough under the title of a mayor, 4 aldermen and 12 burgesses. The town was half destroyed by fire in 1338, but was soon rebuilt. Arundel was formerly a thriving seaport, and in 1813 was connected by canal with London.

See M.A. Tierney, *The History and Antiquities of the Castle and Town of Arundel* (London, 1834); *Victoria County History—Sussex.*

ARUNDELL OF WARDOUR, THOMAS ARUNDELL, 1ST BARON (*c.* 1562-1639), son of Sir Mathew Arundell of Wardour Castle in

Wiltshire, a member of the ancient family of Arundells of Lanherne in Cornwall, and of Margaret, daughter of Sir Henry Willoughby, was born about 1562. In 1579 he was personally recommended by Queen Elizabeth to the emperor Rudolph II. He greatly distinguished himself while serving with the imperial troops against the Turks in Hungary, and at the siege of Gran or Esztergom on the 13th of August 1595, he captured the enemy's banner with his own hand. He was created by Rudolph II. a count of the Holy Roman Empire in December 1595, and returned to England after suffering shipwreck and barely preserving his life in January 1596. His assumption of the foreign title created great jealousy among the English peers, who were wont to give a precedence by courtesy to foreign nobles, and he incurred the resentment of his father, who objected to his superior rank and promptly disinherited him. The queen, moreover, was seriously displeased, declared that "as chaste wives should have no glances but for their own spouses, so should faithful subjects keep their eyes at home and not gaze upon foreign crowns," and committed him to the Fleet immediately on his arrival, while she addressed a long letter of remonstrance on the subject to the emperor. Arundell remained under arrest till April, when he was liberated after an examination. In April 1597, however, he was again confined, but declared innocent of any charge save that of "practising to contrive the justification of his vain title with Ministers beyond the seas." In December he was liberated and placed under the care of his father, but next year he was again arrested and accused of a conspiracy against the government. His petitions for a licence to undertake an expedition by sea, wherein he declared "his end was honour which some base minds call ambition," were refused, but in 1599 he was apparently again restored to favour. On the 4th of May 1605 he was created by James I. Baron Arundell of Wardour, but fell again under temporary suspicion at the time of the Gunpowder Plot. In 1623 he once more got into trouble by championing the cause of the recusants, of whom he was himself one, on the occasion of the visit of the Spanish envoys, and he was committed to custody, and in 1625 all the arms were removed by the government from Wardour Castle. After the accession of Charles I. he was pardoned, and attended the sittings of the House of Lords. He was indicted in the king's bench about the year 1627 for not paying some contribution, and in 1632 he was accused of harbouring a priest. In 1637 he was declared exempt from the recusancy laws by the king's order, but in 1639 he again petitioned for relief. The same year he paid £500 in lieu of attending the king at York. He died on the 7th of November 1639. Arundell was an earnest Roman Catholic, but the suspicions of the government as to his loyalty were probably unfounded and stifled a career destined by nature for successful adventure. He married (1) Mary, daughter of Henry Wriothesley, 2nd earl of Southampton, by whom besides other children he had Thomas, who succeeded him as 2nd baron; and (2) Anne, daughter of Miles Philipson, by whom he had several daughters.

Henry Arundell, 3rd Baron Arundell of Wardour (*c.* 1607-1694), son of Thomas, 2nd baron, and of Blanche, daughter of Edward, earl of Worcester, was born on the 21st of July 1607, and succeeded on his father's death in 1643 to the family title and estates. A strong royalist and Roman Catholic, he supported the king's cause, and distinguished himself in 1644 by the recapture of his castle at Wardour from the parliamentarians, who had taken it in the previous year in spite of his mother's brave defence of the place. In 1648 he was one of the delinquents exempted from pardon in the proposals sent to Charles in the Isle of Wight. His estates had been confiscated, but he was permitted about 1653 to compound for them in the sum of £35,000. In 1652, in consequence of his being second at a duel in which one of the combatants was killed, he was arrested, and tried in 1653; he pleaded his peerage, but the privilege was disallowed as the House of Lords had been abolished. At the Restoration he regained possession of the family estates, and in 1663 was made master of the horse to Henrietta Maria. He was one of the few admitted to the king's confidence concerning the projects for the restoration of the Roman Catholic religion and the alliance with France. In 1669 he took part in the secret council assembled by Charles II., and in October was sent to France, ostensibly for the funeral of Henrietta Maria, but in reality to negotiate with Louis XIV. the agreement which took shape in 1670 in the treaties of Dover (see Charles II.). In 1676 he was privy to James's negotiations with Rome through Coleman. He was accused in 1678 by Titus Oates of participation in the popish plot, and was one of the five Roman Catholic peers arrested and imprisoned in the Tower in October, found guilty by the Middlesex grand jury of high treason, and impeached subsequently by the parliament. Lord Stafford was found guilty and executed in December 1680, but after the perpetration of this injustice the proceedings were interrupted, and the three surviving peers were released on bail on the 12th of February 1684. On the 22nd of May 1685, after James II.'s accession, the charge was annulled, and on the 1st of June 1685 they obtained their full liberty. In February 1686, with other Roman Catholics, Arundell urged upon the king the removal of his mistress, Lady Dorchester, on account of her strong Protestantism. In spite of his religion he was made a privy councillor in August 1686, and keeper of the privy seal in 1687, being excused from taking the oaths by the king's dispensation. He presented the thanks of the Roman Catholics to James in June 1687 for the declaration of indulgence. His public career ended with the abdication of the king, and he retired to Breamore, the family residence since the destruction of Wardour Castle. He died on the 28th of December 1694. He was the author of five religious poems said to be composed during his confinement in the Tower in 1679, published the same year and reprinted in *A Collection of Eighty-six Loyal Poems* in 1685. His piety and benevolence to his unfortunate co-religionists were conspicuous. Evelyn calls him "very good company" and he was a noted sportsman, the Quorn pack being descended from his pack of hounds at Breamore. He married Cecily, daughter of Sir Henry Compton, by whom besides other children he had Thomas, who succeeded him as 4th baron.

The barony is still held in the Arundell family, which has never ceased to be Roman Catholic. The 14th baron (b. 1859) was a direct descendent of the 6th.

ARUSIANUS MESSIUS, or Messus, Latin grammarian, flourished in the 4th century A.D. He was the author of a small extant work *Exempla Elocutionum*, dedicated to Olybrius and Probinus, consuls for the year 395. It contains an alphabetical list, chiefly of verbs admitting more than one construction, with examples from each of the four writers, Virgil, Sallust, Terence and Cicero. Cassiodorus, the only writer who mentions Arusianus, refers to it by the term Quadriga. 711

See Keil, *Grammatici Latini*, vii.; Suringar, *Historia Critica Scholiastarum Latinorum* (1834-1835); Van der Hoeven, *Specimen Literarium* (1845).

ARVAL BROTHERS (Fratres Arvales), in Roman antiquities, a college or priesthood, consisting of twelve members, elected for life from the highest ranks in Rome, and always apparently, during the empire, including the emperor. Their chief duty was to offer annually public sacrifice for the fertility of the fields (Varro, *L. L.* v. 85). It is generally held that the college was founded by Romulus (see Acca Larentia). This legend probably arose from the connexion of Acca Larentia, as *mater Larum*, with the Lares who had a part in the religious ceremonies of the Arvales. But apart from this, there is proof of the high antiquity of the college, which was said to have been older than Rome itself, in the verbal forms of the song with which, down to late times, a part of the ceremonies was accompanied, and which is still preserved. It is clear also that, while the members were themselves always persons of distinction, the duties of their office were held in high respect. And yet it is singular that no mention of them occurs in Cicero or Livy, and that altogether literary allusions to them are very scarce. On the other hand, we possess a long series of the *acta* or minutes of their proceedings, drawn up by themselves, and inscribed on stone. Excavations, commenced in the 16th century and continued to the 19th, in the grove of the Dea Dia about 5 m. from Rome, have yielded 96 of these records from A.D. 14 to 241. The brotherhood appears to have languished in obscurity during the republic, and to have been revived by Augustus. In his time the college consisted of a master (*magister*), a vice-master (*promagister*), a *flamen*, and a *praetor*, with eight ordinary members, attended by various servants, and in particular by four chorus boys, sons of senators, having both parents alive. Each wore a wreath of corn, a white fillet and the praetexta. The election of members was by co-optation on the motion of the president, who, with a flamen, was himself elected for one year. The great annual festival which they had to conduct was held in honour of the anonymous Dea Dia, who was probably identical with Ceres. It occupied three days in May. The ceremony of the first day took place in Rome itself, in the house of the magister or his deputy, or on the Palatine in the temple of the emperors, where at sunrise fruits and incense were offered to the goddess. A sumptuous banquet took place, followed by a distribution of doles and garlands. On the second and principal day of the festival the ceremonies were conducted in the grove of the Dea Dia. They included a dance in the temple of the goddess, at which the song of the brotherhood was sung, in language so antiquated that it was hardly intelligible (see the text and translation in Mommsen, *Hist, of Rome*, bk. i. ch. xv.) even to Romans of the time of Augustus, who regarded it as the oldest existing document in their mother-tongue. Especial mention should be made of the ceremony of purifying the grove, which was held to be defiled by the felling of trees, the breaking of a bough or the presence of any iron tools, such as those used by the lapidary who engraved the records of the proceedings on stone. The song and dance were followed by the election of officers for the next year, a banquet and

races. On the third day the sacrifice took place in Rome, and was of the same nature as that offered on the first day. The Arvales also offered sacrifice and solemn vows on behalf of the imperial family on the 3rd of January and on other extraordinary occasions. The brotherhood is said to have lasted till the time of Theodosius. The British Museum contains a bust of Marcus Aurelius in the dress of a Frater Arvalis.

Marini, *Atti e Monumenti de' Fratri Arvali* (1795); Hoffmann, *Die A.* (1858): Oldenberg, *De Sacris Fratrum A.* (1875); Bergk, *Das Lied der Arvalbrüder* (1856); Bréal, "Le Chant des Arvals" in *Mém. de la Soc. de Linguistique* (1881); Edon, *Nouvelle Étude sur le Chant Lémural* (1884); *Corpus Inscriptionum Latinarum*, vi. 2023-2119; Henzen, *Acta Fratrum Arvalium* (1874).

ARVALS, Arvels or Arthels (O. Norse *Arfr*, inheritance, and *öl*, A.S. Ale, a banquet), primarily the funeral dinner, and later, especially in the north of England, a thin, light, sweet cake, spiced with cinnamon and nutmeg, served to the poor at such feasts. The funeral meal was called the Arvel-dinner. The custom seems to have been to hold on such occasions an informal inquest, when the corpse was publicly exposed, to exculpate the heir and those entitled to the property of the dead from all accusations of foul play.

ARVERNI, the name of an ancient Gaulish tribe in the Auvergne, which still bears its name. It resisted Caesar longer than most of Gaul; when once vanquished it adopted Roman civilization readily. Its tribal deity, the god of the mountain, the Puy de Dôme, rechristened in Roman phrase Mercurius Dumias, was famous far beyond its territory. Part of his temple has been excavated recently.

ARYAN, a term which has been used in a confusing variety of significations by different philologists. By Max Müller especially it was employed as a convenient short term for the whole body of languages more commonly known as Indo-European (*q.v.*) or Indo-Germanic. In the same way Max Müller used Aryas as a general term for the speakers of such languages, as in his book published in 1888, *Biographies of Words and the Home of the Aryas*. "Aryas are those who speak Aryan languages, whatever their colour, whatever their blood. In calling them Aryas we predicate nothing of them except that the grammar of their language is Aryan" (p. 245). It is to be observed, therefore, that Max Müller is careful to avoid any ethnological signification. The Aryas are those who speak Aryan without regard to the question whether Aryan is their *hereditary* language or not. As he says still more definitely elsewhere in the same work (p. 120), "I have declared again and again that if I say Aryas, I mean neither blood nor bones, nor hair nor skull; I mean simply those who speak an Aryan language. The same applies to Hindus, Greeks, Romans Germans, Celts and Slaves. When I speak of them I commit myself to no anatomical characteristics. The blue-eyed and fair-haired Scandinavians may have been conquerors or conquered, they may have adopted the language of their darker lords or their subjects, or vice versa. I assert nothing beyond their language when I call them Hindus, Greeks, Romans, Germans, Celts and Slaves; and in that sense, and in that sense only, do I say that even the blackest Hindus represent an earlier stage of Aryan speech and thought than the fairest Scandinavians.... To me an ethnologist who speaks of Aryan race, Aryan blood, Aryan eyes and hair, is as great a sinner as a linguist who speaks of a dolichocephalic dictionary or a brachycephalic grammar."

From the popularity of Max Müller's works on comparative philology this is the use of the word which is most familiar to the general public. The arguments in support of this use are set forth by him in the latter part of lecture vi. of the *Lectures on the Science of Language* (first series) and as an appendix to chap. vii. of the final edition (i. pp. 291 ff.). The Sanskrit usage of the word is fully illustrated by him from the early Sanskrit writings in the article "Aryan" in the ninth edition of this encyclopaedia. From the earliest occurrences of the word it is clear that it was used as a national name not only in India but also in Bactria and Persia (in Sanskrit *árya-* and *ārya*, in Zend *airya-*, in Old Persian *ariya-*). That it is in any way connected with a Sanskrit word for earth, *íra*, as Max Müller asserts, is far from certain. As Spiegel remarks (*Die arische Periode*, p. 105), though it is easy enough to connect the word with a root *ar-*, there are several roots of that form which have different meanings, and there is no certain criterion whereby to decide to which of them it is related. Nor are the other connexions for the word outside this group free from doubt. It is, however, certain that the connexion with *Erin* (Ireland), which Pictet in his article "Iren and Arier" (Kuhn and Schleicher's *Beiträge*, i. 1858, pp. 81 ff.) sought to establish, is impossible (Whitley Stokes in Max Müller's *Lectures*, 1891, i. pp. 299 f.), though the word may have the same origin as the *Ario-* of names like *Ariovistus*, which is found in both Celtic and Germanic words (Uhlenbeck, *Kurzgefasstes etymologisches Wörterbuch der altindischen Sprache*, s.v.). The name of Armenia (Old Persian *Armina-*), which has often been connected, is of uncertain origin. Within Sanskrit itself probably two words have to be distinguished: (1) *árya*, the origin of Aryan, from which the usual term *ārya* is a derivative; (2) *aryá*, which frequently appears in the *Rig Veda* as an epithet of deities. In many passages, however, *aryás* may equally well be the genitive of *arí*, which is explained as "active, devoted, pious." Even in this word probably two originally separate words have to be distinguished, for the further meanings which Grassmann in his dictionary to the *Rig Veda* attaches to it, viz. "greedy" (for treasure and for battle), "godless," "enemy," seem more appropriately to be derived from the same source as the Greek ἔρι-ς, "strife." The word *árya-* is not found as a national name in the *Rig Veda*, but appears in the *Vājasaneyi-sainhita*, where it is explained by Mahīdhara as *Vaisya-*, a cultivator or a man of the third among the original four classes of the population. So in the *Atharva Veda* (iv. 20. 4; xix. 62. 1) it is contrasted with the Śudra or fourth class (Spiegel, *Arische Periode*, p. 102). In the *Avesta, airya-* is found both as adjective and substantive in the sense of Aryan, but no light is thrown upon the history of the word. Darius describes himself in an inscription as of Aryan stock, *Dārayaʰvaʰuš ariyaʰčivrʳaʰ*. In the *Avesta* the derivative *airyana-* is also found in the sense of Aryan. In both India and Persia a word is found (Skt. *aryaman-*; Zend *airyaʰman-*) which is apparently of the same origin. In both Sanskrit and Zend it means something like "comrade" or "bosom friend," but in Zend is used of the priestly or highest class. In Sanskrit, besides this use in which it is contrasted with the *Dāsa* or *Dāsyu*, the enemies, the earlier inhabitants, the word is often used for the bridegroom's spokesman, and in both languages is also employed as the name of a divine being. In the *Rig Veda, Aryaman-* as a deity is most frequently coupled with Mitra and Varuna (Grassmann, *Wörterbuch*, s.v.); in Zend, according to Bartholomae (*Altiranisches Wörterbuch*, s.v.), from the earliest literature, the Gathas, there is nothing definite to be learnt regarding *Airyaman*.

Whatever the origin of *arya-*, however, it is clear that it is a word with dignified associations, by which the peoples belonging to the Eastern section of the Indo-Europeans were proud to call themselves. It is now used uniformly by scholars to indicate the Eastern branch as a whole, a compound, *Indo-Aryan*, being employed for that part of the Eastern branch which settled in India to distinguish them from the Iranians (*Iran* is of the same origin), who remained in Bactria and Persia, while *Aryo-Indian* is sometimes employed to distinguish the Indian people of this stock from the Dravidian and other stocks which also inhabit parts of the Indian peninsula. Of the stages in the occupation of the Iranian table-land by the Aryan people nothing is known, the people themselves having apparently no tradition of a time when they did not hold these territories (Spiegel, *Arische Periode*, p. 319). Though the Hindus have no tradition of their invasion of India, it is certain that they are not an indigenous people, and, if they are not, it is clear that they could have come in no other direction save from the other side of the Hindu Kush. At the period of their earliest literature, which may be assigned roughly to about 1000 B.C., they were still settled in the valley of the Indus, and at this time the separation probably had not long taken place, the Eastern portion of the stock having pushed their way along the Kabul valley into the open country of the Indus. According to Professor E.W. Hopkins (*India Old and New*, 1901, p. 31) the *Rig Veda* was composed in the district about Umballa. He argues that the people must have been then to the west of the great rivers, otherwise the dawn could not be addressed as one who "in shining light, before the wind arises, comes gleaming over the waters, making good paths." The vocabulary is still largely the same; whole sentences can be transliterated from one language to the other merely by making regular phonetic changes and without the variation of a single word (for examples see Bartholomae, *Handbuch der altiranischen Dialekte*, 1883, p. v.; Williams Jackson, *Avesta Grammar*, 1892, pp. xxxi. f.; *Grundriss der iranischen Philologie*, 1895, i. p. 1). It is noteworthy that it is those who remain behind whose language has undergone most change.

By four well-marked characteristics the Aryan group is easily distinguishable from the other Indo-European languages. (1) By the confusion of original *e* and *o*, both long and short, with the original long and short *a* sound; (2) the short schwa-sound ə is represented here, and in this group only, by *i* (*pita*, "father," as compared with πατήρ, &c.); (3) original *s* after *i*, *u* and some consonants becomes ṣ; (4) the genitive plural of stems ending in a vowel has a suffix-*nām* borrowed by analogy from the stems ending in *-n* (Skt. *áśvānām*, "of horses"; Zend *aspānām*; Old Persian *aspānām*). The distinctions between Sanskrit and Iranian are also clear, (1) The Aryan voiced aspirates *gh, dh, bh,* which survive in Sanskrit, are confused in Iranian with original *g, d, b,* and further changes take place in the language of the later parts of the Avesta; (2) the Aryan breathed aspirates *kh, th, ph,* except in combination with certain consonants, become spirants in Iranian; (3) Aryan *s* becomes *h* initially before vowels in Iranian and also in certain cases medially, Iranian in these respects resembling Greek (cf. Skt. *saptá*; Zend *hapta*; Gr. ἑπτά, "seven"); (4) in Zend there are many vowel changes which it does not share with Old Persian. Some of these arise from the umlaut or epenthesis which is so prevalent, and which we have already seen in *airya-* as compared with the Skt. *árya*. In other respects the languages are remarkably alike, the only striking difference being in the numeral "one"—Skt. *eka-*; Zend *aeva-*; Old Persian *aiva-*, where the Iranian group has the same stem as that seen in the Greek οἶ(*F*)ο-ς, "alone."

For the subdivisions of the two groups see the articles on Persia: *Language*, and Indo-Aryan Languages. Dr Grierson has shown in his monograph on "The Pisaca Languages of North-Western India" (Royal Asiatic Society, 1906) that there is good reason for regarding various dialects of the north-western frontier (Kafiristan, Chitral, Gilgit, Dardistan) as a separate group descended from Aryan but independent of either Sanskrit or Iranian.

The history of the separation of the Aryan from the other Indo-European languages is not yet clear (see Indo-European Languages). Various attempts have been made, with little success, to identify fragments of unknown languages in cuneiform inscriptions with members of this group. The investigation has entered a new and more favourable stage as the result of the discoveries made by German excavators at Boghaz Keui (said to be identical with Herodotus' Pteria in Cappadocia), where treaties between the king of the Hittites and the king of Mitanni, in the beginning of the 14th century B.C., seem almost certainly to contain the names of the gods Mitra, Varuna and Indra, which belong to the early Aryan mythology (H. Winckler, *Mitteilungen der deutschen Orientgesellschaft*, No. 35; E. Meyer, *Sitzungsberichte der Berliner Akademie*, 1908, pp. 14 ff.; *Zeitschrift für vergleichende Sprachforschung*, 42, 1908, pp. 24 ff.). Still further light is to be expected when the vast collections of the German expedition to Turfan (Turkestan) have been sifted. Up to 1909 only a preliminary account had been given of Tocharish, a hitherto unknown Indo-European language, which is reported to be in some respects more akin to the Western groups than to Aryan. But further investigation is still required (see E. Sieg and W. Siegling, "Tocharisch, die Sprache der Indoskythen," in *Sitzungsberichte der Berl. Akad.* (July 1908, pp. 915 ff.).

(P. Gɪ.)

ARYA SAMAJ, a Hindu religious association with reforming tendencies, which was founded by a Guzerati Brahman named Dayanand Saraswati. This man was born of a Saivite family about 1825, but in early manhood grew dissatisfied with idol-worship. He undertook many pilgrimages and studied the Vedic philosophy in the hope of solving the old problem of the Buddha,—how to alleviate human misery and attain final liberation. About 1866, when he had begun to teach and to gather disciples, he first saw the Christian scriptures, which he vehemently assailed, and the *Rig Veda*, which he correspondingly exalted, though in the conception which he ultimately formed of God the former was much more influential than the latter. Dayanand's treatment of the Vedas was peculiar, and consisted of reading into them his own beliefs and modern scientific discoveries. Thus he explains the *Yajna* (sacrificial cult) as "the entertainment of the learned in proportion to their worth, the business of manufacture, the experiment and application of chemistry, physics and the arts of peace; the instruction of the people, the purification of the air, the nourishment of vegetables by the employment of the principles of meteorology, called *Agni-Notri* in Sanskrit." He denied that the *Vedas* warranted the caste system, but wished to retain the four grades as orders of learning to which admission should be won by examination.

These views naturally met with scanty acceptance among the Brahmans to whom he introduced them, and Dayanand turned to the masses and established *Samajes* in various parts of India, the first being at Bombay in 1875. He chose the epithet Arya as being more dignified than the slightly contemptuous term Hindu. After a successful series of tours, during which he debated publicly with orthodox pundits and with Christian missionaries, he died at Ajmere in 1883.

The Arya Samaj is not an eclectic system like the Brahma Samaj, which strives to find the common basis underlying all the great religions, and its narrower scope and corresponding intensity of conviction have won it a greater strength. It seemed to meet the feeling of many educated natives whose faith in current Hinduism was undermined, but who were predisposed against any foreign religious influence. Their patriotic ardour gladly seized on "a view of the original faith of India that seemed to harmonize with all the discoveries of modern science and the ethics of European civilization," and they cheerfully supported their leader's strange polemic with the agnostic and rationalist literature of Europe. By 1890 their numbers had increased to 40,000, by 1900 to over 92,000. Divisions had, however, set in, especially a cleavage into the *Ghasi* or vegetarian, and the *Mansi* or flesh-eating sections. To the latter belong those Rajputs who though generally in sympathy with the movement declined to adhere to the tenet of the *Samaj* which forbade the destruction of animal life and the consumption of animal food. The age of admission to the Samaj is eighteen, and members are expected to contribute to its funds at least 1% of their income.

The ten articles of their creed may be summarized thus:—

1. The source of all true knowledge is God.
2. God is "all truth, all knowledge, all bliss, boundless, almighty, just, merciful, unbegotten, without a beginning, incomparable, the support and Lord of all, all-pervading, omniscient, imperishable, immortal, eternal, holy, and the cause of the universe; worship is due to him alone."
3. The medium of true knowledge is the *Vedas*.
4. and 5. The truth is to be accepted and to become the guiding principle.
6. The object of the Samaj is to benefit the world by improving its physical, social, intellectual and moral conditions.
7. Love and justice are the right guides of conduct.
8. Knowledge must be spread.
9. The good of others must be sought.
10. In general interests members must subordinate themselves to the good of others; in personal interests they should retain independence.

The sixth clause comprehends a wide programme of reform, including abstinence from spirituous liquors and animal food, physical cleanliness and exercise, marriage reform, the promotion of female education, the abolition of caste and of idolatry.

ARYTENOID (or *arytaenoid*; from Gr. ἀρύταινα, a funnel or pitcher), a term, meaning funnel-shaped, applied to cartilages such as those of the larynx.

ARZAMAS, a town of Russia, in the government of, and 76 m. by rail S. of the town of, Nizhniy-Novgorod, on the Tesha river, at its junction with the Arsha. It is an important centre of trade, and has tanneries, oil, flour, tallow, dye, soap and iron works; knitting is an

important domestic industry. Sheepskins and sail-cloth are articles of trade. The town has several churches. Pop. (1897) 10,591.

AS, the Roman unit of weight and measure, divided into 12 *unciae* (whence both "ounce" and "inch"); its fractions being deunx 11/12, dextrans 5/6, dodrans 3/4, bes 2/3, septunx 7/12, semis 1/2, quincunx 5/12, triens 1/3, quadrans 1/4, sextans 1/6, sescuncia 1/8, uncia 1/12. *As* really denoted any integer or whole; whence the English word "ace." The unit or *as* of weight was the *libra* (pound: = about 11 4/5 oz. avoirdupois); of length, *pes* (foot: = about 11 3/5 in.); of surface, *jugerum* (= about 2/3 acre); of measure, liquid *amphora* (about 5 3/5 gal.), dry *modius* (about 9/10 peck). In the same way *as* signified a whole inheritance; whence *heres ex asse*, the heir to the whole estate, *heres ex semisse*, heir to half the estate. It was also used in the calculation of rates of interest.

As was also the name of a Roman coin, which was of different weight and value at different periods (see Numismatics, § *Roman*). The first introduction of coined money is ascribed to Servius Tullius. The old *as* was composed of the mixed metal *aes*, an alloy of copper, tin and lead, and was called *as libralis*, because it nominally weighed 1 lb or 12 ounces (actually 10). Its original shape seems to have been an irregular oblong bar, which was stamped with the figure of a sheep, ox or sow. This, as well as the word *pecunia* for money (*pecus*, cattle), indicates the fact of cattle having been the earliest Italian medium of exchange. The value was indicated by little points or globules, or other marks. After the round shape was introduced, the one side was always inscribed with the figure of a ship's prow, and the other with the double head of Janus. The subdivisions of the *as* had also the ship's prow on one side, and on the other the head of some deity. The First Punic War having exhausted the treasury, the *as* was reduced to 2 oz. In the Second Punic War it was again reduced to half this weight, viz. to 1 oz. And lastly, by the Papirian law (89 B.C.) it was further reduced to the diminutive weight of half an ounce. It appears to have been still more reduced under Octavian, Lepidus and Antony, when its value was 1/3 of an ounce. Before silver coinage was introduced (269 B.C.) the value of the *as* was about 6d., in the time of Cicero less than a halfpenny. In the time of the emperor Severus it was again lowered to about 5/24 of an ounce. During the commonwealth and empire *aes grave* was used to denote the old as in contradistinction to the existing depreciated coin; while *aes rude* was applied to the original oblong coinage of primitive times.

ASA, in the Bible, son (or, perhaps, rather brother) of Abijah, the son of Rehoboam and king of Judah (1 Kings xv. 9-24). Of his long reign, during which he was a contemporary of Baasha, Zimri and Omri of Israel, little is recorded with the exception of some religious reforms and conflicts with the first-named. Baasha succeeded in fortifying Ramah (*er-Rām*), 5 m. north of Jerusalem, and Asa was compelled to use the residue of the temple-funds (cf. 1 Kings xiv. 26) to bribe the king of Damascus to renounce his league with Baasha and attack Israel. Galilee was invaded and Baasha was forced to return; the building material which he had collected at Ramah being used by Asa to fortify Geba, and Mizpah to the immediate north of Jerusalem. The Book of Chronicles relates a story of a sensational defeat of Zerah the "Cushite," and a great religious revival in which Judah and Israel took part (2 Chron. xiv.-xv. 15) (see Chronicles). Asa was succeeded by his son Jehoshaphat.

"Cushite" may designate an Ethiopian or, more probably, an Arabian (Cush, the "father" of the Sabaeans, Gen. x. 7). "If by Zerah the Ethiopian or Sabaean prince be meant, the only real difficulty of the narrative is removed. No king Zerah of Ethiopia is known at this period, nor does there seem to be room for such a person." (W.E. Barnes, *Cambridge Bible*, Chronicles, p. xxxi.). The identification with Osorkon I. or II. is scarcely tenable considering Asa's weakness; but inroads by desert hordes frequently troubled Judah, and if the tradition be correct in locating the battle at Mareshah it is probable that the invaders were in league with the Philistine towns. Similar situations recur in the reigns of Ahaz and Jehoram.

See also Wellhausen, *Prolegomena*, 208; S.A. Cook, *Expositor* (June 1906), p. 540 sq.

(S. A. C.)

ASAFETIDA (*asa*, Lat. form of Persian *aza* = mastic, and fetidus, stinking, so called in distinction to *asa dulcis*, which was a drug highly esteemed among the ancients as *laser cyrenaicum*, and is supposed to have been a gummy exudation from *Thapsis garganica*), a 714
gum-resin obtained principally from the root of *Ferula fetida,* and probably also from one or two other closely allied species of umbelliferous plants. It is produced in eastern Persia and Afghanistan, Herat and Kandahar being centres of the trade. *Ferula fetida* grows to a height of from 5 to 6 ft., and when the plant has attained the age of four years it is ready for yielding asafetida. The stems are cut down close to the root, and the juice flows out, at first of a milky appearance, but quickly setting into a solid resinous mass. Fresh incisions are made as long as the sap continues to flow, a period which varies according to the size and strength of the plant. A freshly-exposed surface of asafetida has a translucent, pearly-white appearance, but it soon darkens in the air, becoming first pink and finally reddish-brown. In taste it is acrid and bitter; but what peculiarly characterizes it is the strong alliaceous odour it emits, from which it has obtained the name asafetida, as well as its German name *Teufelsdreck* (devil's dung). Its odour is due to the presence of organic sulphur compounds. Asafetida is found in commerce in "lump" or in "tear," the latter being the purer form. Medicinally, asafetida is given in doses of 5 to 15 grains and acts as a stimulant to the intestinal and respiratory tracts and to the nervous system. An enema containing it is useful in relieving flatus. It is sometimes useful in hysteria, which is essentially a lack of inhibitory power, as its nasty properties induce sufficient inhibitory power to render its readministration superfluous. It may also be used in an effervescing draught in cases of malingering, the drug "repeating" in the mouth and making the malingering not worth while. The gum-resin is relished as a condiment in India and Persia, and is in demand in France for use in cookery. In the regions of its growth the whole plant is used as a fresh vegetable, the inner portion of the full-grown stem being regarded as a luxury.

ASAF-UD-DOWLAH, nawab wazir of Oudh from 1775 to 1797, was the son of Shuja-ud-Dowlah, his mother and grandmother being the begums of Oudh, whose spoliation formed one of the chief counts in the charges against Warren Hastings. When Shuja-ud-Dowlah died he left two million pounds sterling buried in the vaults of the zenana. The widow and mother of the deceased prince claimed the whole of this treasure under the terms of a will which was never produced. When Warren Hastings pressed the nawab for the payment of debt due to the Company, he obtained from his mother a loan of 26 lakhs of rupees, for which he gave her a *jagir* of four times the value; he subsequently obtained 30 lakhs more in return for a full acquittal, and the recognition of her *jagirs* without interference for life by the Company. These *jagirs* were afterwards confiscated on the ground of the begum's complicity in the rising of Chai Singh, which was attested by documentary evidence. The evidence now available seems to show that Warren Hastings did his best throughout to rescue the nawab from his own incapacity, and was inclined to be lenient to the begums.

See *The Administration of Warren Hastings, 1772-1785,* by G.W. Forrest (1892).

ASAPH, the eponym of the Asaphite gild of singers, one of the hereditary choirs that superintended the musical services of the temple at Jerusalem in post-exilic times. The names occur in the titles of certain Psalms, and the writer of the Book of Chronicles makes Asaph a seer (2 Chron. xxix. 30), contemporary with David and Solomon, and chief of the singers of his time.

ASBESTOS, a fibrous mineral from Gr. ἄσβεστος, unquenchable, by transference, incombustible, in allusion to its power of resisting the action of fire. The word was applied by Dioscorides and other Greek authors to quicklime, but Pliny evidently used it in its modern sense. It was occasionally woven by the ancients into handkerchiefs, and, it has been said, into shrouds which were used in cremation to prevent the ashes of the corpse from mingling with the wood-ashes of the pyre.

In different varieties of asbestos the fibres vary greatly in character. When silky and flexible they are sometimes known as mountain flax. The finer kinds are often termed amianthus (*q.v.*). When the fibres are naturally interwoven, so as to form a felted mass, the mineral passes under such trivial names as mountain leather, mountain cork, mountain paper, &c. The asbestos formerly used in the arts was generally a fibrous form of some kind of amphibole, like tremolite, or anthophyllite, though occasionally perhaps a pyroxene. In recent years, however, most of the asbestos in the market is a fibrous variety of serpentine, known mineralogically as chrysotile, and probably some of the ancient asbestos was of this character (see Amianthus). Both minerals possess similar properties, so far as resistance to heat is concerned. The amphibole-asbestos, or hornblende-asbestos, is usually white or grey in colour, and may present great length of fibre, some of the Italian asbestos reaching exceptionally a length of 5 or 6 ft., but it is often harsh and brittle. The serpentine-asbestos occurs in narrow veins, yielding fibres of only 2 or 3 in. in length, but of great tensile strength: they are usually of a delicate silky lustre, very flexible and elastic, and of yellowish or greenish colour.

The Canadian asbestos, which of all kinds is at present the most important industrially, occurs in a small belt of serpentine in the province of Quebec, principally near Black Lake and Thetford, where it was first recognized as commercially valuable about 1877. The rock is generally quarried, cobbed by hand, dried if necessary, crushed in rock-breakers, and then passed between rollers; it is reduced to a finer state of division by so-called fiberizers, and graded on a shaking screen, where the loosened fibres are sorted. The process varies in different mills.

In the United States asbestos is worked only to a very limited extent. An amphibole-asbestos is obtained from Sall Mountain, Georgia; and asbestos has also been worked in the serpentine of Vermont. It occurs also in South Carolina, Virginia, Massachusetts, Arizona and elsewhere. Dr G.P. Merrill has shown that some asbestos results from a process of shearing in the rocks.

Formerly asbestos was obtained almost exclusively from Italy and Corsica, and a large quantity is still yielded by Italian workings. This is mostly an amphibole. It is in some cases associated with nodules of green garnet known as "seeds"— *Semenze dell' amianto.* Asbestos is widely distributed, but only in a few localities does it occur in sufficient abundance and purity to be worked commercially; it is found, for example, to a limited extent, at many localities in Tirol, Hungary and Russia; Queensland, New South Wales and New Zealand. In the British Isles it is not unknown, being found among the old rocks of North Wales and in parts of Ireland. Byssolite or asbestoid is a blue or green fibrous amphibole from Dauphiny.

The Asbestos Mountains in Griqualand West, Cape Colony, yield a blue fibrous mineral which is worked under the name of Cape asbestos. This is referable to the variety of amphibole called crocidolite (*q.v.*). It occurs in veins in slaty rocks, associated with jaspers and quartzites rich in magnetite and brown iron-ore. Their geological position is in the Griqua Town series, belonging to what are known in South Africa as the Pre-Cape rocks.

Asbestos was formerly spun and woven into fabrics as a rare curiosity. Charlemagne is said to have possessed a tablecloth of this material, which when soiled was purified by being thrown into the fire. At a meeting of the Royal Society in 1676 a merchant from China exhibited a handkerchief of "salamander's wool," or *linum asbesti.* By the Eskimos of Labrador asbestos has been used as a lamp-wick, and it received a similar application in some of the sacred lamps of antiquity. In recent times asbestos has been applied to a great variety of uses in the industrial arts, and its applications are constantly increasing. Its economic value depends not only on its power of withstanding a high temperature, but also on its low thermal conductivity and its partial resistance to the attack of acids: hence it is used for jacketing boilers and steam-pipes, and as a filtering medium for corrosive liquids. It has also come into use as an electric insulator. It is made into yarn, felt, millboard, &c., and is largely employed as packing for joints, glands and stopcocks in machinery. Fire-proof sheathing and felt are used for flooring and roofing; fire-proof curtains have been made for the stage, and even clothing for firemen. Asbestos enters into the composition of fire-proof cements, plasters and paints: it is used for packing safes; and is made into balls with fire-clay for gas-stoves. Various preparations of asbestos with other materials pass in trade under such names as uralite, salamandrite, asbestolith, gypsine, &c. "Asbestic" is the name given to a Canadian product formed by crushing the serpentine rock containing thin seams of asbestos, and mixing the result with lime so as to form a plaster.

References.—Fritz Cirkel, *Asbestos, its Occurrence, Exploitation and Uses* (Ottawa, 1905); J.H. Pratt and J.S. Diller in Annual Reports on Mineral Resources, U.S. Geol. Survey; G.P. Merrill, *The Non-metallic Minerals* (New York, 1904); R.H. Jones, *Asbestos and Asbestic* (London, 1897).

(F. W. R.*)

ASBJÖRNSEN, PETER CHRISTEN (1812-1885), and **MOE, JÖRGEN ENGEBRETSEN** (1813-1882), collectors of Norwegian folklore, so closely united in their life's work that it is unusual to name them apart. Asbjörnsen was born in Christiania on the 15th of January 1812; he belonged to an ancient family of the Gudbrandsdal, which is believed to have died with him. He became a student at the university in 1833, but as early as 1832, in his twentieth year, he had begun to collect and write down all the fairy stories and legends which he could meet with. Later he began to wander on foot through the length and breadth of Norway, adding to his stores. Moe, who was born at Mo i Hole parsonage, in Sigdal Ringerike, on the 22nd of April 1813, met Asbjörnsen first when he was fourteen years of age. A close friendship began between them, and lasted to the end of their lives. In 1834 Asbjörnsen discovered that Moe had started independently on a search for the relics of national folklore; the friends eagerly compared results, and determined for the future to work in concert. By this time, Asbjörnsen had become by profession a zoologist, and with the aid of the university made a series of investigating voyages along the coasts of Norway, particularly in the Hardanger fjord. Moe, meanwhile, having left Christiania University in 1839, had devoted himself to the study of theology, and was making a living as a tutor in Christiania. In his holidays he wandered through the mountains, in the most remote districts, collecting stories. In 1842-1843 appeared the first instalment of the great work of the two friends, under the title of *Norwegian Popular Stories* (*Norske Folkeeventyr*), which was received at once all over Europe as a most valuable contribution to comparative mythology as well as literature. A second volume was published in 1844, and a new collection in 1871. Many of the *Folkeeventyr* were translated into English by Sir George Dasent in 1859. In 1845 Asbjörnsen published, without help from Moe, a collection of Norwegian fairy tales (*huldreeventyr og folkesagn*). In 1856 the attention of Asbjörnsen was called to the deforestation of Norway, and he induced the government to take up this important question. He was appointed forest-master, and was sent by Norway to examine in various countries of the north of Europe the methods observed for the preservation of timber. From these duties, in 1876, he withdrew with a pension; he died in Christiania on the 6th of January 1885. From 1841 to 1852 Moe travelled almost every summer through the southern parts of Norway, collecting traditions in the mountains. In 1845 he was appointed professor of theology in the Military School of Norway. He had, however, long intended to take holy orders, and in 1853 he did so, becoming for ten years a resident chaplain in Sigdal, and then (1863) parish priest of Bragernes. He was moved in 1870 to the parish of Vestre Aker, near Christiania, and in 1875 he was appointed bishop of Christiansand. In January 1882 he resigned his diocese on account of failing health, and died on the following 27th of March. Moe has a special claim on critical attention in regard to his lyrical poems, of which a small collection appeared in 1850. He wrote little original verse, but in his slender volume are to be found many pieces of exquisite delicacy and freshness. Moe also published a delightful collection of prose stories for children, *In the Well and the Churn* (*I Bronde og i Kjærnet*), 1851; and *A Little Christmas Present* (*En liden Juleegave*), 1860. Asbjörnsen and Moe had the advantage of an admirable style in narrative prose. It was usually said that the vigour came from Asbjörnsen and the charm from Moe, but the fact seems to be that from the

long habit of writing in unison they had come to adopt almost precisely identical modes of literary expression.

(E. G.)

ASBURY, FRANCIS (1745-1816), American clergyman, was born at Hamstead Bridge in the parish of Handsworth, near Birmingham, in Staffordshire, England, on the 20th of August 1745. His parents were poor, and after a brief period of study in the village school of Barre, he was apprenticed at the age of fourteen to a maker of "buckle chapes," or tongues. It seems probable that his parents were among the early converts of Wesley; at any rate, Francis became converted to Methodism in his thirteenth year, and at sixteen became a local preacher. He was a simple, fluent speaker, and was so successful that in 1767 he was enrolled, by John Wesley himself, as a regular itinerant minister. In 1771 he volunteered for missionary work in the American colonies. When he landed in Philadelphia in October 1771, the converts to Methodism, which had been introduced into the colonies only three years before, numbered scarcely 300. Asbury infused new life into the movement, and within a year the membership of the several congregations was more than doubled. In 1772 he was appointed by Wesley "general assistant" in charge of the work in America, and although superseded by an older preacher, Thomas Rankin (1738-1810), in 1773, he remained practically in control. After the outbreak of the War of Independence, the Methodists, who then numbered several thousands, fell, unjustly, under suspicion of Loyalism, principally because of their refusal to take the prescribed oath; and many of their ministers, including Rankin, returned to England. Asbury, however, feeling his sympathies and duties to be with the colonies, remained at his post, and although often threatened, and once arrested, continued his itinerant preaching. The hostility of the Maryland authorities, however, eventually drove him into exile in Delaware, where he remained quietly, but not in idleness, for two years. In 1782 he was reappointed to supervise the affairs of the Methodist congregations in America. In 1784 John Wesley, in disregard of the authority of the Established Church, took the radical step of appointing the Rev. Thomas Coke (1747-1814) and Francis Asbury superintendents or "bishops" of the church in the United States. Dr Coke was ordained at Bristol, England, in September, and in the following December, in a conference of the churches in America at Baltimore, he ordained and consecrated Asbury, who refused to accept the position until Wesley's choice had been ratified by the conference. From this conference dates the actual beginning of the "Methodist Episcopal Church of the United States of America." To the upbuilding of this church Asbury gave the rest of his life, working with tireless devotion and wonderful energy. In 1785, at Abingdon, Maryland, he laid the corner-stone of Cokesbury College, the project of Dr Coke and the first Methodist Episcopal college in America; the college building was burned in 1795, and the college was then removed to Baltimore, where in 1796, after another fire, it closed, and in 1816 was succeeded by Asbury College, which lived for about fifteen years. Every year Asbury traversed a large area, mostly on horseback. The greatest testimony to the work that earned for him the title of the "Father of American Methodism" was the growth of the denomination from a few scattered bands of about 300 converts and 4 preachers in 1771, to a thoroughly organized church of 214,000 members and more than 2000 ministers at his death, which occurred at Spottsylvania, Virginia, on the 31st of March 1816.

His *Journals* (3 vols., New York, 1852), apart from their importance as a history of his life work, constitute a valuable commentary on the social and industrial history of the United States during the first forty years of their existence. Consult also F.W. Briggs, *Bishop Asbury* (London, 1874); W.P. Strickland, *The Pioneer Bishop; or, The Life and Times of Francis Asbury* (New York, 1858); J.B. Wakeley, *Heroes of Methodism* (New York, 1856): W.C. Larrabee, *Asbury and His Co-Laborers* (2 vols., Cincinnati, 1853); H.M. Du Bose, *Francis Asbury* (Nashville, Tenn., 1909); see also under Methodism.

ASBURY PARK, a city of Monmouth county, New Jersey, U.S.A., on the Atlantic Ocean, about 35 m. S. of New York City (50 m. by rail). Pop. (1900) 4148; (1905) 4526; (1910) 10,150. It is served by the Central of New Jersey and the Pennsylvania railways, and by electric railway lines connecting it with other New Jersey coast resorts both north and south. Fresh-water lakes, one of which, Deal Lake, extends for some distance into the wooded country, form the northern and southern boundaries. It is one of the most popular seaside resorts on the Atlantic coast, its numerous hotels and cottages accommodating a summer population that approximates 50,000, and a large transient population in the autumn and winter months. There is an excellent beach, along which extends a board-walk about 1 m. long; the beach is owned and controlled by the municipality. The municipality owns and operates its water-works, water being obtained from artesian wells. Asbury Park was founded in 1869, was named in honour of the Rev. Francis Asbury, was incorporated as a borough in 1874, and was chartered as a city in 1897. In 1906 territory to the west with a population estimated at 6000 was annexed.

ASCALON, now 'Asḳalān, one of the five chief cities of the Philistines, on the coast of the Mediterranean, 12 m. N. of Gaza. The place is mentioned several times in the Tell el-Amarna correspondence. It revolted from Egypt on two occasions, but was reconquered, and a sculpture at Thebes depicts the storming of the city. Ascalon was a well-fortified town, and the seat of the worship of the fish-goddess Derketo. Though situated in the nominal territory of the tribe of Judah, it was never for any length of time in the possession of the Israelites. The only incident in its history recorded in the Bible (the spoliation by Samson, Judg. xiv. 19) may possibly have actually occurred at another place of the same name, in the hill country of Judaea. Sennacherib took it in 701 B.C. The conquest of Alexander hellenized its civilization, and after his time it became tributary alternately to Syria and Egypt. Herod the Great was a native of the city, and added greatly to its beauty; but it suffered severely in the later wars of the Romans and Jews. In the 4th century it again rose to importance; and till the 7th century, when it was conquered by the Moslems, it was the seat of a bishopric and a centre of learning. During the first crusade a signal victory was gained by the Christians in the neighbouring plain on the 15th of August 1099; but the city remained in the hands of the caliphs till 1157, when it was taken by Baldwin III., king of Jerusalem, after a siege of five months. By Baldwin IV. it was given to his sister Sibylla, on her marriage with William of Montferrat in 1178. When Saladin (1187) had almost annihilated the Christian army in the plain of Tiberias, Ascalon offered but a feeble resistance to the victor. At first he repaired and strengthened its fortifications, but afterwards, alarmed at the capture of St Jean d'Acre (Acre) by Richard Cœur de Lion in 1191, he caused it to be dismantled. It was restored in the following year by the English king, but only to be again abandoned. From this time Ascalon lost much of its importance, and at length, in 1270, its fortifications were almost totally destroyed by Sultan Bibars, and its port was filled up with stones. The place is now a desolate heap of ruins, with remains of its walls and fragments of granite pillars. The surrounding country is well watered and very fertile.

See a paper by Guthe, "Die Ruinen Ascalons," in the *Zeitschrift* of the Deutsche Palastina-Verein, ii. 164 (translated in Palestine Exploration Fund *Quarterly Statement,* 1880, p. 182). See also C.R. Conder in the latter journal, 1875, p. 152.

(R. A. S. M.)

ASCANIUS, in Roman legend, the son of Aeneas by Creüsa or Lavinia. From Livy it would appear that tradition recognized two sons of Aeneas called by this name, the one the son of his Trojan, the other of his Latin wife. According to the usual account, he accompanied his father to Italy on his flight from Troy. On the death of Aeneas, the government of Latium was left in the hands of Lavinia, Ascanius being too young to undertake it. After thirty years he left Lavinium, and founded Alba Longa. Ascanius was also called Ilus and Iulus, and the Julian gens claimed to be descended from him. Several more or less contradictory traditions may be found in Dionysius of Halicarnassus, Strabo and other writers.

Virg. *Aen.* ii. 666; Livy i. 3; see also Klausen. *Aeneas und die Penaten* (1840).

ASCENSION, an island in the Atlantic Ocean, between 7° 53′ and 8° S., and 14° 18′ and 14° 26′ W., 800 m. N.W. of St Helena, about 7½ m. in length and 6 in breadth, with an area of 38 sq. m. and a circumference of about 22 m. The island lies within the immediate influence of the south-east trade-wind. The lee side of the island is subject to the visitation of "rollers," which break on the shore with very great violence. Ascension is a volcanic mass erected on a submarine platform. Numerous cones exist. Green Mountain, the principal elevation, is a huge elliptical crater, rising 2820 ft. above the sea, while the plains or table-lands surrounding it vary in height from 1200 to 2000 ft. On the north side they sweep gradually down towards the shore, but on the south they terminate in bold and lofty precipices. Steep and rugged ravines intersect the plains, opening into small bays or coves on the shore, fenced with masses of compact and cellular lava; and all over the island are found products of volcanic action. Ascension was originally destitute of vegetation save on the summit of Green Mountain, which owes its verdure to the mists which frequently enshroud it, but the lower hills have been planted with grasses and shrubs. The air is clear and light, and the climate remarkably healthy, notwithstanding the high temperature—the average day temperature on the shore being 85° F., on Green Mountain 75° F. The average rainfall is about 20 in., March and April being the rainy months. Ascension is noted for the number of turtles and turtle eggs found on its shores, the season lasting from December to May or June. The turtles are caught and kept in large ponds. The coasts abound with a variety of fish of excellent quality, of which the most important are the rock-cod, the cavalli, the conger-eel and the "soldier." Numbers of sheep are bred on the island, and there are a few cattle and deer, besides goats and wild cats. Feathered game is abundant. Like St Helena, the island does not possess any indigenous vertebrate land fauna. The "wideawake" birds frequent the island in large numbers, and their eggs are collected and eaten. Beetles and land-shells are well represented. Flies, ants, mosquitoes, scorpions, centipedes and crickets abound. The flora includes purslane, rock roses and several species of ferns and mosses.

The island was discovered by the Portuguese navigator, João da Nova, on Ascension Day 1501, and was occasionally visited thereafter by ships. In 1701 William Dampier was wrecked on its coast, and during his detention discovered the only spring of fresh water the island contains. Ascension remained uninhabited till after the arrival of Napoleon at St Helena (1815), when it was taken possession of by the British government, who sent a small garrison thither. A settlement, named George Town (locally known as Garrison), was made on the north-west coast, water being obtained from "Dampier's" springs in the Green Mountain, 6 m. distant. The island is under the rule of the admiralty, and was likened by Darwin to "a huge ship kept in first-rate order." It is governed by a naval captain borne on the books of the flagship of the admiral superintendent at Gibraltar. A depot of stores for the navy is maintained, but the island is used chiefly as a sanatorium. Ascension is connected by cable with Europe and Africa, and is visited once a month by mail steamers from the Cape. Formerly letters were left by passing ships in a crevice in one of the rocks. The population, about 300, consists of seamen, marines, and Krumen from Liberia.

See *Africa Pilot*, part ii., 5th ed. (London, 1901); C. Darwin, *Geological Observations on the Volcanic Islands visited during the Voyage of H.M.S. "Beagle"* (London, 1844); *Report of the Scientific Results of the Voyage of the "Challenger,"* vol. i. part 2 (London, 1885); and *Six Months in Ascension*, by Mrs Gill (London, 1878), an excellent sketch of the island and its inhabitants. It was at Ascension that Mr, afterwards Sir, David Gill determined, in 1877, the solar parallax.

ASCENSION, FEAST OF THE, one of the oecumenical festivals of the Christian Church, ranking in solemnity with those of Christmas, of Easter and of Pentecost. It is held forty days after Easter, or ten days before Whitsunday, in celebration of Christ's ascension into heaven forty days after the resurrection. It always falls on a Thursday, and the day is known as Ascension Day, or Holy Thursday. The festival is of great antiquity; and though there is no discoverable trace of it before the middle of the 4th century, subsequent references to it assume its long establishment. Thus St Augustine (*Ep.* 54 *ad Januar.*) mentions it as having been kept from time immemorial and as probably instituted by the apostles. Chrysostom, in his homily on the ascension, mentions a celebration of the festival in the church of Romanesia outside Antioch, and Socrates (*Hist. eccles.* vii. 26) records that in the year 390 the people of Constantinople "of old custom" (ἐξ ἔθους) celebrated the feast in a suburb of the city. As these two references suggest, the festival was associated with a professional pilgrimage, in commemoration of the passing of Christ and his apostles to the Mount of Olives; such a procession is described by Adamnan, abbot of Iona, as taking place at Jerusalem in the 7th century, when the feast was celebrated in the church on Mount Olivet (*de loc. sanct.* i. 22). The *Peregrinatio* of Etheria (Silvia), which dates from *c.* A.D. 385, says that the festival was held in the Church of the Nativity at Bethlehem (Duchesne, *Chr. Worship*, p. 515). In the West, however, in the middle ages, the procession with candles and banners outside the church was taken as symbolical of Christ's triumphant entry into heaven.

In the East the festival is known as the ἀνάληψις, "taking up," or ἐπισωζομένη, a term first used in the Cappadocian church, and of which the meaning has been disputed, but which probably signifies the feast "of completed salvation." The word *ascensio*, adopted in the West, implies the ascension of Christ by his own power, in contradistinction to the *assumptio*, or taking up into heaven of the Virgin Mary by the power of God.

In the Roman Catholic Church the most characteristic ritual feature of the festival is now the solemn extinction of the paschal candle after the Gospel at high mass. This candle, lighted at every mass for the forty days after Easter, symbolizes the presence of Christ with his disciples, and its extinction his parting from them. The custom dates from 1263, and was formerly confined to the Franciscans; it was prescribed for the universal church by the Congregation of Rites on the 19th of May 1697. Other customs, now obsolete, were formerly associated with the liturgy of this feast; *e.g.* the blessing of the new beans after the Commemoration of the Dead in the canon of the mass (Duchesne, p. 183). In some churches, during the middle ages, an image of Christ was raised from the altar through a hole in the roof, through which a burning straw figure representing Satan was immediately thrown down.

In the Anglican Church Ascension Day and its octave continue to be observed as a great festival, for which a special preface to the consecration prayer in the communion service is provided, as in the case of Christmas, Easter, Whitsunday, and Trinity Sunday. The celebration of the Feast of the Ascension was also retained in the Lutheran churches as warranted by Holy Scripture.

See Herzog-Hauck, *Realencyklopädie* (1900), s. *"Himmelfahrtsfest"*; L. Duchesne, *Christian Worship* (2nd Eng. ed., London, 1904); *The Catholic Encyclopaedia* (London and New York, 1907).

ASCETICISM, the theory and practice of bodily abstinence and self-mortification, generally religious. The word is derived from the Gr. verb ἀσκέω, "I practise," whence the noun ἄσκησις and the adjective ἀσκητικός; and it embodies a metaphor taken from the ancient wrestling-place or palaestra, where victory rewarded those who had best trained their bodies. Not a few other technical terms of Greek philosophic asceticism, used in the first instance by Cynics and Neo-pythagoreans, and then continued among the Greek Jews and Christians, were metaphors taken from athletic contests—but only metaphors, for all asceticism, worthy of the name, has a moral purport, and is based on the eternal contrast of the proposition, "This is right," with the proposition, "That is pleasant." The ascetic instinct is probably as old as humanity, yet we must not forget that early religious practices are apt to be deficient in lofty spiritual meaning, many things being esteemed holy that are from a modern point of view trifling and even obscene. We may therefore expect in primitive asceticism to find many abstentions and much self-torture apparently valueless for the training of character and discipline of the feelings, which are the essence of any healthy asceticism. Nevertheless these non-moral *taboos* or restraints may have played a part in building up in us that faculty of preferring the larger good to the impulse of the moment which is the note of real civilization. Aristotle in his *Ethics* defines, as the barbarian's ideal of life, "the living as one likes." Yet nothing is less true; for the savage, more than the civilized man, is tied down at every step with superstitious scruples and restrictions barely traceable in higher civilizations except as primitive survivals. It is not that savages are devoid of the ascetic instinct. It is on the contrary over-developed in them, but ill-informed and working in ways unessential or even morally harmful. It is the note of every great religious reformer, Moses, Buddha, Paul, Mani,

Mahomet, St Francis, Luther, to enlighten and direct it to higher aims, substituting a true personal holiness for a ritual purity or *taboo*, which at the best was viewed as a kind of physical condition and contagion, inherent as well in things and animals as in man.

It is useful, therefore, in a summary sketch of asceticism, to begin with the facts as they can be observed among less advanced races, or as mere survivals among people who have reached the level of genuine moral reflection; and from this basis to proceed to a consideration of self-denial consciously pursued as a method of ethical perfection. The latter is as a rule less cruel and rigorous than primitive forms of asceticism. Under this head fall the following:—Fasting, or abstention from certain meats and drinks; denial of sexual instinct; subjection of the body to physical discomforts, such as nakedness, vigils, sleeping on the bare ground, tattooing, deformation of skull, teeth, feet, &c., vows of silence to be observed throughout life or during pilgrim-ages, avoidance of baths, of hair-cutting and of clean raiment, living in a cave; actual self-infliction of pain, by scourging, branding, cutting with knives, wearing of hair shirts, fire-walking, burial alive, hanging up of oneself by hooks plunged into the skin, suspension of weights by such hooks to the tenderer parts of the body, self-mutilation and numerous other, often ingenious, modes of torture. Such customs repose on various superstitions; for example, the self-mutilation of the Galli or priests of Cybele was probably a magical ceremony intended to fertilize the soil and stimulate the crops. Others of the practices enumerated, probably the greater part of them, spring from demonological beliefs.

Fasting (*q.v.*) is used in primitive asceticism for a variety of reasons, among which the following deserve notice. Certain animals and vegetables are *taboo*, *i.e.* too holy, or—what among Semites and others was the same thing—too defiling and unclean, to be eaten. Thus in Leviticus xi. the Jews are forbidden to eat animals other than cloven-footed ruminants; thus the camel, coney, hare and swine were forbidden; so also any water organisms that had not fins and scales, and a large choice of birds, including swan, pelican, stork, heron and hoopoe. All winged creeping things that have four feet were equally abominable. Lastly, the weasel, mouse and most lizards were *taboo*. All or nearly all of these were at one time totem animals among one or another of the Semitic tribes, and were not eaten because primitive men will not eat animals between which and themselves and their gods they believe a peculiar tie of kinship to exist. Men do not eat an animal for which they have a reverential dread, or if they eat it at all, it is only in a sacramental feast and in order to absorb into themselves its life and holy properties. Such abstinences as the above, though based on *taboo*, that is, on a reluctance to eat the totem or sacred animal, are yet ascetic in so far as they involve much self-denial. No flesh is more wholesome or succulent than beef, yet the Egyptians and Phoenicians, says Porphyry (*de Abst.* ii. 11), would rather eat human flesh than that of the cow, and so would two hundred and fifty millions of modern Hindus. The privation involved in abstention from the flesh of the swine, a *taboo* hardly less widespread, is obvious.

Similar prohibitions are common in Africa, where fetish priests are often reduced to a diet of herbs and roots. That such dietary restrictions were merely ceremonial and superstitious, and not intended to prevent the consumption of meats which would revolt modern tastes, is certain from the fact that the Levitical law freely allowed the eating of locusts, grasshoppers, crickets and cockroaches, while forbidding the consumption of rabbits, hares, storks, swine, &c. The Pythagoreans were forbidden to eat beans.

Another widespread reason for avoiding flesh diet altogether was the fear of absorbing the irrational soul of the animal, which especially resided in the blood. Hence the rule not to eat meats strangled, except in sacramental meals when the god inherent in the animal was partaken of. It is equally a soul or spirit in wine which inspires the intoxicated; the old Egyptian kings avoided wine at table and in libations, because it was the blood of rebels who had fought with the gods, and out of whose rotting bodies grew the vines; to drink the blood was to imbibe the soul of these rebels, and the frenzy of intoxication which followed was held to be possession by their spirits. The medieval Jews also held that there is a cardiac demon in wine which takes possession of drunken men; and the Mahommedan prohibition of wine-drinking is based on a similar superstition. The avoidance of wine, therefore, by Rechabites, Nazirites, Arab dervishes and Pythagoreans, and also of leaven in bread, is parallel to and explicable in the same way as abstention from flesh. Porphyry (*de Abst.* i. 19) acquaints us with another widespread scruple against flesh diet. It was this, that the souls of men transmigrated into animals, so that if you ate these, you might consume your own kind, cannibal-wise. Contemporary meat-eaters set themselves to combat this prejudice, and argued that it was a pious duty to kill animals and so release the human souls imprisoned. In the same tract Porphyry relates (ii. 48) how wizards acquired the mantic powers of certain birds, such as ravens and hawks, by swallowing their hearts. The soul of the bird, he explains, enters them with its flesh, and endows them with power of divination. The lover of wisdom, who is priest of the universal God, rather than risk the taking into himself of inferior souls and polluting demons, will abstain from eating animals. Such is Porphyry's argument.

The same fear of imbibing the irrational soul of animals, and thereby reinforcing the lower appetites and instincts of the human being, inspired the vegetarianism of Apollonius of Tyana and of the Jewish Therapeutae, who in their sacred meals were careful to have a table free from blood-containing meats; and the fear of absorbing the animal's psychic qualities equally motived the Jewish and early Christian rule against eating things strangled. It was an early belief, which long survived among the Manichaean sects, that fish, being born in and of the waters, and without any sexual connexion on the part of other fishes are free from the taint which pollutes all animals *quae copulatione generantur*. Fish, therefore, unlike flesh, could be safely eaten. Here we have the origin of the Catholic rule of fasting, seldom understood by those who observe it. The same scruple against flesh-eating is conveyed in the beautiful confession, in the *Cretans* of Euripides, of one who had been initiated in the mysteries of Orpheus and became a "Bacchos." The last lines of this, as rendered by Dr Gilbert Murray, are as follows:—

"Robed in pure white, I have borne me clean
From man's vile birth and coffined clay,
And exiled from my lips alway
Touch of all meat where life hath been."

This Orphic fast from meat was only broken by an annual sacramental banquet, originally, perhaps, of human, but later of raw bovine flesh.

The Manichaeans held that in every act of begetting, human or otherwise, a soul is condemned afresh to a cycle of misery by imprisonment in flesh—a thoroughly Indian notion, under the influence of which their perfect or elect ones scrupulously abstained from flesh. The prohibition of taking life, which they took over from the Farther East, in itself entailed fasting from flesh. A fully initiated Manichaean would not even cut his own salad, but employed a catechumen to commit on his behalf this act of murder, for which he subsequently shrived him.

We come to a third widespread reason for fasting, common among savages. Famished persons are liable to morbid excitement, and fall into imaginative ecstasies, in the course of which they see visions and spectres, converse with gods and angels, and are the recipients of supernatural revelations. Accordingly King Saul "ate no bread all the day nor all the night" in which the witch of Endor revealed to him the ghost of Samuel. Weak and famished, he hardly wanted to eat the fatted calf when the vision was over. Among the North American Indians ecstatic fasting is regularly practised. A faster writes down his visions and revelations for a whole season. They are then examined by the elders of the tribe, and if events have verified them, he is recognized as a supernaturally gifted being, and rewarded with chieftaincy. All over the world fasting is a recognized mode of evoking, consulting and also of overcoming the spirit world. This is why the Zulus and other primitive races distrust a medicine man who is not an ascetic and lean with fasting. In the Semitic East it is an old belief that a successful fast in the wilderness of forty days and nights gives power over the Djinns. The Indian *yogi* fasts till he sees face to face all the gods of his Pantheon; the Indian magician fasts twelve days before producing rain or working any cure. The Bogomils fasted till they saw the Trinity face to face. From the first, fasting was practised in the church for similar reason. In the *Shepherd of Hermas* a vision of the church rewards frequent fasts and prayer; and it is related in extra-canonical sources that James the Less vowed that he would fast until he too was vouchsafed a vision of the risen Lord. After a long and rigorous fast the Lord appeared to him. Not a few saints were rewarded for their fasting by glimpses of the beatific vision. Dr Tylor writes on this point as follows (*Prim. Cult.* ii. 415): "Bread and meat would have robbed the ascetic of many an angel's visit: the opening of the refectory door must many a time have closed the gates of heaven to his gaze."

Among the Semites and Tatars worshippers lacerate themselves before the god. So in I Kings xviii. 28 the priests of Baal engaged in a rain-making ceremony, gashed themselves with knives and lances till the blood gushed out upon them. The Syriac word *ethkashshaph*, which means literally to "cut oneself," is the regular equivalent of to "make supplication." Among Greeks and Arabs, mourners also cut themselves with knives and scratched their faces; the Hebrew law forbade such mourning, and we find the prohibition repeated in many canons of the Eastern churches. At first sight these rites seem intended to call down the pity of heaven on man, but as Robertson Smith points out, their real import was by shedding blood on a holy stone or in a holy place to tie or renew a blood-bond between the God and his faithful ones. We have no clear information about the mind of the Flagellants, who in 1259, and again in 1349, swarmed through the streets of European cities, naked and thrashing themselves, till the blood ran, with leather thongs and iron whips. They were penitents,

and no doubt imbued with the ancient belief that without the shedding of blood there is no remission of sins.

Asceticism then in its origin was usually not ascetic in a modern sense, that is, not ethical. It was rather of the nature of the savage *taboo* (*q.v.*), the outcome of totemistic beliefs or a mode of averting the contaminating presence of djinns and demons. Above all, fasting was a mode of preparing oneself for the sacramental eating of a sacred animal, and as such often assisted by use of purgatives and aperients. It was essential in the old Greek rites of averting the *Kêres* or djinns, the ill regulated ghosts who return to earth and molest the living, to abstain from flesh. The Pythagoreans and Orphic *mystae* so abstained all their life long, and Porphyry eloquently insists on such a discipline for all who "are not content merely to talk about Reason, but are really intent on casting aside the body and living through Reason with Truth. Naked and without the tunic of the flesh these will enter the arena and strive in the Olympic contest of the soul."

It is time to pass on to Buddhist asceticism, in its essence a more ethical and philosophical product than some of the forms so far considered. The keynote of Buddhist asceticism is deliverance from life and its inevitable suffering. Once at a village where he rested the 719
Blessed One (Buddha) addressed his brethren and said: "It is through not understanding and grasping four Noble Truths, O brethren, that we have had to run so long, to wander so long in this weary path of transmigration, both you and I." These noble truths were about sorrow, its cause, its cessation and the path which leads to that cessation. Once they are grasped the craving for existence is rooted out, that which leads to renewed existence is destroyed, and there is no more birth. The Buddha believed he had a way of Truth, which if an elect disciple possessed he might say of himself, "Hell is destroyed for me, and rebirth as an animal, or a ghost, or in any place of woe. I am converted, I am no longer liable to be reborn in a state of suffering, and am assured of final salvation."

Suffering, said the sage in his great sermon at Benares, is inseparable from birth and old age. Sickness is suffering, so is death, so is union with the unloved, and separation from the loved; not to obtain what one desires is suffering; the entire fivefold clinging to the earthly is suffering. Its origin is the thirst for being which leads from birth to birth, together with lust and desire, which find gratification here and there; the thirst for pleasures, for being, for power. This thirst must be extinguished by complete annihilation of desire, by letting it go, expelling it, separating oneself from it, giving it no room. This extinction is achieved in eight ways, namely rectitude of faith, resolve, speech, action, living, effort, thought, self-concentration.

In this gospel we must be done with the outer world, participation in which is not the self, yet means for the self birth and death, appetites, longings, emotions, change and suffering, pleasure and pain. He that has put off all lust and desire, all hope and fear, all will to exist as a sinful, because a sentient, being, has won to the heaven of extinction or Nirvana. He may still tread the earth, but he is a saint or Brahman, is in heaven, has quitted the transient and enjoys eternity.

Such was the Buddha's gospel, as his most ancient scriptures enunciate it. Nirvana is constantly defined in them as supreme happiness. It is not even clear how far, if we interpret it strictly, this philosophy leaves any self to be happy. However this be, its practical expression is the life of the monk who has separated himself from the world. Five commandments must be observed by him who would even approach the higher life of saint and ascetic. They are these: to kill no living thing; not to lay hands on another's property; not to touch another's wife; not to speak what is untrue; not to drink intoxicating drinks.

Though couched in the negative, these rules must be interpreted in the amplest and widest sense by all believers. The Order, however, which the would-be ascetic can enter by regular initiation, when he is twenty years of age, entails a discipline much more severe. He has gone forth from home into homelessness, and has not where to lay his head. He must eat only the morsels he gets by begging; must dress in such rags as he can pick up; must sleep under trees. Mendicancy is his recognized way of life. Furthermore, he must abstain all his life from sexual intercourse; he may not take even a blade of grass without permission of the owner; he must not kill even a worm or ant; he must not boast of his perfection. In practice the lives of Buddhist monks are not so squalid as these rules would lead us to suppose. Thanks to the reverent charity of the laymen, they do not live much worse than Benedictine monks; and the prohibition to live in houses does not extend to caves. Everywhere in India and Ceylon they hollowed out cells and churches in the cliffs and rocks, which are the wonder of the European tourist.

But long before the advent of Buddhism, the hermit, or wandering beggar, was a familiar figure in India. No formal initiation was imposed on the would-be ascetic, save (in the case of young men) the duty to live at first in his teacher's house. One who had thus fulfilled the duties of the student order must "go forth remaining chaste," says the *Āpastamba*, ii. 9. 8. He shall then "live without a fire, without a house, without pleasures, without protection; remaining silent and uttering speech only on the occasion of the daily recitation of the Veda; begging so much food only in the village as will sustain his life, he shall wander about, neither caring for this world nor for heaven. He shall only wear clothes thrown away by others. Some declare that he shall even go naked. Abandoning truth and falsehood, pleasure and pain, the Vedas, this world and the next, he shall seek the Universal Soul, in knowledge of which standeth eternal salvation."

Such a life was specially recommended for one who has lived the life of a householder, and, having begotten sons according to the sacred law and offered sacrifices, desires in his old age to abandon worldly objects and direct his mind to final liberation. He leaves his wife, if she will not accompany him, and goes forth into the forest, committing her and his house to his sons. He must indeed take with him the sacred fire and implements for domestic sacrifice, but until death overtakes him he must wander silent, alone, possessing no hearth nor dwelling, begging his food in the villages, firm of purpose, with a potsherd for an alms bowl, the roots of trees for a dwelling, and clad in coarse worn out garments. "Let him not desire to die, let him not desire to live; let him wait for his appointed time, as a servant waits for the payment of his wages. Let him drink water purified by straining with a cloth, let him utter speech purified by truth, let him keep his heart pure. Let him patiently bear hard words, let him not insult anybody, let him not become any one's enemy for the sake of this perishable body.... Let him reflect on the transmigrations of men, caused by their sinful deeds, on their falling into hell, and on their torments in the world of Yama.... A twice-born man who becomes an ascetic thus shakes off sin here below and reaches the highest Brahman" (*Laws of Manu*, by G. Bühler, vi. 85).

This old-world wisdom of the Hindus, a thousand years before our era, is worthily to be paralleled from the Manichaeism of about the year 400. Augustine has preserved (*contra Faustum*, v. 1) the portraiture of a Manichaean elect as drawn by himself:—

> "I have given up father and mother, wife, children and all else that the gospel bids us, and do you ask if I accept the gospel? Are you then still ignorant of what the word gospel means? It is nothing else than the preaching and precept of Christ. I have cast away gold and silver, and have ceased to carry even copper in my belt, being content with my daily bread, nor caring for the morrow, nor anxious how my belly shall be filled or my body clothed; and do you ask me if I accept the gospel? You behold in me those beatitudes of Christ which make up the gospel, and you ask me if I accept it. You behold me gentle, a peacemaker, pure of heart, a mourner, hungering, thirsting, bearing persecutions and hatreds for righteousness' sake, and do you doubt whether I accept the gospel.... All that was mine I have given up, father, mother, wife, children, gold, silver, eating, drinking, delights, pleasures. Deem this a sufficient answer to your question and deem yourself on the way to be blessed, if you have not been scandalized in me."

The Greek Cynics (see Cynics) played a great part in the history of Asceticism, and they were so much the precursors of the Christian hermits that descriptions of them in profane literature have been mistaken for pictures of early monasticism. In striving to imitate the rugged strength and independence of their master Socrates, they went to such extremes as rather to caricature him. They affected to live like beggars, bearing staff and wallet, owning nothing, renouncing pleasures, riches, honours. For older thinkers like Plato and Aristotle the perfect life was that of the citizen and householder; but the Cynics were individualists, citizens of the world without loyalty or respect for the ancient city state, the decay of which was coincident with their rise. Their zeal for renunciation often extended not to pleasures, marriage and property alone, but to cleanliness, knowledge and good manners as well, and in this respect also they were the forerunners of later monks.

Philo (20 B.C.-A.D. 40) has left us many pictures of the life which to his mind impersonated the highest wisdom, and they are all inspired by the more respectable sort of cynicism, which had taken deep root among Greek Jews of the day. One such picture merits citation from his tract *On Change of Names* (vol. i. 583, ed. Mangey): "All this company of the good and wise have of their own free will divested themselves of too copious wealth; nay, have spurned the things dear to the flesh. For of good habit and lusty are athletes, since they have 720
fortified against the soul the body which should be its servant; but the disciples of wisdom are pale and wasted, and in a manner reduced to skeletons, because they have sacrificed the whole of their bodily strength to the faculties of the soul."

His own favourite ascetics, the Therapeutae, whose chief centre was in Egypt, had renounced property and all its temptations, and fled, irrevocably abandoning brothers, children, wives, parents, throngs of kinsmen, intimacy of friends, the fatherlands where they were born and bred (see Therapeutae). Here we have the ideal of early Christian renunciation at work, but apart from the influence of Jesus. In the pages of Epictetus the same ideal is constantly held up to us.

In the Christian Church there was from the earliest age a leaning to excessive asceticism, and it needed a severe struggle on the part of

Paul, and of the Catholic teachers who followed him, to secure for the baptized the right to be married, to own property, to engage in war and commerce, or to assume public office. One and all of the permanent institutions of society were condemned by the early enthusiasts, especially by those who looked forward to a speedy advent of the millennium, as alien to the kingdom of God and as impediments to the life of grace.

Marriage and property had already been eschewed in the Jewish Essene and Therapeutic sects, and in Christianity the name of Encratite was given to those who repudiated marriage and the use of wine. They did not form a sect, but represented an impulse felt everywhere. In early and popular apocryphal histories the apostles are represented as insisting that their converts should either not contract wedlock or should dissolve the tie if already formed. This is the plot of the *Acts of Thecla*, a story which probably goes back to the first century. Repudiation of the tie by fervent women, betrothed or already wives, occasioned much domestic friction and popular persecution. In the Syriac churches, even as late as the 4th century, the married state seems to have been regarded as incompatible with the perfection of the initiated. Renunciation of the state of wedlock was anyhow imposed on the faithful during the lengthy, often lifelong, terms of penance imposed upon them for sins committed; and later, when monkery took the place, in a church become worldly, partly of the primitive baptism and partly of that rigorous penance which was the rebaptism and medicine of the lapsed, celibacy and virginity were held essential thereto, no less than renunciation of property and money-making.

Together with the rage for virginity went the institution of *virgines subintroductae*, or of spiritual wives; for it was often assumed that the grace of baptism restored the original purity of life led by Adam and Eve in common before the Fall. Such rigours are encouraged in the *Shepherd of Hermas*, a book which emanated from Rome and up to the 4th century was read in church. They were common in the African churches, where they led to abuses which taxed the energy even of a Cyprian. They were still rife in Antioch in 260. We detect them in the Celtic church of St Patrick, and, as late as the 7th century, among the Celtic elders of the north of France. In the Syriac church as late as 340, such relations prevailed between the “Sons and daughters of the Resurrection.” It continued among the Albigenses and other dissident sects of the middle ages, among whom it served a double purpose; for their elders were thus not only able to prove their own chastity, but to elude the inquisitors, who were less inclined to suspect a man of the catharism which regarded marriage as the “greater adultery” (*maius adulterium*) if they found him cohabiting (in appearance at least) with a woman. There was hardly an early council, great or small, that did not condemn this custom, as well as the other one, still more painful to think of, of self-emasculation. In the Catholic church, however, common sense prevailed, and those who desired to follow the Encratite ideal repaired to the monasteries.

AUTHORITIES.—E.B. Tylor, *Primitive Culture* (London, 1903); Robertson Smith, *Religion of the Semites* (London, 1901); J.E. Harrison, *Prolegomena to the Study of Greek Religion*; F. Max Müller, *The Sacred Books of the East*; Victor Henry, *La Magie dans l’Inde antique*; J.G. Frazer, *The Golden Bough* (London, 1900), and *Adonis, Attis, Osiris* (London, 1906); Georges Lafay, *Culte des divinitês d’Alexandrie* (Paris, 1884); Döllinger, *Sectengeschichte des Mittelalters* (Munich, 1890); Fr. Cumont, *Mysteries of Mithra* (Chicago, 1903); Zöckler, *Gesch. der Ascese* (1863). See also under PURIFICATION. Goldziher, “De l’ascetisme aux premiers temps de l’Islam,” in *Revue de l’histoire des religions* (1898), p. 314; Muratori, *De Synisactis et Agapetis* (Pavia, 1709); Jas. Martineau, *Types of Ethical Theory* (Oxford, 1885); T.H. Green, *Prolegomena to Ethics* (Oxford, 1883); Franz Cumont, *Les Religions orientales dans le paganisme romain* (Paris, 1907); Porphyrius, *De Abstinentia*; Plutarchus, *De Carnium Esu*.

(F. C. C.)

ASCHAFFENBURG, a town of Germany, in the kingdom of Bavaria, on the right bank of the Main, at its confluence with the Aschaff, near the foot of the Spessart, 26 m. by rail S.E. of Frankfort-On-Main. Pop. (1900) 18,091; (1905) 25,275. Its chief buildings are the Johannisburg, built (1605-1614) by Archbishop Schweikard of Cronberg, which contains a library with a number of *incunabula*, a collection of engravings and paintings; the *Stiftskirche*, or cathedral, founded in 980 by Otto of Bavaria, but dating in the main from the early 12th and the 13th centuries, in which are preserved various monuments by the Vischers, and a sarcophagus, with the relics of St Margaret (1540); the Capuchin hospital; a theatre, which was formerly the house of the Teutonic order; and several mansions of the German nobility. The town, which has been remarkable for its educational establishments since the 10th century, has a gymnasium, lyceum, seminarium and other schools. There is an archaeological museum in the old abbey buildings. The graves of Klemens Brentano and his brother Christian (d. 1851) are in the churchyard; and Wilhelm Heinse is buried in the town. Coloured and white paper, ready-made clothing, cellulose, tobacco, lime and liqueurs are the chief manufactures, while a considerable export trade is done down the Main in wood, cattle and wine.

Aschaffenburg, called in the middle ages Aschafaburg and also Askenburg, was originally a Roman settlement. The 10th and 23rd Roman legions had their station here, and on the ruins of their *castrum* the Frankish mayors of the palace built a castle. Bonifacius erected a chapel to St Martin, and founded a Benedictine monastery. A stone bridge over the Main was built by Archbishop Willigis in 989. Adalbert increased the importance of the town in various ways about 1122. In 1292 a synod was held here, and in 1474 an imperial diet, preliminary to that of Vienna, in which the concordat was decided which has therefore been sometimes called the *Aschaffenburg Concordat*.

The town suffered greatly during the Thirty Years’ War, being held in turn by the various belligerents. In 1842-1849, King Louis built himself to the west of the town a country house, called the *Pompeianum*, from its being an imitation of the house of Castor and Pollux at Pompeii. In 1866 the Prussians inflicted a severe defeat on the Austrians in the neighbourhood.

The principality of Aschaffenburg, deriving its name from the city, comprehended an area of 654 English sq. m. It formed part of the electorate of Mainz, and in 1803 was made over to the archchancellor, Archbishop Charles of Dalberg. In 1806 it was annexed to the grand-duchy of Frankfort; and in 1814 was transferred to Bavaria, in virtue of a treaty concluded on the 19th of June between that power and Austria. With lower Franconia, it now forms a district of the kingdom of Bavaria.

ASCHAM, ROGER (*c.* 1515-1568), English scholar and writer, was born at Kirby Wiske, a village in the North Riding of Yorkshire, near Northallerton, about the year 1515. His name would be more properly spelt Askham, being derived, doubtless, from Askham in the West Riding. He was the third son of John Ascham, steward to Lord Scrope of Bolton. The family name of his mother Margaret is unknown, but she is said to have been well connected. The authority for this statement, as for most others concerning Ascham’s early life, is Edward Grant, headmaster of Westminster, who collected and edited his letters and delivered a panegyrical oration on his life in 1576.

Ascham was educated not at school, but in the house of Sir Humphry Wingfield, a barrister, and in 1533 speaker of the House of Commons, as Ascham himself tells us, in the *Toxophilus*, p. 120 (not, as by a mistake which originated with Grant and has been repeated ever since, Sir Anthony Wingfield, who was nephew of the speaker). Sir Humphry “ever loved and used to have many children brought up in his house,” where they were under a tutor named R. Bond. Their sport was archery, and Sir Humphry “himself would at term times bring down from London both bows and shafts and go with them himself to the field and see them shoot.” Hence Ascham’s earliest English work, the *Toxophilus*, the importance which he attributed to archery in educational establishments, and probably the provision for archery in the statutes of St Albans, Harrow and other Elizabethan schools. From this private tuition Ascham was sent “about 1530,” at the age, it is said, of fifteen, to St John’s College, Cambridge, then the largest and most learned college in either university. Here he fell under the influence of John Cheke, who was admitted a fellow in Ascham’s first year, and Sir Thomas Smith. His guide and friend was Robert Pember, “a man of the greatest learning and with an admirable facility in the Greek tongue.” On his advice he practised seriously the precept embodied in the saying, “I know nothing about the subject, I have not even lectured on it,” and “to learn Greek more quickly, while still a boy, taught Greek to boys.” In Latin he specially studied Cicero and Caesar. He became B.A. on the 18th of February 1534/5. Dr Nicholas Metcalfe was then master of the college, “a papist, indeed, and yet if any young man given to the new learning as they termed it, went beyond his fellows,” he “lacked neither open praise, nor private exhibition.” He procured Ascham’s election to a fellowship, “though being a new bachelor of arts, I chanced among my companions to speak against the Pope ... after grievous rebuke and some punishment, open warning was given to all the fellows, none to be so hardy, as to give me his voice at that election.” The day of election Ascham regarded as his “birthday,” and “the whole foundation of the poor learning I have and of all the furtherance that hitherto elsewhere I have obtained.” He took his M.A. degree on the 3rd of July 1537. He stayed for some time at Cambridge taking pupils, among

whom was William Grindal, who in 1544 became tutor to Princess Elizabeth. Ascham himself cultivated music, acquired fame for a beautiful handwriting, and lectured on mathematics. Before 1540, when the Regius professorship of Greek was established, Ascham "was paid a handsome salary to profess the Greek tongue in public," and held also lectures in St John's College. He obtained from Edward Lee, then archbishop of York, a pension of £2 a year, in return for which Ascham translated Oecumenius' Commentaries on the Pauline Epistles. But the archbishop, scenting heresy in some passage relating to the marriage of the clergy, sent it back to him, with a present indeed, but with something like a reprimand, to which Ascham answered with an assurance that he was "no seeker after novelties," as his lectures showed. He was on safer ground in writing in 1542-1543 a book, which he told Sir William Paget in the summer of 1544 was in the press, "on the art of Shooting." This was no doubt suggested partly by the act of parliament 33 Henry VIII. c. 9, "an acte for mayntenaunce of Artyllarie and debarringe of unlawful games," requiring every one under sixty, of good health, the clergy, judges, &c., excepted, "to use shooting in the long bow," and fixing the price at which bows were to be sold. Under the title of *Toxophilus* he presented it to Henry VIII. at Greenwich soon after his triumphant return from the capture of Boulogne, and promptly received a grant of a pension of £10 a year, equal to some £200 a year of our money. A novelty of the book was that the author had "written this Englishe matter in the Englishe tongue for Englishe men," though he thought it necessary to defend himself by the argument that what "the best of the realm think it honest to use" he "ought not to suppose it vile for him to write." It is a Platonic dialogue between Toxophilus and Philologus, and nowadays its chief interest lies in its incidental remarks. It may probably claim to have been the model for Izaak Walton's *Compleat Angler*.

From 1541, or earlier, Ascham acted as letter-writer to the university and also to his college. Perhaps the best specimen of his skill was the letter written to the protector Somerset in 1548 on behalf of Sedbergh school, which was attached to St John's College by the founder, Dr Lupton, in 1525, and the endowment of which had been confiscated under the Chantries Act. In 1546 Ascham was elected public orator by the university on Sir John Cheke's retirement.

Shortly after the beginning of the reign of Edward VI., Ascham made public profession of Protestant opinions in a disputation on the doctrine of the Mass, begun in his own college and then removed for greater publicity to the public schools of the university, where it was stopped by the vice-chancellor. Thereon Ascham wrote a letter of complaint to Sir William Cecil. This stood him in good stead. In January 1548, Grindal, the princess Elizabeth's tutor, died. Ascham had already corresponded with the princess, and in one of his letters says that he returns her pen which he has mended. Through Cecil and at the princess's own wish he was selected as her tutor against another candidate pressed by Admiral Seymour and Queen Katherine. Ascham taught Elizabeth—then sixteen years old—for two years, chiefly at Cheshunt. In a letter to Sturm, the Strassburg schoolmaster, he praises her "beauty, stature, wisdom and industry. She talks French and Italian as well as English: she has often talked to me readily and well in Latin and moderately so in Greek. When she writes Greek and Latin nothing is more beautiful than her handwriting ... she read with me almost all Cicero and great part of Titus Livius: for she drew all her knowledge of Latin from those two authors. She used to give the morning to the Greek Testament and afterwards read select orations of Isocrates and the tragedies of Sophocles. To these I added St Cyprian and Melanchthon's Commonplaces." In 1550 Ascham quarrelled with Elizabeth's steward and returned to Cambridge. Cheke then procured him the secretaryship to Sir Richard Morrison (Moryson), appointed ambassador to Charles V. It was on his way to join Morrison that he paid his celebrated morning call on Lady Jane Grey at Bradgate, where he found her reading Plato's *Phaedo*, while every one else was out hunting.

The embassy went to Louvain, where he found the university very inferior to Cambridge, then to Innsbruck and Venice. Ascham read Greek with the ambassador four or five days a week. His letters during the embassy, which was recalled on Mary's accession, were published in English in 1553, as a "Report" on Germany. Through Bishop Gardiner he was appointed Latin secretary to Queen Mary with a pension of £20 a year. His Protestantism he must have quietly sunk, though he told Sturm that "some endeavoured to hinder the flow of Gardiner's benevolence on account of his religion." Probably his never having been in orders tended to his safety. On the 1st of June 1554 he married Margaret Howe, whom he described as niece of Sir R. (? J., certainly not, as has been said, Henry) Wallop. By her he had two sons. From his frequent complaints of his poverty then and later, he seems to have lived beyond his income, though, like most courtiers, he obtained divers lucrative leases of ecclesiastical and crown property. In 1555 he resumed his studies with Princess Elizabeth, reading in Greek the orations of Aeschines and Demosthenes' *De Corona*. Soon after Elizabeth's accession, on the 5th of October 1559, he was given, though a layman, the canonry and prebend of Wetwang in York minster. In 1563 he began the work which has made him famous, *The Scholemaster*. The occasion of it was, he tells us (though he is perhaps merely imitating Boccaccio), that during the "great plague" at London in 1563 the court was at Windsor, and there on the 10th of December he was dining with Sir William Cecil, secretary of state, and other ministers. Cecil said he had "strange news; that divers scholars of Eaton be run away from the schole for fear of beating"; and expressed his wish that "more discretion was used by schoolmasters in correction than commonly is." A debate took place, the party being pretty evenly divided between floggers and anti-floggers, with Ascham as the champion of the latter. Afterwards Sir Richard Sackville, the treasurer, came up to Ascham and told him that "a fond schoolmaster" had, by his brutality, made him hate learning, much to his loss, and as he had now a young son, whom he wished to be learned, he offered, if Ascham would name a tutor, to pay for the education of their respective sons under Ascham's orders, and invited Ascham to write a treatise on "the right order of teaching." *The Scholemaster* was the result. It is not, as might be supposed, a general treatise on educational method, but "a plaine and perfite way of teachyng children to understand, write and speake in Latin tong"; and it was not intended for schools, but "specially prepared for the private brynging up of youth in gentlemen and noblemens houses." The perfect way simply consisted in "the double translation of a model book"; the book recommended by this professional letter-writer being "Sturmius' *Select Letters of Cicero*." As a method of learning a language by a single pupil, this method might be useful; as a method of education in school nothing more deadening could be conceived. The method itself seems to have been taken from Cicero. Nor was the famous plea for the substitution of gentleness and persuasion for coercion and flogging in schools, which has been one of the main attractions of the book, novel. It was being practised and preached at that very time by Christopher Jonson (*c.* 1536-1597) at Winchester; it had been enforced at length by Wolsey in his statutes for his Ipswich College in 1528, following Robert Sherborne, bishop of Chichester, in founding Rolleston school; and had been repeatedly urged by Erasmus and others, to say nothing of William of Wykeham himself in the statutes of Winchester College in 1400. But Ascham's was the first definite demonstration in favour of humanity in the vulgar tongue and in an easy style by a well-known "educationist," though not one who had any actual experience as a schoolmaster. What largely contributed to its fame was its picture of Lady Jane Grey, whose love of learning was due to her finding her tutor a refuge from pinching, ear-boxing and bullying parents; some exceedingly good criticisms of various authors, and a spirited defence of English as a vehicle of thought and literature, of which it was itself an excellent example. The book was not published till after Ascham's death, which took place on the 23rd of December 1568, owing to a chill caught by sitting up all night to finish a New Year's poem to the queen.

His letters were collected and published in 1576, and went through several editions, the latest at Nuremberg in 1611; they were re-edited by William Elstob in 1703. His English works were edited by James Bennett with a life by Dr Johnson in 1771, reprinted in 8vo in 1815. Dr Giles in 1864-1865 published in 4 vols. select letters with the *Toxophilus* and *Scholemaster* and the life by Edward Grant. *The Scholemaster* was reprinted in 1571 and 1589. It was edited by the Rev. J. Upton in 1711 and in 1743, by Prof. J.E.B. Mayor in 1863, and by Prof. Edward Arber in 1870. The *Toxophilus* was republished in 1571, 1589 and 1788, and by Prof. Edward Arber in 1868 and 1902.

(A. F. L.)

ASCHERSLEBEN, a town of Germany, in the Prussian province of Saxony, 36 m. by rail N.W. from Halle, and at the junction of lines to Cothen and Nienhagen. Pop. (1900) 27,245; (1905) 27,876. It contains one Roman Catholic and four Protestant churches, a synagogue, a fine town-hall dating from the 16th century, and several schools. The discovery of coal in the neighbourhood stimulated and altered its industries. In addition to the manufacture of woollen wares, for which it has long been known, there is now extensive production of vinegar, paraffin, potash and especially beetroot-sugar; while the surrounding district, which was formerly devoted in great part to market-gardening, is now turned almost entirely into beetroot fields. There are also iron, zinc and chemical manufactures, and the cultivation of agricultural seeds is carried on. In the neighbourhood are brine springs and a spa (Wilhelmsbad). Aschersleben was probably founded in the 11th century by Count Esico of Ballenstedt, the ancestor of the house of Anhalt, whose grandson, Otto, called himself count of Ascania and Aschersleben, deriving the former part of the title from his castle in the neighbourhood of the town. On the death of Otto III. (1315) Aschersleben passed into the hands of the bishop of Halberstadt, and at the peace of 1648 was, with the bishopric, united to Brandenburg.

ASCIANO, a town of Tuscany, in the province of Siena, 19 m. S.E. of the town of Siena by rail. Pop. (1901) 7618. It is surrounded by walls built by the Sienese in 1351, and has some 14th-century churches with paintings of the same period. Six miles to the south is the large Benedictine monastery of Monte Oliveto Maggiore, founded in 1320, famous for the frescoes by Luca Signorelli (1497-1498) and Antonio Bazzi, called Sodoma (1505), in the cloister, illustrating scenes from the legend of St Benedict; the latter master's work is perhaps nowhere better represented than here. The church contains fine inlaid choir stalls by Fra Giovanni da Verona. The buildings, which are mostly of red brick, are conspicuous against the gray clayey and sandy soil. The monastery is described by Aeneas Sylvius Piccolomini (Pope Pius II.) in his *Commentaria*. Remains of Roman baths, with a fine mosaic pavement, were found within the town in 1898 (G. Pellegrini in *Notizie degli scavi*, 1899, 6).

ASCITANS (or Ascitae; from ἀσκός, the Greek for a wine-skin), a peculiar sect of 2nd-century Christians (Montanists), who introduced the practice of dancing round a wine-skin at their meetings.

ASCITES, (ἀσκίτης dropsical, from ἀσκός *sc.* νόσος disease), the term in medicine applied to an effusion of non-inflammatory fluid within the peritoneum. It is not a disease in itself, but is one of the manifestations of disease elsewhere—usually in the kidneys, heart, or in connexion with the liver (portal obstruction). Portal obstruction is the commonest cause of well-marked ascites. It is produced by (1) diseases within the liver, as cirrhosis (usually alcoholic) and cancer; (2) diseases outside the liver, as cancer of stomach, duodenum or pancreas, causing pressure on the portal vein, or enlarged glands in the fissure of the liver producing the same effect. Ascites is one of the late symptoms in the disease, and precedes dropsy of the leg, which may come on later, due to pressure on the large veins in the abdominal cavity by the ascitic fluid. In ascites due to heart disease, the dropsy of the feet and legs precedes the ascites, and there will be a history of palpitation, shortness of breath, and perhaps cough. In the ascites of kidney troubles there will be a history of general oedema—puffiness of face and eyes on rising in the morning probably having attracted the attention of the patient or his friends previously. Other less common causes of ascites are chronic peritonitis, either tuberculous in the young, or due to cancer in the aged, and more rarely still pernicious anaemia.

ASCLEPIADES, Greek physician, was born at Prusa in Bithynia in 124 B.C., and flourished at Rome in the end of the 2nd century B.C. He travelled much when young, and seems at first to have settled at Rome as a rhetorician. In that profession he did not succeed, but he acquired great reputation as a physician. He founded his medical practice on a modification of the atomic or corpuscular theory, according to which disease results from an irregular or inharmonious motion of the corpuscles of the body. His remedies were, therefore, directed to the restoration of harmony, and he trusted much to changes of diet, accompanied by friction, bathing and exercise, though he also employed emetics and bleeding. He recommended the use of wine, and in every way strove to render himself as agreeable as possible to his patients. His pupils were very numerous, and the school formed by them was called the Methodical. Asclepiades died at an advanced age.

ASCLEPIADES, of Samos, epigrammatist and lyric poet, friend of Theocritus, flourished about 270 B.C. He was the earliest and most important of the convivial and erotic epigrammatists. Only a few of his compositions are actual "inscriptions"; others sing the praises of the poets whom he specially admired, but the majority of them are love-songs. It is doubtful whether he is the author of all the epigrams (some 40 in number) which bear his name in the Greek Anthology. He possibly gave his name to the Asclepiadean metre.

ASCLEPIODOTUS, Greek military writer, flourished in the 1st century B.C. Nothing is known of him except that he was a pupil of Poseidonius the Stoic (d. 51 B.C.). He is the supposed author of a treatise on Graeco-Macedonian tactics (Τακτικὰ Κεφάλαια), which, however, is probably not his own work, but the skeleton outline of the lectures delivered by his master, who is known to have written a work on the subject.

ASCOLI, GRAZIADIO ISAIA (1820-1907), Italian philologist; of Jewish family, was born at Görz at an early age showed a marked linguistic talent. In 1854 he published his *Studii orientali e linguistici*, and in 1860 was appointed professor of philology at Milan. He made various learned contributions to the study of Indo-European and Semitic languages, and also of the gipsy language, but his special field was the Italian dialects. He founded the *Archivio glottologico italiano* in 1873, publishing in it his *Saggi Ladini*, and making it in succeeding years the great organ of original scholarship on this subject. He was universally recognized as the greatest authority on Italian linguistics, and his article in the *Encyclopaedia Britannica* (9th ed., revised for this edition) became the classic exposition in English. (See Italy: *Language*.)

ASCOLI PICENO[1] (anc. *Ausculum*) a town and episcopal see of the Marches, Italy, the capital of the province of Ascoli Piceno, 17 m. W. of Porto d' Ascoli (a station on the coast railway, 56 m. S.S.E. of Ancona), and 53 m. S. of Ancona direct, situated on the S. bank of the Tronto (anc. *Truentus*) at its confluence with the Castellano, 500 ft. above sea-level, and surrounded by lofty mountains. Pop. (1901) town, 12,256; commune, 28,608. The Porta Romana is a double-arched Roman gate; adjacent are remains of the massive ancient city walls, in rectangular blocks of stone 2 ft. in height, and remains of still earlier fortifications have been found at this point (F. Barnabei in *Notizie degli scavi*, 1887, 252). The church of S. Gregorio is built into a Roman tetrastyle Corinthian temple, two columns of which and the *cella* are still preserved; the site of the Roman theatre can be distinguished; and the church and convent of the Annunziata (with two fine cloisters and a good fresco by Cola d' Amatrice in the refectory) are erected upon large Roman substructures of concrete, which must have supported some considerable building. Higher up is the castle, which now shows no traces of fortifications older than

medieval; it commands a fine view of the town and of the mountains which encircle it. The town has many good pre-Renaissance buildings; the picturesque colonnaded market-place contains the fine Gothic church of S. Francesco and the original Palazzo del Comune, now the prefecture (Gothic with Renaissance additions). The cathedral is in origin Romanesque,[2] but has been much altered, and was stored in 1888 by Count Giuseppe Sacconi (1855-1905). The frescoes in the dome, of the same date, are by Cesare Mariani. The cope presented to the cathedral treasury by Pope Nicholas IV. was stolen in 1904, and sold to Mr J. Pierpont Morgan, who generously returned it to the Italian government, and it was then placed for greater safety in the Galleria Corsini at Rome. The baptistery still preserves its ancient character; and the churches of S. Vittore and SS. Vincenzo ed Anastasio are also good Romanesque buildings. The fortress of the Malatesta, constructed in 1349, has been in the main destroyed; the part of it which remains is now a prison. The present Palazzo Comunale, a Renaissance edifice, contains a fine museum, chiefly remarkable for the contents of prehistoric tombs found in the district (including good bronze fibulae, necklaces, amulets, &c., often decorated with amber), and a large collection of acorn-shaped lead missiles (*glandes*) used by slingers, belonging to the time of the siege of Asculum during the Social War (89 B.C.). There is also a picture gallery containing works by local masters, Pietro Alamanni, Cola d' Amatrice, Carlo Crivelli, &c. The bridges across the ravines which defend the town are of considerable importance; the Ponte di Porta Cappucina is a very fine Roman bridge, with a single arch of 71 ft. span. The Ponte di Cecco (so named from Cecco d' Ascoli), with two arches, is also Roman and belongs to the Via Salaria; the Ponte Maggiore and the Ponte Cartaro are, on the other hand, medieval, though the latter perhaps preserves some traces of Roman work. Near Ascoli is Castel Trosino, where an extensive Lombard necropolis of the 7th century was discovered in 1895; the contents of the tombs are now exhibited in the Museo Nazionale delle Terme at Rome (*Notizie degli scavi*, 1895, 35).

The ancient Asculum was the capital of Picenum, and it occupied a strong position in the centre of difficult country. It was taken in 268 B.C. by the Romans, and the Via Salaria was no doubt prolonged thus far at this period; the distance from Rome is 120 m. It took a prominent part in the Social War against Rome, the proconsul Q. Servilius and all the Roman citizens within its walls being massacred by the inhabitants in 90 B.C. It was captured after a long siege by Pompeius Strabo in 89 B.C. The leader, Judacilius, committed suicide, the principal citizens were put to death, and the rest exiled. The Roman general celebrated his triumph on the 25th of December of that year. Caesar occupied it, however, as a strong position after crossing the Rubicon; and it received a Roman colony, perhaps under the triumvirs, and became a place of some importance. In A.D. 301 it became the capital of Picenum Suburbicarium. In 545 it was taken by Totila, but is spoken of by Paulus Diaconus as the chief city of Picenum shortly afterwards. From the time of Charlemagne it was under the rule of its bishops, who had the title of prince and the right to coin money, until 1185, when it became a free republic. It had many struggles with Fermo, and in the 15th century came more directly under the papal sway.

See N. Persichetti in *Romische Mitteilungen* (1903), 295 seq.

(T. As.)

1 The epithet distinguishes it from Ascoli Satriano (anc. *Ausculum*), which lies 19 m. S. of Foggia by rail.

2 It contains a fine polyptych by Carlo Crivelli (1473).

ASCONIUS PEDIANUS, QUINTUS (9 B.C.-A.D. 76; or A.D. 3-88), Roman grammarian and historian, was probably a native of Patavium (Padua). In his later years he resided at Rome, where he died, after having been blind for twelve years, at the age of eighty-five. During the reigns of Claudius and Nero he compiled for his sons, from various sources—*e.g.* the Gazette (*Acta Publica*), shorthand reports or "skeletons" (*commentarii*) of Cicero's unpublished speeches, Tiro's life of Cicero, speeches and letters of Cicero's contemporaries, various historical writers, *e.g.* Varro, Atticus, Antias, Tuditanus and Fenestella (a contemporary of Livy whom he often criticizes)—historical commentaries on Cicero's speeches, of which only five, viz. *in Pisonem*, *pro Scauro*, *pro Milone*, *pro Cornelio* and *in toga Candida*, in a very mutilated condition, are preserved. In a note upon the speech *pro Scauro*, he speaks of Longus Caecina (d. A.D. 57) as still living, while his words imply that Claudius (d. 54) was not alive. This statement, therefore, must have been written between A.D. 54 and 57. These valuable notes, written in good Latin, relate chiefly to legal, historical and antiquarian matters. A commentary, of inferior Latinity and mainly of a grammatical character, on Cicero's Verrine orations, is universally regarded as spurious. Both works were found by Poggio in a MS. at St Gallen in 1416. This MS. is lost, but three transcripts were made by Poggio, Zomini (Sozomenus) of Pistoia and Bartolommeo da Montpulciano. That of Poggio is now at Madrid (Matritensis x. 81), and that of Zomini is in the Forteguerri library at Pistoia (No. 37). A copy of Bartolommeo's transcript exists in Florence (Laur. liv. 5). The later MSS. are derived from Poggio's copy. Other works attributed to Asconius were: a life of Sallust, a defence of Virgil against his detractors, and a treatise (perhaps a symposium in imitation of Plato) on health and long life.

Editions by Kiessling-Schöll (1875), and A.C. Clark (Oxford, 1906), which contains a previously unpublished collation of Poggio's transcript. See also Madvig, *De Asconio Pediano* (1828).

ASCOT, a village in the Wokingham parliamentary division of Berkshire, England, famous for its race-meetings. Pop. of parish of Ascot Heath (1901), 1927. The station on the Southwestern railway, 29 m. W.S.W. of London, is called Ascot and Sunninghill; the second name belonging to an adjacent township with a population (civil parish) of 4719. The race-course is on Ascot Heath, and was laid out by order of Queen Anne in 1711, and on the 11th of August in that year the first meeting was held and attended by the queen. The course is almost exactly 2 m. in circumference, and the meetings are held in June. The principal race is that for the Ascot Gold Cup, instituted in 1807. The meeting is one of the most fashionable in England, and is commonly attended by members of the royal family. The royal procession, for which the meeting is peculiarly famous, was initiated by George IV. in 1820.

See R. Herod, *Royal Ascot* (London, 1900).

ASCUS (Gr. ἀσκός, a bag), a botanical term for the membranous sacs containing the reproductive spores in certain lichens and fungi. Various compounds of the word are used, *e.g. ascophorous*, producing asci; *ascospore*, the spore (or sporule) developed in the ascus; *ascogonium*, the organ producing it, &c.

ASELLI [ASELLIUS, or ASELLIO], **GASPARO** (1581-1626), Italian physician, was born at Cremona about 1581, became professor of anatomy and surgery at Pavia, and practised at Milan, where he died in 1626. To him is due the discovery of the lacteal vessels, published in *De Lactibus* (Milan, 1627).

ASGILL, JOHN (1659-1738), English writer, was born at Hanley Castle, in Worcestershire, in 1659. He was bred to the law, and gained considerable reputation in his profession, increased by two pamphlets—the first (1696) advocating the establishment of some currency other than the usual gold and silver, the second (1698) on a registry for titles of lands. In 1699, when a commission was appointed to settle disputed claims in Ireland, he set out for that country, attracted by the hopes of practice. Before leaving London he put in the hands of the printer a tract, entitled *An Argument proving that, according to the Covenant of Eternal Life revealed in the Scripture, Man may be translated from hence into that Eternal Life without passing through Death* (1700). Coleridge has highly praised the "genuine Saxon English," the "irony" and "humour" of this extraordinary pamphlet, which interpreted the relation between God and man by the technical rules of law, and insisted that, Christ having wiped out Adam's sin, the penalty of death must consequently be illegal for those who claim exemption. How far it was meant seriously was doubted at the time, and may be doubted now. But its fame preceded the author to Ireland, and was of material service in securing his professional success, so that he amassed money, purchased an estate, and married a daughter of the second Lord Kenmare. He was returned both to the Irish and English parliaments, but was expelled from both on account of his "blasphemous" pamphlet. He was also involved in money difficulties, and litigation about his Irish estate, and these circumstances may have had something to do with his trouble in parliament. In 1707 he was arrested for debt, and the remainder of his life was spent in the Fleet prison, or within the rules of the king's bench. He died in 1738. Asgill also wrote in 1714-1715 some pamphlets defending the Hanoverian succession against the claims of the Pretender.

ASH[1] (Ger. *Esche*), a common name (Fr. *fréne*) given to certain trees. The common ash (*Fraxinus excelsior*) belongs to the natural order Oleaceae, the olive family, an order of trees and shrubs which includes lilac, privet and jasmine. The Hebrew word *Oren*, translated "ash" in Isaiah xliv. 14, cannot refer to an ash tree, as that is not a native of Palestine, but probably refers to the Aleppo pine (*Pinus halepensis*). The ash is a native of Great Britain and the greater part of Europe, and also extends to Asia. The tree is distinguished for its height and contour, as well as for its graceful foliage. It attains a height of from 50 to 80 ft., and flowers in March and April, before the leaves are developed. The reddish flowers grow in clusters, but are not showy. They are naked, that is without sepals or petals, and generally imperfect, wanting either stamens or pistil. The large leaves, which are late in appearing, are pinnately compound, bearing four to seven pairs of gracefully tapering toothed leaflets on a slender stalk. The dry winged fruits, the so-called keys, are a characteristic feature and often remain hanging in bunches long after the leaves have fallen in autumn. The leaves fall early, but the greyish twigs and black buds render the tree conspicuous in winter and especially in early spring.

The ash is in Britain next in value to the oak as a timber-tree. It requires a good deep loam with gravelly subsoil, and a situation naturally sheltered, such as the steep banks of glens, rivers or lakes; in cold and wet clay it does not succeed. As the value of the timber depends chiefly on its toughness and elasticity, it is best grown in masses where the soil is good; the trunk is thus drawn up free from large side-branches. The tree is easily propagated from seeds; it throws up strong root shoots. The ash requires much light, but grows rapidly, and its terminal shoots pierce easily through thickets of beech, with which it is often associated. Unmixed ash plantations are seldom satisfactory, because the foliage does not sufficiently cover the ground; but when mixed with beech it grows well, and attains great height and girth. Owing to the dense mass of roots which it sends out horizontally a little beneath the surface of the ground, the ash does much harm to vegetation beneath its shade, and is therefore obnoxious as a hedgerow tree. Coppice shoots yield excellent hop-poles, crates, hoops, whip-handles, &c. The timber is much used for agricultural implements, and by coach-builders and wheelwrights.

A variety of the common species, known as var. *heterophylla*, has simple leaves. It occurs wild in woods in Europe and England. Another variety of ash (*pendula*) is met with in which the branches are pendulous and weeping. Sometimes this variety is grafted on the tall stem of the common ash, so as to produce a pleasing effect. It is said that the weeping variety was first observed at Gamlingay, in Cambridgeshire. A variety (*crispa*) occurs with curled leaves, and another with warty stems and branches, called *verrucosa*. *F. Ornus* is the manna ash (see Manna), a handsome tree with greenish-white flowers and native in south Europe. In southern Europe there is a small-leaved ash, called *Fraxinus parvifolia*. *F. floribunda*, a large tree with terminal panicles of white flowers, is a native of the Himalayas. In America there are several species—such as *Fraxinus americana*, the white ash; *F. pubescens*, the red ash; and *F. sambucifolia*, the black ash.

The "mountain ash" belongs to a totally different family from the common ash. It is called *Pyrus Aucuparia*, and belongs to the natural order Rosaceae, and the tribe *Pomeae*, which includes also apples, pears, &c. Its common name is probably due to its resemblance to the true ash, in its smooth grey bark, graceful ascending branches, and especially the form of the leaf, which is also pinnately compound but smaller than in the true ash. Its common name in Scotland is the rowan tree; it is well known by its clusters of white blossoms and succulent scarlet fruit. The name of poison ash is given to *Rhus venenata*, the North American poison elder or sumach, belonging to the Anacardiaceae (Cashew family). The bitter ash of the West Indies is *Simaruba excelsa*, which belongs to the natural order Simarubaceae. The Cape ash is *Ekebergia capensis*, belonging to the natural order Meliaceae, a large tree, a native of the Cape of Good Hope. The prickly ash, *Xanthoxylon Clava-Herculis* (nat. ord. Xanthoxyleae), a native of the south-eastern United States, is a small tree, the trunk of which is studded with corky tubercles, while the branches are armed with stout, sharp, brown prickles.

1 The homonym, ash or (pl.) ashes, the residue (of a body, &c.) after burning, is a common Teutonic word, Ger. *Asche*, connected with the root found in Lat. *ardere*, to burn.

A'SHĀ [Maimūn ibn Qais], Arabian poet, was born before Mahomet, and lived long enough to accept the mission of the prophet. He was born in Manfuha, a village of al-Yemāma in the centre of Arabia, and became a wandering singer, passing through all Arabia from Hadramut in the south to al-Hīra in the north, and naturally frequenting the annual fair at Okaz (Ukāz). His love poems are devoted to the praise of Huraira, a black female slave. Even before the time of Mahomet he is said to have believed in the resurrection and last judgment, and to have been a monotheist. These beliefs may have been due to his intercourse with the bishop of Nejran (Najrān) and the 'Ibādites (Christians) of al-Hīra. His poems were praised for their descriptions of the wild ass, for the praise of wine, for their skill in praise and satire, and for the varieties of metre employed. His best-known poem is that in praise of Mahomet.

His poems have been collected from various sources in L. Cheikho's *Les Poètes arabes chrétiens* (Jesuit press, Beirut, 1890), pp. 357-399. His eulogy of Mahomet has been edited by H. Thorbecke, *Al AšSa'ṣ Lobgedicht auf Muhammad* (Leipzig, 1875).

(G. W. T.)

ASHANTI, a British possession in West Africa, bounded W. by the (French) Ivory Coast colony, N. by the British Protectorate known as Northern Territories of the Gold Coast (see Gold Coast), and E. by the river Volta (which separates it from the German colony of Togoland); the southern frontier is conterminous with the northern frontier of the (British) Gold Coast colony. It forms an irregular oblong, with a triangular projection (the country of the Adansi) southward. It has an area of 23,000 sq. m., and a population estimated (1907) at 500,000.

Physical Features; Flora and Fauna.—A great part of Ashanti is covered with primeval and almost impenetrable forest.[1] Many of the trees, chiefly silk-cotton and hardwood, attain splendid proportions, the bombax reaching a height of over 200 ft., but the monotony is oppressive, and is seldom relieved by the sight of flowers, birds or beasts. Ferns are abundant, and the mimosa rises to heights of from 30 to 60 ft. All over the forest spread lianas, or monkey-ropes, their usual position being that of immense festoons hanging from tree to tree. To these lianas (species of which yield one kind of the rubber of commerce) is due largely the weird aspect of the forest. The country round the towns, however, is cultivated with care, the fields yielding in abundance grain, yams, vegetables and fruits. In the north-

eastern districts the primeval forest gives place to park-like country, consisting of plains covered with high coarse grass, and dotted with occasional baobabs, as well as with wild plum, shea-butter, dwarf date, fan palms, and other small trees. Among the wild animals are the elephant (comparatively rare), the leopard, varieties of antelope, many kinds of monkeys and numerous venomous snakes. Crocodiles and two kinds of hippopotami, the ordinary and a pygmy variety, are found in the rivers. Of birds, parrots are the most characteristic. Insect life is abundant.

About 25 m. south-east of Kumasi is Lake Busumchwi, the sacred lake of the Ashanti. It is surrounded by forest-clad hills some 800 ft. high, is nearly circular and has a maximum diameter of 6 m. The Black Volta, and lower down the Volta (*q.v.*), form the northern frontier, and various tributaries of the Volta, running generally in a northerly direction, traverse the eastern portion of the country. In the central parts are the upper courses of the Ofin and of some tributaries of the Prah. Farther west are the Tano and Bia rivers, which empty their waters into the Assini lagoon. In their course through Ashanti, the rivers, apart from the Volta, are navigable by canoes only. The elevation of the country is generally below 2000 ft., but it rises towards the north.

Climate.—The climate, although unsuited to the prolonged residence of Europeans, is less unhealthy than that of the coast towns of West Africa. The water-supply is good and abundant. The rainy season lasts from the end of May until October; storms are frequent and violent. The mean temperature at Kumasi is 76° F., the mean annual rainfall 40 ins.

Inhabitants.—The most probable tradition represents the Ashanti as deriving their origin from bands of fugitives, who in the 16th or 17th century were driven before the Moslem tribes migrating southward from the countries on the Niger and Senegal. Having obtained possession of a region of impenetrable forest, they defended themselves with a valour which, becoming part of their national character, raised them to the rank of a powerful and conquering nation. They are of the pure negro type, and are supposed to be originally of the same race as the Fanti, nearer the coast, and speak the same language. The separation of Fanti and Ashanti has been ascribed to a famine which drove the former south, and led them to live on *fan*, or herbs, while the latter subsisted on *san*, or Indian corn, &c., whence the names Fanti and Santi. The Ashanti are divided into a large number of tribes, of whom a dozen may be distinguished, namely, the Bekwai, Adansi, Juabin, Kokofu, Kumasi, Mampon, Nsuta, Nkwanta, Dadiassi, Daniassi, Ofinsu and Adjisu. Each tribe has its own king, but from the beginning of the 18th century the king of Kumasi was recognized as king paramount, and was spoken of as the king of Ashanti. As paramount king he succeeded to the "golden stool," the symbol of authority among the Ashanti. After the deposition of Prempeh (1896) no king of Kumasi was chosen; Prempeh himself was never "enstooled." The government of Ashanti was formerly a mixture of monarchy and military aristocracy. The confederate tribes were originally organized for purposes of war into six great divisions or clans, this organization developing into the main social fabric of the state. The chiefs of the clans, with a few sub-chiefs having hereditary rights, formed the King's Council, and the king, unless of exceptionally strong character, often exercised less power than the council of chiefs, each of whom kept his little court, making a profuse display of barbaric pomp. Land is held in common by the tribes, lands unallotted being attached to the office of head chief or king and called "stool lands." Polygamy is practised by all who can afford it. It is stated by the early chroniclers that the king of Ashanti was bound to maintain the "fetish" number of 3333 wives; many of these, however, were employed in menial services. The crown descended to the king's brother, or his sister's son, not to his own offspring. The queen mother exercised considerable authority in the state, but the king's wives had no power. The system of human sacrifices, practised among the Ashanti until the closing years of the 19th century, was founded on a sentiment of piety towards parents and other connexions—the chiefs believing that the rank of their dead relatives in the future world would be measured by the number of attendants sent after them. There were two periods, called the great Adai and little Adai, at which human victims, chiefly prisoners of war or condemned criminals, were immolated. There is reason to believe that the extent of this practice was not so great as was currently reported.

There are a few Mahommedans in Ashanti, most of them traders from other countries, and the Basel and Wesleyan missionaries have obtained some converts to Christianity; but the great bulk of the people are spirit-worshippers. Unlike many West African races, the Ashanti in general show a repugnance to the doctrines of Islam.

Towns and Trade.—Besides the capital, Kumasi (*q.v.*), with a population of some 6000, there are few important towns in Ashanti. Obuassi, in the south-west, is the centre of the gold-mining industry. Wam is on the western border, Nkoranza, Atabubu and Kintampo in the north. Kintampo is a town of some size and is about 130 m. north-east of Kumasi. It is the meeting-place of traders from the Niger countries and from the coast. Formerly one of the great slave and ivory marts of West Africa, it is now a centre of the kola-nut commerce and a depot for government stores. The Ashanti are skilful in several species of manufacture, particularly in weaving cotton. Their pottery and works in gold also show considerable skill. A large quantity of silver-plate and goldsmiths' work of great value and considerable artistic elaboration was found in 1874 in the king's palace at Kumasi, not the least remarkable objects being masks of beaten gold. The influence of Moorish art is perceptible.

The vegetable products do not differ greatly from those found on the Gold Coast; the most important commercially is the rubber tree (*Funtumia elastica*). The nut of the kola tree is in great demand, and since 1905 many cocoa plantations have been established, especially in the eastern districts. Tobacco is cultivated in the northern regions. Gum copal is exported. Part of the trade of Ashanti had been diverted to the French port of Assini in consequence of the wars waged between England and the Ashanti, but on the suppression of the revolt of 1900 measures were taken to improve trade between Kumasi and Cape Coast. Kumasi is the distributing centre for the whole of Ashanti and the hinterland. Gold exists in the western districts of the country, and several companies were formed to work the mines in the period 1895-1901. Most of the gold exported from the Gold Coast in 1902 and following years came from the Obuassi mines. The gold output from Ashanti amounted in 1905 to 68,259 oz., valued at £254,790. The railway to Kumasi from Sekondi, which was completed in 1903, passes through the auriferous region. As far as the trade goes through British territory southward, the figures are included in those of the Gold Coast; but Ashanti does also a considerable trade with its French and German neighbours, and northwards with the Niger countries. Its revenue and expenditure are included in those of the Gold Coast. Revenue is obtained principally from caravan taxes, liquor licences, rents from government land and contributions from the gold-mining companies.

Communications.—The railway to Kumasi, cut through one of the densest forest regions, is described under Gold Coast. The usual means of communication is by tortuous paths through the forest, too narrow to admit any wheeled vehicle. A wide road, 141 m. long, has been cut through the bush from Cape Coast to Kumasi, and from Kumasi ancient caravan routes go to the chief trading centres farther inland. Where rivers and swamps have to be crossed, ferries are maintained. A favourite mode of travelling in the bush is in a palanquin borne on the heads of four carriers. Telegraph lines connect Kumasi with the coast towns and with the towns in the Northern Territories. There is a well-organized postal service.

History.—The Ashanti first came under the notice of Europeans early in the 18th century, through their successful wars with the kingdoms bordering the maritime territory. Osai Tutu may be considered as the real founder of the Ashanti power. He either built or greatly extended Kumasi; he subdued the neighbouring state of Denkera (1719) and the Mahommedan countries of Gaman (Jaman) and Banna, and extended the empire by conquests both on the east and west. At last he was defeated and slain (1731); but his successor, Osai Apoko, made further acquisitions towards the coast. In 1800, Osai Tutu Quamina, an enterprising and ambitious man, who appears early to have formed the desire of opening a communication with white nations, became king. About 1807, two chiefs of the Assin, whom he had defeated in battle, sought refuge among the Fanti, the ruling people on the coast. On the refusal of the Fanti to deliver up the fugitives, Osai Tutu invaded their country, defeated them and drove them towards the sea. The Ashanti reached the coast near Anamabo, where there was then a British fort. The governor exhorted the townsmen to come to terms and offered to mediate; but they resolved to abide the contest. The result was the destruction of the town, and the slaughter of 8000 of the inhabitants. The Ashanti, who lost over 2000 men, failed, however, to storm the English fort, though the garrison was reduced from twenty-four to eight men. A truce was agreed to, and the king refusing to treat except with the governor of Cape Coast, Colonel G. Torrane (governor 1805-1807) repaired to Anamabo, where he was received with great pomp. Torrane determined to surrender the fugitive Assin chiefs, but one succeeded in escaping; the other, on being given up, was put to death by the Ashanti. Torrane concluded an agreement with the Ashanti, acknowledging their conquest of Fantiland, and delivering up to them half the fugitives in Anamabo fort (most of the remainder were sold by Torrane and the members of his council as slaves). The governor also agreed to pay rent to the Ashanti for Anamabo fort and Cape Coast castle. The character of this man, who died on the coast in 1808, is indicated by Osai Tutu's eulogy of him. "From the hour Governor Torrane delivered up Tchibbu [one of the Assin fugitives] I took the English for my friends," said the king of Ashanti, "because I saw their object was trade only and they did not care for the people. Torrane was a man of sense and he pleased me much."

Early relations with the British.

In consequence of repeated invasions of Fantiland by the Ashanti, the British in 1817 sent Frederick James, commandant of Accra fort, T.E. Bowdich and W. Hutchinson on a mission to Kumasi. After one or two harmonious interviews, the king advanced a claim for the payment of the quit rents for Anamabo fort and Cape Coast castle, rents the major part of which the Fanti had induced the British to pay to them, leaving only a nominal sum for transmission to Kumasi. Mr James, the head of the mission, volunteered no satisfactory

explanation, whereupon the king broke into uncontrollable rage, calling the emissaries cheats and liars. Bowdich and Hutchinson, thinking that British interests and the safety of the mission were endangered, took the negotiation into their own hands. Mr James was recalled, and a treaty was concluded, by which the king's demands were satisfied, and the right of the British to control the natives in the coast towns recognized.

The government at home, though they demurred somewhat to the course that had been pursued, saw the wisdom of cultivating intercourse with this powerful African kingdom. They sent out, therefore, to Kumasi, as consul, Mr Joseph Dupuis, formerly consul at Mogador, who arrived at Cape Coast in January 1819. By that time fresh difficulties had arisen between the coast natives, who were supported by the British, and the Ashanti. Dupuis set out on the 9th of February 1820, and on the 28th arrived at Kumasi. After several meetings with the king, a treaty was drawn up, which acknowledged the sovereignty of Ashanti over the territory of the Fanti, and left the natives of Cape Coast to the mercy of their enemies. Mr J. Hope Smith, the governor of Cape Coast, disowned the treaty, as betraying the interests of the natives under British protection. Mr Hope Smith was supported by the government in London, which in 1821 assumed direct control of the British settlements. Sir Charles M'Carthy, the first governor appointed by the crown, espoused the cause of the Fanti, but was defeated in battle by the Ashanti, the 21st of January 1824, at a place beyond the Prah called Essamako. The Ashanti had 10,000 men to Sir Charles's 500. Sir Charles and eight other Europeans were killed. The skull of the governor was afterwards used at Kumasi as a royal drinking-cup. It was asserted that Sir Charles lost the battle through his ordnance-keeper bringing up kegs filled with vermicelli instead of ammunition. The fact is that the mistake, if made, only hastened the inevitable catastrophe. On the very day of this defeat Osai Tutu Quamina died and was succeeded by Osai Okoto. A state of chronic warfare ensued, until the Ashanti sustained a signal defeat at Dodowah on the 7th of August 1826. From this time the power of the Ashanti over the coast tribes waned, and in 1831 the king was obliged to purchase peace from Mr George Maclean, then administrator of the Gold Coast, at the price of 600 oz. of gold, and to send his son as a hostage to Cape Coast. The payment of ground rent for the forts held by the British had ceased after the battle of Dodowah, and by the treaty concluded by Maclean the river Prah was fixed as the boundary of the Ashanti kingdom, all the tribes south of it being under British protection.

Sir Charles M'Carthy's fate.

The king (Kwaka Dua I.), who had succeeded Osai Okoto in 1838, was a peace-loving monarch who encouraged trade, but in 1852 the Ashanti tried to reassert authority over the Fanti in the Gold Coast protectorate, and in 1863 a war was caused by the refusal of the king's demand for the surrender by the British of a fugitive chief and a runaway slave-boy. The Ashanti were victorious in two battles and retired unmolested. The governor, Mr Richard Pine, urged the advisability of an advance on Kumasi, but this the British government would not allow. No further fighting followed, but the prestige of the Ashanti greatly increased. "The white men" (said Kwaka Dua) "bring many cannon to the bush, but the bush is stronger than the cannon." In April 1867 Kwaka Dua died, and after an interval of civil war was succeeded by Kofi Karikari, who on being enstooled swore, "My business shall be war." Thereafter preparations were made throughout Ashanti to attack the Fanti tribes, and the result was the war of 1873-74.

Two distinct events were the immediate cause of the war. The principal was the transference of Elmina fort from the Dutch to the British, which took place on the 2nd of April 1872. The Elmina were regarded by the Ashanti as their subjects, and the king of Ashanti held the Elmina "custom-note,"—that is, he received from the Dutch an annual payment, in its origin a ground rent for the fort, but looked upon by the Dutch as a present for trade purposes. The Ashanti greatly resented the occupation by Britain of what they considered Ashanti territory. Another but minor cause of the war was the holding in captivity by the Ashanti of four Europeans. An Ashanti force invaded Krepi, a territory beyond the Volta, and in June 1869 captured Mr Fritz A. Ramseyer, his wife and infant son (the child died of privation shortly afterwards), and Mr J. Kühne, members of the Basel mission. Monsieur M.J. Bonnat, a French trader, was also captured at another place. The captives were taken to Kumasi. Negotiations for their release were begun, but the Europeans were still prisoners when the sale of Elmina occurred. The Ashanti delayed war until their preparations were complete, whilst the Gold Coast officials appear to have thought the risk of hostilities remote. However, on the 22nd of January 1873 an Ashanti force crossed the Prah and invaded the British protectorate. They defeated the Fanti, stirred up disputes at Elmina, and encamped at Mampon near Cape Coast, to the great alarm of the inhabitants. Measures were taken for the defence of the territory and the punishment of the assailants, which culminated in the despatch of Sir Garnet (afterwards Viscount) Wolseley as British administrator, £800,000 being voted by parliament for the expenses of the expedition. On landing (October 2) at Cape Coast, Wolseley found the Ashanti, who had been decimated by smallpox and fever, preparing to return home. He determined, however, to march to Kumasi, whilst Captain (afterwards Sir) John Glover, R.N., administrator of Lagos, was with a force of native levies to co-operate from the east and take the Ashanti in rear. Meanwhile the enemy broke up camp, and, although harassed by native levies raised by the British, effected an orderly retreat. The Ashanti army re-entered Kumasi on the 22nd of December. Wolseley asked for the help of white troops, and the 2nd battalion Rifle Brigade, the 23rd Fusiliers and 42nd Highlanders were despatched. Seeing the preparations made by his enemy, Kofi Karikari endeavoured to make peace, and in response to General Wolseley's demands the European captives were released (January 1874). Sir Garnet determined that peace must be signed in Kumasi and continued his advance. On the 20th of January the river Prah was crossed by the European troops; on the 24th the Adansi hills were reached; on the 31st there was severe fighting at Amoaful; on the 1st of February Bekwai was captured; and on the evening of the 4th the victorious army was in Kumasi, after seven hours' fighting. The king, who had led his army, fled into the bush when he saw the day was lost. As the 42nd Highlanders pushed forward to Kumasi, the town was found full of Ashanti soldiers, but not a shot was fired at the invaders. Sir Garnet Wolseley sent messengers to the king, but Kofi Karikari refused to surrender. As his force was small, provisions scarce, and the rainy season setting in, and as he was encumbered with many sick and wounded, the British general decided to retire. On the 6th, therefore, the homeward march was commenced, the city being left behind in flames. In the meantime Captain Glover's force had crossed the Prah on the 15th of January, and the Ashanti opposition weakening after the capture of Kumasi, Glover was able to push forward. On the 11th of February, Captain (later General) R.W. Sartorius, who had been sent ahead with twenty Hausa only, found Kumasi still deserted. Captain Sartorius and his twenty men marched 50 m. through the heart of the enemy's country. On the 12th Glover and his force of natives entered the Ashanti capital. The news of Glover's approach induced the king, who feared also the return of the white troops, to sue for peace. On the 9th of February a messenger from Kofi Karikari overtook Sir Garnet, who on the 13th at Fomana received the Ashanti envoys. A treaty was concluded whereby the king agreed, among other conditions, to pay 50,000 oz. of gold, to renounce all claim to homage from certain neighbouring kings, and all pretensions of supremacy over any part of the former Dutch protectorate, to promote freedom of trade, to keep open a road from Kumasi to the Prah, and to do his best to check the practice of human sacrifice. Besides coloured troops, there were employed in this campaign about 2400 Europeans, who suffered severely from fever and otherwise, though the mortality among the men was slight. Seventy-one per cent of the troops were on the sick list, and more than forty officers died—only six from wounds. The success of the expedition was facilitated by the exertions of Captain (afterwards General Sir William) Butler and Captain (afterwards General W. L.) Dalrymple, who effected diversions with very inadequate resources.

The war of 1873-1874.

One result of the war of 1873-74 was that several states dependent on Ashanti declared themselves independent, and sought British protection. This was refused, and the inaction of the colonial office contributed to the reconsolidation of the Ashanti power.[2] Shortly after the war the Ashanti deposed Kofi Karikari, and placed on the golden stool—the symbol of sovereignty—his brother Mensa. This monarch broke almost every article of the Fomana treaty, and even the payment of the indemnity was not demanded. (In all, only 4000 oz. of gold, out of the 50,000 stipulated for, were paid.) Mensa's rule was tyrannous and stained with repeated human sacrifices. In 1883 a revolution displaced that monarch, who was succeeded by Kwaka Dua II.—a young man who died (June 1884) within a few months of his election. In the same month died the ex-king Kofi Karikari, and disruption threatened Ashanti. At length, after a desolating civil war, Prince Prempeh—who took the name of Kwaka Dua III.—was chosen king (March 26, 1888), the colonial government having been forced to intervene in the dispute owing to the troubles it occasioned in the Gold Coast. The election of Prempeh took place in the presence and with the sanction of an officer of the Gold Coast government. Prempeh defeated his enemies, and for a time peace and prosperity returned to Ashanti. However in 1893 there was fresh trouble between Ashanti and the tribes of the protectorate, and the roads were closed to traders by Prempeh's orders. The British government was forced to interfere, more especially as the country, by international agreement, had been included in the British sphere of influence. A mission was despatched to Prempeh, calling upon him to fulfil the terms of the 1874 treaty, and further, to accept a British protectorate and receive a resident at Kumasi. The king declined to treat with the governor of the Gold Coast, and despatched informal agents to England, whom the secretary of state refused to receive. To the demands of the British mission relative to the acceptance of a protectorate and other matters, Prempeh made no reply in the three weeks' grace allowed, which expired on the 31st of October 1895. To enforce the British demands, to put an end to the misgovernment and barbarities carried on at Kumasi, and to establish law, order and security for trade, an expedition was at length decided upon. The force, placed under Colonel Sir Francis Scott, consisted of the 2nd West Yorkshire regiment, a "special service corps," made up of detachments from various regiments in the United Kingdom, under specially selected officers, the 2nd West India regiment, and the Gold Coast and Lagos Hausa. The composition of the special service corps was much criticized at the time; but as it was not called upon for fighting purposes, no inferences as to its efficiency are possible. The details of the expedition were carefully organized. Before the arrival of the staff and contingent from England (December 1895) the native forces were employed in improving the road from Cape Coast to Prahsu (70 m.), and in establishing road stations to serve as standing camps for

A British protectorate established.

the troops. About 12,000 carriers were collected, the load allotted to each being 50 lb.[1] In addition, a force of native scouts, which ultimately reached a total of 860 men, was organized in eighteen companies, and partly armed with Snider rifles, to cover the advance of the main column, which started on the 27th of December, and to improve the road. The king of Bekwai having asked for British protection, a small force was pressed forward and occupied this native town, about 25 m. from Kumasi, on the 4th of January 1896. The advance continued, and at Ordahsu a mission arrived from King Prempeh offering unconditional submission. On the 17th of January Kumasi was occupied, and Colonel Sir F. Scott received the king. Effective measures were taken to prevent his escape, and on the 20th 728

Prempeh deposed.

Prempeh made submission to Mr (afterwards Sir W. E.) Maxwell, the governor of Cape Coast, in native fashion. After this act of public humiliation, the king and the queen mother with the principal chiefs were arrested and taken as prisoners to Cape Coast, where they were embarked on board H.M.S. "Racoon" for Elmina. The fetish buildings at Bantama were burned, and on the 22nd of January Bokro, a village 5 m. from Kumasi, and Maheer, the king's summer palace, were visited by the native scouts and found deserted. On the same day, leaving the Hausa at Kumasi, the expedition began the return march of 150 m. to Cape Coast. The complete success of the expedition was due to the excellent organization of the supply and transport services, while the promptitude with which the operations were carried out probably accounts in great measure for the absence of resistance. Although no fighting occurred, a heavy strain was thrown upon all ranks, and fever claimed many victims, among whom was Prince Henry of Battenberg, who had volunteered for the post of military secretary to Colonel Sir F. Scott.

Siege and relief of Kumasi.

After the deportation of Prempeh no successor was appointed to the throne of Ashanti. A British resident, Captain Donald W. Stewart, was installed at Kumasi, and whilst the other states of the confederacy retained their king and tribal system the affairs of the Kumasi were administered by chiefs under British guidance. Mr and Mrs Ramseyer (two of the missionaries imprisoned by King Kofi Karikari for four and a half years) returned to Kumasi, and other missionaries followed. A fort was built in Kumasi and garrisoned with Gold Coast constabulary. Though outwardly submissive, the Kumasi chiefs were far from reconciled to British rule, and in 1900 a serious rebellion broke out. The tribes involved were the Kumasi, Adansi and Kokofu; the other tribes of the Ashanti confederation remained loyal. The rebels were, however, able to command a force reported to number 40,000. On the 28th of March, before the rebellion had declared itself, the governor of the Gold Coast, Sir F. Hodgson, in a public palaver at Kumasi, announced that the Ashanti chiefs would have to pay the British government 4000 oz. of gold yearly, and he reproached the chiefs with not having brought to him the golden stool, which the Kumasi had kept hidden since 1896. Three days afterwards the Kumasi warriors attacked a party of Hausa sent with the chief object of discovering the golden stool. (In the previous January a secret attempt to seize the stool had failed.) The Kumasi, who were longing to wipe out the dishonour of having let Prempeh be deported without fighting, next threatened the fort of Kumasi. Mr Ramseyer and the other Basel missionaries, and Sir F. and Lady Hodgson, took refuge in the fort, and reinforcements were urgently asked for. On the 18th of April 100 Gold Coast constabulary arrived. On the 29th the Kumasi attacked in force, but were repulsed. The same day a party of 250 Lagos constabulary reached Kumasi. They had fought their way up, and came in with little ammunition. On the 15th of May Major A. Morris arrived from the British territory north of Ashanti, also with 250 men. The garrison now numbered 700. The 29 Europeans in the fort included four women. Outside the fort were gathered 3000 native refugees. Famine and disease soon began to tell their tale. Sir F. Hodgson sent out a message on the 4th of June (it reached the relieving force on the 12th of June), saying that they could only hold out to the 11th of June. However, it was not till the 23rd of June that the governor and all the Europeans save three, together with 600 Hausa of all ranks, sallied out of the fort. Avoiding the main road, held by the enemy in force, they attacked a weakly held stockade, and succeeded in cutting their way through, with a loss of two British officers mortally wounded, 39 Hausa killed, and double that number wounded or missing. The governor's party reached Cape Coast safely on the 10th of July.

A force of 100 Hausa, with three white men (Captain Bishop, Mr Ralph and Dr Hay), was left behind in Kumasi fort with rations to last three weeks. Meantime a relief expedition had been organized at Cape Coast by Colonel James Willcocks. This officer reached Cape Coast from Nigeria on the 26th of May. The difficulties before him were appalling. Carriers could scarcely be obtained, there were no local food supplies, the rainy season was at its height, all the roads were deep mire, the bush was almost impenetrable, and the enemy were both brave and cunning, fighting behind concealed stockades. It was not until the 2nd of July that Colonel Willcocks was able to advance to Fumsu. On the next day he heard of the escape of the governor and of the straits of the garrison left at Kumasi. He determined to relieve the fort in time, and on the 9th of July reached Bekwai, the king of which place had remained loyal. Making his final dispositions, the colonel spread a report that on the 13th he would attack Kokofu, east of Bekwai, and this drew off several thousands of the enemy from Kumasi. After feinting to attack Kokofu, Colonel Willcocks suddenly marched west. There was smart fighting on the 14th, and at 4.30 P.M. on the 15th, after a march since daybreak through roads "in indescribably bad condition," the main rebel stockade was encountered. It was carried at the point of the bayonet by the Yoruba troops, who proved themselves fully equal to the Hausa. "The charge could not have been beaten in *élan* by any soldiers." Kumasi was entered the same evening, a bugler of the war-worn garrison of the fort sounding the "general salute" as the relieving column came in view. Most of the defenders were too weak to stand. Outside the fort nothing was to be seen but burnt-down houses and putrid bodies. The relieving force that marched into Kumasi consisted of 1000 fighting men (all West Africans), with 60 white officers and non-commissioned officers, two 75-millimetre guns, four seven-pounder guns and six Maxims.

Kumasi relieved, there remained the task of crushing the rebellion. Colonel Willcocks's force was increased by Yaos and a few Sikhs from Central Africa to a total of 3368 natives, with 134 British officers and 35 British non-commissioned officers. In addition there were Ashanti levies. On the 30th of September the Kumasi were completely beaten at Obassa. Thereafter many of the rebel chiefs surrendered, and the only two remaining in the field were captured on the 28th of December. Thus 1901 opened with peace restored. The total number of casualties during the campaign (including those who died of disease) was 1007. Nine British officers were killed in action, forty-three were wounded, and six died of disease. The commander, Colonel Willcocks, was promoted and created a K.C.M.G.

Progress under British administration.

By an order in council, dated the 26th of September 1901, Ashanti was formally annexed to the British dominions, and given a separate administration under the control of the governor of the Gold Coast. A chief commissioner represents the governor in his absence, and is assisted by a staff of four commissioners and four assistant commissioners. A battalion of the Gold Coast regiment is stationed in the country with headquarters at Kumasi. The order in council mentioned, which may be described as the first constitution granted Ashanti by its British owners, provides that the governor, in issuing ordinances respecting the administration of justice, the raising of revenue, or any other matter, shall respect any native laws by which the civil relations of any chiefs, tribes or populations are regulated, "except so far as they may be incompatible with British sovereignty or clearly injurious to the welfare of the natives themselves." After the annexation of the country in 1901 the relations between the governing power and the governed steadily improved. Mr F.C. Fuller, who succeeded Sir Donald Stewart as chief commissioner early in 1905, was able to report in the following year that among the Ashanti suspicion of the "white man's" ulterior motives was speedily losing ground. The marked preference shown by the natives to resort to the civil and criminal courts established by the British demonstrated their faith in the impartial treatment awarded therein. Moreover, the maintenance of the tribal system and the support given to the lawful chiefs did much to win the confidence and respect of a people naturally suspicious, and mindful of their exiled king.

BIBLIOGRAPHY.—For a general survey of the country, see *Travels in Ashanti and Jaman*, by R.A. Freeman (London, 1898); *Historical Geography of the British Colonies*, vol. iii. "West Africa," by C.P. Lucas (Oxford, 1900); and the *Annual Reports, Ashanti*, issued from 1906 onward by the Colonial Office, London. *The Tshi-speaking Peoples of the Gold Coast*, by Col. A.B. Ellis (London, 1887), deals with ethnology. Of early works on the country the most valuable are *A Mission from Cape Coast Castle to Ashantee*, by T.E. Bowdich (London, 1819); and *Journal of a Residence in Ashantee* (London, 1824), by J. Dupuis. For history generally, see *A History of the Gold Coast of West Africa*, by Col. A.B. Ellis (London, 1893); and *History of the Gold Coast and Asante ... from about 1500 to 1860*, by C.C. Reindorf, a native pastor of the Basel mission (Basel, 1895). 729

For the British military campaigns, in addition to the official blue-books, consult: *Narrative of the Ashantee War*, 2 vols., by (Sir) Henry Brackenbury (London, 1874); *The Story of a Soldier's Life* by Viscount Wolseley, vol. ii. chs. xliii.-l. (London, 1903); *Coomassie*, by (Sir) H.M. Stanley, being the story of the 1873-74 expedition (new ed., London, 1896); *Life of Sir John Hawley Glover*, by Lady Glover, chs. iii.-x. (London, 1897); *The Downfall of Prempeh*, by (General) R.S.S. Baden-Powell, an account of the 1895-96 expedition (London, 1896); *From Kabul to Kumassi* (chs. xv. to end), by Sir James Willcocks, (London, 1904); *The Ashanti Campaign of 1900*, by Capt. C.H. Armitage and Lieut.-Col. A.F. Montanaro (London, 1901); *The Relief of Kumasi*, by Capt. H.C.J. Biss (London, 1901). The two bocks following are by besieged residents in Kumasi: *The Siege of Kumasi*, by Lady Hodgson (London, 1901); *Dark and Stormy Days at Kumasi*, 1900, from the diary of the Rev. Fritz Ramseyer (London, 1901). Many of the works quoted under GOLD COAST deal also with Ashanti.

(F. R. C.)

1 The exact area of dense forest land is unknown, but is estimated at fully 12,000 sq. m.

2 An attempt was made late in 1875, by the despatch of Dr V.S. Gouldsbury on a mission to Eastern Akim, Juabin and Kumasi, to repair the effects of the previous inaction of the colonial government, but without success.

ASH'ARĪ [Abū-l Hasan 'Ali ibn Isma'īl ul-Ash'arī], (873-935), Arabian theologian, was born of pure Arab stock at Basra, but spent the greater part of his life at Bagdad. Although belonging to an orthodox family, he became a pupil of the great Mu'tazalite teacher al-Jubbā'ī, and himself remained a Mu'tazalite until his fortieth year. In 912 he returned to the faith of his fathers and became its most distinguished champion, using the philosophical methods he had learned in the school of heresy. His theology, which occupied a mediate position between the extreme views on most points, became dominant among the Shafi'ites. He is said to have written over a hundred works, of which only four or five are known to be extant.

See W. Spitta, *Zur Geschichte Abu 'l-Hasan al Aš'arī's* (Leipzig, 1876); A.F. Mehren, *Exposé de la reforme de l'Islamisme commencée par Abou. 'l-Hasan Ali el-Ash'ari* (Leiden, 1878); and D.B. Macdonald's *Muslim Theology* (London, 1903), especially the creed of Ash'ari in Appendix iii.

(G. W. T.)

ASHBOURNE, a market-town in the western parliamentary division of Derbyshire, England, 13 m. W.N.W. of Derby, on the London & North-Western and the North Staffordshire railways. Pop. of urban district (1901) 4039. It is pleasantly situated on rising ground between two small valleys opening into that of the Dove, and the most beautiful scenery of Dovedale is not far distant. The church of St Oswald is cruciform, Early English and later; a fine building with a central tower and lofty octagonal spire. Its monuments and brasses are of much interest. The town has a large agricultural trade and a manufacture of corsets. The streams in the neighbourhood are in favour with trout fishermen. Ashbourne Hall, an ancient mansion, has associations with "Prince Charlie," who occupied it both before and after his advance on Derby in 1745. There are also many connexions with Dr Johnson, a frequent visitor here to his friend Dr Taylor, who occupied a house opposite the grammar school.

ASHBURNHAM, JOHN (*c.* 1603-1671), English Royalist, was the son of Sir John Ashburnham of Ashburnham in Sussex. He early entered the king's service. In 1627 he was sent to Paris by his relative the duke of Buckingham to make overtures for peace, and in 1628 he prepared to join the expedition to Rochelle interrupted by the duke's assassination. The same year he was made groom of the bedchamber and elected member of parliament for Hastings, which borough he also represented in the Long Parliament of 1640. In this capacity he rendered services by reporting proceedings to the king. He made a considerable fortune and recovered the Ashburnham estates alienated by his father. He became one of the king's chief advisers and had his full confidence. He attended Charles at York on the outbreak of the war with Scotland. In the Civil War he was made treasurer of the royal army, in which capacity he aroused Hyde's jealousy and remonstrances by infringing on his province as chancellor of the exchequer. In 1644 he was a commissioner at Uxbridge. He accompanied Charles in his flight from Oxford in April 1646 to the Scots, and subsequently escaped abroad, joining the queen at Paris, residing afterwards at Rouen and being sent to the Hague to obtain aid from the prince of Orange. After the seizure of Charles by the army, Ashburnham joined him at Hampton Court in 1647, where he had several conferences with Cromwell and other army officers. When Charles escaped from Hampton Court on the 11th of November, he followed Ashburnham's advice in opposition to that of Sir John Berkeley, who urged the king to go abroad, and took refuge in the Isle of Wight, being placed by Ashburnham in the hands of Robert Hammond, the governor. "Oh, Jack," the king exclaimed when he understood the situation, "thou hast undone me!" when Ashburnham, "falling into a great passion of weeping, offered to go and kill Hammond." By this fatal step Ashburnham incurred the unmerited charge of treachery and disloyalty. Clarendon, however, who censures his conduct, absolves him from any crime except that of folly and excessive self-confidence, and he was acquitted both by Charles I. and Charles II. He was separated with Berkeley from Charles on the 1st of January 1648, waited on the mainland in expectation of Charles's escape, and was afterwards taken and imprisoned at Windsor, and exchanged during the second Civil War for Sir W. Masham and other prisoners. He was one of the delinquents specially exempted from pardon in the treaty of Newport. In November he was allowed to compound for his estates, and declared himself willing to take the covenant. After the king's death he remained in England, an object of suspicion to all parties, corresponded with Charles II., and underwent several terms of imprisonment in the Tower and in Guernsey. At the Restoration he was reinstated in his former place of groom of the bedchamber and was compensated for his losses. He represented Sussex in parliament from 1661 till the 22nd of November 1667, when he was expelled the House for taking a bribe of £500 from French merchants for landing their wines. He died on the 15th of June 1671.

He had eight children, the eldest of whom, William, left a son John (1656-1710), who in 1689 was created Baron Ashburnham. John's second son, John (1687-1737), who became 3rd Baron Ashburnham on his brother's death in 1710, was created Viscount St Asaph and earl of Ashburnham in 1730. The 5th earl (b. 1840) was his direct descendant. Bertram (1797-1878), the 4th earl, was the collector of the famous Ashburnham library, which was dispersed in 1883 and 1884.

A Letter from Mr Ashburnham to a Friend, defending John Ashburnham's conduct with regard to the king, was published in 1648. His longer *Narrative* was published in 1830 by George, 3rd earl of Ashburnham (the latter's championship of his ancestor, however, being entirely uncritical and unconvincing); *A Letter to W. Lenthall* (1647) repudiates the charge brought against the king of violating his parole (*Thomason Tracts*, Brit. Museum, E 418 [4]).

ASHBURTON, ALEXANDER BARING, 1ST BARON[1] (1774-1848), English politician and financier, 2nd son of Sir Francis Baring (the founder of the house of Baring Brothers & Co.) and of Harriet, daughter of William Herring, was born on the 27th of October 1774, and was brought up in his father's business. He was sent by the latter to the United States; married Anne, daughter of William Bingham, of Philadelphia, and formed wide connexions with American houses. In 1810, by his father's death, he became head of the firm. He sat in parliament for Taunton (1806-1826), Callington (1826-1831), Thetford (1831-1832), North Essex (1832-1835). He regarded politics from the point of view of the business man, opposed the orders in council, and the restrictions on trade with the United States in 1812, and in 1826 the act for the suppression of small bank-notes. He was a strong antagonist of Reform. He accepted the post of chancellor of the exchequer in the duke of Wellington's projected ministry of 1832; but afterwards, alarmed at the scene in parliament, declared "he would face a thousand devils rather than such a House of Commons," and advised the recall of Lord Grey. In 1834 he was president of the board of trade and master of the mint in Sir Robert Peel's government, and on the latter's retirement was created Baron Ashburton on the 10th of April 1835, taking the title previously held by John Dunning, his aunt's husband. In 1842 he was despatched to America, and the same year concluded the Ashburton or Webster-Ashburton treaty. A compromise was settled concerning the north-east boundary of Maine, the extradition of certain criminals was arranged, each state agreed to maintain a squadron of at least eighty guns on the coast of Africa for the suppression of the slave trade, and the two governments agreed to unite in an effort to persuade other powers to close all slave markets within their territories. Despite his earlier attitude, Lord Ashburton disapproved of Peel's free-trade projects, and opposed the Bank Charter Act of 1844. He was a trustee of the British Museum and of the National Gallery, a privy councillor and D.C.L. of Oxford. He published, besides several speeches, *An Enquiry into the Causes and Consequences of the Orders in Council* (1808), and *The Financial and Commercial Crisis Considered* (1847). He died on the 13th of May 1848, leaving a large family, his eldest son becoming 2nd baron. The 5th baron (b. 1866) succeeded to the title in 1889.

1 *i.e.* in the existing line; see below for the earlier creation.

ASHBURTON, JOHN DUNNING, 1ST BARON[1] (1731-1783), English lawyer, the second son of John Dunning of Ashburton, Devonshire, an attorney, was born at Ashburton on the 18th of October 1731, and was educated at the free grammar school of his native place. At first articled to his father, he was admitted, at the age of nineteen, to the Middle Temple, and called to the bar in 1756, where he came very slowly into practice. He went the western circuit for several years without receiving a single brief. In 1762 he was employed to draw up a defence of the British East India Company against the Dutch East India Company, which had memorialized the crown on certain grievances, and the masterly style which characterized the document procured him at once reputation and emolument. In 1763 he distinguished himself as counsel on the side of Wilkes, whose cause he conducted throughout. His powerful argument against the validity of general warrants in the case of *Leach* v. *Money* (June 18, 1763) established his reputation, and his practice from that period gradually increased to such an extent that in 1776 he is said to have been in the receipt of nearly £10,000 per annum. In 1766 he was chosen recorder of Bristol, and in December 1767 he was appointed solicitor-general. The latter appointment he held till May 1770, when he retired with his friend Lord Shelburne. In 1771 he was presented with the freedom of the city of London. From this period he was considered as a regular member of the opposition, and distinguished himself by many able speeches in parliament. He was first chosen member for Calne in 1768, and continued to represent that borough until he was promoted to the peerage. In 1780 he brought forward a motion that the "influence of the crown had increased, was increasing, and ought to be diminished," which he carried by a majority of eighteen. He strongly opposed the system of sinecure officers and pensions; but his probity was not strong enough to prevent his taking advantage of it himself. In 1782, when the marquis of Rockingham became prime minister, Dunning was appointed chancellor of the duchy of Lancaster, a rich sinecure; and about the same time he was advanced to the peerage, with the title of Lord Ashburton. Under Lord Shelburne's administration he accepted a pension of £4000 a year. He died at Exmouth on the 18th of August 1783. Though possessed of an insignificant person, an awkward manner and a provincial accent, Lord Ashburton was one of the most fluent and persuasive orators of his time. He had married Elizabeth Baring, and was succeeded as 2nd baron by his son Richard, at whose death in 1823 the title became extinct, being revived in 1835 by Alexander Baring.

Besides the answer to the Dutch memorial, Lord Ashburton is supposed to have assisted in writing a pamphlet on the law of libel, and to have been the author of *A Letter to the Proprietors of East India Stock, on the subject of Lord Clive's Jaghire, occasioned by his Lordship's Letter on that Subject* (1764, 8vo). He was at one time suspected of being the author of the *Letters of Junius*.

1 *i.e.* of the first creation; for the present title see above.

ASHBURTON, a river of Western Australia, rising in the mountains west of the Great Sandy Desert, and following a course north-westward for 400 m., into Exmouth Gulf. In its upper reaches it flows through a rich gold-bearing district to which it gives name, and nearer its mouth it traverses a vast tract of fine pastoral country. The outlet for both these districts is the port of Onslow, at the mouth of the river, near which there are several pearl-fishing stations. The river is not navigable.

ASHBURTON, a market-town in the Ashburton parliamentary division of Devonshire, England, 24 m. N.W. by W. of Plymouth, on a branch of the Great Western railway. Pop. of urban district (1901) 2628. It lies in a valley surrounded by hills, at a short distance from the river Dart; the scenery, towards Dartmoor and in the neighbourhood of Buckland and Holne Chase, being unsurpassed in the county. The church of St. Andrew is cruciform with a lofty tower. It was built early in the 15th century, and contains a fine old oak roof over the north aisle, and a tablet in memory of John Dunning, solicitor-general and 1st Baron Ashburton (1731-1783). The inscription is by Dr Johnson. Lord Ashburton was educated at the grammar school, which was founded as a chantry in 1314. Serge is manufactured in Ashburton, and there are breweries, paint factories and saw-mills. A large deposit of umber is worked in the neighbourhood. Slate quarries and copper and tin mines were formerly valuable. A neighbouring centre of the serge industry is the urban district of BUCKFASTLEIGH (pop. 2520), 3 m. S S.W. Between the two towns is Buckfast Abbey, said to have been, before the Conquest, a Benedictine house, and refounded for Cistercians in 1137. It was restored to use in 1882 by a French Benedictine community, the fine Perpendicular abbot's tower remaining, while other parts have been rebuilt on the original lines.

Ashburton (Essebretona, Asperton, Ashperton) is a borough by prescription and an ancient stannary town. It was governed by a portreeve and bailiff, elected annually at the court leet held by the lord of the manor. According to Domesday, Ashburton was held in chief by Osbern, bishop of Exeter, and rendered geld for six hides. In 1552, as the two manors of Ashburton Borough and Ashburton Foreign, it was sold by the bishop, and subsequently became crown property. Finally, it was acquired in moieties by the Clinton family, and the present Lord Clinton is joint lord of the manor with Sir Robert Jardine. In 1298 and 1407 Ashburton returned two members, from 1407 until 1640 one member only, and then again two members, until deprived of one by the Reform Act of 1832 and of the other by the Reform Act of 1885. In the reign of Edward II. Bishop Stapledon obtained a Saturday market, and two annual fairs lasting three days at the feasts of St Laurence (August 10) and St Martin in winter (November 11). In 1672 John Ford was granted a Tuesday market for the sale of wool and woollen goods made from English yarn, and in 1705 Andrew Quicke obtained two annual fairs, on the first Thursdays in March and June, for the sale of cattle, corn and merchandise.

ASHBY, TURNER (1824-1862), American cavalry leader in the Confederate army, was born in Fauquier county, Virginia, in 1824. Before the Civil War he was a planter in Markham, Fauquier county, and a local politician. When hostilities began he raised a regiment of cavalry, which he led with conspicuous success in the Valley campaigns of 1861-62, under Joseph Johnston and Stonewall Jackson. He was promoted a brigadier-general shortly before his death, which took place in a cavalry skirmish at Harrisonburg, Va., on the 6th of June 1862. By his early death the Confederates lost one of the best cavalry officers in their service.

ASHBY-DE-LA-ZOUCH, a market-town in the Bosworth parliamentary division of Leicestershire, England; 118 m. N.W. by N. from London by the Midland railway, on the Leicester-Burton branch. Pop. of urban district (1901) 4726. The church of St Helen is a fine Perpendicular building, restored and enlarged (1880); it contains monuments of the Huntingdon family, and an old finger-pillory for the punishment of misbehaviour in church. The Ivanhoe baths, erected in 1826, are frequented for their saline waters, which, as containing bromine, are found useful in scrofulous and rheumatic complaints. The springs are at Moira, 3 m. west. There is a Queen Eleanor cross commemorating the countess of Loudoun, by Sir Gilbert Scott. To the south of the town are the extensive remains of Ashby Castle. There are extensive coal-mines in the neighbouring district, as at Moira, whence the Ashby-de-la-Zouch canal runs south to the Coventry canal.

At the time of the Domesday survey Ashby-de-la-Zouch formed part of the estates of Hugh de Grentmaisnel. Soon after it was held by Robert Beaumeis, from whom it passed by female descent to the family of la Zouch, whence it derived the adjunct to its name, having been hitherto known as Ashby or Essebi. The earliest record of a grant of market rights is in 1219, when Roger la Zouch obtained a grant

of a weekly market and a two days' fair at the feast of St Helen, in consideration of a fine of one palfrey. In the 15th century the manor was held by James Butler, earl of Ormond, after whose attainder it was granted in 1461 to Lord Hastings, who in 1474 obtained royal licence to empark 3000 acres and to build and fortify a castle. At this castle Mary queen of Scots was detained in 1569 under the custody of the earls of Huntingdon and Shrewsbury. During the Civil War Colonel Henry Hastings fortified and held it for the king, and it was visited by Charles in 1645. In 1648, at the close of the war, it was dismantled by order of parliament. It plays a great part in Sir Walter Scott's *Ivanhoe*. In the 18th century Ashby was celebrated as one of the best markets for horses in England, and had besides prosperous factories for woollen and cotton stockings and for hats.

See *Victoria County History—Leicestershire; History of Ashby-de-la-Zouch* (Ashby-de-la-Zouch, 1852).

A-SHE-HO (Manch. *Alchuku*), a town of Manchuria, China, 125 m. N.E. of Kirin, and 30 m. S. of the Sungari. It is governed by a mandarin of the second class. Pop. about 60,000.

ASHER, a tribe of Israel, called after the son of Jacob and Zilpah, Leah's maid. The name is taken by the narrator of Gen. xxx. 12 seq. (J) to mean happy or propitious, possibly an allusion to the fertility of the tribe's territory (with which cf. Gen. xlix. 20, Deut. xxxiii. 24); on the other hand, like Gad, it may have been originally a divine title. The district held by this tribe bordered upon Naphtali, and lay to the north of Issachar and Zebulun, and to the south of Dan. But the boundaries are not definite and the references to its territory are obscure. Asher is blamed for taking no part in the fight against Sisera (Judg. v. 17), and although it shares with Zebulun and Naphtali in Gideon's defeat of the Midianites (Judg. vi. 35, vii. 23), the narrative in question is not the older of the two accounts of the event, and the incorporation of the name is probably due to a late redactor. Lying as it did in the closest proximity to Phoenicians and Aramaeans, its population must have been exceptionally mixed, and the description of the occupation of Palestine in Judg. i. 31 seq. shows that it contained a strong Canaanite element. In the Blessing of Moses it is bidden to defend itself—evidently against invasion (Deut. xxxiii. 25).

Even in the time of Seti I. and Rameses II. (latter half of 14th cent. B.C.) the district to the west of Galilee appears to have been known to the Egyptians as Aser(u), so that it is possible to infer either (*a*) that Asher was an Israelite tribe which, if it ever went down into Egypt, separated itself from its brethren in Egypt and migrated north, "an example which was probably followed by some of the other tribes as well" (Hommel, *Ancient Hebrew Tradition*, p. 228); or (*b*) it was a district which, if never closely bound to Israel, was at least regarded as part of the national kingdom, and treated as Israelite by the genealogical device of making it a "son" of Jacob. It is possible that some of its Israelite population had followed the example of Dan and moved from an earlier home in the south. Two of the clans of Asher, Heber and Malchiel, have been associated with Milk-ili and Habiri, the names of a hostile chief and people in the Amarna Tablets (Jastrow, *Journal Bibl. Lit.* xi. pp. 118 seq., xii. pp. 61 seq., Hommel), but it is scarcely probable that events of about 1400 B.C. should have survived only in this form. This applies also to the suggestion that the name Asher has been derived from a famous Abd-ashirta of the same period (Barton, *ib.* xv. p. 174). Some connexion with the goddess Ashir(t)a, however, is not unlikely.

See further H.W. Hogg, *Ency. Bibl.* col. 327 seq.; E. Meyer, *Israeliten*, pp. 540 sqq.

(S. A. C.)

'ASHER BEN-YEHIEL (known as *Rosh*), Jewish rabbi and codifier, was born in the Rhine district *c.* 1250, and died in Toledo 1327. Endangered by the persecutions inflicted on the German Jews in the 13th century, 'Asher fled to Spain, where he was made rabbi of Toledo. His enforced exile impoverished him, and from this date begins an important change in the status of medieval rabbis. Before the 14th century, rabbis had obtained a livelihood by the exercise of some secular profession, particularly medicine, and received no salary for performing the rabbinic function. This was now changed. A disciple of Meir of Rothenburg, 'Asher's sole interest was in the Talmud. He was a man of austere piety, profound and narrow. He was a determined opponent of the study of philosophy, and thus was antipathetic to the Spanish spirit. The Jews of Spain continued, nevertheless, devotees of secular sciences as well as of rabbinical lore. 'Asher was the first of the German rabbis to display strong talent for systematization, and his chief work partook of the nature of a compendium of the Talmud. Compiled between 1307 and 1314, 'Asher's *Compendium* resembled, and to a large extent superseded, the work of 'Al-phasi (*q.v.*). 'Asher's *Compendium* is printed in most editions of the Talmud, and it differed from previous Compendia in greater simplicity and in the deference shown to German authorities. 'Asher's son Jacob, who died at Toledo before 1340, was the author of the four *Turim*, a very profound and popular codification of rabbinical law. This work was the standard code until Joseph Qaro directly based on it his widely accepted Code of Jewish law, the *Shulḥan 'Arukh*.

(I. A.)

ASHEVILLE, a city and the county-seat of Buncombe county, North Carolina, U.S.A., in the mountainous Blue Ridge region in the west part of the state, about 210 m. W. of Raleigh. Pop. (1890) 10,235; (1900) 14,692, of whom 4724 were negroes; (1910, census) 18,762. Asheville is situated at the junction of three branches of the Southern railway, on a high terrace on the east bank of the French Broad river, at the mouth of the Swannanoa, about 2300 ft. above the sea. The city is best known as one of the most popular health and pleasure resorts in the south, being a summer resort for southerners and a winter resort for northerners. It has a dry and equable climate and beautiful scenery. Among its social clubs are the Albemarle, the Asheville, the Elks, the Tahkeeostee and the Swannanoa Country clubs. An extensive system of city and suburban parks, connected by a series of beautiful drives, adds to the city's attractiveness. There are great forests in the vicinity. Among the public buildings are the city hall, the court house, the Federal building, the public library and an auditorium. In or near Asheville are a normal and collegiate institute for young women (1892), and, occupying the same campus, a home industrial school (1887) for girls, both under the control of the Woman's Board of Home Missions of the Presbyterian Church; the Asheville farm school for boys, an industrial school for negroes; the Asheville school for boys (5 m. west of Asheville); and the Bingham school (1793), founded at Pittsboro, N.C., by William Bingham (d. 1826), and removed to its present site (3 m. north-west of Asheville) in 1891. About 2 m. south-east of the city is Biltmore, the estate of George W. Vanderbilt, its 125,000 acres constituting what is probably the finest country place in the United States. The central feature of the estate is a château (375 × 150 ft.) of French Renaissance design, after the famous château at Blois, France. In the neighbourhood is a model village, with an elementary school, an industrial school for whites, a hospital and a church, maintained by Mr Vanderbilt. Both the château and the village were designed by Richard M. Hunt; the landscape gardening was done by Frederick Law Olmsted. A collection of woody plants, one of the largest and finest in the world, and a broad forest and hunting preserve, known as Pisgah Forest (100,000 acres), are also maintained by the owner. Asheville is a market for live-stock, dairy products, lumber and fruits, and has various manufactories (in which a good water-power is utilized), including tanneries, cotton mills, brick and tile factories, and a wood-working and veneer plant. The value of the city's factory products increased from $1,300,698 in 1900 to $1,918,362 in 1905, or 47.5%. The city was named in honour of Samuel Ashe (1725-1813), chief-justice of North Carolina from 1777 to 1796, and John Ashe (1720-1781), a North Carolina soldier who distinguished himself in the War of Independence, was settled about 1790, and was incorporated in 1835. The city's boundaries were enlarged in 1905.

ASHFORD, a market-town in the Southern or Ashford parliamentary division of Kent, England, 56 m. S.E. of London by the South-Eastern & Chatham railway. Pop. of urban district (1901) 12,808. It is pleasantly situated on a gentle eminence near the confluence of the upper branches of the river Stour. It has a fine Perpendicular church dedicated to St Mary, with a lofty, well-proportioned tower and many interesting monuments. The grammar school was founded by Sir Norman Knatchbull in the reign of Charles I. Ashford has agricultural implement works and breweries; and the large locomotive and carriage works of the South-Eastern & Chatham railway are here. At Bethersden, between Ashford and Tenterden, marble quarries were formerly worked extensively, supplying material to the cathedrals of Canterbury and Rochester, and to many local churches. At Charing, north-west of Ashford, the archbishops of Canterbury had a residence from pre-Conquest times, and ruins of a palace, mainly of the Decorated period, remain. On the south-eastern outskirts of Ashford is the populous village of Willesborough (3602).

Ashford (Esselesford, Asshatisforde, Essheford) was held at the time of the Domesday survey by Hugh de Montfort, who came to England with William the Conqueror. A Saturday market and an annual fair were granted to the lord of the manor by Henry III. in 1243. Further annual fairs were granted by Edward III. in 1349 and by Edward IV. in 1466. In 1672 Charles II. granted a market on every second Tuesday, with a court of pie-powder. James I. in 1607, at the petition of the inhabitants of Ashford, gave Sir John Smith, Kt., the right of holding a court of record in the town on every third Tuesday. The fertility of the pasture-land in Romney Marsh to the south and east of Ashford caused the cattle trade to increase in the latter half of the 18th century, and led to the establishment of a stock market in 1784. The town has never been incorporated.

See Edward Hasted, *History and Survey of Kent* (Canterbury, 1778-1799, 2nd ed. 1797-1801); *Victoria County History—Kent*.

'ASHI (352-427), Jewish *'amora*, the first editor of the Talmud, was born at Babylon. He was head of the Sura Academy, and there began the Babylonian Talmud, spending thirty years of his life at it. He left the work incomplete, and it was finished by his disciple Rabina just before the year 500 A.D. (See TALMUD.)

ASHINGTON, an urban district in the Wansbeck parliamentary division of Northumberland, England, 4 m. E. of Morpeth, on the Newbiggin branch of the North Eastern railway. Pop. (1901) 13,956. The district, especially along the river Wansbeck, is not without beauty, but there are numerous collieries, from the existence of which springs the modern growth of Ashington. At Bothal on the river (from which parish that of Ashington was formed) is the castle originally belonging to the Bertram family, of which Roger Bertram probably built the gatehouse, the only habitable portion remaining, in the reign of Edward III. The ruins of the castle are fragmentary, but of considerable extent. The church of St Andrew here has interesting details from Early English to Perpendicular date, and in the neighbouring woods is a ruined chapel of St Mary. The mining centre of Ashington lies 2 m. north-east, on the high ground north of the Wansbeck.

'ASHKENAZI, SEBI (1656-1718), known as Ḥakham Ṣebi, for some time rabbi of Amsterdam, was a resolute opponent of the followers of the pseudo-Messiah, Sabbatai Ṣebi (*q.v.*). He had a chequered career, owing to his independence of character. He visited many lands, including England, where he wielded much influence. His *Responsa*, are held in high esteem.

ASHLAND, a city of Boyd county, Kentucky, U.S.A., on the Ohio river, about 130 m. E. by N. of Frankfort. Pop. (1890) 4195; (1900) 6800 (489 negroes); (1910) 8688. It is served by the Chesapeake & Ohio (being a terminal of the Lexington and Big Sandy Divisions) and the Norfolk & Western railways, and is connected with Huntington, West Virginia, by an electric line. The city has a fine natural park (Central Park) of about 30 acres; and Clyffeside Park (maintained by a private corporation), of about 75 acres, just east of the city, is a pleasure resort and a meeting-ground (with a casino seating 3000 people) for the Tri-State "Chautauqua" (for certain parts of Kentucky, Ohio and West Virginia). The surrounding country abounds in coal, iron ore, oil, clay, stone and timber, for which the city is a distributing centre. Ashland has considerable river traffic, and various manufactures, including pig iron, nails, wire rods, steel billets, sheet steel, dressed lumber (especially poplar), furniture, fire brick and leather. Ashland was settled in 1854, and was chartered as a city in 1870.

ASHLAND, a borough of Schuylkill county, Pennsylvania, U.S.A., about 50 m. N.E. of Harrisburg and about 100 m. N.W. of Philadelphia. Pop. (1890) 7346; (1900) 6438 (969 foreign-born); (1910) 6855. It is served by the Lehigh Valley and the Philadelphia & Reading railways, and by the electric lines of the Schuylkill Railway Company and the Shamokin & Mount Carmel Transit Company. The borough is built on the slope of Locust Mountain, about 885 ft. above sea-level. Its chief industry is the mining of anthracite coal at several collieries in the vicinity; and at Fountain Springs, 1 m. south-east, is a state hospital for injured persons of the Anthracite Coal Region of Pennsylvania, opened in 1883. The municipality owns and operates the waterworks. Ashland was laid out as a town in 1847, and was named in honour of Henry Clay's home at Lexington, Ky.; in 1857 it was incorporated.

ASHLAND, a village of Hanover county, Virginia, U.S.A., 17 m. N.W. of Richmond. Pop. (1900) 1147; (1910) 1324. It is served by the Richmond, Fredericksburg & Potomac railway, and is a favourite resort from Richmond. Here is situated the Randolph-Macon College (Methodist Episcopal, South), one of the oldest Methodist Episcopal colleges in the United States. In 1832, two years after receiving its charter, it opened near Boydton, Mecklenburg county, Virginia, and in 1868 was removed to Ashland. The college in 1907-1908 had 150 students and a faculty of 16; it publishes an endowed historical series called *The John P. Branch Historical Papers of Randolph-Macon College*; and it is a part of the "Randolph-Macon System of Colleges and Academies," which includes, besides, Randolph-Macon Academy (1890) at Bedford City, Virginia, and Randolph-Macon Academy (1892) at Front Royal, Virginia, both for boys; Randolph-Macon Woman's College (1893) at Lynchburg, Virginia, which in 1907-1908 had an enrolment of 390; and Randolph-Macon Institute, for girls, Danville, Virginia, which was admitted into the "System" in 1897. These five institutions are under the control of a single board of trustees; the work of the preparatory schools is thus correlated with that of the colleges. About 7 m. out of Ashland is the birthplace of Henry Clay, and about 15 m. distant is the birthplace of Patrick Henry. Ashland was settled in 1845 and was incorporated in 1856.

ASHLAND, a city and the county-seat of Ashland county, Wisconsin, U.S.A., situated about 315 m. N.W. of Milwaukee, and about 70 m. E. of Superior and Duluth, in the N. part of the state, at the head of Chequamegon Bay, an arm of Lake Superior. Pop. (1890) 9956; (1900) 13,074, of whom 4417 were foreign-born; (1910, census) 11,594. It is served by the Chicago & North-Western, the Northern Pacific, the Chicago, St Paul, Minneapolis & Omaha, and the Wisconsin Central railways, and by several steamboat lines on the Great Lakes. The city is attractively situated, has a dry, healthful climate, and is a summer resort. It has a fine Federal building, one of the best high-school buildings in Wisconsin, the Vaughn public library (1895), a Roman Catholic hospital, and the Rinehart hospital, and is the seat of the Northland College and Academy (Congregational). Ashland has an excellent harbour, has large iron-ore and coal docks, and is the principal port for the shipment of iron ore from the rich Gogebic Range, the annual ore shipment approximating 3,500,000 tons, valued at $12,000,000, and it has also an extensive export trade in lumber. Brownstone quarried in the vicinity is also an important export. The lake trade amounts to more than $35,000,000 annually. Ashland has large saw-mills, iron and steel rolling mills, foundries and machine shops, railway repair shops (of the Chicago & North-Western railway), knitting works, and manufactories of dynamite, sulphite fibre, charcoal and wood-alcohol. In 1905 its total factory product was valued at $4,210,265. Settled about 1854, Ashland was incorporated as a village in 1863 and received a city charter in 1887.

ASHLAR, also written Ashler, Ashelere, &c. (probably from Lat. *axilla*, diminutive of *axis*, an axle), hewn or squared stone, generally applied to that used for facing walls. In a contract of date 1398 we read—"Murus erit exterius de puro lapide vocato *achilar*, plane incisso, interius vero de lapide fracto vocato *roghwall*." "Clene hewen ashler" often occurs in medieval documents; this no doubt means tooled or finely worked, in contradistinction to rough-axed faces.

An "ashlar piece" in building is an upright piece of timber framed between the common rafters and the wall plate.

ASHLEY, WILLIAM JAMES (1860-), English economist, was born in London on the 25th of February 1860. He was educated at St Olave's grammar school and Balliol College, Oxford, and became a fellow of Lincoln College. In 1888 he was appointed professor of political economy and constitutional history in Toronto University, a post which he resigned in 1892, in order to become professor of economic history at Harvard University. In 1901 he was appointed professor of commerce and finance in Birmingham University and in 1902 dean of the faculty of commerce. Professor Ashley became well known for his work on the early history of English industry, and for his prominence among those English economists who supported Mr Chamberlain's tariff reform movement. His most important works are *Early History of the English Woollen Industry* (1887); *Introduction to English Economic History and Theory* (2 parts, 1888-1893); *Surveys, Historic and Economic* (1900); *Adjustment of Wages* (1903); the *Tariff Problem* (2nd ed. 1904); *Progress of the German Working Classes* (1904).

ASHMOLE, ELIAS (1617-1692), English antiquarian, and founder of the Ashmolean Museum at Oxford, was born at Lichfield on the 23rd of May 1617, the son of a saddler. In 1638 he became a solicitor, and in 1644 was appointed commissioner of excise. At Oxford, whither this brought him when the Royalist Parliament was sitting there, he made friends with Captain (afterwards Sir) George Wharton, through whose influence he obtained the king's commission as captain of horse and comptroller of the ordnance. In 1646 he was initiated as a Freemason—the first gentleman, or amateur, to be "accepted." In 1649 he married Lady Mainwaring, some twenty years his senior and a relative of his first wife who had died eight years before. This marriage placed him in a position of affluence that enabled him to devote his whole time to his favourite studies. His interest in astrology, aroused by Wharton, and by William Lilly,—whom with other astrologers he met in London in 1646,—seems, in the following years, to have subsided in favour of heraldry and antiquarian research. In 1657 his wife petitioned for a separation, but failing to gain her case returned to live with him. Between this crisis in his domestic life and the time of her death in 1668, Ashmole was in high favour at court. He was made successively Windsor herald, commissioner, comptroller and accountant-general of excise, commissioner for Surinam and comptroller of the White Office. He afterwards refused the office of Garter king-at-arms in favour of Sir William Dugdale, whose daughter he had married in 1668. In 1672 he published his *Institutions, Laws and Ceremonies of the Order of the Garter*, a work which was practically exhaustive, and is an example of his diligence and years of patient antiquarian research. Five years later he presented the Ashmolean Museum, the first public museum of curiosities in the kingdom, the larger part of which he had inherited from a friend, John Tradescant, to the university of Oxford. He made it a condition that a suitable building should be erected for its reception, and the collection was not finally installed until 1683. Subsequently he made the further gift to the university of his library. He died on the 18th of May 1692.

ASHRAF (Shurefa, Sherifs), a small scattered tribe of African "Arabs" settled near Tokar, in the valleys of the Gash and Baraka, and in the Amarar country north of Suakin. They call themselves Beni Hashin, and claim descent from Mahomet; hence their name, *sherif* (plural *ashraf*) being the title applied to descendants of the prophet. In the time of the khalifa Abdulla (1885-1898), Ashraf was the name by which the family and adherents of his late master the mahdi were known, the mahdi's family claiming to be Ashraf. The Ashraf of Tokar remained loyal to Egypt during the Sudan troubles.

See *Anglo-Egyptian Sudan*, edited by Count Gleichen (London, 1905); *Fire and Sword in the Sudan*, by Slatin Pasha (London, 1896); for the Ashraf or Sherifs in Arabia, see Arabia: *Geography*.

ASHREF, a town of Persia in the province of Mazandaran, about 50 m. W. of Astarabad and 5 m. inland from the Caspian Sea, in 36° 42′ N. and 53° 32′ E. The population is about 6000, comprising descendants of some Georgians introduced by Shah Abbas I. (1587-1629) and a number of Gudars, a peculiar pariah race, probably of Indian origin. The place was without importance until 1612, when Shah Abbas began building and laying out the palaces and gardens in the neighbourhood now collectively known as Bagh i Shah (the garden of the shah). The palaces, completed in 1627, are now in ruins, but the gardens with their luxuriant vegetation and gigantic cypress and orange trees ate well worth a visit. There were originally six separate gardens, all contained within one large wall but separated one from another by high walls. The principal palace was the Chehel Situn (forty pillars), destroyed by the Afghans in 1723, and, although rebuilt by Nadir Shah in 1731, already in ruins in 1743. About ¾ m. north of the town is the Safi-abad garden, with a palace built by Shah Safi (1629-1642) for his daughter. It is situated on a lovely wooded hill, and was repaired and in part renovated about 1870 by Náṣiru'd-Din Shah.

ASHTABULA, a city of Ashtabula county, Ohio, U.S.A., in Ashtabula township, on the Ashtabula river and Lake Erie, and 54 m. N.E. of Cleveland. Pop. (1890) 8338; (1900) 12,949, of whom 3688 were foreign-born; (1910, census) 18,266. There is a large Finnish-born population in the city and in Ashtabula county, and the *Amerikan Sanomat*, established here in 1897, is one of the most widely read Finnish weeklies in the country. Ashtabula is served by the Pennsylvania, the Lake Shore & Michigan Southern, and the New York, Chicago & St Louis railways, and by inter-urban electric lines. The city is built on the high bank of the river about 75 ft. above the lake, and commands good views of diversified scenery. There is a public library. Ashtabula has an excellent harbour, to and from which large quantities of iron ore and coal are shipped. More iron ore is received at this port annually than at any other port in the country, or, probably, in the world; the ore is shipped thence by rail to Pittsburg, Youngstown and other iron manufacturing centres. In 1907 the port received 7,542,149 gross tons of iron ore, and shipped 2,632,027 net tons of soft coal. Among the city's manufactures are leather, worsted goods, agricultural implements, and foundry and machine shop products; in 1905 the total value of the factory product was $1,895,454, an increase of 114.3% in five years. There are large green-houses in and near Ashtabula, and quantities of lettuce, cucumbers and tomatoes are raised under glass and shipped to Pittsburg and other large cities. The first settlement here was made about 1801. Ashtabula township was created in 1808, and from it the townships of Kingsville, Plymouth and Sheffield have subsequently been formed. The village of Ashtabula was incorporated in 1831, and received a city charter in 1891. The name *Ashtabula* is an Indian word first applied to the river and said to mean "fish river."

ASHTON-IN-MAKERFIELD, an urban district in the Newton parliamentary division of Lancashire, England, 4 m. S. of Wigan, on the Great Central railway. Pop. (1901) 18,687. The district is rich in minerals, and has large collieries, and a colliery company's institute; iron goods are manufactured.

ASHTON-UNDER-LYNE, a market-town and municipal and parliamentary borough of Lancashire, England, on the river Tame, a tributary of the Mersey, 185 m. N. W. by N. from London and 6½ E. from Manchester. Area, 1346 acres. Pop. (1891) 40,486; (1901) 43,890. It is served by the London & North-Western and the Lancashire & Yorkshire railways (Charlestown station), and by the Great Central (Park Parade station). The church of St Michael is Perpendicular, but almost wholly rebuilt. In the vicinity are barracks. The Old Hall, or manor house of the Asshetons, remains in an altered form, with an ancient prison adjoining, and the name of Gallows Meadow, still preserved, recalls the summary execution of justice by the lords of the manor. In the vicinity of Ashton a few picturesque old houses remain among the numerous modern residences. Stamford Park, presented by Lord Stamford, is shared by the towns of Ashton and Stalybridge, which extends across the Tame into Cheshire. A technical school, school of art and free library, and several hospitals are maintained. Chief among industries are cotton-spinning, hat-making and iron-founding and machinery works; and there are large collieries in the neighbourhood. The parliamentary borough, which returns one member, extends into Cheshire. The corporation consists of a mayor, 8 aldermen and 24 councillors.

The derivation from the Saxon *æsc* (ash) and *tun* (an enclosed place) accounts for the earliest orthography Estun. The addition *subtus lineam* is found in ancient deeds and is due to the position of the place below the line or boundary of Cheshire, which once formed the frontier between the kingdoms of Northumbria and Mercia. The manor was granted to Roger de Poictou by William I., but before the end of his reign came to the Greslets as part of the barony of Manchester. It was held by the Asshetons from 1335 to 1515, when it passed by marriage to the Booths of Dunham Massey, and is now held by the earl of Stamford, the representative of that family. The lord of the manor still holds the ancient court-leet and court-baron half-yearly in May and November, in which cognizance is taken of breaches of agreement among the tenants, especially concerning the repair of roads and cultivation of lands. The place had long enjoyed the name of borough, but it was not till 1847 that a charter of incorporation was granted. Under the Reform Act (1832) it returns one member. One of the markets dates back to 1436. The ancient industry was woollen, but soon after the invention of the spinning frame the cotton trade was introduced, and as early as 1769 the weaving of ginghams, nankeens and calicoes was carried on, and the weaving of cotton yarn by machinery soon became the staple industry. A chapel or church existed here as early as 1261-1262.

ASH WEDNESDAY, in the Western Church, the first day of Lent (*q.v.*), so called from the ceremonial use of ashes, as a symbol of penitence, in the service prescribed for the day. The custom, which is ultimately based on the penance of "sackcloth and ashes" spoken of by the prophets of the Old Testament, has been dropped in those of the reformed Churches which still observe the fast; but it is retained in the Roman Catholic Church, the day being known as *dies cinerum* (day of ashes) or *dies cineris et cilicii* (day of ash and sackcloth). The ashes, obtained by burning the palms or their substitutes used in the ceremonial of the previous Palm Sunday, are placed in a vessel on the altar before High Mass. The priest, vested in a violet cope, prays that God may send His angel to hallow the ash, that it become a *remedium salubre* for all penitents. After another prayer the ashes are thrice sprinkled with holy water and thrice censed. Then the priest invites those present to approach and, dipping his thumb in the ashes, marks them as they kneel with the sign of the cross on the forehead (or in the case of clerics on the place of tonsure), with the words: *Memento, homo, quid pulvis es et in pulverem reverteris* (Remember, man, that thou art dust and unto dust thou shall return). The celebrant himself either sprinkles the ash on his own head in silence, or receives it from the priest of highest dignity present.

This ceremony is derived from the custom of public penance in the early Church, when the sinner to be reconciled had to appear in the congregation clad in sackcloth and covered with ashes (cf. Tertullian, *De Pudicitia*, 13). At what date this use was extended to the whole congregation is not known. The phrase *dies cinerum* appears in the earliest extant copies of the Gregorian Sacramentary, and it is probable that the custom was already established by the 8th century. The Anglo-Saxon homilist Aelfric, in his *Lives of the Saints* (996 or 997), refers to it as in common use; but the earliest evidence of its authoritative prescription is a decree of the synod of Beneventum in 1091.

Of the reformed Churches the Anglican Church alone marks the day by any special service. This is known as the Commination service, its distinctive element being the solemn reading of "the general sentences of God's cursing against sinners, gathered out of the seven and twentieth chapter of Deuteronomy, and other places of Scripture." The lections for the day are the same as in the Roman Church (Joel ii. 12, &c., and Matt. vi. 16, &c.). In the American Prayer Book the office of Commination is omitted, with the exception of the three concluding prayers, which are derived from the prayers and anthems said or sung during the blessing and distribution of the ashes according to the Sarum Missal. The ceremonial of the ashes was not proscribed in England at the Reformation; it was indeed enjoined by a proclamation of Henry VIII. (February 26, 1538) and again in 1550 under Edward VI.; but it had fallen into complete disuse by the beginning of the 17th century.

See Wetzer and Welte, *Kirchenlexikon*, and Herzog-Hauck, *Realencyklopädie* (3rd ed.), s. "*Aschermittuoch*"; L. Duchesne, *Christian Worship*, trans. by M.L. McClure (London, 1904).

ASHWELL, LENA (1872-), English actress, was the daughter of Commander Pocock, R.N. In 1896 she married the actor Arthur Playfair, whom she divorced in 1908; later in the latter year she married Dr Simson. In 1895 she played Elaine in Sir Henry Irving's

production of *King Arthur* at the Lyceum, and again acted with him in 1903 in *Dante*. She made her first striking success, however, on the London stage in *Mrs Dane's Defence* with Sir Charles Wyndham in 1900, and a few years later her acting in *Leah Kleschna* confirmed her position as one of the leading actresses in London. In 1907 she started under her own management at the Kingsway theatre.

ASIA, the name of one of the great continents into which the earth's surface is divided, embracing the north-eastern portion of the great mass of land which constitutes what is generally known as the Old World, of which Europe forms the north-western and Africa the south-western region.

Much doubt attaches to the origin of the name. Some of the earliest Greek geographers divided their known world into two portions only, Europe and Asia, in which last Libya (the Greek name for Africa) was included. Herodotus, who ranks Libya as one of the chief divisions of the world, separating it from Asia, repudiates as fables the ordinary explanations assigned to the names Europe and Asia, but confesses his inability to say whence they came. It would appear probable, however, that the former of these words was derived from an Assyrian or Hebrew root, which signifies the west or setting sun, and the latter from a corresponding root meaning the east or rising sun, and that they were used at one time to imply the west and the east. There is ground also for supposing that they may at first have been used with a specific or restricted local application, a more extended signification having eventually been given to them. After the word Asia had acquired its larger sense, it was still specially used by the Greeks to designate the country around Ephesus. The idea of Asia as originally formed was necessarily indefinite, and long continued to be so; and the area to which the name was finally applied, as geographical knowledge increased, was to a great extent determined by arbitrary and not very precise conceptions, rather than on the basis of natural relations and differences subsisting between it and the surrounding regions.

Geography

Boundaries.

The northern boundary of Asia is formed by the Arctic Ocean; the coast-line falls between 70° and 75° N., and so lies within the Arctic circle, having its extreme northern point in Cape Sivero-Vostochnyi (*i.e.* north-east) or Chelyuskin, in 78° N. On the south the coast-line is far more irregular, the Arabian Sea, the Bay of Bengal, and the China Sea reaching about to the northern tropic at the mouths of the Indus, of the Ganges and of the Canton river; while the great peninsulas of Arabia, Hindostan and Cambodia descend to about 10° N., and the Malay peninsula extends within a degree and a half of the equator. On the west the extreme point of Asia is found on the shore of the Mediterranean, at Cape Baba, in 26° E., nor far from the Dardanelles. Thence the boundary passes in the one direction through the Mediterranean, and down the Red Sea to the southern point of Arabia, at the strait of Bab-el-Mandeb, in 45° E.; and in the other through the Black Sea, and along the range of Caucasus, following approximately 40° N. to the Caspian, whence it turns to the north on a line not far from the 60th meridian, along the Ural Mountains, and meets the Arctic Ocean nearly opposite the island of Novaya Zemlya. The most easterly point of Asia is East Cape (Vostochnyi, *i.e.* east, or Dezhnev), in 190° E., at the entrance of Bering Strait. The boundary between this point and the extremity of the Malay Peninsula follows the coast of the Northern Pacific and the China Sea, on a line deeply broken by the projection of the peninsulas of Kamchatka and Korea, and the recession of the Sea of Okhotsk, the Yellow Sea, and the Gulfs of Tongking and Siam.

Islands.

On the east and south-east of Asia are several important groups of islands, the more southern of which link this continent to Australia, and to the islands of the Pacific. The Kurile islands, the Japanese group, Luchu, Formosa and the Philippines, may be regarded as unquestionable outliers of Asia. Between the islands of the Malay archipelago from Sumatra to New Guinea, and the neighbouring Asiatic continent, no definite relations appear ever to have existed, and no distinctly marked boundary for Asia has been established by the old geographers in this quarter. Modern science, however, has indicated a line of physical separation along the channel between Borneo and Celebes, called the Straits of Macassar, which follows approximately 120° E., to the west of which the flora and fauna are essentially Asiatic in their type, while to the south and east the Australian element begins to be distinctly marked, soon to become predominant. To this boundary has been given the name of Wallace's line, after the eminent naturalist, A.R. Wallace, who first indicated its existence.

Form of continent.

Owing to the great extent of Asia, it is not easy to obtain a correct conception of the actual form of its outline from ordinary maps, the distortions which accompany projections of large spherical areas on a flat surface being necessarily great and misleading. Turning, therefore, to a globe, Asia, viewed as a whole, will be seen to have the form of a great isosceles spherical triangle, having its north-eastern apex at East Cape (Vostochnyi), in Bering Strait; its two equal sides, in length about a quadrant of the sphere, or 6500 m., extending on the west to the southern point of Arabia, and on the east to the extremity of the Malay peninsula; and the base between these points occupying about 60° of a great circle, or 4500 m., and being deeply indented by the Arabian Sea and the Bay of Bengal on either side of the Indian peninsula. A great circle, drawn through East Cape and the southern point of Arabia, passes nearly along the coast-line of the Arctic Ocean, over the Ural Mountains, through the western part of the Caspian, and nearly along the boundary between Persia and Asiatic Turkey. Asia Minor and the north-western half of Arabia lie outside such a great circle, which otherwise indicates, with fair accuracy, the north-western boundary of Asia. In like manner a great circle drawn through East Cape and the extremity of the Malay peninsula, passes nearly over the coasts of Manchuria, China and Cochin-China, and departs comparatively little from the eastern boundary.

General physiography.

Asia is divided laterally along the parallel of 40° north by a depression which, beginning on the east of the desert of Gobi, extends westwards through Mongolia to Chinese Turkestan. To the west of Kashgar the central depression is limited by the meridional range of Sarikol and the great elevation of the Pamir, of which the Sarikol is the eastern face. The level of this depression (once a vast inland sea) between the mountains which enclose the sources of the Hwang-ho and the Sarikol range probably never exceeds 2000 ft. above sea, and modern researches tend to prove that in the central portions of the Gobi (about Lop Nor) it may be actually below sea-level. A vast proportion of the continent north of this central line is but a few hundred feet in altitude. Shelving gradually upward from the low flats of Siberia the general continental level rises to a great central water-parting, or divide, which stretches from the Black Sea through the Elburz and the Hindu Kush to the Tian-shan mountains in the Pamir region, and hence to Bering Strait on the extreme north-east. This great divide is not always marked by well-defined ranges facing steeply either to the north or south. There are considerable spaces where the strike, or axis, of the main ranges is transverse to the water-parting, which is then represented by intermediate highlands forming lacustrine regions with an indefinite watershed. Only a part of this great continental divide (including such ranges as the Hindu Kush, Tian-shan, Altai or Khangai) rises to any great height, a considerable portion of it being below 5000 ft. in altitude. South of the divide the level at once drops to the central depression of Gobi, which forms a vast interior, almost waterless space, where the local drainage is lost in deserts or swamps. South of this enclosed depression is another great hydrographic barrier which parts it from the low plains of the Amur, of China, Siam and India, bordered by the shallows of the Yellow Sea and the shoals which enclose the islands of Japan and Formosa, all of them once an integral part of the continent. This second barrier is one of the most mighty upheavals in the world, by reason both of its extent and its altitude. Starting from the Amur river and reaching along the eastern margin of the Gobi desert towards the sources of the Hwang-ho, it merges into the Altyn-tagh and the Kuen-lun, forming the northern face of the vast Tibetan highlands which are bounded on the south by the Himalaya. The Pamir highlands between the base of the Tian-shan mountains and the eastern buttresses of the Hindu Kush unite these two great divides, enclosing the Gobi depression on the west; and they would again be united on the east but for the transverse valley of the Amur, which parts the Khingan mountains from the Yablonoi system to the east of Lake Baikal.

If we consider the whole continent to be divided into three sections, viz. a northern section with an average altitude of less than 5000 ft. above sea, where all the main rivers flow northward to the Mediterranean, the Arctic Sea, or the Caspian; a central section of depression, where the drainage is lost in swamps or *hamūns*, and of which the average level probably does not exceed 2000 ft. above sea; and a southern section divided between highly elevated table-lands from 15,000 to 16,000 ft. in altitude, and lowlands of the Arabian, Indian, Siamese and Chinese peninsulas, with an ocean outlet for its drainage; we find that there is only one direct connexion between northern and southern sections which involves no mountain passes, and no formidable barrier of altitudes. That one is afforded by the narrow valley of the Hari Rud to the west of Herat. From the Caspian to Karachi it is possible to pass without encountering any orographic obstacle greater than the divide which separates the valley of the Hari Rud from the Helmund *hamūn* basin, which may be represented by an altitude of about 4000 ft. above sea-level. This fact possesses great significance in connexion with the development of Asiatic railways.

Hydrography.

If we examine the hydrographic basins of the three divisions of Asia thus indicated we find that the northern division, including the drainage falling into the Arctic Sea, the Aralo-Caspian depression, or the Mediterranean, embraces an area of about 6,394,500 sq. m., as follows:—

	Sq. m.
Area of Arctic river basins	4,367,000
” Aralo-Caspian basin	1,759,000
” Mediterranean	268,500
Total	6,394,500

The southern division is nearly equal in extent—

	Sq. m.
Pacific drainage	3,641,000
Indian Ocean	2,873,000
Total	6,514,000

The interior or inland basins, including the lacustrine regions south of the Arctic watershed, the Gobi depression, Tibetan plateau, the Iranian (or Perso-Afghan) uplands, the Syro-Arabian inland basin, and that of Asia Minor, amount to 3,141,500 sq. m. or about half the extent of the other two.

By far the largest Asiatic river basin is that of the Ob, which exceeds 1,000,000 sq. m. in extent. On the east and south the Amur embraces no less than 776,000 sq. m., the Yang-tsze-kiang including 685,000, the Ganges 409,500, and the Indus 370,000 sq. m.[1]

The lakes of Asia are innumerable, and vary in size from an inland sea (such as Lakes Baikal and Balkash) to a highland loch, or the indefinitely extended swamps of Persia. Many of them are at high elevations (Lake Victoria, 13,400 ft., being probably the most elevated), and are undoubted vestiges of an ancient period of glaciation. Such lakes, as a rule, show indications of a gradual decrease in size. Others are relics of an earlier geological period, when land areas recently upheaved from the sea were spread at low levels with alternate inundations of salt and fresh water. Of these Lop Nor and the Helmund *hamūns* are typical. Such lakes (in common with all the plateau *hamūns* of south-west Baluchistan and Persia) change their form and extent from season to season, and many of them are impregnated with saline deposits from the underlying strata. The *kavirs*, or salt depressions, of the Persian desert are more frequently widespread deposits of mud and salt than water-covered areas.

Political divisions.

Although for the purposes of geographical nomenclature, boundaries formed by a coast-line—that is, by depressions of the earth’s solid crust *below* the ocean level—are most easily recognized and are of special convenience; and although such boundaries, from following lines on which the continuity of the land is interrupted, often necessarily indicate important differences in the conditions of adjoining countries, and of their political and physical relations, yet variations of the elevation of the surface *above* the sea-level frequently produce effects not less marked. The changes of temperature and climate caused by difference of elevation are quite comparable in their magnitude and effect on all organized creatures with those due to differences of latitude; and the relative position of the high and low lands on the earth’s surface, by modifying the direction of the winds, the fall of rain, and other atmospheric phenomena, produce effects in no sense less important than those due to the relative distribution of the land and sea. Hence the study of the mountain ranges of a continent is, for a proper apprehension of its physical conditions and characteristics, as essential as the examination of its extent and position in relation to the equator and poles, and the configuration of its coasts.

Himalayan boundary.

From such causes the physical conditions of a large part of Asia, and the history of its population, have been very greatly influenced by the occurrence of the mass of mountain above described, which includes the Himalaya and the whole elevated area having true physical connexion with that range, and occupies an area about 2000 m. in length and varying from 100 to 500 m. in width, between 65° and 100° east and between 28° and 35° north. These mountains, which include the highest peaks in the world, rise, along their entire length, far above the line of perpetual snow, and few of the passes across the main ridges are at a less altitude than 15,000 or 16,000 ft. above the sea. Peaks of 20,000 ft. abound along the whole chain, and the points that exceed that elevation are numerous. A mountain range such as this, attaining altitudes at which vegetable life ceases, and the support of animal life is extremely difficult, constitutes an almost impassable barrier against the spread of all forms of living creatures. The mountain mass, moreover, is not less important in causing a complete separation between the atmospheric conditions on its opposite flanks, by reason of the extent to which it penetrates that stratum of the atmosphere which is in contact with the earth’s surface and is effective in determining climate. The highest summits create serious obstructions to the movements of nearly three-fourths of the mass of the air resting on this part of the earth, and of nearly the whole of the moisture it contains; the average height of the entire chain is such as to make it an almost absolute barrier to one-half of the air and three-fourths of the moisture; while the lower ranges also produce important atmospheric effects, one-fourth of the air and one-half of the watery vapour it carries with it lying below 9000 ft.

This great mass of mountain, constituting as it does a complete natural line of division across a large part of the continent, will form a convenient basis from which to work, in proceeding, as will now be done, to give a general view of the principal countries contained in Asia.

Tibet.

The summit of the great mountain mass is occupied by Tibet, a country known by its inhabitants under the name of *Bod* or *Bodyul*. Tibet is a rugged table-land, narrow as compared with its length, broken up by a succession of mountain ranges, which follow as a rule the direction of the length of the table-land, and commonly rise into the regions of perpetual snow; between the flanks of these lie valleys, closely hemmed in, usually narrow, having a very moderate inclination, but at intervals opening out into wide plains, and occupied either by rivers, or frequently by lakes from which there is no outflow and the waters of which are salt. The eastern termination of Tibet is in the line of snowy mountains which flanks China on the west, between the 27th and 35th parallels of latitude, and about 103° east. On the west the table-land is prolonged beyond the political limits of Tibet, though with much the same physical features, to about 70° east, beyond which it terminates; and the ranges which are covered with perpetual snow as far west as Samarkand, thence rapidly diminish in height, and terminate in low hills north of Bokhara.

The mean elevation of Tibet may be taken as 15,000 ft. above the sea. The broad mountainous slope by which it is connected with the lower levels of Hindostan contains the ranges known as the Himalaya; the name Kuen-lun is generally applied to the northern slope that descends to the central plains of the Gobi, though these mountains are not locally known under those names, Kuen-lun being apparently a Chinese designation.

The extreme rigour of the climate of Tibet, which combines great cold with great drought, makes the country essentially very poor, and the chief portion of it little better than desert. The vegetation is everywhere most scanty, and scarcely anything deserving the name of a tree is to be found unless in the more sheltered spots, and then artificially planted. The population in the lower and warmer valleys live in houses, and follow agriculture; in the higher regions they are nomadic shepherds, thinly scattered over a large area.

China.

China lies between the eastern flank of the Tibetan plateau and the North Pacific, having its northern and southern limits about on 40° and 20° N. respectively. The country, though generally broken up with mountains of moderate elevation, possesses none of very great importance apart from those of its western border. It is well watered, populous, and, as a rule, highly cultivated, fertile, and well wooded; the climate is analogous to that of southern Europe, with hot summers, and winters everywhere cold and in the north decidedly severe.

Indo-Chinese region.

From the eastern extremity of the Tibetan mountains, between the 95th and 100th meridians, high ranges extend from about 35° N. in a southerly direction, which, spreading outwards as they go south, reach the sea at various points in Cochin-China, the Malay peninsula, and the east flank of Bengal. Between these ranges, which are probably permanently snowy to about 27° N., flow the great rivers of the Indo-Chinese peninsula, the Mekong, the Menam, the Salween, and the Irrawaddy, the valleys of which form the main portions of the states of Cochin-China (including Tongking and Cambodia), of Siam (including Laos) and of Burma. The people of Cochin-China are called Anam; it is probably from a corruption of their name for the capital of Tongking, Kechao, that the Portuguese Cochin has been derived. All these countries are well watered, populous and fertile, with a climate very similar to that of eastern Bengal. The geography of the region in which the mountains of Cochin-China and Siam join Tibet is still imperfectly known, but there is no ground left for doubting that the great river of eastern Tibet, the Tsanpo, supplies the main stream of the Brahmaputra. The two great rivers of China, the Hwang-ho and the Yang-tsze-kiang take their rise from the eastern face of Tibet, the former from the north-east angle, the latter from the south-east. The main stream of this last is called Dichu in Tibet, and its chief feeder is the Ya-lung-kiang, which rises not far from the Hwang-ho, and is considered the territorial boundary between China and Tibet.

British India.

British India comprises approximately the area between the 95th and 70th meridians, and between the Tibetan table-land and the Indian Ocean. The Indian peninsula from 25° N. southwards is a table-land, having its greatest elevation on the west, where the highest points rise to over 8000 ft., though the ordinary altitude of the higher hills hardly exceeds 4000 ft.; the general level of the table-land lies between 3000 ft. as a maximum and 1000 ft.

From the delta of the Ganges and Brahmaputra on the east to that of the Indus on the west, and intervening between the table-land of

the peninsula and the foot of the Himalayan slope of the Tibetan plateau, lies the great plain of northern India, which rises at its highest point to about 1000 ft., and includes altogether, with its prolongation up the valley of Assam, an area of about 500,000 sq. m., comprising the richest, the most populous and most civilized districts of India. The great plain extends, with an almost unbroken surface, from the most western to the most eastern extremity of British India, and is composed of deposits so finely comminuted, that it is no exaggeration to say that it is possible to go from the Bay of Bengal up the Ganges, through the Punjab, and down the Indus again to the sea, over a distance of 2000 m. and more, without finding a pebble, however small.

The great rivers of northern India—the Ganges, the Brahmaputra and the Indus—all derive their waters from the Tibetan mountain mass; and it is a remarkable circumstance that the northern water-parting of India should lie to the north of the Himalaya in the regions of central Tibet.

The population of India is very large, some of its districts being among the most densely peopled in the world. The country is generally well cleared, and forests are, as a rule, found only along the flanks of the mountains, where the fall of rain is most abundant. The more open parts are highly cultivated, and large cities abound. The climate is generally such as to secure the population the necessaries of life without severe labour; the extremes of heat and drought are such as to render the land unsuitable for pasture, and the people everywhere subsist by cultivation of the soil or commerce, and live in settled villages or towns.

The island of Ceylon is distinguished from the neighbouring parts of British India by little more than its separate administration and the Buddhistic religion of its population. The highest point in Ceylon rises to about 9000 ft. above the sea, and the mountain slopes are densely covered with forest. The lower levels are in climate and cultivation quite similar to the regions in the same latitude on the Malay peninsula.

Of the islands in the Bay of Bengal the Nicobar and Andaman groups are alone worth notice. They are placed on a line joining the north end of Sumatra and Cape Negrais, the south-western extremity of Burma. They possibly owe their existence to the volcanic agencies which are known to extend from Sumatra across this part of the Indian Ocean.

(Click to enlarge left side.)
(Click to enlarge right side.)

The Laccadives and Maldives are groups of small coral islands, situated along the 73rd meridian at no great distance from the Indian peninsula on which they have a political dependency.

The Nearer East.

The portion of Asia west of British India excluding Arabia and Syria forms another extensive plateau covering an area as large as that of Tibet though at a much lower altitude. Its southern border runs along the Arabian Sea, the Persian Gulf, the Tigris and thence westward to the north-east angle of the Levant, on the north the high land follows nearly 36° N. to the southern shore of the Caspian and thence to the Black Sea and Sea of Marmora. Afghanistan, Baluchistan, Iran or Persia, Armenia and the provinces of Asia Minor occupy this high region with which they are nearly conterminous. The eastern flank of this table-land follows a line of hills drawn a short distance from the Indus between the mouth of that river and the Himalaya, about on the 72nd meridian, these hills do not generally exceed 4000 or 5000 ft. in elevation but a few of the summits reach 10,000 ft. or more. The southern and south western face follows the coast closely up the Persian Gulf from the mouth of the Indus, and is formed farther west by the mountain scarp, which, rising in many points to 10,000 ft. flanks the Tigris and the Mesopotamian plains, and extends along Kurdistan and Armenia nearly to the 40th meridian, beyond which it turns along the Taurus range, and the north eastern angle of the Mediterranean. The north eastern portion of the Afghan table-land abuts on the Himalaya and Tibet, with which it forms a continuous mass of mountain between the 71st and 72nd meridians and 34° and 36° N. From the point of intersection of the 71st meridian with the 36th parallel of latitude, an unbroken range of mountain stretches on one side towards the north east, up to the crest of the northern slope of the Tibetan plateau, and on the other nearly due west as far as the Caspian. The north eastern portion of this range is of great altitude, and separates the headwaters of the Oxus, which run off to the Aral Sea, from those of the Indus and its Kabul tributary, which, uniting below Peshawar are thence discharged southward into the Arabian Sea. The western part of the range, which received the name of Paropamisus Mons from the ancients, diminishes in height west of the 65th meridian and constitutes the northern face of the Afghan and Persian plateau rising abruptly from the plains of the Turkoman desert which lies between the Oxus and the Caspian. These mountains at some points attain a height of 10,000 or 12,000 ft. Along the south coast of the Caspian this line of elevation is prolonged as the Elburz range (not to be confused with the Elburz of the Caucasus), and has its culminating point in Demavend, which rises to 19,400 ft. above the sea thence it extends to the north west to Ararat, which rises to upwards of 17,000 ft. from the vicinity of which the Euphrates flows off to the south west across the high lands of Armenia. Below the north east declivity of this range lies Georgia, on the

other side of which province rises the Caucasus, the boundary of Asia and Europe between the Caspian and Black Seas, the highest points of which reach an elevation of nearly 19,000 ft. West of Ararat high hills extend along the Black Sea between which and the Taurus range lies the plateau of Asia Minor reaching to the Aegean Sea, the mountains along the Black Sea, on which are the Olympus and Ida of the ancients rise to 6000 or 7000 ft., the Taurus is more lofty—reaching 8000 and 10,000 ft.—both ranges decline in altitude as they approach the Mediterranean.

This great plateau extending from the Mediterranean to the Indus has a length of about 2500 m. from east to west, and a breadth of upwards of 600 m. on the west and nowhere of less than 250 m. It lies generally at altitudes between 2000 ft. and 8000 ft. above the sea level. Viewed as a whole the eastern half of this region, comprising Persia, Afghanistan and Baluchistan, is poor and unproductive. The climate is very severe in the winter and extremely hot in summer. The rainfall is very scanty, and running waters are hardly known excepting among the mountains which form the scarps of the elevated country. The population is sparse, frequently nomadic, and addicted to plunder, progress in the arts and habits of civilization is small. The western part of the area falls within the Turkish empire. Its climate is less hot and and its natural productiveness much greater and its population more settled and on the whole more advanced.

Arabia.

The peninsula of Arabia with Syria, its continuation to the north-west, has some of the characteristics of the hottest and driest parts Persia and Baluchistan. Excepting the northern part of this tract which is conterminous with the plain of Mesopotamia (which at its highest point reaches an elevation of about 700 ft. above the sea) the country is covered with low mountains, rising to 3000 or 4000 ft. in altitude having among them narrow valleys in which the vegetation is scanty with exceptional regions of greater fertility in the neighbourhood of the coasts where the rainfall is greatest. In northern Syria the mountains of Lebanon rise to about 10,000 ft. and with a more copious water supply the country becomes more productive. The whole tract, excepting south eastern Arabia is nominally subject to Turkey but the people are to no small extent practically independent living a nomadic pastoral and freebooting life under petty chiefs in the more arid districts, but settled in towns in the more fertile tracts where agriculture becomes more profitable and external commerce is established.

Trans-Caspian region and central Asia.

The area between the northern border of the Persian high lands and the Caspian and Aral Seas is a nearly desert low lying plain, extending to the foot of the north-western extremity of the great Tibeto-Himalayan mountains and prolonged eastward up the valleys of the Oxus (Amu Darya) and Jaxartes (Syr-Darya), and northward across the country of the Kirghiz to the south western border of Siberia. It includes Bokhara, Khiva and Turkestan proper in which the Uzbeg Turks are dominant, and for the most part is inhabited by nomadic tribes, who are marauders, enjoying the reputation of being the worst among a race of professed robbers. The tribes to the north, subject to Russia, are naturally more peaceable, and have been brought into some degree of discipline. In this tract the rainfall is nowhere sufficient for the purposes of agriculture, which is only possible by help of irrigation, and the fixed population (which contains a non-Turkish element) is comparatively small, and restricted to the towns and the districts near the rivers.

The north-western extremity of the elevated Tibeto-Himalayan mountain plateau is situated about on 73° E. and 39° N. This region is known as Pamir, it has all the characteristics of the highest regions of Tibet, and so far fitly receives the Russian designation of steppe, but it seems to have no special peculiarities, and the reason of its having been so long regarded as a geographical enigma is not obvious. From it the Oxus, or Amu, flows off to the west, and the Jaxartes, or Syr, to the north, through the Turki state of Khokand, while to the east the waters run down past Kashgar to the central desert of the Gobi, uniting with the streams from the northern slope of the Tibetan plateau that traverse the principalities of Yarkand and Khotan, which are also Turki. Here the Tibetan mountains unite with the line of elevation which stretches across the continent from the Pacific, and which separates Siberia from the region commonly spoken of under the name of central Asia.

Manchuria.

A range of mountains, called Stanovor, rising to heights of 4000 or 5000 ft., follows the southern coast of the eastern extremity of Asia from Kamchatka to the borders of Manchuria, as far as the 135th meridian, in lat. 55° N. Thence the Yablonoi range, continuing in the same direction, divides the waters of the river Lena, which flows through Siberia into the Arctic Sea, from those of the river Amur, which falls into the North Pacific, the basin of this river, with its affluents, constitutes Manchuria. From the north of Manchuria the Khingan range stretches southward to the Chinese frontier near Peking, east of which the drainage falls into the Amur and the Yellow Sea, while to the west is an almost rainless region, the inclination of which is towards the central area of the continent, Mongolia.

Mongolia.

From the western end of the Yablonoi range, on the 115th meridian, a mountainous belt extends along a somewhat irregular line to the extremity of Pamir, known under various names in its different parts, and broken up into several branches, enclosing among them many isolated drainage areas, from which there is no outflow, and within which numerous lakes are formed. The most important of these ranges is the Tian-shan or Celestial Mountains, which form the northern boundary of the Gobi desert, they lie between 40° and 43° N., and between 75° and 95° E., and some of the summits are said to exceed 20,000 ft. in altitude, along the foot of this range are the principal cultivated districts of central Asia, and here too are situated the few towns which have sprung up in this barren and thinly peopled region. Next may be named the Ala-tau, on the prolongation of the Tian-shan, flanking the Syr on the north, and rising to 14,000 or 15,000 ft. It forms the barrier between the Issyk-kul and Balkash lakes, the elevation of which is about 5000 ft. Last is the Altai, near the 50th parallel, rising to 10,000 or 12,000 ft., which separates the waters of the great rivers of western Siberia from those that collect into the lakes of north-west Mongolia, Dzungaria and Kalka. A line of elevation is continued west of the Altai to the Ural Mountains, not rising to considerable altitudes; this divides the drainage of south-west Siberia from the great plains lying north east of the Aral Sea.

The central area bounded on the north and north-west by the Yablonoi Mountains and their western extension in the Tian-shan, on the south by the northern face of the Tibetan plateau and on the east by the Khingan range before alluded to, forms the great desert of central Asia, known as the Gobi. Its eastern part is nearly conterminous with south Mongolia, its western forms Chinese or eastern Turkestan. It appears likely that no part of this great central Asiatic desert is less than 2000 ft. above the sea level. The elevation of the plain about Kashgar and Yarkand is from 4000 to 6000 ft. The more northern parts of Mongolia are between 4000 and 6000 ft., and no portion of the route across the desert between the Chinese frontier and Kiakhta is below 3000 ft. The precise positions of the mountain ridges that traverse this central area are not properly known, their elevation is everywhere considerable, and many points are known to exceed 10,000 or 12,000 ft.

In Mongolia the population is essentially nomadic, its wealth consisting in herds of horned cattle, sheep, horses and camels. The Turki tribes, occupying western Mongolia, are among the least civilized of human beings, and it is chiefly to their extreme barbarity and cruelty that our ignorance of central Asia is due. The climate is very severe, with great extremes of heat and cold. The drought is very great, rain falls rarely and in small quantities. The surface is for the most part a hard stony desert, areas of blown sand occurring but exceptionally. There are few towns or settled villages, except along the slopes of the higher mountains, on which the rain falls more abundantly, or the melting snow supplies streams for irrigation. It is only in such situations that cultivated lands are found, and beyond them trees are hardly to be seen.

Siberia.

The portion of Asia which lies between the Arctic Ocean and the mountainous belt bounding Manchuria, Mongolia and Turkestan on the north is Siberia. It includes an immense high and broken plateau which spreads from south-west to north-east, losing in width and altitude as it advances north-east. It is fringed on either side by high border ridges, which subside on the north-west into a stretch of high plains, 1500 to 2000 ft. high, finally dropping to lowlands a few hundred feet above sea-level. The extremes of heat and cold are very great. The rainfall, though not heavy, is sufficient to maintain such vegetation as is compatible with the conditions of temperature, and the surface is often swampy or peaty. The mountain-sides are commonly clothed with pine forests, and the plains with grasses or shrubs. The population is very scanty; the cultivated tracts are comparatively small in extent and restricted to the more settled districts. The towns are entirely Russian. The indigenous races are nomadic Mongols, of a peaceful character, but in a very backward state of civilization. The Ural Mountains do not exceed 2000 or 3000 ft. in average altitude, the highest summits not exceeding 6000 ft., and one of the passes being as low as 1400 ft. In the southern half of the range are the chief mining districts of Russia. The Ob, Yenisei and Lena, which traverse Siberia, are among the largest rivers in the world.

Malay Archipelago.

The southern group of the Malay Archipelago, from Sumatra to Java and Timor, extends in the arc of a circle between 95° and 127° E., and from 5° to 10° S. The central part of the group is a volcanic region, many of the volcanoes being still active, the summits frequently rising to 10,000 ft. or more.

Sumatra, the largest of the islands, is but thinly peopled; the greater part of the surface is covered with dense forest, the cultivated area being comparatively small, confined to the low lands, and chiefly in the volcanic region near the centre of the island. Java is the most thickly peopled, best cultivated and most advanced island of the whole Eastern archipelago. It has attained a high degree of wealth and prosperity under the Dutch government. The people are peaceful and industrious, and chiefly occupied with agriculture. The highest of the volcanic peaks rises to 12,000 ft. above the sea. The eastern islands of this group are less productive and less advanced.

Borneo, the most western and the largest of the northern group of islands which extends between 110° and 150° E., as far as New Guinea or Papua, is but little known. The population is small, rude and uncivilized; and the surface is rough and mountainous and

generally covered with forest except near the coast, to the alluvial lands on which settlers have been attracted from various surrounding countries. The highest mountain rises to nearly 14,000 ft., but the ordinary elevations do not exceed 4000 or 5000 ft.

Of Celebes less is known than of Borneo, which it resembles in condition and natural characteristics. The highest known peaks rise to 8000 ft., some of them being volcanic.

Pacific Islands.

New Guinea extends almost to the same meridian as the eastern coast of Australia, from the north point of which it is separated by Torres Straits. Very little is known of the interior. The mountains are said to rise to 20,000 ft., having the appearance of being permanently covered with snow; the surface seems generally to be clothed with thick wood. The inhabitants are of the Negrito type, with curly or crisp and bushy hair; those of the west coast have come more into communication with the traders of other islands and are fairly civilized. Eastward, many of the tribes are barbarous savages.

The Philippine Islands lie between 5° and 20° N., between Borneo and southern China. The highest land does not rise to a greater height than 10,250 ft.; the climate is well suited for agriculture, and the islands generally are fertile and fairly cultivated, though not coming up to the standard of Java either in wealth or population.

Formosa, which is situated under the northern tropic, near the coast of China, is traversed by a high range of mountains, reaching nearly 13,000 ft. in elevation. On its western side, which is occupied by an immigrant Chinese population, are open and well-cultivated plains; on the east it is mountainous, and occupied by independent indigenous tribes in a less advanced state.

The islands of Japan, not including Sakhalin, of which half is Japanese, lie between the 30th and 45th parallels. The whole group is traversed by a line of volcanic mountains, some of which are in activity, the highest point being about 13,000 ft. above the sea. The country is generally well watered, fertile and well cultivated. The Japanese people have added to their ancient civilization and their remarkable artistic faculty, an adaptation of Western methods, and a capacity for progress in war and commerce, which single them out among Eastern races as a great modern world-force.

Exploration

The progress of geodetic surveys in Russia had long ago extended across the European half of the great empire, St Petersburg being connected with Tiflis on the southern slopes of the Caucasus by a direct system of triangulation carried out with the highest scientific precision. St Petersburg, again, is connected with Greenwich by European systems of triangulation; and the Greenwich meridian is adopted by Russia as the zero for all her longitude values. But beyond the eastern shores of the Caspian no system of direct geodetic measurements by first-class triangulation has been possible, and the surveys of Asiatic Russia are separated from those of Europe by the width of that inland sea. The arid nature of the trans-Caspian deserts has proved an insuperable obstacle to those rigorous methods of geodetic survey which distinguish Russian methods in Europe, so that Russian geography in central Asia is dependent on other means than that of direct measurement for the co-ordinate values in latitude and longitude for any given point. The astronomical observatory at Tashkent is adopted for the initial starting-point of the trans-Caspian triangulation of Russia; the triangulation ranks as second-class only, and now extends to the Pamir frontier beyond Osh. The longitude of the Tashkent observatory has been determined by telegraph differentially with Pulkova as follows:—

		H.	M.	S.
In 1875 via Ekaterinburg	and Omsk	2	35	52.151
In 1891 via Saratov	and Orenburg	2	35	52.228
In 1895 via Kiev	and Baku	2	35	51.997

With these three independent values, all falling within a range of $0^{S}.25$, it is improbable that the mean value has an error as large as $0^{S}.10$.

Extent of exact surveys in Asia.

Exact surveys in Russia, based upon triangulation, extend as far east as Chinese Turkestan in longitude about 75° E. of Greenwich. In India geodetic triangulation furnishes the basis for exact surveys as far east as the eastern boundaries of Burma in longitude about 100° E.

The close of the 19th century witnessed the forging of the final links in the great geodetic triangulation of India, so far as the peninsula is concerned. Further geodetic connexion with the European systems remains to be accomplished. Since 1890 further and more rigorous application of the telegraphic method of determining longitudes differentially with Greenwich has resulted in a slight correction (amounting to about 2″ of arc) to the previous determination by the same method through Suez. This last determination was effected through four arcs as follows:—

I. Greenwich—Potsdam.
II. Potsdam—Teheran.
III. Teheran—Bushire.
IV. Bushire—Karachi.

Each arc was measured with every precaution and a multitude of observations. The only element of uncertainty was caused by the retardation of the current, which between Potsdam and Teheran (3000 m.) took $0^{S}.20$ to travel; but it is probable that the final value can be accepted as correct to within $0^{S}.05$.

The final result of this latest determination is to place the Madras observatory 2′ 27″ to the west of the position adopted for it on the strength of absolute astronomical determinations.

Connexion between Russian and Indian surveys.

But while we have yet to wait for that expansion of principal triangulation which will bring Asia into connexion with Europe by the direct process of earth measurement, a topographical connexion has been effected between Russian and Indian surveys which sufficiently proves that the deductive methods employed by both countries for the determination of the co-ordinate values of fixed points so far agree that, for all practical purposes of future Asiatic cartography, no difficulty in adjustment between Indian and Russian mapping need be apprehended.

Extension of geographical surveys.

In connexion with the Indian triangulation minor extensions carried out on systems involving more or less irregularity have been pushed outwards on all sides. They reach through Afghanistan and Baluchistan to the eastern districts of Persia, and along the coast of Makran to that of Arabia. They have long ago included the farther mountain peaks of Nepal, and they now branch outwards towards western China and into Siam. These far extensions furnish the basis for a vast amount of exploratory survey of a strictly geographical character, and they have contributed largely towards raising the standard of accuracy in Asiatic geographical surveys to a level which was deemed unattainable fifty years ago. There is yet a vast field open in Asia for this class of surveys. While at the close of the 19th century western Asia (exclusive of Arabia) may be said to have been freed from all geographical perplexity, China, Mongolia and eastern Siberia still include enormous areas of which geographical knowledge is in a primitive stage of nebulous uncertainty.

Indian explorers.

Of scientific geographical exploration in Asia (beyond the limits of actual surveys) the modern period has been so prolific that it is only possible to refer in barest outline to some of the principal expeditions, most of which have been directed either to the great elevated table-land of Tibet or to the central depression which exists to the north of it. In southern Tibet the trans-Himalayan explorations of the native surveyors attached to the Indian survey, notably Pundits Nain Singh and Krishna, added largely to our knowledge of the great plateau. Nain Singh explored the sources of the Indus and of the Upper Brahmaputra in the years 1865-1867; and in 1874-1875 he followed a line from the eastern frontiers of Kashmir to the Tengri Nor lake and thence to Lhasa, in which city he remained for some months. Krishna's remarkable journey in 1879-1882 extended from Lhasa northwards through Tsaidam to Sachu, or Saitu, in Mongolia. He subsequently passed through eastern Tibet to the town of Darchendo, or Tachienlu, on the high road between Lhasa and Peking, and on the borders of China. Failing to reach India through Upper Assam he returned to the neighbourhood of Lhasa, and crossed the Himalayas by a more westerly route. Both these explorers visited Lhasa.

Russian explorers.

In 1871-1873 the great Russian explorer, Nicolai Prjevalsky, crossed the Gobi desert from the north to Kansu in western China. He first defined the geography of Tsaidam, and mapped the hydrography of that remarkable region, from which emanate the great rivers of China, Siam and Burma. He penetrated southwards to within a month's march of Lhasa. In 1876 he visited the Lop Nor and discovered the Altyn Tagh range. In 1879 he followed up the Urangi river to the Altai Mountains, and demonstrated to the world the extraordinary physical changes which have passed over the heart of the Asiatic continent since Jenghiz Khan massed his vast armies in those provinces. He crossed, and named, the Dzungarian extension of the

Gobi desert, and then traversed the Gobi itself from Hami to Sachu, which became a point of junction between his journeys and those of Krishna. He visited the sources of the Hwang-ho (Yellow river) and the Salween, and then returned to Russia. His fourth journey in 1883-1885 was to Sining (the great trade centre of the Chinese borderland), and thence through northern Tibet (crossing the Altyn Tagh to Lop Nor), and by the Cherchen-Keriya trade route to Khotan. From Khotan he followed the Tarim to Aksu.

Following Prjevalsky the Russian explorers, Pevtsov and Roborovski, in 1889-1890 (and again in 1894), added greatly to our knowledge of the topography of western Chinese Turkestan and the northern borders of Tibet; all these Russian expeditions being conducted on scientific principles and yielding results of the highest value. Among other distinguished Russian explorers in Asia, the names of Lessar, Annentkov (who bridged the Trans-Caspian deserts by a railway), P.K. Kozlov and Potanin are conspicuous during the 19th century.

Other explorations in central Asia.

Although the establishment of a lucrative trade between India and central Asia had been the dream of many successive Indian viceroys, and much had been done towards improving the approaches to Simla from the north, very little was really known of the highlands of the Pamirs, or of the regions of the great central depression, before the mission of Sir Douglas Forsyth to Yarkand in 1870. Robert Barkley Shaw and George Hayward were the European pioneers of geography into the central dominion of Kashgar, arriving at Yarkand within a few weeks of each other in 1868. Shaw subsequently accompanied Forsyth's mission in 1870, when Henry Trotter made the first maps of Chinese Turkestan. The next great accession to our knowledge of central Asiatic geography was gained with the Russo-Afghan Boundary Commission of 1884-1886, when Afghan Turkestan and the Oxus regions were mapped by Colonel Sir T.H. Holdich, Colonel St George Gore and Sir Adelbert Talbot; and when Ney Elias crossed from China through the Pamirs and Badakshan to the camp of the commission, identifying the great "Dragon Lake," Rangkul, on his way. About the same time a mission, under Captain (afterwards Sir Willaim) Lockhart, crossed the Hindu Kush into Wakhan, and returned to India by the Bashgol valley of Kafiristan. This was Colonel Woodthorpe's opportunity, and he was then enabled to verify the results of W.W. M'Nair's previous explorations, and to determine the conformation of the Hindu Kush. In 1885 Arthur Douglas Carey and Andrew Dalgleish, following more or less the tracks of Prjevalsky, contributed much that was new to the map of Asia; and in 1886 Captain (afterwards Sir Francis) Younghusband completed a most adventurous journey across the heart of the continent by crossing the Muztagh, the great mountain barrier between China and Kashmir.

Tibetan explorations.

It was in 1886-1887 that Pierre G. Bonvalot, accompanied by Prince Henri d'Orléans, crossed the Tibetan plateau from north to south but failed to enter Lhasa. In 1889-1891 the American traveller, W.W. Rockhill, commenced his Tibetan journeys, and also attempted to reach Lhasa, without success. By his writings, as much as by his explorations, Rockhill has made his name great in the annals of Asiatic research. In 1891 Hamilton Bower made his famous journey from Leh to Peking. He, too, failed to penetrate the jealously-guarded portals of Lhasa; but he secured (with the assistance of a native surveyor) a splendid addition to our previous Tibetan mapping. In 1891-1892-1893 the gallant French explorer, Dutreuil de Rhins, was in the field of Tibet, where he finally sacrificed his life to his work; and the same years saw George N. (afterwards Lord) Curzon in the Pamirs, and St George Littledale on his first great Tibetan journey, accompanied by his wife. Littledale's first journey ended at Peking; his second, in 1894-1895, took him almost within sight of the sacred walls of Lhasa, but he failed to pass inside. Greatest among modern Asiatic explorers (if we except Prjevalsky) is the brave Swede, Professor Sven Hedin, whose travels through the deserts of Takla Makan and Tibet, and whose investigations in the glacial regions of the Sarikol mountains, occupied him from 1894 to 1896. His is a truly monumental record. From 1896 to 1898 we find two British cavalry officers taking the front position in the list of Tibetan travellers-Captain M.S. Wellby of the 18th Hussars and Captain H. Deasy of the 16th Lancers, each striking out a new line, and rendering most valuable service to geography. The latter continued the Pamir triangulation, which had been carried across the Hindu Kush by Colonels Sir T.H. Holdich and R.A. Wahab during the Pamir Boundary Commission of 1895, into the plains of Kashgar and to the sources of the Zarafshan.

Since the beginning of the century the work of Deasy in western Tibet has been well extended by Dr M.A. Stein and Captain C. G. Rawling, who have increased our knowledge of ancient fields of industry and commerce in Turkestan and Tibet. Ellsworth Huntington threw new light on the Tian-shan plateau and the Alai range by his explorations of 1903; and Sven Hedin, between 1899 and 1902, was collecting material in Turkestan and Tibetan fields, and resumed his journeys in 1905-1908, the result being to revolutionize our knowledge of the region north of the upper Tsanpo (see Tibet). The mission of Sir Francis Younghusband to Lhasa in 1904 resulted in an extension of the Indian system of triangulation which finally determined the geographical position of that city, and in a most valuable reconnaissance of the valleys of the Upper Brahmaputra and Indus by Captains C.H.D. Ryder and C.G. Rawling.

Chinese explorations.

Meanwhile, in the Farther East so rapid has been the progress of geographical research since the first beginnings of investigation into the route connexion between Burma and China in 1874 (when the brave Augustus Margary lost his life), that a gradually increasing tide of exploration, setting from east to west and back again, has culminated in a flood of inquiring experts intent on economic and commercial development in China, essaying to unlock those doors to trade which are hereafter to be propped open for the benefit of humanity. Captain William Gill, of the Indian survey, first made his way across China to eastern Tibet and Burma, and subsequently delighted the world with his story of the *River of Golden Sand*. Then followed another charming writer, E.C. Baber, who, in 1877-1878, unravelled the geographic mysteries of the western provinces of the Celestial empire. Mark Bell crossed the continent in 1887 and illustrated its ancient trade routes, following the steps of Archibald Colquhoun, who wandered from Peking to Talifu in 1881. Meanwhile, the acquisition of Burma and the demarcation of boundaries had opened the way to the extension of geographical surveys in directions hitherto untraversed. Woodthorpe was followed into Burmese fields by many others; and amongst the earliest travellers to those mysterious mountains which hide the sources of the Irrawaddy, the Salween and the Mekong, was Prince Henri d'Orleans. Burma was rapidly brought under survey; Siam was already in the map-making hands of James M'Carthy, whilst Curzon and Warrington Smyth added much to our knowledge of its picturesque coast districts. No more valuable contribution to the illustration of western Chinese configuration has been given to the public than that of C.C. Manifold who explored and mapped the upper basin of the Yang-tsze river between the years 1900 and 1904, whilst our knowledge of the geography of the Russo-Chinese borderland on the north-east has been largely advanced by the operations attending the Russo-Japanese war which terminated in 1905.

Indian frontiers—Afghanistan, Baluchistan, Persia.

Turning our attention westwards, no advance in the progress of scientific geography is more remarkable than that recorded on the northern and north-western frontiers of India. Here there is little matter of exploration. It has rather been a wide extension of scientific geographical mapping. Afghan war of 1878-80; the Russo-Afghan Boundary Commission of 1884-1885; the occupation of Gilgit and Chitral; the extension of boundaries east and north of Afghanistan, and again, between Baluchistan and Persia—these, added to the opportunities afforded by the systematic survey of Baluchistan which has been steadily progressing since 1880—combined to produce a series of geographical maps which extend from the Oxus to the Indus, and from the Indus to the Euphrates.

In these professional labours the Indian surveyors have been assisted by such scientific geographers as General Sir A. Houtum Schindler, Captain H.B. Vaughan and Major Percy M. Sykes in Persia, and by Sir George Robertson and Cockerill in Kafiristan and the Hindu Kush.

Arabia.

In still more western fields of research much additional light has been thrown since 1875 on the physiography of the great deserts and oases of Arabia. The labours of Charles Doughty and Wilfrid S. Blunt in northern Arabia in 1877-1878 were followed by those of G. Schweinfurth and E. Glaser in the south-west about ten years later. In 1884-1885 Colonel S.B. Miles made his adventurous journey through Oman, while Theodore Bent threw searchlights backwards into ancient Semitic history by his investigations in the Bahrein Islands in 1888 and in Hadramut in 1894-1895.

Northern Asia, Siberia, &c.

In northern Asia it is impossible to follow in detail the results of the organized Russian surveys. The vast steppes and forest-clad mountain regions of Siberia have assumed a new geographical aspect in the light of these revelations, and already promise a new world of economic resources to Russian enterprise in the near future. A remarkable expedition by Baron Toll in 1892 through the regions watered by the Lena, resulted in the collection of material which will greatly help to elucidate some of the problems which beset the geological history of the world, proving *inter alia* the primeval existence of a boreal zone of the Jurassic sea round the North Pole.

General results of investigation.

In no other period of the world's history, of equal length of time, has so much scientific enterprise been directed towards the field of Asiatic inquiry. The first great result of recent geographical research has been to modify pre-existing ideas of the orography of the vast central region represented by Tibet and Mongolia. The great highland plateau which stretches from the Himalaya northwards to Chinese Turkestan, and from the frontier of Kashmir eastwards to China, has now been defined with comparative geographical exactness. The position of Sachu (or Saitu) in Mongolia may be taken as an obligatory point in modern map construction. The longitude value now adopted is 94° 54′ E. of Greenwich, which is the revised value given by Prjevalsky in the map accompanying the account of his fourth exploration into central Asia. Other values are as follows:—

Prjevalsky, by his second and third explorations	94° 26′
Krishna	94° 23′
Carey and Dalgleish	94° 48′

Littledale	94° 49′
Kreitner (with Szecheny's expedition)	94° 58′

The longitude of Darchendo, or Tachienlu, on the extreme east, may be accepted as another obligatory point. The adopted value by the Royal Geographical Society is 102° 12″. Krishna gives 102° 15″, Kreitner 102° 5″, Baber 102° 18″.

South and west the bounding territories are well fixed in geographical position by the Indian survey determinations of the value of Himalayan peaks. On the north the Chinese Turkestan explorations are now brought into survey connexion with Kashmir and India.

No longer do we regard the Kuen-lun mountains, which extend from the frontiers of Kashmir, north of Leh, almost due east to the Chinese province of Kansu, as the southern limit of the Gobi or Turkestan depression. This very remarkable longitudinal chain is undoubtedly the northern limit of the Chang Tang, the elevated highland steppes of Tibet; but from it there branches a minor system to the north-east from a point in about 83° E. longitude, which culminates in the Altyn Tagh, and extends eastwards in a continuous water-divide to the Nan Shan mountains, north of the Koko Nor basin. Thus between Tibet and the low-lying sands of Gobi we have, thrust in, a system of elevated valleys (Tsaidam), 8000 to 9000 ft. above sea-level, forming an intermediate steppe between the highest regions and the lowest, east of Lop Nor. All this is comparatively new geography, and it goes far to explain why the great trade routes from Peking to the west were pushed so far to the north.

Russo-Chinese boundary.

On the western edge of the Kashgar plains, the political boundary between Russia and China is defined by the meridional range of Sarikol. This range (known to the ancients as Taurus and in medieval times as Bolor) like many others of the most important great natural mountain divisions of the world, consists of two parallel chains, of which the western is the water-divide of the Pamirs, and the eastern (which has been known as the Kashgar or Kandar range) is split at intervals by lateral gorges to allow of the passage of the main drainage from the eastern Pamir slopes.

Indian frontiers—Afghanistan, &c.

In western Asia we have learned the exact value of the mountain barrier which lies between Merv and Herat, and have mapped its connexion with the Elburz of Persia. We can now fully appreciate the factor in practical politics which that definite but somewhat irregular mountain system represents which connects the water-divide north of Herat with the southern abutment of the Hindu Kush, near Bamian. Every pass of importance is known and recorded; every route of significance has been explored and mapped; Afghanistan has assumed a new political entity by the demarcation of a boundary; the value of Herat and of the Pamirs as bases of aggression has been assessed, and the whole intervening space of mountain and plain thoroughly examined.

Persia.

Although within the limits of western Asiatic states, still under Asiatic government and beyond the active influence of European interests, the material progress of the Eastern world has appeared to remain stationary, yet large accessions to geographical knowledge have at least been made, and in some instances a deeper knowledge of the surface of the country and modern conditions of life has led to the straightening of many crooked paths in history, and a better appreciation of the slow processes of advancing civilization. The steady advance of scientific inquiry into every corner of Persia, backed by the unceasing efforts of a new school of geographical explorers, has left nothing unexamined that can be subjected to superficial observation. The geographical map of the country is fairly complete, and with it much detailed information is now accessible regarding the coast and harbours of the Persian Gulf, the routes and passes of the interior, and the possibilities of commercial development by the construction of trade roads uniting the Caspian, the Karun, the Persian Gulf, and India, via Seistan. Persia has assumed a comprehensible position as a factor in future Eastern politics.

Arabia.

In Arabia progress has been slower, although the surveys carried out by Colonel Wahab in connexion with the boundary determined in the Aden hinterland added more exact geographical knowledge within a limited area. Little more is known of the wide spaces of interior desert than has already been given to the world in the works of Sir Richard F. Burton, Wm. Gifford Palgrave and Sir Lewis Pelly amongst Englishmen, and Karsten Niebuhr, John Lewis Burckhardt, Visconte, Joseph Halévy and others, amongst foreign travellers. Charles Doughty and Wilfrid S. Blunt have visited and illustrated the district of Nejd, and described the waning glories of the Wahabi empire. But extended geographical knowledge does not point to any great practical issue. Commercial relations with Arabia remain much as they were in 1875.

Asia Minor, &c.

In Asia Minor, Syria and Mesopotamia there is little to record of progress in material development beyond the promises held out by the Euphrates Valley railway concession to a German company. The exact information obtained by the researches of English surveyors in Palestine and beyond Jordan, or by the efforts of explorers in the regions that lie between the Mediterranean and the Caspian, have so far led rather to the elucidation of history than to fresh commercial enterprise or the possible increase of material wealth.

Russia in Asia.

Asiatic Russia, especially eastern Siberia and Mongolia, have been brought within the sphere of Russian exploration, with results so surprising as to form an epoch in the history of Asia. Here there has been a development of the resources of the Old World which parallels the best records of the New.

Chinese Turkestan and Oxus basin.

The great central depression of the continent which reaches from the foot of the Pamir plateau on the west through the Tarim desert to Lop Nor and the Gobi has yielded up many interesting secrets. The remarkable phenomenon of the periodic shifting of the Lop Nor system has been revealed by the researches of Sven Hedin, and the former existence of highly civilized centres of Buddhist art and industry in the now sand-strewn wastes of the Turkestan desert has been clearly demonstrated by the same great explorer and by Dr M.A. Stein. The depression westward of the Caspian and Aral basins, and the original connexion of these seas, have also come under the close investigation of Russian scientists, with the result that the theory of an ancient connexion between the Oxus and the Caspian has been displaced by the more recent hypothesis of an extension of the Caspian Sea eastwards into Trans-Caspian territory within the post-Pleiocene age. The discovery of shells (now living in the Caspian) at a distance of about 100 m. inland, at an altitude of 140 to 280 ft. above the present level of the Caspian, gives support to this hypothesis, which is further advanced by the ascertained nature of the Kara-kum sands, which appear to be a purely marine formation exhibiting no traces of fluviatile deposits which might be considered as delta deposits of the Oxus.

In the discussion of this problem we find the names of Baron A. Kaulbars, Annentkov, P.M. Lessar, and A.M. Konshin prominent. Further matter of interest in connexion with the Oxus basin was elucidated by the researches of L. Griesbach in connexion with the Russo-Afghan Boundary Commission. He reported the gradual formation of an anticlinal or ridge extending longitudinally through the great Balkh plain of Afghan Turkestan, which effectually shuts off the northern affluents of that basin from actual junction with the river. This evidence of a gradual process of upheaval still in action may throw some light on the physical (especially the climatic) changes which must have passed over that part of Asia since Balkh was the "mother of cities," the great trade centre of Asia, and the plains of Balkh were green with cultivation. In the restoration of the outlines of ancient and medieval geography in Asia Sven Hedin's discoveries of the actual remains of cities which have long been buried under the advancing waves of sand in the Takla Makan desert, cities which flourished in the comparatively recent period of Buddhist ascendancy in High Asia, is of the very highest interest, filling up a blank in the identification of sites mentioned by early geographers and illustrating more fully the course of old pilgrim routes.

Baluchistan and Makran.

With the completion of the surveys of Baluchistan and Makran much light has also been thrown on the ancient connexion between east and west; and the final settlement of the southern boundaries of Afghanistan has led to the reopening of one at least of the old trade routes between Seistan and India.

Burma and China.

Farther east no part of Asia has been brought under more careful investigation than the hydrography of the strange mountain wilderness that divides Tibet and Burma from China. In this field the researches of travellers already mentioned, combined with the more exact reconnaissance of native surveyors and of those exploring parties which have recently been working in the interests of commercial projects, have left little to future inquiry. We know now for certain that the great Tsanpo of Tibet and the Brahmaputra are one and the same river; that north of the point where the great countermarch of that river from east to west is effected are to be found the sources of the Salween, the Mekong, the Yang-tsze-kiang and the Hwang-ho, or Yellow river, in order, from west to east; and that south of it, thrust in between the extreme eastern edge of the Brahmaputra basin and the Salween, rise the dual sources of the Irrawaddy. From the water-divide which separates the most eastern affluent of the Brahmaputra, eastwards to the deep gorges which enclose the most westerly branch of the upper Yang-tsze-kiang (here running from north to south), is a short space of 100 m.; and within that space two mighty rivers, the Salween and the Mekong, send down their torrents to Burma and Siam. These three rivers flow parallel to each other for some 300 m., deep hidden in narrow and precipitous troughs, amidst some of the grandest scenery of Asia; spreading apart where the Yank-tsze takes its course eastwards, not far north of the parallel of 25°.

The comparatively restricted area which still remains for close investigation includes the most easterly sources of the Brahmaputra, the most northerly sources of the Irrawaddy, and some 300 m. of the course of the upper Salween.

Modern Boundary Demarcation.—The period from about 1880 has been an era of boundary-making in Asia, of defining the politico-geographical limits of empire, and of determining the responsibilities of government. Russia, Persia, Afghanistan, Baluchistan, India and China have all revised their borders, and with the revision the political relations between these countries have acquired a new and more assured basis. See also the articles on the different countries. We are not here concerned with understandings as to "spheres of influence," or with arrangements such as the Anglo-Russian Convention of 1907 concerning Persia.

Southern boundary of Russia in Asia.

The advance of Russia to the Turkoman deserts and the Oxus demanded a definite boundary between her trans-Caspian conquests and the kingdom of Afghanistan. This was determined on the north-west by the Russo-Afghan Boundary Commission of 1884-1886. A boundary was then fixed between the Hari Rud (the river of Herat) and the Oxus, which is almost entirely artificial in its construction. Zulfikar, where the boundary leaves the Hari Rud, is about 70 m. south of Sarakhs, and the most southerly point of the boundary (where it crosses the Kushk) is about 60 m. north of Herat. From the junction of the boundary with the Oxus at Khamiab about 150 m. above the crossing-point of the Russian Trans-Caspian railway at Charjui, the main channel of the Oxus river becomes the northern boundary of Afghanistan, separating that country from Russia, and so continues to its source in Victoria Lake of the Great Pamir. Beyond this point the Anglo-Russian Commission of 1895 demarcated a line to the snowfields and glaciers which overlook the Chinese border. Between the Russian Pamirs and Chinese Turkestan the rugged line of the Sarikol range intervenes, the actual dividing line being still indefinite. Beyond Kashgar the southern boundary of Siberia follows an irregular course to the north-east, partly defined by the Tian-shan and Alatau mountains, till it attains a northerly point in about 53° N. lat. marked by the Sayan range to the west of Irkutsk. It then deflects south-east till it touches the Kerulen affluent of the Amur river at a point which is shown in unofficial maps as about 117° 30′ E. long, and 49° 20′ N. lat. From here it follows this affluent to its junction with the Amur river, and the Amur river to its junction with the Usuri. It follows the Usuri to its head (its direction now being a little west of south), and finally strikes the Pacific coast on about 42° 30′ N. lat. at the mouth of the Tumen river 100 m. south of the Amur bay, at the head of which lies the Russian port of Vladivostok. At two points the Russian boundary nearly approaches that of provinces which are directly under British suzerainty. Where the Oxus river takes its great bend to the north from Ishkashim, the breadth of the Afghan territory intervening between that river and the main water-divide of the Hindu Kush is not more than 10 or 12 m.; and east of the Pamir extension of Afghanistan, where the Beyik Pass crosses the Sarikol range and drops into the Taghdumbash Pamir, there is but the narrow width of the Karachukar valley between the Sarikol and the Muztagh. Here, however, the boundary is again undefined. Eastwards of this the great Kashgar depression, which includes the Tarim desert, separates Russia from the vast sterile highlands of Tibet; and a continuous series of desert spaces of low elevation, marking the limits of a primeval inland sea from the Sarikol meridional watershed to the Khingan mountains on the western borders of Manchuria, divide her from the northern provinces of China. From the Khingan ranges to the Pacific, south of the Amur, stretch the rich districts of Manchuria, a province which connects Russia with the Korea by a series of valleys formed by the Sungari and its affluents—a land of hill and plain, forest and swamp, possessing a delightful climate, and vast undeveloped agricultural resources. Throughout this land of promise Russian influence was destroyed by Japan in the war of 1904. The possession of Port Arthur, and direct political control over Korea, place Japan in the dominant position as regards Manchuria.

Afghan political boundaries.

Coincident with the demarcation of Russian boundaries in Turkestan was that of northern Afghanistan. From the Hari Rud on the west to the Sarikol mountains on the east her northern limits were set by the Boundary Commissions of 1884-1886 and of 1895 respectively. Her southern and eastern boundaries were further defined by a series of minor commissions, working on the basis of the Kabul agreement of 1893, which lasted for nearly four years, terminating with the Mohmand settlement at the close of an expedition in 1897.

The Pamir extension of Afghan territory to the north-east reaches to a point a little short of 75° E., from whence it follows the water-divide to the head of the Taghdumbash Pamir, and is thenceforward defined by the water-parting of the Hindu Kush. It leaves the Hindu Kush near the Dorah Pass at the head of one of the minor Chitral affluents, and passing south-west divides Kafiristan from Chitral and Bajour, separates the sections of the Mohmands who are within the respective spheres of Afghan and British sovereignty, and crosses the Peshawar-Kabul route at Lundi-Khana. It thus places a broad width of independent territory between the boundaries of British India (which have remained practically, though not absolutely, untouched) and Afghanistan; and this independent belt includes Swat, Bajour and a part of the Mohmand territory north of the Kabul river. The same principle of maintaining an intervening width of neutral territory between the two countries is definitely established throughout the eastern borders of Afghanistan, along the full length of which a definite boundary has been demarcated to the point where it touches the northern limits of Baluchistan on the Gomal river. From the Gomal Baluchistan itself becomes an intervening state between British India and Afghanistan, and the dividing line between Baluchistan and Afghanistan is laid down with all the precision employed on the more northerly sections of the demarcation.

Baluchistan.

Baluchistan can no longer be regarded as a distinct entity amongst Asiatic nations, such as Afghanistan undoubtedly is. Baluchistan independence demands qualification. There is British Baluchistan *par excellence*, and there is the rest of Baluchistan which exists in various degrees of independence, but is everywhere subject to British control. British Baluchistan officially includes the districts of Peshin, Sibi and of Thal-Chotiali. As these districts had originally been Afghan, they were transferred to British authority by the treaty of Gandamak in 1879, although nominally they had been handed over to Kalat forty years previously. Now they form an official province of British Baluchistan within the Baluchistan Agency; and the agency extends from the Gomal to the Arabian Sea and the Persian frontier. Within this agency there are districts as independent as any in Afghanistan, but the political status of the province as a whole is almost precisely that of the native states of the Indian peninsula. The agent to the governor-general of India, with a staff of political assistants, practically exercises supreme control.

Kirman.

The increase of Russian influence on the northern Persian border and its extension southwards towards Seistan led to the appointment of a British consul at Kirman, the dominating town of southern Khorasan, directly connected with Meshed on the north; and the acquisition of rights of administration of the Nushki district secured to Great Britain the trade between Seistan and Quetta by the new Helmund desert route.

Boundary between French territory and India.

While British India has so far avoided actual geographical contact with one great European power in Asia on the north and west, she has touched another on the east. The Mekong river which limits British interests in Burma limits also those of France in Tongking. The eastern boundaries of Burma are not yet fully demarcated on the Chinese frontier. At a point level in latitude with Mogaung, near the northern termination of the Burmese railway system, this boundary is defined by the eastern watershed of the Nmaikha, the eastern of the two great northern affluents of the Irrawaddy. Then it follows an irregular course southwards to a position south-east of Bhamo in lat. 24°. It next defines the northern edge of the Shan States, and finally strikes the Mekong river in lat. 21° 45′ (approximately). From that point southwards the river becomes the boundary between the Shan States and Tongking for some 200 m., the channel of the river defining the limits of occupation (though not entirely of interest) between French and British subjects. Approximately on the parallel of 20° N. lat. the Burmese boundary leaves the Mekong to run westwards towards the Salween, and thereafter following the eastern watershed of the Salween basin it divides the Lower Burma provinces from Siam.

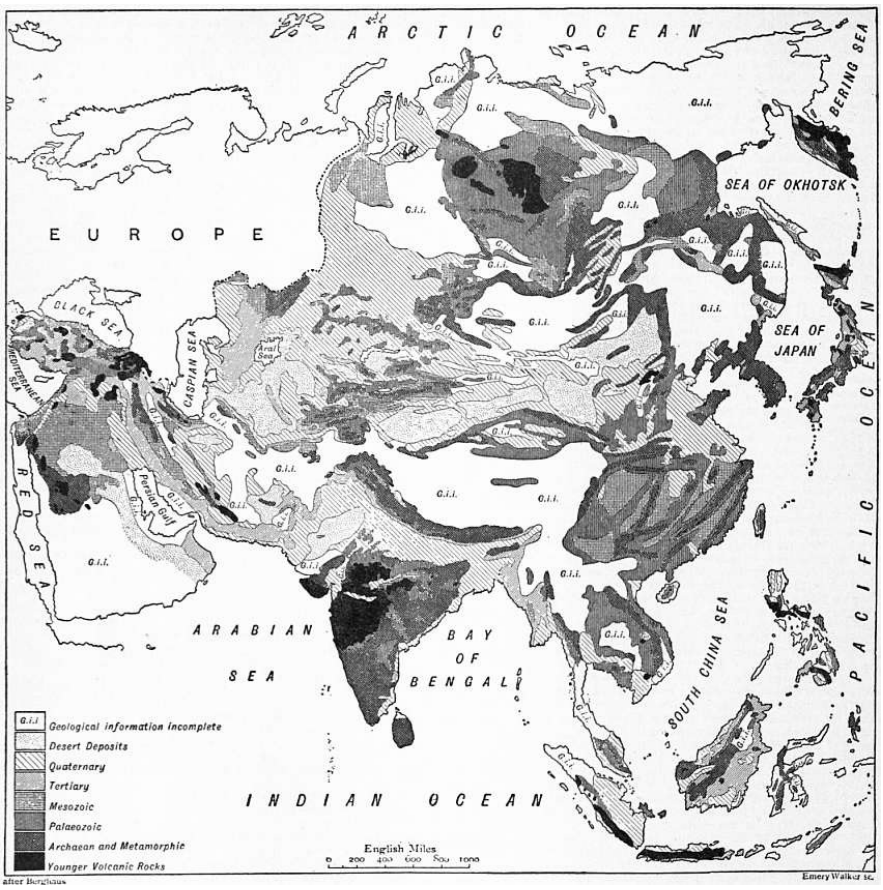
Area and political division.

The following table shows the areas of territories in Asia (continental and insular) dependent on the various extra-Asiatic powers, and of those which are independent or nominally so:—

Territory	Sq. m.
Russian	6,495,970
British	1,998,220
Dutch	586,980
French	247,580
U.S.A.	114,370
German	193
Turkish	681,980
Chinese	4,299,600
Japanese	161,110
Other independent territories	2,232,270

The total area of Asia, continental and insular, is therefore somewhat over 16,819,000 sq. m. (but various authorities differ considerably in their detailed estimates). The population may be set down roughly as 823,000,000, of which 330,000,000 inhabit Chinese territory, 302,000,000 British, and 25,000,000 Russian.

(T. H. H.*)



Geology

The geology of Asia is so complex and over wide areas so little known that it is difficult to give a connected account of either the structure or the development of the continent, and only the broader features can be dealt with here.

In the south, in Syria, Arabia and the peninsula of India, none but the oldest rocks are folded, and the Upper Palaeozoic, the Mesozoic and the Tertiary beds lie almost horizontally upon them. It is a region of quiescence or of faulting, but not of folding. North of this lies a broad belt in which the Mesozoic deposits and even the lower divisions of the Tertiary system are thrown into folds which extend in a series of arcs from west to east and now form the principal mountain ranges of central Asia. This belt includes Asia Minor, Persia, Afghanistan, Baluchistan, the Himalayas, the Tian-shan, and, although they are very different in direction, the Burmese ranges. The Kuen-lun, Nan-shan and the mountain ranges of southern China are, perhaps, of earlier date, but nevertheless they be in the same belt. It is not true that throughout the whole width of this zone the beds are folded. There are considerable tracts which are but little disturbed, but these tracts are enclosed within the arcs formed by the folds, and the zone taken as a whole is distinctly one of crumpling. North of the folded belt, and including the greater part of Siberia, Mongolia and northern China, lies another area which is, in general, free from any important folding of Mesozoic or Tertiary age. There are, it is true, mountain ranges which are formed of folded beds; but in many cases the direction of the chains is different from that of the folds, so that the ranges must owe their elevation to other causes; and the folds, moreover, are of ancient date, for the most part Archaean or Palaeozoic. The configuration of the region is largely due to faulting, trough-like or tray-like depressions being formed, and the intervening strips, which have not been depressed, standing up as mountain ridges. Over a large part of Siberia and in the north of China, even the Cambrian beds still lie as horizontally as they were first laid down. In the extreme north, in the Verkhoyansk range and in the mountains of the Taimyr peninsula, there are indications of another zone of folding of Mesozoic or later date, but our information concerning these ranges is very scanty. Besides the three chief regions into which the mainland is thus seen to be divided, attention should be drawn to the festoons of islands which border the eastern side of the continent, and which are undoubtedly due to causes similar to those which produced the folds of the folded belt.

Of all the Asiatic ranges the Himalayan is, geologically, the best known; and the evidence which it affords shows clearly that the folds to which it owes its elevation were produced by an overthrust from the north. It is, indeed, as if the high land of central Asia had been pushed southward against and over the unyielding mass formed by the old rocks of the Indian peninsula, and in the process the edges of the over-riding strata had been crumpled and folded. Overlooking all smaller details, we may consider Asia to consist of a northern mass and a southern mass, too rigid to crumple, but not too strong to fracture, and an intermediate belt of softer rock which was capable of folding. If then by the contraction of the earth’s interior the outer crust were forced to accommodate itself to a smaller nucleus, the central softer belt would yield by crumpling, the more rigid masses to the north and south, if they gave way at all, would yield by faulting. It is interesting to observe, as will be shown later, that during the Mesozoic era there was a land mass in the north of Asia and another in the south, and between them lay the sea in which ordinary marine sediments were deposited. The belt of folding does not precisely coincide with this central sea, but the correspondence is fairly close.

The present outline of the eastern coast and the nearly enclosed seas which lie between the islands and the mainland, are attributed by Richthofen chiefly to simple faulting.

Little is known of the early geological history of Asia beyond the fact that a large part of the continent was covered by the sea during the Cambrian and Ordovician periods. But there is positive evidence that much of the north and east of Asia has been land since the Palaeozoic era, and it has been conclusively proved that the peninsula of India has never been beneath the sea since the Carboniferous period at least. Between these ancient land masses lies an area in which marine deposits of Mesozoic age are well developed and which was evidently beneath the sea during the greater part of the Mesozoic era. The northern land mass has been named Angaraland by E. Suess; the southern, of which the Indian peninsula is but a fragment, is called Gondwanaland by Neumayr, Suess and others, while the intervening sea is the central Mediterranean sea of Neumayr and the Tethys of Suess. The greater part of western Asia, including the basin of the Obi, the drainage area of the Aral Sea, together with Afghanistan, Baluchistan, Persia and Arabia, was covered by the sea during the later stages of the Cretaceous period, but a considerable part of this region was probably dry land in Jurassic times.

The northern land mass begins in the north with the area which lies between the Yenisei and the Lena. Here the folded Archean rocks are overlaid by Cambrian and Ordovician beds, which still lie for the most part flat and undisturbed. Upon these rest patches of freshwater deposits containing numerous remains of plants. They consist chiefly of sandstone and conglomerate, but include workable seams of coal. Some of the deposits appear to be of Permian age, but others are probably Jurassic, and they are all included under the general name of the Angara series. Excepting in the extreme north, where marine Jurassic and Cretaceous fossils have been found, there is no evidence that this part of Siberia has been beneath the sea since the early part of the Palaeozoic era. Besides the plant beds extensive outflows of basic lava rest directly upon the Cambrian and Ordovician strata. The date of these eruptions is still uncertain, but they probably continued to a very recent period.

South and east of the Palaeozoic plateau is an extensive area consisting chiefly of Archean rocks, and including the greater part of Mongolia north of the Tian-shan. Here again there are no marine beds of Mesozoic or Tertiary age, while plant-bearing deposits belonging

to the Angara series are known. Structurally, the folds of this region are of ancient date, but the area is crossed by a series of depressions formed by faults, and the intervening strips, which have not been depressed to the same extent, now stand up as mountain ranges. Farther south, in the Chinese provinces of Shansi and Shensi, the geological succession is similar in some respects to that of the Siberian Palaeozoic plateau, but the sequence is more complete. There is again a floor of folded Archean rocks overlaid by nearly horizontal strata of Lower Palaeozoic age, but these are followed by marine beds belonging to the Carboniferous period. From the Upper Carboniferous onward, however, no marine deposits are known; and, as in Siberia, plant bearing beds are met with. Southern China is very different in structure, consisting largely of folded mountain chains; but the geological succession is very similar, and excepting near the Tibetan and Burmese borders, there are no marine deposits of Mesozoic or Tertiary age.

Thus it appears that from the Arctic Ocean there stretches a broad area as far as the south of China, in which no marine deposits of later date than Carboniferous have yet been found, except in the extreme north. Freshwater and terrestrial deposits of Mesozoic age occur in many places, and the conclusion is irresistible that the greater part of this area has been land since the close of the Palaeozoic era. The Triassic deposits of the Verkhoyansk Range show that this land did not extend to the Bering Sea, while the marine Mesozoic deposits of Japan on the east, the western Tian-shan on the west and Tibet on the south give us some idea of its limits in other directions.

In the same way the entire absence of any marine fossils in the peninsula of India, excepting near its borders, and the presence of the terrestrial and freshwater deposits of the Gondwana series, representing the whole of the geological scale from the top of the Carboniferous to the top of the Jurassic, show that this region also has been land since the Carboniferous period. It was a portion of a great land mass which probably extended across the Indian Ocean and was at one time united with the south of Africa.

But these two land masses were not connected. Between India and China there is a broad belt in which marine deposits of Mesozoic and Tertiary age are well developed. Marine Tertiary beds occur in Burma; in the Himalayas and in south Tibet there is a nearly complete series of marine deposits from the Carboniferous to the Eocene; in Afghanistan the Mesozoic beds are in part marine and in part fluviatile. The sea in which these strata were deposited seems to have attained its greatest extension in Upper Cretaceous times when its waters spread over the whole of western Asia and even encroached slightly upon the Indian land. The Eocene sea however cannot have been much inferior in extent.

It was after the Eocene period that the main part of the elevation of the Himalayas took place, as is shown by the occurrence of nummulitic limestone at a height of 20,000 ft. The formation of this and of the other great mountain chains of central Asia resulted in the isolation of portions of the former central sea, and the same forces finally led to the elevation of the whole region and the union of the old continents of Angara and Gondwana. Gondwanaland, however, did not long survive, and the portion which lay between India and South Africa sank beneath the waves in Tertiary times.

Leaving out of consideration all evidence of more ancient volcanic activity, each of the three regions into which, as we have seen, the continent may be divided has been, during or since the Cretaceous period, the seat of great volcanic eruptions. In the southern region of unfolded beds are found the lavas of the “harras” of Arabia, and in India the extensive flows of the Deccan Trap. In the central folded belt lie the great volcanoes, now mostly extinct, of Asia Minor, Armenia, Persia and Baluchistan. In Burma also there is at least one extinct volcano. In the northern unfolded region great flows of basic lava lie directly upon the Cambrian and Ordovician beds of Siberia, but are certainly in part of Tertiary age. Similar flows on a smaller scale occur in Manchuria, Korea and northern China.

In all these cases, however, the eruptions have now almost ceased, and the great volcanoes of the present day lie in the islands off the eastern and south eastern coasts.

References—E. Suess, *Das Antlitz der Erde* (see, especially, vol. iii. part 1.); F.V. Richthofen, “Ueber Gestalt und Gliederung einer Grundlinie in der Morphologie Ost-Asiens,” *Sitz. k. preuss. Akad. Wiss.* (Berlin, 1900), pp. 888-925, and Geomorphologische Studien aus Ostasien, *ibid.*, 1901, pp. 782-808, 1902, pp. 944-975, 1903, pp. 867-918.

(P. La.)

Climate.

Temperature.

Among the places on the globe where the temperature falls lowest are some in northern Asia; and among those where it rises highest are some in southern Asia. The mean temperature of the north coast of eastern Siberia is but a few degrees above the zero of Fahrenheit; the lowest mean temperature anywhere observed is about 4° Fahr., at Melville Island, north of the American continent. The isothermals of mean annual temperature lie over northern Asia on curves tolerably regular in their outline, having their western branches in a somewhat higher latitude than their eastern; a reduction of 1° of latitude corresponds approximately—and irrespective of modifications due to elevation—to a rise of ½° Fahr., as far say as 30° N, where the mean temperature is about 75° Fahr. Farther south the increase is slower, and the highest mean temperature anywhere attained in southern Asia is not much above 82° Fahr.

The variations of temperature are very great in Siberia, amounting near the coast to more than 100° Fahr., between the mean of the hottest and coldest months, and to still more between the extreme temperatures of those months. In southern Asia, and particularly near the sea, the variation between the hottest and coldest monthly means is very much less, and under the equator it is reduced to about 5°. In Siberia the difference between the means of the hottest and coldest months is hardly anywhere less than 60° Fahr. On the Sea of Aral it is 80° Fahr., and at Astrakhan, on the Caspian, more than 50°. At Tiflis it is 45°. In northern China, at Peking, it is 55°, reduced to 30° at Canton, and to 20° at Manila. In northern India the greatest difference does not exceed 40°, and it falls off to about 15° at Calcutta and to about 10° or 12° at Bombay and Madras. The temperatures at the head of the Persian Gulf approximate to those of northern India, and those of Aden to Madras. At Singapore the range is less than 5°, and at Batavia in Java, and Galle in Ceylon, it is about the same. The extreme temperatures in Siberia may be considered to lie between 80° and 90° Fahr. for maxima, and between −40° and −70° Fahr. for minima. The extreme of heat near the Caspian and Aral Seas rises to nearly 100° Fahr., while that of cold falls to −20° Fahr. or lower. Compared with these figures, we find in southern Asia 110° or 112° Fahr. as a maximum hardly ever exceeded. The absolute minimum in northern India, in lat. 30°, hardly goes below 32°; at Calcutta it is about 40°, though the thermometer seldom falls to 50°. At Madras it rarely falls as low as 65°, or at Bombay below 60°. At Singapore and Batavia the thermometer very rarely falls below 70°, or rises above 90°. At Aden the minimum is a few degrees below 70°, the maximum not much exceeding 90°.

These figures sufficiently indicate the main characteristics of the air temperatures of Asia. Throughout its northern portion the winter is long and of extreme severity; and even down to the circle of 35° N. lat., the minimum temperature is almost as low as zero of Fahrenheit. The summers are hot, though short in the northern latitudes, the maximum of summer heat being comparatively little less than that observed in the tropical countries farther south. The moderating effect of the proximity of the ocean is felt in an important degree along the southern and eastern parts of Asia, where the land is broken up into islands or peninsulas. The great elevations above the sea-level of the central part of Asia, and of the table-lands of Afghanistan and Persia, tend to exaggerate the winter cold; while the sterility of the surface, due to the small rainfall over the same region, operates powerfully in the opposite direction in increasing the summer heat. In the summer a great accumulation of solar heat takes place on the dry surface soil, from which it cannot be released upwards by evaporation, as might be the case were the soil moist or covered with vegetation, nor can it be readily conveyed away downwards as happens on the ocean. In the winter similar consequences ensue, in a negative direction, from the prolonged loss of heat by radiation in the long and clear nights—an effect which is intensified wherever the surface is covered with snow, or the air little charged with vapour. In illustration of the very slow diffusion of heat in the solid crust of the earth, and as affording a further indication of the climate of northern Asia, reference may here be made to the frozen soil of Siberia, in the vicinity of Yakutsk. In this region the earth is frozen permanently to a depth of more than 380 ft. at which the temperature is still 5° or 6° Fahr. below the freezing point of water, the summer heat merely thawing the surface to a depth of about 3 ft. At a depth of 50 ft. the temperature is about 15 Fahr. below the freezing point. Under such conditions of the soil, the land, nevertheless, produces crops of wheat and other grain from fifteen to forty fold.

The very high summer temperatures of the area north of the tropic of Cancer are sufficiently accounted for, when compared with those observed south of the tropic, by the increased length of the day in the higher latitude, which more than compensates for the loss of heat due to the smaller mid-day altitude of the sun. The difference between the heating power of the sun’s rays at noon on the 21st of June, in latitude 20° and in latitude 45°, is only about 2%; while the accumulated heat received during the day, which is lengthened to 15½ hours in the higher latitude, is greater by about 11% than in the lower latitude, where the day consists only of 13¼ hours.

Although the foregoing account of the temperatures of Asia supplies the main outline of the observed phenomena, a very important modifying cause, of which more will be said hereafter, comes into operation over the whole of the tropical region, namely, the periodical summer rains. These tend very greatly to arrest the increase of the summer heat over the area where they prevail, and otherwise give it altogether peculiar characteristics.

Pressure and Winds.

The great summer heat, by expanding the air upwards, disturbs the level of the planes of equal pressure, and causes an outflow of the upper strata from the heated area. The winter cold produces an effect of just an opposite nature, and causes an accumulation of air over the cold area. The diminution of barometric pressure which takes place all over Asia during the summer months, and the increase in the winter, are hence, no doubt, the results of the alternate heating and cooling of

the air over the continent.

The necessary and immediate results of such periodical changes of pressure are winds, which, speaking generally, blow from the area of greatest to that of least pressure—subject, however, to certain modifications of direction, arising from the absolute motion of the whole body of the air due to the revolution of the earth on its axis from west to east. The south-westerly winds which prevail north of the equator during the hot half of the year, to which navigators have given the name of the south-west monsoon (the latter word being a corruption of the Indian name for season), arise from the great diminution of atmospheric pressure over Asia, which begins to be strongly marked with the great rise of temperature in April and May, and the simultaneous relatively higher pressure over the equator and the regions south of it. This diminution of pressure, which continues as the heat increases till it reaches its maximum in July soon after the solstice, is followed by the corresponding development of the south-west monsoon; and as the barometric pressure is gradually restored, and becomes equalized within the tropics soon after the equinox in October, with the general fall of temperature north of the equator, the south-west winds fall off, and are succeeded by a north-east monsoon, which is developed during the winter months by the relatively greater atmospheric pressure which then occurs over Asia, as compared with the equatorial region.

Although the succession of the periodical winds follows the progress of the seasons as just described, the changes in the wind's direction everywhere take place under the operation of special local influences which often disguise the more general law, and make it difficult to trace. Thus the south-west monsoon begins in the Arabian Sea with west and north-westerly winds, which draw round as the year advances to south-west and fall back again in the autumn by north-west to north. In the Bay of Bengal the strength of the south-west monsoon is rather from the south and south-east, being succeeded by north-east winds after October, which give place to northerly and north-westerly winds as the year advances. Among the islands of the Malay Archipelago the force of the monsoons is much interrupted, and the position of this region on the equator otherwise modifies the directions of the prevailing winds. The southerly summer winds of the Asiatic seas between the equator and the tropic do not extend to the coasts of Java, and the south-easterly trade winds are there developed in the usual manner. The China Sea is fully exposed to both monsoons, the normal directions of which nearly coincide with the centre of the channel between the continent of Asia and the eastern islands.

The south-west monsoon does not generally extend, in its character of a south-west wind, over the land. The current of air flowing in from over the sea is gradually diverted towards the area of least pressure, and at the same time is dissipated and loses much of its original force. The winds which pass northward over India blow as south-easterly and easterly winds over the north-eastern part of the Gangetic plain, and as south winds up the Indus. They seem almost entirely to have exhausted their northward velocity by the time they have reached the northern extremity of the great Indian plain; they are not felt on the table-lands of Afghanistan, and hardly penetrate into the Indus basin or the ranges of the Himalaya, by which mountains, and those which branch off from them into the Malay peninsula, they are prevented from continuing their progress in the direction originally imparted to them.

Among the more remarkable phenomena of the hotter seas of Asia must be noticed the revolving storms or cyclones, which are of frequent occurrence in the hot months in the Indian Ocean and China Sea, in which last they are known under the name of typhoon. The cyclones of the Bay of Bengal appear to originate over the Andaman and Nicobar islands, and are commonly propagated in a north-westward direction, striking the east coast of the Indian peninsula at various points, and then often advancing with an easterly tendency over the land, and passing with extreme violence across the delta of the Ganges. They occur in all the hot months, from June to October, and more rarely in November, and appear to be originated by adverse currents from the north meeting those of the south-west monsoon. The cyclones of the China Sea also occur in the hot months of the year, but they advance from north-east to south-west, though occasionally from east to west; they originate near the island of Formosa, and extend to about the 10th degree of N. lat. They are thus developed in nearly the same latitudes and in the same months as those of the Indian Sea, though their progress is in a different direction. In both cases, however, the storms appear to advance towards the area of greatest heat. In these storms the wind invariably circulates from north by west through south to east.

Rainfall.

The heated body of air carried from the Indian Ocean over southern Asia by the south-west monsoon comes up highly charged with watery vapour, and hence in a condition to release a large body of water as rain upon the land, whenever it is brought into circumstances which reduce its temperature in a notable degree. Such a reduction of temperature is brought about along the greater part of the coasts of India and of the Burmo-Siamese peninsula by the interruption of the wind current by continuous ranges of mountains, which force the mass of air to rise over them, whereby the air being rarefied, its specific capacity for heat is increased and its temperature falls, with a corresponding condensation of the vapour originally held in suspension.

This explanation of the principal efficient cause of the summer rains of south Asia is immediately based on an analysis of the complicated phenomena actually observed, and it serves to account for many apparent anomalies. The heaviest falls of rain occur along lines of mountain of some extent directly facing the vapour-bearing winds, as on the Western Ghats of India and the west coast of the Malay peninsula. The same results are found along the mountains at a distance from the sea, the heaviest rainfall known to occur anywhere in the world (not less than 600 in. in the year) being recorded on the Khasi range about 100 m. north-east of Calcutta, which presents an abrupt front to the progress of the moist winds flowing up from the Bay of Bengal. The cessation of the rains on the southern border of Baluchistan, west of Karachi, obviously arises from the projection of the south-east coast of Arabia, which limits the breadth of the south-west monsoon air current and the length of the coast-line directly exposed to it. The very small and irregular rainfall in Sind and along the Indus is to be accounted for by the want of any obstacle in the path of the vapour-bearing winds, which, therefore, carry the uncondensed rain up to the Punjab, where it falls on the outer ranges of the western Himalaya and of Afghanistan.

The diurnal mountain winds are very strongly marked on the Himalaya, where they probably are the most active agents in determining the precipitation of rain along the chain—the monsoon currents, as before stated, not penetrating among the mountains. The formation of dense banks of cloud in the afternoon, when the up wind is strongest, along the southern face of the snowy ranges of the Himalaya, is a regular daily phenomenon during the hotter months of the year, and heavy rain, accompanied by electrical discharges, is the frequent result of such condensation.

Too little is known of the greater part of Asia to admit of any more being said with reference to this part of the subject, than to mention a few facts bearing on the rainfall. In northern Asia there is a generally equal rainfall of 19 to 29 in. between the Volga and the Lena in Manchuria and northern China, rather more considerable increase in Korea, Siam and Japan. At Tiflis the yearly fall is 22 in.; on the Caspian about 7 or 8 in.; on the Sea of Aral 5 or 6 in. In south-western Siberia it is 12 or 14 in., diminishing as we proceed eastward to 6 or 7 in. at Barnaul, and to 5 or 6 in. at Urga in northern Mongolia. In eastern Siberia it is about 15 to 20 in. In China we find about 23 in. to be the fall at Peking; while at Canton, which lies nearly on the northern tropic and the region of the south-west monsoon is entered, the quantity is increased to 78 in. At Batavia in Java the fall is about 78 in.; at Singapore it is nearly 100 in. The quantity increases considerably on that part of the coast of the Malay peninsula which is not sheltered from the south-west by Sumatra. On the Tenasserim and Burmese coast falls of more than 200 in. are registered, and the quantity is here nowhere less than 75 or 80 in., which is about the average of the eastern part of the delta of the Ganges, Calcutta standing at about 64 in. On the hills that flank Bengal on the east the fall is very great. On the Khasi hills, at an elevation of about 4500 ft., the average of ten years is more than 550 in. As much as 150 in. has been measured in one month, and 610 in. in one year. On the west coast of the Indian peninsula the fall at the sea-level varies from about 75 to 100 in., and at certain elevations on the mountains more than 250 in. is commonly registered, with intermediate quantities at intervening localities. On the east coast the fall is far less, nowhere rising to 50 in., and towards the southern apex of the peninsula being reduced to 25 or 30 in. Ceylon shows from 60 to 80 in. As we recede from the coast the fall diminishes, till it is reduced to about 25 or 30 in. at the head of the Gangetic plain. The tract along the Indus to within 60 or 80 m. of the Himalaya is almost rainless, 6 or 8 in. being the fall in the southern portion of the Punjab. On the outer ranges of the Himalaya the yearly fall amounts to about 200 in. on the east in Sikkim, and gradually diminishes on the west, where north of the Punjab it is about 70 or 80 in. In the interior of the chain the rain is far less, and the quantity of precipitation is so small in Tibet that it can be hardly measured. It is to the greatly reduced fall of snow on the northern faces of the highest ranges of the Himalaya that is to be attributed the higher level of the snow-line, a phenomenon which was long a cause of discussion.

In Afghanistan, Persia, Asia Minor and Syria, winter and spring appear to be the chief seasons of condensation. In other parts of Asia the principal part of the rain falls between May and September, that is, in the hottest half of the year. In the islands under the equator the heaviest fall is between October and February.

(R. S.)

Flora and Fauna

The general assemblage of animals and plants found over northern Asia resembles greatly that found in the parts of Europe which are adjacent and have a similar climate. Siberia, north of the 50th parallel, has a climate not much differing from a similarly situated portion of Europe, though the winters are more severe and the summers hotter. The rainfall, though moderate, is still sufficient to maintain the supply of water in the great rivers that traverse the country to the Arctic Sea, and to support an abundant vegetation. A similar affinity exists between the life of the southern parts of Europe and that in the zone of Asia extending from the Mediterranean across to the Himalaya and northern China. This belt, which embraces Asia Minor, northern Persia, Afghanistan, and the southern slopes of the

Himalaya, from its elevation has a temperate climate, and throughout it the rainfall is sufficient to maintain a vigorous vegetation, while the summers, though hot. and the winters, though severe, are not extreme. The plants and animals along it are found to have a marked similarity of character to those of south Europe, with which region the zone is virtually continuous.

The extremely dry and hot tracts which constitute an almost unbroken desert from Arabia, through south Persia and Baluchistan, to Sind, are characterized by considerable uniformity in the types of life, which closely approach to those of the neighbouring hot and dry regions of Africa. The region of the heavy periodical summer rains and high temperature, which comprises India, the Indo-Chinese peninsula, and southern China, as well as the western part of the Malay Archipelago, is also marked by much similarity in the plants and animals throughout its extent. The area between the southern border of Siberia and the margin of the temperate alpine zone of the Himalaya and north China, comprising what are commonly called central Asia, Turkestan, Mongolia and western Manchuria, is an almost rainless region, having winters of extreme severity and summers of intense heat. Its animals and plants have a special character suited to the peculiar climatal conditions, more closely allied to those of the adjacent northern Siberian tract than of the other bordering regions. The south-eastern parts of the Malay Archipelago have much in common with the Australian continent, to which they adjoin, though their affinities are chiefly Indian. North China and Japan also have many forms of life in common. Much still remains to be done in the exploration of China and eastern Asia; but it is known that many of the special forms of this region extend to the Himalaya, while others clearly indicate a connexion with North America.

The foregoing brief review of the principal territorial divisions according to which the forms of life are distributed in Asia, indicates how close is the dependence of this distribution on climatic conditions, and this will be made more apparent by a somewhat fuller account of the main features of the flora and fauna.

Northern Asia.

Flora.—The flora of the whole of northern Asia is in essentials the same as that of northern Europe, the differences being due rather to variations of species than of genera. The absence of the oak and of all heaths east of the Ural may be noticed. Pines, larch, birch are the principal trees on the mountains; willow, alders and poplars on the lower ground. The northern limit of the pine in Siberia is about 70° N.

Along the warm temperate zone, from the Mediterranean to the Himalaya, extends a flora essentially European in character. Many European species reach the central Himalaya, though few are known in its eastern parts. The genera common to the Himalaya and Europe are much more abundant, and extend throughout the chain, and to all elevations. There is also a corresponding diffusion of Japanese and Chinese forms along this zone, these being most numerous in the eastern Himalaya, and less frequent in the west.

The truly tropical flora of the hotter and wetter regions of eastern India is continuous with that of the Malayan peninsula and islands, and extends along the lower ranges of the Himalaya, gradually becoming less marked and rising to lower elevations as we go westward, where the rainfall diminishes and the winter cold increases.

The vegetation of the higher and therefore cooler and less rainy ranges of the Himalaya has greater uniformity of character along the whole chain, and a closer general approach to European forms is maintained; an increased number of species is actually identical, among these being found, at the greatest elevations, many alpine plants believed to be identical with species of the north Arctic regions. On reaching the Tibetan plateau, with the increased dryness the flora assumes many features of the Siberian type. Many true Siberian species are found, and more Siberian genera. Some of the Siberian forms, thus brought into proximity with the Indian flora, extend to the rainy parts of the mountains, and even to the plains of upper India. Assemblages of marine plants form another remarkable feature of Tibet, these being frequently met with growing at elevations of 14,000 to 15,000 ft. above the sea, more especially in the vicinity of the many salt lakes of those regions.

The vegetation of the hot and dry region of the south-west of the continent consists largely of plants which are diffused over Africa, Baluchistan and Sind; many of these extend into the hotter parts of India, and not a few common Egyptian plants are to be met with in the Indian peninsula.

Indian region.

The whole number of species of plants indigenous in the region of south-eastern Asia, which includes India and the Malayan peninsula and islands, from about the 65th to the 105th meridian, was estimated by Sir J.D. Hooker at 12,000 to 15,000. The principal orders, arranged according to their numerical importance, are as follows:—Leguminosae, Rubiaceae, Orchidaceae, Compositae, Gramineae, Euphorbiaceae, Acanthaceae, Cyperaceae and Labiatae. But within this region there is a very great variation between the vegetation of the more humid and the more arid regions, while the characteristics of the flora on the higher mountain ranges differ wholly from those of the plains. In short, we have a somewhat heterogeneous assemblage of tropical, temperate and alpine plants, as has been already briefly indicated, of which, however, the tropical are so far dominant as to give their character to the flora viewed as a whole. The Indian flora contains a more general and complete illustration of almost all the chief natural families of all parts of the world than any other country. Compositae are comparatively rare; so also Gramineae and Cyperaceae are in some places deficient, and Labiatae, Leguminosae and ferns in others. Euphorbiaceae and Scrophulariaceae and Orchidaceae are universally present, the last in specially large proportions.

The perennially humid regions of the Malayan peninsula and western portion of the archipelago are everywhere covered with dense forest, rendered difficult to traverse by the thorny cane, a palm of the genus *Calamus*, which has its greatest development in this part of Asia. The chief trees belong to the orders of Terebinthaceae, Sapindaceae, Meliaceae, Clusiaceae, Dipterocarpaceae, Ternstroemiaceae, Leguminosae, laurels, oaks and figs, with Dilleniaceae, Sapotaceae and nutmegs. Bamboos and palms, with *Pandanus* and *Dracaena*, are also abundant. A similar forest flora extends along the mountains of eastern India to the Himalaya, where it ascends to elevations varying from 6000 to 7000 ft. on the east to 3000 or 4000 ft. on the west.

The arboreous forms which least require the humid and equable heat of the more truly tropical and equatorial climates, and are best able to resist the high temperatures and excessive drought of the northern Indian hot months from April to June, are certain Leguminosae,. *Bauhinia, Acacia, Butea* and *Dalbergia, Bombax, Skorea, Nauclea, Lagerstroemia*, and *Bignonia*, a few bamboos and palms, with others which extend far beyond the tropic, and give a tropical aspect to the forest to the extreme northern border of the Indian plain.

Of the herbaceous vegetation of the more rainy regions may be noted the Orchidaceae, Orontiaceae, Scitamineae, with ferns and other Cryptogams, besides Gramineae and Cyperaceae. Among these some forms, as among the trees, extend much beyond the tropic and ascend into the temperate zones on the mountains, of which may be mentioned *Begonia, Osbeckia*, various Cyrtandraceae, Scitamineae, and a few epiphytical orchids.

Of the orders most largely developed in south India, and more sparingly elsewhere, may be named Aurantiaceae, Dipterocarpaceae, Balsaminaceae, Ebenaceae, Jasmineae, and Cyrtandraceae; but of these few contain as many as 100 peculiar Indian species. *Nepenthes* may be mentioned as a genus specially developed in the Malayan area, and extending from New Caledonia to Madagascar; it is found as far north as the Khasi hills, and in Ceylon, but does not appear on the Himalaya or in the peninsula of India. The Balsaminaceae may be named as being rare in the eastern region and very abundant in the peninsula. A distinct connexion between the flora of the peninsula and Ceylon and that of eastern tropical Africa is observable not only in the great similarity of many of the more truly tropical forms, and the identity of families and genera found in both regions, but in a more remarkable manner in the likeness of the mountain flora of this part of Africa to that of the peninsula, in which several species occur believed to be identical with Abyssinian forms. This connexion is further established by the absence from both areas of oaks, conifers and cycads, which, as regards the first two families, is a remarkable feature of the flora of the peninsula and Ceylon, as the mountains rise to elevations in which both of them are abundant to the north and east. With these facts it has to be noticed that many of the principal forms of the eastern flora are absent or comparatively rare in the peninsula and Ceylon.

The general physiognomy of the Indian flora is mainly determined by the conditions of humidity of climate. The impenetrable shady forests of the Malay peninsula and eastern Bengal, of the west coast of the Indian peninsula, and of Ceylon, offer a strong contrast to the more loosely-timbered districts of the drier regions of central India and the north-western Himalaya. The forest areas of India include the dense vegetation and luxuriant growth of the Tarai jungles at the foot of the eastern Himalaya, and wide stretches of loosely-timbered country which are a prevailing feature in the Central Provinces and parts of Madras. Where the lowlands are highly cultivated they are adorned with planted wood, and where they are cut off from rain they are nearly completely desert.

The higher mountains rise abruptly from the plains; on their slopes, clothed below almost exclusively with the more tropical forms, a vegetation of a warm temperate character, chiefly evergreen, soon begins to prevail, comprising Magnoliaceae, Ternstroemiaccae, subtropical Rosaceae, rhododendron, oak, *Ilex, Symplocos*, Lauraceae, *Pinus longifolia*, with mountain forms of truly tropical orders, palms, *Pandanus, Musa, Vitis, Vernonia*, and many others. On the east the vegetation of the Himalaya is most abundant and varied. The forest extends, with great luxuriance, to an elevation of 12,000 ft., above which the sub-alpine region may be said to begin, in which rhododendron scrub often covers the ground up to 13,000 or 14,000 ft. Only one pine is found below 8000 ft., above which several other Coniferae occur. Plantains, tree-ferns, bamboos, several *Calami*, and other palms, and *Pandanus*, are abundant at the lower levels. Between 4000 and 8000 ft. epiphytal orchids are very frequent, and reach even to 10,000 ft. Vegetation ascends on the drier and less snowy mountain slopes of Tibet to above 18,000 ft. On the west, with the drier climate, the forest is less luxuriant and dense, and the hill-

sides and the valleys better cultivated. The warm mountain slopes are covered with *Pinus longifolia*, or with oaks and rhododendron, and the forest is not commonly dense below 8000 ft., excepting in some of the more secluded valleys at a low elevation. From 8000 to 12,000 ft., a thick forest of deciduous trees is almost universal, above which a sub-alpine region is reached, and vegetation as on the east continues up to 18,000 ft. or more. The more tropical forms of the east, such as the tree-ferns, do not reach west of Nepal. The cedar or deodar is hardly indigenous east of the sources of the Ganges, and at about the same point the forms of the west begin to be more abundant, increasing in number as we advance towards Afghanistan.

The cultivated plants of the Indian region include wheat, barley, rice and maize; various millets, *Sorghum, Penicillaria, Panicum* and *Eleusine*; many pulses, peas and beans; mustard and rape; ginger and turmeric; pepper and capsicum; several Cucurbitaceae; tobacco, *Sesamum*, poppy, *Crotolaria* and *Cannabis*; cotton, indigo and sugar; coffee and tea; oranges, lemons of many sorts; pomegranate, mango, figs, peaches, vines and plantains. The more common palms are *Cocos, Phoenix* and *Borassus*, supplying cocoa-nut and toddy. Indian agriculture combines the harvests of the tropical and temperate zones. North of the tropic the winter cold is sufficient to admit of the cultivation of almost all the cereals and vegetables of Europe, wheat being sown in November and reaped early in April. In this same region the summer heat and rain provide a thoroughly tropical climate, in which rice and other tropical cereals are freely raised, being as a rule sown early in July and reaped in September or October. In southern India, and the other parts of Asia and of the islands having a similar climate, the difference of the winter and summer half-years is not sufficient to admit of the proper cultivation of wheat or barley. The other cereals may be seen occasionally, where artificial irrigation is practised, in all stages of progress at all seasons of the year, though the operations of agriculture are, as a general rule, limited to the rainy months, when alone is the requisite supply of water commonly forthcoming.

The trees of India producing economically useful timber are comparatively few, owing to the want of durability of the wood, in the extremely hot and moist climate. The teak, *Tectona grandis*, supplies the finest timber. It is found in greatest perfection in the forests of the west coasts of Burma and the Indian peninsula, where the rainfall is heaviest, growing to a height of 100 or 150 ft., mixed with other trees and bamboos. The sal, *Shorea robusta*, a very durable wood, is most abundant along the skirts of the Himalaya from Assam to the Punjab, and is found in central India, to which the teak also extends. The sal grows to a large size, and is more gregarious than the teak. Of other useful woods found in the plains may be named the babool, *Acacia*; toon, *Cedrela*; and sissoo, *Dalbergia*. The only timber in ordinary use obtained from the Himalaya proper is the deodar, *Cedrus deodara*. Besides these are the sandalwood, *Santalum*, of southern India, and many sorts of bamboo found in all parts of the country. The cinchona has recently been introduced with complete success; and the mahogany of America reaches a large size, and gives promise of being grown for use as timber.

Western Asia.

The flora of the rainless region of south-western Asia is continuous with the desert flora of northern and eastern Africa, and extends from the coast of Senegal to the meridian of 75° E., or from the great African desert to the border of the rainless tract along the Indus and the southern parts of the Punjab. It includes the peninsula of Arabia, the shores of the Persian Gulf, south Persia, and Afghanistan and Baluchistan. On the west its limit is in the Cape Verde Islands, and it is partially represented in Abyssinia.

The more common plants in the most characteristic part of this region in southern Arabia are Capparidaceae, Euphorbiaceae, and a few Leguminosae, a *Reseda* and *Dipterygium*; palms, Polygonaceae, ferns, and other cryptogams, are rare. The number of families relative to the area is very small, and the number of genera and species equally restricted, in very many cases a single species being the only representative of an order. The aspect of the vegetation is very peculiar, and is commonly determined by the predominance of some four or five species, the rest being either local or sparingly scattered over the area. The absence of the ordinary bright green colours of vegetation is another peculiarity of this flora, almost all the plants having glaucous or whitened stems. Foliage is reduced to a minimum, the moisture of the plant being stored up in massive or fleshy stems against the long-continued drought. Aridity has favoured the production of spines as a defence from external attack, sharp thorns are frequent, and asperities of various sorts predominate. Many species produce gums and resins, their stems being encrusted with the exudations, and pungency and aromatic odour is an almost universal quality of the plants of desert regions.

The cultivated plants of Arabia are much the same as those of northern India—wheat, barley, and the common *Sorghum*, with dates and lemons, cotton and indigo. To these must be added coffee, which is restricted to the slopes of the western hills. Among the more mountainous regions of the south-western part of Arabia, known as Arabia Felix, the summits of which rise to 6000 or 7000 ft., the rainfall is sufficient to develop a more luxuriant vegetation, and the valleys have a flora like that of similarly situated parts of southern Persia, and the less elevated parts of Afghanistan and Baluchistan, partaking of the characters of that of the hotter Mediterranean region. In these countries aromatic shrubs are abundant. Trees are rare, and almost restricted to *Pistacia, Celtis* and *Dodonaea*, with poplars, and the date palm. Prickly forms of *Statice* and *Astragalus* cover the dry hills. In the spring there is an abundant herbaceous vegetation, including many bulbous plants, with genera, if not species, identical with those of the Syrian region, some of which extend to the Himalaya.

The flora of the northern part of Afghanistan approximates to that of the contiguous western Himalaya. *Quercus Ilex*, the evergreen oak of southern Europe, is found in forests as far east as the Sutlej, accompanied with other European forms. In the higher parts of Afghanistan and Persia Boraginaceae and thistles abound; gigantic Umbelliferae, such as *Ferula, Galbanum, Dorema, Bubon, Peucedanum, Prangos*, and others, also characterize the same districts, and some of them extend into Tibet.

The flora of Asia Minor and northern Persia differs but little from that of the southern parts of Europe. The mountains are clothed, where the fall of rain is abundant, with forests of *Quercus, Fagus, Ulmus, Acer, Carpinus* and *Corylus*, and various Coniferae. Of these the only genus that is not found on the Himalaya is *Fagus*. Fruit trees of the plum tribe abound. The cultivated plants are those of southern Europe.

Eastern Asia.

The vegetation of the Malayan Islands is for the most part that of the wetter and hotter region of India; but the greater uniformity of the temperature and humidity leads to the predominance of certain tropical forms not so conspicuous in India, while the proximity of the Australian continent has permitted the partial diffusion of Australian types which are not seen in India. The liquidambar and nutmeg may be noticed among the former, the first is one of the most conspicuous trees in java, on the mountains of the eastern part of which the casuarina, one of the characteristic forms of Australia, is also abundant. Rhododendrons occur in Borneo and Sumatra, descending to the level of the sea. On the mountains of Java there appears to be no truly alpine flora, *Saxifraga* is not found. In Borneo some of the temperate forms of Australia appear on the higher mountains. On the other islands similar characteristics are to be observed, Australian genera extending to the Philippines, and even to southern China.

The analysis of the Hong Kong flora indicates that about three-fifths of the species are common to the Indian region, and nearly all the remainder are either Chinese or local forms. The number of species common to southern China, Japan and northern Asia is small. The cultivated plants of China are, with a few exceptions, the same as those of India South China, therefore seems, botanically hardly distinct from the great Indian region, into which many Chinese forms penetrate, as before noticed. The flora of north China, which is akin to that of Japan, shows manifest relation to that of the neighbouring American continent, from which many temperate forms extend, reaching to the Himalaya, almost as far as Kashmir. Very little is known of the plants of the interior of northern China, but it seems probable that a complete botanical connexion is established between it and the temperate region of the Himalaya.

Central Asia.

The vegetation of the dry region of central Asia is remarkable for the great relative number of Chenopodiaceae, *Salicornia* and other salt plants being common; Polygonaceae also are abundant, leafless forms being of frequent occurrence, which gives the vegetation a very remarkable aspect. Peculiar forms of Leguminosae also prevail, and these with many of the other plants of the southern and drier regions of Siberia, or of the colder regions of the desert tracts of Persia and Afghanistan, extend into Tibet, where the extreme drought and the hot (nearly vertical) sun combine to produce a summer climate not greatly differing from that of the plains of central Asia.

Zoological Regions.

Fauna.—The zoological provinces of Asia correspond very closely with the botanical. The northern portion of Asia, as far south as the Himalaya, is not zoologically distinct from Europe, and these two areas, with the strip of Africa north of the Atlas, constitute the Palaearctic region of Dr. Sclater, whose zoological primary divisions of the earth have met with the general approval of naturalists. The south-eastern portion of Asia with the adjacent islands of Sumatra, Java, Borneo and the Philippines, form his Indian region. The extreme south-west part of the continent constitutes a separate zoological district, comprising Arabia, Palestine and southern Persia, and reaching, like the hot desert botanical tract, to Baluchistan and Sind, it belongs to what Dr. Sclater calls the Ethiopian region, which extends over Africa, south of the Atlas. Celebes, Papua, and the other islands east of Java beyond Wallace’s line fall within the Australian region.

Mammals and birds.

Nearly all the mammals of Europe also occur in northern Asia, where however, the Palaearctic fauna is enriched by numerous additional species. The characteristic groups belong mostly to forms which are restricted to cold and temperate regions. Consequently the Quadrumana, or monkeys, are nearly unrepresented, a single species occurring in Japan, and one or two others in northern China and Tibet. Insectivorous bats are numerous, but the frugivorous division of this order is only represented by a single species in Japan. Carnivora are also numerous, particularly the frequenters of cold climates, such as bears, weasels, wolves and foxes. Of the Insectivora, numerous forms of moles, shrews and hedgehogs prevail. The Rodents are also well represented by various squirrels, mice, and hares. Characteristic forms ot this order in northern Asia are the

marmots (*Arctomys*) and the pikas or tailless hares (*Lagomys*). The great order of Ungulata is represented by various forms of sheep, as many as ten or twelve wild species of *Ovis* being met with in the mountain chains of Asia, and more sparingly by several peculiar forms of antelope, such as the saiga (*Saiga tatarica*) and the *Gazella gutturosa*, or yellow sheep. Coming to the deer, we also meet with characteristic forms in northern Asia, especially those belonging to the typical genus *Cervus*. The musk deer (*Moschus*) is also quite restricted to northern Asia, and is one of its most peculiar types.

The ornithology ot northern Asia is even more closely allied to that of Europe than the mammal fauna. Nearly three fourths of the well-known species of Europe extend through Siberia into the islands of the Japanese empire. Here again, we have an absence of all tropical forms, and a great development of groups characteristic of cold and temperate regions. One of the most peculiar of these is the genus *Phasianus*, of which splendid birds all the species are restricted in their wild state to northern Asia. The still more magnificently clad gold pheasants (*Thaumalea*), and the eared pheasants (*Crossoptilon*) are also confined to certain districts in the mountains of north eastern Asia. Amongst the *Passeres*, such forms as the larks, stone chats, finches, linnets, and grosbeaks are well developed and exhibit many species.

The mammal fauna of the Indian region of Asia is much more highly developed than that of the Palaearctic. The Quadrumana are represented by several peculiar genera, amongst which are *Semnopithecus*, *Hylobates* and *Simia*. Two peculiar forms of the Lemurine group are also met with. Both the insectivorous and frugivorous divisions of the bats are well represented. Amongst the Insectivora very peculiar forms are found, such as *Gymnura* and *Tupaia*. The *Carnivora* are likewise numerous, and this region may be considered as the true home of the tiger, though this animal has wandered far north into the Palaearctic division of Asia. Other characteristic Carnivora are civets, various ichneumons, and the benturong (*Arctictis*). Two species of bears are likewise restricted to the Indian region. In the order of Rodents squirrels are very numerous and porcupines of two genera are met with. The Indian region is the home of the Indian elephant—one of the two sole remaining representatives of the order Proboscidea. Of the Ungulates, four species of rhinoceros and one of tapir are met with, besides several peculiar forms of the swine family. The Bovidae or hollow-horned ruminants, are represented by several genera of antelopes, and by species of true *Bos*—such as *B. sondaicus*, *B. frontalis* and *B. bubalus*. Deer are likewise numerous, and the peculiar group of chevrotains (*Tragulus*) is characteristic of the Indian region. Finally, this region affords us representatives of the order Edentata, in the shape of several species of *Manis*, or scaly ant-eater.

The assemblage of birds of the Indian region is one of the richest and most varied in the world, being surpassed only by that of tropical America. Nearly every order, except that of the Struthiones or ostriches, is well represented, and there are many peculiar genera not found elsewhere, such as *Buceros*, *Harpactes*, *Lophophorus*, *Euplocamus*, *Pajo* and *Ceriornis*. The *Phasianidae* (exclusive of true *Phasianus*) are highly characteristic ot this region, as are likewise certain genera of barbets (*Megalaema*), parrots (*Palaeornis*), and crows (*Dendrocitta*, *Urocissa* and *Cissa*). The family *Eurylaemidae* is entirely confined to this part of Asia.

The Ethiopian fauna plays but a subordinate part in Asia, intruding only into the south-western corner, and occupying the desert districts of Arabia and Syria, although some of the characteristic species reach still farther into Persia and Sind, and even into western India. The lion and the hunting leopard, which may be considered as in this epoch at least, Ethiopian types extend thus far, besides various species of jerboa and other desert-loving forms.

In the birds, the Ethiopian type is shown by the prevalence of larks and stone chats, and by the complete absence of the many peculiar genera of the Indian region.

The occurrence of mammals of the Marsupial order in the Molucca Islands and Celebes, while none have been found in the adjacent islands of Java and Borneo, lying on the west of Wallace's line, or in the Indian region, shows that the margin of the Australian region has here been reached. The same conclusion is indicated by the absence from the Moluccas and Celebes of various other Mammals, Quadrumana, Carnivora, Insectivora and Ruminants, which abound in the western part of the Archipelago. Deer do not extend into New Guinea, in which island the genus *Sus* appears to have its eastern limit. A peculiar form of baboon, *Cynopithecus*, and the singular ruminant, *Anoa*, found in Celebes, seem to have no relation to Asiatic animals, and rather to be allied to those in Africa.

The birds of these islands present similar peculiarities. Those of the Indian region abruptly disappear at, and many Australian forms reach but do not pass, the line above spoken of. Species of birds akin to those of Africa also occur in Celebes.

Of the marine orders of Sirenia and Cetacea the Dugong, *Halicore*, is exclusively found in the Indian Ocean and a dolphin, *Platanista*, peculiar to the Ganges, ascends that river to a great distance from the sea.

Fishes.

Of the sea fishes of Asia, among the Acanthopterygii, or spiny-rayed fishes, the *Percidae*, or perches, are largely represented, the genus *Serranus*, which has only one species in Europe, is very numerous in Asia, and the forms are very large. Other allied genera are abundant and extend from the Indian seas to eastern Africa. The Squamipennes, or scaly-finned fishes, are principally found in the seas of southern Asia, and especially near coral reefs. The *Mullidae* or red mullets are largely represented by genera differing from those of Europe. The *Polynemidae*, which range from the Atlantic through the Indian Ocean to the Pacific, supply animals from which isinglass is prepared; one of them, the mango fish, esteemed a great delicacy, inhabits the seas from the Bay of Bengal to Siam. The *Sciaenidae* extend from the Bay of Bengal to China, but are not known to the westward. The *Stromateidae*, or pomfrets, resemble the dory, a Mediterranean form, and extend to China and the Pacific. The sword fishes *Xiphidae*, the lancet fishes, *Acanthuridae*, and the scabbard fishes, *Trichuridae*, are distributed through the seas of south Asia. Mackerels of various genera abound, as well as gobies, blenniesm and mullets.

Among the Anacanthim, the cod family so well known in Europe shows but one or two species in the seas of south Asia, though the soles and allied fishes are numerous along the coasts. Of the Physostomi, the siluroids are abundant in the estuaries and muddy waters; the habits of some of these fishes are remarkable, such as that of the males carrying the ova in their mouths till the young are hatched. The small family of *Scopelidae* affords the gelatinous *Harpodon*, or bumalo. The gar-fish and flying fishes are numerous, extending into the seas of Europe. The *Clupeidae* or herrings, are most abundant, and anchovies, or sardines, are found in shoals, but at irregular and uncertain intervals. The marine eels, *Muraenidae*, are more numerous towards the Malay Archipelago than in the Indian seas. Forms of sea-horses (*Hippocampus*), pipe-fishes (*Syngnathus*), fife-fishes (*Sclerodermus*), and sun-fish, globe-fish, and other allied forms of *Gymnodontes*, are not uncommon.

Of the cartilaginous fishes, Chondropterygii, the true sharks and hammer-headed sharks, are numerous. The dog-fish also is found, one species extending from the Indian seas to the Cape of Good Hope. The saw-fishes, *Pristidae*, the electrical rays, *Torpedinae*, and ordinary rays and skates, are also found in considerable numbers.

The fresh waters of southern Asia are deficient in the typical forms of the Acanthopterygii, and are chiefly inhabited by carp, siluroids, simple or spined eels, and the walking and climbing fishes. The *Siluridae* attain their chief development in tropical regions. Only one *Silurus* is found in Europe, and the same species extends to southern Asia and Africa. The *Salmonidae* are entirely absent from the waters of southern Asia, though they exist in the rivers that flow into the Arctic Ocean and the neighbouring parts of the northern Pacific, extending perhaps to Formosa; and trout, though unknown in Indian rivers, are found beyond the watershed of the Indus, in the streams flowing into the Caspian. The *Cyprinidae*, or carp, are largely represented in southern Asia, and there grow to a size unknown in Europe; a *Barbus* in the Tigris has been taken of the weight of 300 lb. The chief development of this family, both as to size and number of forms, is in the mountain regions with a temperate climate; the smaller species are found in the hotter regions and in the low-lying rivers. Of the *Clupeidae*, or herrings, numerous forms occur in Asiatic waters, ascending the rivers many hundred miles; one of the best-known of Indian fishes, the hilsa, is of this family. The sturgeons, which abound in the Black Sea and Caspian, and ascend the rivers that fall into them, are also found in Asiatic Russia, and an allied form extends to southern China. The walking or climbing fishes, which are peculiar to south-eastern Asia and Africa, are organized so as to be able to breathe when out of the water, and they are thus fitted to exist under conditions which would be fatal to other fishes, being suited to live in the regions of periodical drought and rain in which they are found.

Insects.

The insects of all southern Asia, including India south of the Himalaya, China, Siam and the Malayan Islands, belong to one group; not only the genera, but even the species are often the same on the opposite sides of the Bay of Bengal. The connexion with Africa is marked by the occurrence of many genera common to Africa and India, and confined to those two regions, and similarities of form are not uncommon there in cases in which the genera are not peculiar. Of Coleopterous insects known to inhabit east Siberia, nearly one-third are found in western Europe. The European forms seem to extend to about 30° N., south of which the Indo-Malayan types are met with, Japan being of the Europeo-Asiatic group. The northern forms extend generally along the south coast of the Mediterranean up to the border of the great desert, and from the Levant to the Caspian.

Domesticated animals.

Of the domesticated animals of Asia may first be mentioned the elephant. It does not breed in captivity, and is not found wild west of the Jumna river in northern India. The horse is produced, in the highest perfection in Arabia and the hot and dry countries of western Asia. Ponies are most esteemed from the wetter regions of the east, and the hilly tracts. Asses are abundant in most places, and two wild species occur. The horned cattle include the humped oxen and buffaloes of India, and the yak of Tibet. A hybrid between the yak and Indian cattle, called zo, is commonly reared in Tibet and the Himalaya. Sheep abound in the more temperate regions, and goats are universally met with; both of these animals are used as beasts of burden in the mountains of Tibet. The reindeer of northern Siberia call also for special notice; they are used for the saddle as well as for

draught.

(R. S.)

Ethnology

Racial types.

Asia, including its outlying islands, has become the dwelling-place of all the great families into which the races of men have been divided. By far the largest area is occupied by the Mongolian group. These have yellow-brown skins, black eyes and hair, flat noses and oblique eyes. They are short in stature, with little hair on the body and face. In general terms they extend, with modifications of character probably due to admixture with other types and to varying conditions of life, over the whole of northern Asia as far south as the plains bordering the Caspian Sea, including Tibet and China, and also over the Indo-Malayan peninsula and Archipelago, excepting Papua and some of the more eastern islands.

Next in numerical importance to the Mongolians are the races which have been called by Professor Huxley *Melanochroic* and *Xanthochroic*. The former includes the dark-haired people of southern Europe, and extends over North Africa, Asia Minor, Syria to south-western Asia, and through Arabia and Persia to India. The latter race includes the fair-haired people of northern Europe, and extends over nearly the same area as the Melanochroi, with which race it is greatly intermixed. The Xanthochroi have fair skins, blue eyes and light hair; and others have dark skins, eyes and hair, and are of a slighter frame. Together they constitute what were once called the Caucasian races. The Melanochroi are not considered by Huxley to be one of the primitive modifications of mankind, but rather to be the result of the admixture of the Xanthochroi with the Australoid type, next to be mentioned.

The third group is that of the Australoid type. Their hair is dark, generally soft, never woolly. The eyes and skin are dark, the beard often well developed, the nose broad and flat, the lips coarse, and jaws heavy. This race is believed to form the basis of the people of the Indian peninsula, and of some of the hill tribes of central India, to whom the name Dravidian has been given, and by its admixture with the Melanochroic group to have given rise to the ordinary population of the Indian provinces. It is also probable that the Australoid family extends into south Arabia and Egypt.

The last group, the Negroid, is represented by the races to which has been given the name of *Negrito*, from the small size of some of them. They are closely akin to the negroes of South Africa, and possess the characteristic dark skins, woolly but scanty beard and body hair, broad flat noses, and projecting lips of the African; and are diffused over the Andaman Islands, a part of the Malay peninsula, the Philippines, Papua, and some of the neighbouring islands. The Negritos appear to be derived from a mixture of the true Negro with the Australoid type.

Mongolians.

The distribution of the Mongolian group in Asia offers no particular difficulty. There is complete present, and probably previous long-existing, geographical continuity in the area over which they are found. There is also considerable similarity of climate and other conditions throughout the northern half of Asia which they occupy. The extension of modified forms of the Mongolian type over the whole American continent may be mentioned as a remarkable circumstance connected with this branch of the human race.

The Mongolians of the northern half of Asia are almost entirely nomadic, hunters and shepherds or herdsmen. The least advanced of these, but far the most peaceful, are those that occupy Siberia. Farther south the best-known tribes are the Manchus, the Mongols proper, the Moguls and the Turks, all known under the name of Tatars, and to the ancients as Scythians, occupying from east to west the zone of Asia comprised between the 40th and 50th circles of N. lat. The Turks are Mahommedans; their tribes extend up the Oxus to the borders of Afghanistan and Persia, and to the Caspian, and under the name of Kirghiz into Russia, and their language is spoken over a large part of western Asia. Their letters are those of Persia. The Manchus and Mongols are chiefly Buddhist, with letters derived from the ancient Syriac. The Manchus are now said to be gradually falling under the influence of Chinese civilization, and to be losing their old nomadic habits, and even their peculiar language. The predatory habits of the Turkish, Mongolian and Manchu population of northern Asia, and their irruptions into other parts of the continent and into Europe, have produced very remarkable results in the history of the world.

The Chinese branch of the Mongolian family are a thoroughly settled people of agriculturists and traders. They are partially Buddhist, and have a peculiar monosyllabic, uninflected language, with writing consisting of symbols, which represent words, not letters.

The countries lying between India and the Mongolian are occupied by populations chiefly of the Mongolian and Chinese type, having languages fundamentally monosyllabic, but using letters derived from India, and adopting their religion, which is almost everywhere Buddhist, from the Indians. Of these may be named the Tibetans, the Burmese and the Siamese. Cochin-China is more nearly Chinese in all respects. It is known that to the Tibeto-Chinese modifications of the pure Mongolian type all the eastern Burmese tribes—Chins, Kachins, Shans, &c.—belong (as indeed do the Burmese themselves), and that a cognate race occupies the Himalaya to the eastern limits of Kashmir.

Some light has been thrown on the connexion between the Tibetan race and certain tribes of central India, the Bhils and Kols; and it seems more probable that these tribes are the remnants of a Mongolian race which first displaced a yet earlier Negroid population, and was then itself shouldered out by a Caucasian irruption, than that they entered India by any of the northern passages within historic times. Mongolian settlements have lately been found very much farther extended into the border countries of north-west India than has been hitherto recognized. The Mingals, who, conjointly with the Brahuis, occupy the hills south of Kalat to the limits of the Rajput province of Las Bela, claim Mongolian descent, and traces of a Mongolian colony have been found in Makran.

Malays.

The Malays, who occupy the peninsula and most of the islands of the Archipelago called after them, are Mongols apparently modified by their very different climate, and by the maritime life forced upon them by the physical conditions of the region they inhabit. As they are now known to us, they have undergone a process of partial civilization, first at the hands of the Brahminical Indians, from whom they borrowed a religion, and to some extent literature and an alphabet, and subsequently from intercourse with the Arabs, which has led to the adoption of Mahommedanism by most of them.

Aryans.

The name of Aryan has been given to the races speaking languages derived from, or akin to, the ancient form of Sanskrit, who now occupy the temperate zone extending from the Mediterranean, across the highlands of Asia Minor, Persia and Afghanistan, to India. The races speaking the languages akin to the ancient Assyrian, which are now mainly represented by Arabic, have been called Semitic, and occupy the countries south-west of Persia, including Syria and Arabia, besides extending into North Africa. Though the languages of these races are very different they cannot be regarded as physically distinct, and they are both without doubt branches of the Melanochroi, modified by admixture with the neighbouring races, the Mongols, the Australoids and the Xanthochroi.

The Aryans of India are probably the most settled and civilized of all Asiatic races. This type is found in its purest form in the north and north-west, while the mixed races and the population referred to the Australoid type predominate in the peninsula and southern India. The spoken languages of northern India are very various, differing one from another in the sort of degree that English differs from German, though all are thoroughly Sanskritic in their vocables, but with an absence of Sanskrit grammar that has given rise to considerable discussion. The languages of the south are Dravidian, not Sanskritic. The letters of both classes of languages, which also vary considerably, are all modifications of the ancient Pali, and probably derived from the Dravidians, not from the Aryans. They are written from left to right, exception being made of Urdu or Hindostani, the mixed language of the Mahommedan conquerors of northern India, the character used for writing which is the Persian. From the river Sutlej and the borders of the Sind desert, as far as Burma and to Ceylon, the religion of the great bulk of the people of India is Hindu or Brahminical, though the Mahommedans are often numerous, and in some places even in a majority. West of the Sutlej the population of Asia may be said to be wholly Mahommedan with the exception of certain relatively small areas in Asia Minor and Syria, where Christians predominate. The language of the Punjab does not differ very materially from that of Upper India. West of the Indus the dialects approach more to Persian, which language meets Arabic and Turki west of the Tigris, and along the Turkoman desert and the Caspian. Through the whole of this tract the letters are used which are common to Persian, Arabic and Turkish, written from right to left.

Racial distribution.

Considerable progress has been made in the classification of the various races which occupy the continent to the west of the great Mongolian region. The ancient Sacae, or Scyths, are recognized in the Aryan population, who may be found in great numbers and in their purest form in the more inaccessible mountains and glens of the central highlands. These Tajiks (as they are usually called) form the underlying population of Persia, Baluchistan, Afghanistan and Badakshan, and their language (in the central districts of Asia) is found to contain words of Aryan or Sanskrit derivation which are not known in Persian. They have been for the most part dispossessed of their country by Turkish immigration and conquests, but they still retain their original intellectual superiority over the Turkish and other mixed tribes by which they are surrounded. Uzbegs and Kirghiz have but small affinity with the Mongol element of Asia. They are the representatives of those countless Turkish irruptions which have taken place through all history. Of the two divisions (Kara Kirghiz and Kassak Kirghiz) into which the Kirghiz tribes are divided by Russian authorities, the Kassak Kirghiz is the more closely allied to the Mongol type; the Kara Kirghiz, who are found principally in the valleys of the Tian-shan and Altai mountains, being unmistakably Turkish. The Kipchaks are only a Kirghiz clan. The language of the Kirghiz is Turki and

their religion that of Mahomet. As a nomadic people they have great contempt for the Sarts, who represent the town dwellers of the tribe. The Kalmucks are a Buddhist and Mongolian people who originated in a confederacy of tribes dwelling in Dzungaria, migrated to Siberia, and settled on the Lower Volga. From thence they returned late in the 18th century to the reoccupation of their old ground in Kulja under the Chinese. The Turkoman is the purest form of the Turk element, and his language is the purest form of the Turkish tongue, which is represented at Constantinople by a comparatively mongrel, or mixed, dialect. Ethnographers have traced a connexion between the Turkoman of central Asia and the Teutonic races of Europe, based on a similarity of national customs and immemorial usage. Evidence of an original affinity between Turkoman and Rajput has also been found in the mutual possession by these races of a ruddy skin, so that as ethnographical inquiry advances the Turk appears to recede from his Mongolian affinities and to approach the Caucasian. Turks and Mongols alike were doubtless included under the term Scyth by the ancients, and as Tatars by more modern writers, insomuch that the Turkish dynasty at Delhi, founded by Baber, is usually termed the Mogul dynasty, although there can be no distinction traced between the terms Mogul and Mongol. The general results of recent inquiry into the ethnography of Afghanistan is to support the general correctness of Bellew's theories of the origin of the Afghan races. The claim of the Durani Afghan to be a true Ben-i-Israel is certainly in no way weakened by any recent investigation. The influence of Greek culture in northern India is fully recognized, and the distribution of Greek colonies previous to Alexander's time is attested by practical knowledge of the districts they were said to occupy. The *habitat* of the Nysaeana, and the identity of certain tribes of Kafiristan with the descendants of these pre-Alexandrian colonists from the west, are also well established. To this day hymns are unwittingly sung to Bacchus in the dales and glens of Kafiristan. The ethnographical status of the mixed tribes of the mountains that lie between Chitral and the Peshawar plains has been fairly well fixed by John Biddulph, and much patient inquiry in the vast fields of Baluchistan by Major Mockler, G.P. Tate and others has resulted in quite a new appreciation of the tribal origin of the great conglomeration of Baluch peoples.

The result of trans-border surveys to the north and west of India has been to establish the important geographical fact that it is by two gateways only, one on the north-west and one on the west of India, that the central Asiatic tides of immigration have flowed into the peninsula. The Kabul valley indicates the north-western entrance, and Makran indicates that on the west. By the Kabul valley route, which includes at its head the group of passes across the Hindu Kush which extend from the Khawak to the Kaoshan, all those central Asian hordes, be they Sacae, Yue-chi, Jats, Goths or Huns, who were driven towards the rich plains of the south, entered the Punjab. Some of them migrated from districts which belong to eastern Asia, but none of them penetrated into India by eastern passes. Such tides as set towards the Himalaya broke against their farther buttresses, leaving an interesting ethnographical flotsam in the northern valleys; but they never overflowed the Himalayan barrier. Later most of the historic invasions of India from central Asia followed the route which leads directly from Kabul to Peshawar and Delhi.

By the western gates of Makran prehistoric irruptions from Mesopotamia broke into the plains of Lower Sind, and either passed on towards the central provinces of India or were absorbed in the highlands south of Kalat. In later centuries the Arabs from the west reached the valley of the Indus by their western route, and there established a dynasty which lasted for 300 years. The identification of existing peoples with the various Scythic, Persian and Arab races who have passed from High Asia into the Indian borderland, has opened up a vast field of ethnographical inquiry which has hardly yet found adequate workers for its investigation. To such fields may be added the yet more complicated problems of those reflex waves which flowed backwards from India into the border highlands.

(T. H. H.*)

History

1. The borders assigned to Asia on the west are somewhat arbitrary. The Urals indicate no real division of races, and in both Greek and Turkish times Asia Minor has been connected with the opposite shores of Europe rather than with the lands lying to the east. A juster view of early history is probably obtained by thinking of the countries round the Mediterranean as interacting on one another than by separating Palestine and Asia Minor as Asiatic.

Asiatic characteristics.

2. The words "Asiatic" and "Oriental" are often used as if they denoted a definite and homogeneous type, but Russians resemble Asiatics in many ways, and Turks, Hindus, Chinese, &c., differ in so many important points that the common substratum is small. It amounts to this, that Asiatics stand on a higher level than the natives of Africa or America, but do not possess the special material civilization of western Europe. As far as any common mental characteristic can be assigned it is also somewhat negative, namely, that Asiatics have not the same sentiment of independence and freedom as Europeans. Individuals are thought of as members of a family, state or religion, rather than as entities with a destiny and rights of their own. This leads to autocracy in politics, fatalism in religion and conservatism in both. Hence, too, Asiatic history has large and simple outlines. Though longer chronologically than the annals of Europe, it is less eventful, less diversified and offers fewer personalities of interest. But the same conditions which render individual eminence difficult procure for it when once attained a more ready recognition, and the conquerors and prophets of Asia have had more power and authority than their parallels in Europe. Jenghiz Khan and Timur covered more ground than Napoleon, and no European has had such an effect on the world as Mahomet.

Religion and civilisation.

3. Attention has often been called to the religious character of Asia. Not only the great religions of the world—Buddhism, Christianity, Islam—but those of secondary importance, such as Judaism, Parseeism, Taoism, are all Asiatic. No European race left to itself has developed any thing more than an unsystematic paganism. It is true that Greek philosophy advanced far beyond this stage, but it produced nothing sufficiently popular to be called a religion. On the other hand Christianity, though Asiatic in its origin and essential ideas, has to a large extent taken its present form on European soil, and some of its most important manifestations— notably the Roman Church—are European reconstructions in which little of the Asiatic element remains. Christianity has made little way farther east then Asia Minor. Modern missions have made no great conquests there, and in earlier times the Nestorians and Jacobites who penetrated to central Asia, China and India, received respectful hearing, but never had anything like the success which attended Buddhism and Islam. Yet Buddhism has never made much impression west of India; and Islam is clearly repugnant to Europeans, for even when under Moslem rule (as in Turkey) they refuse to accept it in a far larger proportion than did the Hindus in similar circumstances. Hence there is clearly a deep-seated difference between the religious feelings of the two continents.

Since Asiatic records go back much farther than those of Europe, it is natural that Asia should be thought the birthplace of civilization. But this originality cannot be absolute, for, whatever may have been the relations of Babylonia and the Aryans, the latter brought civilization to India from the west, and it is not always clear whether similarity of government and institutions is the result of borrowing or of parallel development. Both in Europe and in Asia small feudal or aristocratic states tended to consolidate themselves into monarchies, but whereas in Europe from the early days of Rome onwards royalty has often been driven out and replaced temporarily or permanently by popular government, this change seems not to occur in Asia, where revolution means only a change of dynasty. The few cases where the government is not monarchical, as Arabia, seem to represent the persistence of very ancient conditions.

The contemplation of Asia suggests that progress is most rapid when accompanied by the migration of races or the transplantation of ideas and institutions. Thus Greece excelled the Eastern countries from whom she may have derived her civilization, and Buddhism had a far more brilliant career outside India than in it.

General historical outlines.

4. In many parts of southern Asia are found semi-barbarous races representing the earliest known stratum of population, such as the Veddahs of Ceylon, and various tribes in China and the Malay Archipelago. Some of them offer analogies to the Australians. This connexion, if true, must be very ancient, since it apparently goes back to a time when the distribution of land and water was other than at present. In northern Asia are found other aborigines, such as the Ainus of Japan and the so-called hyperborean races (Chukchis, &c.), but no materials are at present forthcoming for their history. There is some record of the migrations of the later races superimposed on these aborigines. The Chinese came from the west, though how far west is unknown: the Hindus and Persians from the north-west: the Burmese and Siamese from the north. We do not know if the Mongols, Turks, &c., had any earlier home than central Asia, but their extensive movements from that region are historical.

The antiquity of Asiatic history is often exaggerated. With the exception of Babylonia and Assyria, we can hardly even conjecture what was the condition of this continent much before 1500 B.C. At that period the Chinese were advancing along the Hwang-ho, and the Aryans were entering India from the north-west. Both were in conflict with earlier races. The influence of Babylonian civilization was probably widespread. Some connexion between Babylonia and China is generally admitted, and all Indian alphabets seem traceable to a Semitic original borrowed in the course of commerce from the Persian Gulf.

Apart from European conquests, the internal history of Asia in the last 2000 years is the result of the interaction of four main influences: (*a*) Chinese, (*b*) Indian, (*c*) Mahommedan, (*d*) Central Asian. Of these the first three represent different types of civilization: the fourth has little originality, but has been of great importance in affecting the distribution of races and political power.

(*a*) China has moulded the civilization of the eastern mainland and Japan, without much affecting the Malay Archipelago. In the sphere

of direct influence fall Korea, Japan and Annam; in the outer sphere are Mongolia, Tibet, Siam, Cambodia and Burma, where Indian and Chinese influence are combined, the Indian being often the stronger. These countries, except Japan, have all been at some time at least nominal tributaries of China. Where Chinese influence had full play it introduced Confucianism, a special style in art and the Chinese system of writing. After the Christian era it was accompanied by Chinese Buddhism. The cumbrous Chinese script maintains itself in the Far East, but has not advanced west of China proper and Annam.

(*b*) Indian influence may be defined as Buddhism, if it is understood that Buddhism is not at all periods clearly distinguishable from Hinduism. Its sphere includes Indo-China, much of the Malay Archipelago, Tibet and Mongolia, Moreover, China and Japan themselves may be said to fall within this sphere, in view of the part which Buddhism has played in their development. The Buddhist influence is not merely religious, for it is always accompanied by Indian art and literature, and often by an Indian alphabet. Much of this art is Greek in origin, being derived from the Perso-Greek states on the north-west frontiers of India. Indian alphabets have spread to Tibet, Cambodia, Java and Korea. The history of Indian civilization in Indo-China and the Archipelago is still obscure, in spite of the existence of gigantic ruins, but it would appear that in some parts at least two periods must be distinguished, first the introduction of Hinduism (or mixed Hinduism and Buddhism), perhaps under Indian princes, and secondly a later and more purely ecclesiastical introduction of Sinhalese Buddhism, with its literature and art.

(*c*) Mahommedanism or Islam is perhaps the greatest transforming force which the world has seen. It has profoundly affected and to a large extent subjugated all western Asia including India, all eastern and northern Africa as well as Spain, and all eastern Europe. Its open advocacy of force attracts warlike races, and the intensity of its influence is increased by the fusion of secular and religious power, so that the Moslem Church is a Moslem state characterized by slavery, polygamy, and, subject to the autocracy of the ruler, by the theoretical equality of Moslems, who in political status are superior to non-Moslems. Thus, whenever the population of a Moslem country is of mixed belief, a ruling caste of Moslems is formed, as in Turkey at the present day and India under the Moguls. Islam is paramount in Turkey, Persia, Arabia and Afghanistan. India is the dividing line: Islam is strong in northern and central India, weaker in the south. But only one-fifth of the whole population is Moslem. Beyond India it has spread to Malacca and the Malay Archipelago, where it overwhelmed Hindu civilization, and reached the southern Philippines. But it made no progress in Indo-China or Japan; and though there is a large Moslem population in China the Chinese influence has been stronger, for alone of all Asiatics the Chinese have succeeded in forcing Islam to accept the ordinary limitations of a religion and to take its place as a creed parallel to Buddhism or any other.

Even more than Buddhism Islam has carried with it a special style of art and civilization. It is usually accompanied by the use of the Arabic alphabet, and in the languages of Moslem nations (notably Turkish, Persian, Hindustani and Malay) a large proportion of the vocabulary is borrowed from Arabic. Hindi and Hindustani, two forms of the same language as spoken by Hindus and Mahommedans respectively, are a curious example of how deeply religion may affect culture.

(*d*) The great part which central Asian tribes have played in history is obscured by the absence of any common name for them. Linguistically they can be divided into several groups such as Turks, Mongols and Huns, but they were from time to time united into states representing more than one group, and their armies were recruited, like the Janissaries, from all the military races in the neighbourhood. Soon after the Christian era central Asia began to boil over, and at least seven great invasions and more or less complete conquests can be ascribed to these tribes without counting minor movements, (i.) The early invasions of Europe by the Avars, Huns and Bulgarians. (ii.) The invasion and temporary subjection of Russia by the Mongols, who penetrated as far west as Silesia, (iii.) The conquests of Timur. (iv.) The conquest of Asia Minor and eastern Europe by the Turks. (v.) The conquest of India by the Moguls. (vi.) The conquest of China by the Mongols under Kublai. (vii.) The later conquest of China by the Manchus. To these may be added numerous lesser invasions of India, China and Persia.

These tribes have a genius for warfare rather than for government, art or literature, and with few exceptions (*e.g.* the Moguls in India) have proved poor administrators. Apart from conquest their most important function has been to keep up communications in central Asia, and to transport religions and civilizations from one region to another. Thus they are mainly responsible for the introduction of Islam with its Arabic or Persian civilization into India and Europe, and in earlier times their movements facilitated the infiltration of Graeco-Bactrian civilization into India, besides maintaining communication between China and the West.

5. *Babylonia and Assyria.*—The movements mentioned above have been the chief factors of relatively modern Asiatic history, but in early times the centre of activity and culture lay farther west, in Babylonia and Assyria. These ancient states began to decline in the 7th century B.C., and on their ruins rose the Persian empire, which with various political metamorphoses continued to be an important power till the 7th century A.D., after which all western Asia was overwhelmed by the Moslem wave, and old landmarks and kingdoms were obliterated.

The materials for the study of their institutions and population are abundant, but lend themselves to discussion rather than to a summary of admitted facts. In the early history of south-western Asia the Semites form the most important ethnic group, which is primarily linguistic but also shares other remarkable characteristics. Two of the greatest religions of the world, Christianity and Islam, are Semitic in origin, as well as Judaism. In politics these races have been less successful in modern times, but the Semitic states of Babylonia and Assyria were once the principal centres for the development and distribution of civilization. It is generally agreed that this civilization can be traced back to an earlier race, the Sumero-Akkadians, whose language seems allied to the agglutinative idioms of central Asia. If this ancient civilized race was really allied to the ancestors of the Turks and Huns, it is a remarkable instance of how civilization thrives best by being transplanted at a certain period of growth. Still less is known of the early non-Aryan races of Asia Minor such as the Hittites and Alorodians. One hypothesis supposes that the shores of the Mediterranean were originally inhabited by a homogeneous race neither Aryan nor Semitic.

The earliest Sumerian records seem to be anterior to 4000 B.C. Shortly after that period Babylonia was invaded by Semites, who became the ruling race. The city of Babylon came to the fore as metropolis about 2285 B.C. under Khammurabi. Assyria was an offshoot of Babylonia lying to the north-west, and apparently colonized before the second millennium. While using the same language as the Babylonians, the Assyrians had an individuality which showed itself in art and religion. In the 9th and 8th centuries B.C. they became the chief power within their sphere and the suzerain of their parent Babylon. But they succumbed before the advance of the Medo-Persian power in 606 B.C., whereas it was not till 555 that Cyrus took Babylon. Assyria, being essentially a military power, disappeared with the destruction of Nineveh, but Babylon continued to exercise an influence on culture and religion for many centuries after the Persian conquest.

6. *China.*—This is the oldest of existing states, though its authentic history does not go back much beyond 1000 B.C. It is generally admitted that there was some connexion between the ancient civilizations of China and Babylonia, but its precise nature is still uncertain. It is clear, however, that the Chinese came from the west, and entered their present territory along the course of the Hwang-ho at an unknown period, possibly about 3000 B.C. In early historical times China consisted of a shifting confederacy of feudal states, but about 220 B.C. the state of Tsin or Chin (whence the name China) came into prominence, and succeeded in forming a homogeneous empire, which advanced considerably towards the south. The subsequent history of China is mainly a record of struggles with various tribes, commonly, but not very correctly, called Tatars. The empire was frequently broken up by successful incursions, or divided between rival dynasties, but at least twice became a great Asiatic power: under the Han dynasty (about 200 B.C.-A.D. 220), and the T'ang (A.D. 618-906). The dominions of the latter extended across central Asia to northern India, but were dismembered by the attacks of the Kitans, whence the name Cathay. China proper, minus these external provinces, was again united under the Sung dynasty (960-1127), but split into the northern (Tatar) and southern (Chinese) kingdoms. In the 13th century arose the Mongol power, and Kublai Khan conquered China. The Mongol dynasty lasted less than a century, but the Ming, the native Chinese dynasty which succeeded it, reigned for nearly 300 years and despatched expeditions which reached India, Ceylon and East Africa. In 1644 the Ming succumbed to the attacks of the Manchus, a northern tribe who captured Peking and founded the present imperial house.

Until the advent of Europeans, the Chinese were always in contact with inferior races. Whether they expanded at the expense of weak aboriginal tribes or were conquered by more robust invaders, Chinese civilization prevailed and assimilated alike the conquered and the conquerors. It is largely to this that we must ascribe the national conservatism and contempt for foreigners. The spirit of the Chinese polity is self-contained, anti-military and anti-sacerdotal. Rank is nominally determined by merit, as tested by competitive examinations. Society is conceived as regulated by mutual obligations, of which the duties of parents and children are the most important. The emperor is head of the state and the high priest, who sacrifices to Heaven on behalf of his people, but he can be deposed, and no divine right is inherent in certain families as in Japan and Turkey. On the contrary there have been 20 dynasties since the Christian era.

The most conspicuous figure in Chinese literature is Confucius (551-475 B.C.). Though he laid no claim to originality and merely sought to collect and systematize the traditions of antiquity, his influence in the Far East has been unbounded, and he must be pronounced one of the most powerful advocates of peace and humanity that have ever existed. Confucianism is an ethical rather than a religious system,

and hence was able to co-exist, though not on very friendly terms, with Buddhism, which reached China about the 1st century A.D. and was the chief source of Chinese religious ideas, except the older ancestor worship. But they are not a religious people, and like many Europeans regard the church as a department of the state.

7. *Japan* appears to have been formerly inhabited by the Ainus, who have traditions of an older but unknown population, but was invaded in prehistoric times by a race akin to the Koreans, which was possibly mingled with Malay elements after occupying the southern part of the islands. Authentic history does not begin till about the 6th century A.D., when Chinese civilization and Buddhism were introduced. The government was originally autocratic, but as early as the 7th century the most characteristic feature of Japanese politics—the power of great families who overshadowed the throne—makes its appearance. We hear first of the Fujiwara family, and then of the rivalry between the houses of Taira and Minamoto. The latter prevailed, and in 1192 established the dual system of government under which the emperor or Mikado ruled only in name, and the real power was in the hands of a hereditary military chief called Shogun. Japan has never been invaded in historical times, but an attempt made by Kublai Khan to conquer it was successfully repulsed. The chief power then passed to the Ashikaga dynasty of Shoguns, who retained it for about 200 years and were distinguished for their patronage of the arts. The second half of the 16th century was a period of ferment and anarchy, marked by the arrival of the Portuguese and the rise of some remarkable adventurers, one of whom, Hideyoshi, conquered Korea and apparently meditated the invasion of China. His plans were interrupted by his death, and his successor, Ieyasu, who shaped the social and political life of Japan for nearly 300 years (1603-1868), definitely decided on a policy of seclusion and isolation. All ideas of external conquest were abandoned, Christianity was forbidden, and Japan closed to foreigners, only the Dutch being allowed a strictly limited commerce. In 1854-1859 the Christian powers, beginning with the United States, successfully asserted their right to trade with Japan. The influx of new ideas provoked civil war, in which the already decadent Shogunate was abolished and the authority of the Mikado restored. Recognizing that their only chance of competing with Europeans was to fight them with their own weapons, the Japanese set themselves deliberately to assimilate the material civilization and to some extent the institutions of Europe, such as constitutional government. Their progress and success are without parallel. In 1895 they defeated the Chinese and ten years later the Russians. Their exceptional status among Asiatic nations has been recognized by treaties which, contrary to the general practice in non-Christian countries, place all foreigners in Japan under Japanese law.

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This sudden development of the Japanese is perhaps the most important event of the second half of the 19th century, since it marks the rise of an Asiatic power capable of competing with Europe on equal terms. Their history is so different from that of the rest of Asia that it is not surprising if the result is different. The nation hardly came into existence till China and India had passed their prime, and remained secluded and free from the continual struggle against barbarian invaders, which drained the energies of its neighbours. It was left untouched by Mahommedanism, and for an unprecedentedly long period kept Europeans at bay without wasting its strength in hostilities. The military spirit was evolved, not in raids and massacres of the usual Asiatic type which create little but intense racial hatred, but in feuds between families and factions of the same race, which restrained ferocity and tended to create a temper like that of the feudal chivalry of Europe. On the other hand it is noticeable that the Japanese have little which is original in the way of religion, literature or philosophy. Unlike the Chinese and Indians, they have hitherto not had the smallest influence on the intellectual development of Asia, and though they have in the past sometimes shown themselves intensely nationalist and conservative, they have, compared with India and China, so little which is really their own that their assimilation of foreign ideas is explicable.

8. *Korea* received its civilization and religion from China, but differs in language, and to some extent in customs. An alphabet derived from Indian sources is in use as well as Chinese writing. The country was at most periods independent though nominally tributary to China. In the 16th century the Japanese occupied it for a short period, and in 1894 they went to war with China on account of her claims to suzerainty. In 1895 Korea was declared independent.

9. *India.*—The population of India comprises at least three strata: firstly, uncivilized aborigines, such as the Kols and Santhals, and secondly, the Dravidians (Tamils, Kanarese, &c.), who perhaps represent the earliest northern invaders, and appear to have attained some degree of culture on their own account. The most recent authorities are of opinion that the Kolarians and Dravidians represent a single physical type; but, whatever the historical explanation may be, they certainly have different languages and show different stages of civilization. In prehistoric times they were spread over the whole of India, but were driven to the centre and south of the peninsula by the third stratum of Aryans, and perhaps also by invasions of so-called Mongolian races from the north-west. No historical record has been preserved of these latter, but they appear to have profoundly affected the population of Bengal, which is believed to be Mongolo-Dravidian in composition. The Aryans appear to have been settled to the north of the Hindu Kush, and to have migrated south-eastwards about 1500 B.C. Their original home has been a subject of much discussion, but the view now prevalent is that they arose in southern Russia or Asia Minor, whence a section spread eastwards and divided into two closely related branches—the Hindus and Iranians. There were probably two successive Aryan immigrations, and the tradition of a struggle between them may be preserved in the *Mahābhārata*. The life of the ancient Aryans, as portrayed in their sacred songs, the *Rig Veda*, was quasi-nomadic and in many ways democratic, but by the 6th century B.C. settled states had been formed in the Ganges valley. They were absolute monarchies, but the power of the king was tempered by the extraordinary influence possessed by the hereditary sacerdotal class or Brahmans. The position of this class, which has remained till the present day, is connected with the institution of caste, a division of the population into groups founded partly on racial distinctions. The peaceful progress of Brahmanism was hindered by the doctrine of the Indian prince Gotama, called the Buddha, which grew into one of the greatest religions of the world. For many centuries the culture and development of the Hindus depended mainly on the interaction of the old Brahmanical religion and Buddhism. The latter was finally absorbed, and disappeared in India itself, but has spread Indian influence over the whole of eastern Asia, where it still flourishes.

In 326 B.C. Alexander invaded the Punjab. The immediate result was small, but the establishment of Perso-Greek kingdoms in central Asia had a powerful influence on Indian art and culture. It may also have helped to familiarize the Hindu mind with the idea of an empire, which appeared among them later than in other Asiatic countries. The first empire, called Maurya, reached its greatest extent in the time of Asoka (264-227 B.C.), who ruled from Afghanistan to Madras. He was a zealous Buddhist and gave the first example of a missionary religion, for by his exertions the faith was spread over all India and Ceylon. No Hindu empires have lasted long, and the Maurya dominions broke up fifty years after his death.

In the next period (*c.* 150 B.C.-A.D. 300) India was invaded from the north by tribes partly of Parthian and partly of Turki (Yue-chi, &c.) origin. Owing to the absence of dated records, the chronology of these invasions has not yet been set beyond dispute, but the most important was that of the Kushans, whose king Kanishka founded a state which comprised northern India and Kashmir. They were Buddhists, and it is probable that the Mahayana or northern form of Buddhism was due to an amalgamation of Gotama's doctrines with the ideas (largely Greek and Persian) which they brought with them. Much of Sivaism has probably the same origin. Another native empire, known as Gupta, rose on the ruins of the Kushan kingdom, and embraced nearly the whole peninsula, but it broke up in the 5th century, partly owing to the attacks of new northern invaders, the Huns. The Malava dynasty maintained Hindu civilization in the 6th century, and from 606 to 646 Harsha established a brief but brilliant empire in the north with its capital at Kanauj. This epoch is marked by the renaissance of Sanskrit literature and the gradual revival of Hinduism at the expense of Buddhism. But after Harsha Hindu history is lost in a maze of small and transitory states, incapable of resisting the ever advancing Mahommedan peril. As early as 712 the Arabs conquered Sind, and by the end of the 11th century the whole of northern India was in Moslem hands. Two periods may be distinguished, namely the Turki (1200-1526) and the Mogul empire. The former comprised several dynasties of mixed Turki and Iranian race, but was wanting in coherency. In the neighbourhood of the Moslem capitals, Islam spread rapidly, but in such districts as Rajputana and specially Vijayanagar (Mysore) Hindu civilization and religion maintained themselves.

In 1526 the Moguls descended on India from Transoxiana and seized the throne of Delhi. They never subjugated the south, but the empire which they founded in the north was for about two centuries, under such rulers as Akbar and Shah Jehan, one of the most brilliant which Asia has seen. After 1707 it began to decline: the governors became independent: a powerful Mahratta confederacy arose in central India; Nadir Shah of Persia sacked Delhi; and Ahmed Shah made repeated invasions. A still more formidable danger, the power of the French and English, continued to increase. Amidst such confusion the authority of the Mogul empire rapidly disappeared, but it lasted as a name till the Mutiny (1857).

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Indian history until Mahommedan times is marked by the unusual prominence of religious ideas, and is a record of intellectual development rather than of political events. Whatever national unity the Hindu peoples possessed came from the persistent and penetrating influence of the Brahman caste. Kings held a secondary position, and were generally regarded as adventitious tyrants, rather than as the heads and representatives of the nation. Even the great dynasties have left few traces, and it is with difficulty that the patient historian disinters the minor kingdoms from obscurity, but Indian religion, literature and art have influenced all Asia from Persia to Japan.

10. *Persia.*—The Persians, with whom are often coupled the Medes, appear to be pure Aryans in origin, and the earliest form of their language and religion offers remarkable analogies to the Vedas. It is reasonable to suppose that their ancestors and those of the Hindus

at one time formed a single tribe somewhere in central Asia. The religion was remodelled by Zoroaster, who seems to be a historical character and to have lived about the 7th century B.C. About the same time they shook off the domination of Assyria. From the 6th century onwards their empire, then known as Median, began to expand at the expense of the surrounding states. They destroyed Nineveh in alliance with the Babylonians, and half a century later Cyrus took Babylon and founded the great dynasty of the Achaemenidae. The substitution of the Persian for the Median power, which took place with the advent of Cyrus, seems to indicate merely the pre-eminence of a particular tribe and not conquest by another race. The power of the Achaemenidae, when at its maximum, extended from the Oxus and Indus in the east to Thrace in the west and Egypt in the south, but fell before Greece, after lasting for rather more than 200 years. Darius and Xerxes were repulsed in their efforts to subjugate the Greek Peninsula, and Alexander the Great conquered their successor Darius III. in 329. But the greater part of the empire continued to exist under new masters, the Seleucids, as a Hellenistic power which was of great importance for the dissemination of Greek culture in the East. Bactria soon became independent under an Indo-Greek dynasty, and the blending of Greek, Persian, central Asiatic and Hindu influences had an important effect on the art and religion of India, and through India on all eastern Asia. About the same period (250 B.C.-A.D. 227) the Parthian empire arose under the Arsacids in Khorasan and the adjacent districts. The Parthians appear to have been a Turanian tribe who had adopted many Persian customs. They successfully withstood the Romans, and at one time their power extended from India to Syria. They succumbed to the Persian dynasty of the Sassanids, who ruled successfully for about four centuries, established the Zoroastrian faith as their state religion, and maintained a creditable conflict with the East Roman empire. But in the 7th century they were defeated by Heraclius, and shortly afterwards were annihilated before the first impetus of the Mahommedan conquest, which established Islam in Persia and the neighbouring lands, sweeping away old civilizations and boundaries. During the greater part of the Mahommedan period Persia has been ruled by troubled and short-lived dynasties. It attained a certain dignity and unity under Abbas Shah (1585-1628), but in later times was distracted and disorganized by Afghan invasions. The present dynasty, which is of Turkoman origin, dates from 1789.

The achievements of the Persians in art, literature and religion are by no means contemptible, but somewhat mixed and cosmopolitan. Owing to its position, the Persian state, when it from time to time became a conquering empire, overlapped Asia Minor, Babylon and India, and hence acted as an intermediary for transmitting art and ideas, sending for instance Greek sculpture to India and the cult of Mithra to western Europe. It is perhaps on account of this intermediate flavour that the literature of Persia—for instance the adaptations of Omar Khayyam—is more appreciated in Europe than that of other Oriental nations. On the other hand, the wars between Persia and Greece were recognized both at the time and afterwards as a struggle between Europe and Asia; the fact that both combatants were Aryans was not felt, and has no importance compared to the difference of continent.

11. *Jews.*—The Israelites appear to have been originally a nomadic tribe akin to the Arabs, whom they resemble in their want of political instinct and in their extraordinary religious genius. Among many remarkable qualities they have been distinguished from the earliest times by a species of commensalism, or power of living among other nations without becoming either socially merged or politically distinct. Their traditional history represents them as migrating to the borders of Egypt and living there for some centuries. After the exodus, which perhaps took place about 1300 B.C., they moved northwards again and founded a state of modest dimensions, which attained a short-lived unity under Solomon, but succumbed to internal dissensions and to the attacks of Assyria and Babylon. Shalmanezer destroyed the northern kingdom or Israel in 720, and following the practice of the times deported the majority of the population, whose traces became lost to history. There is no reason why their descendants should not be found to-day in various tribes, but the physical type commonly called Jewish is characteristic not so much of Israel as of western Asia generally. In 588 Nebuchadnezzar carried off the Jews in captivity, but after the Persian conquest of Babylonia they were allowed to return to Palestine in 538. Their institutions and ideas were probably considerably modified during this period. Babylon long continued to be a Jewish centre whence the Jews radiated to other countries. The restored state of Jerusalem lived for about six centuries in partial independence under Persian, Egyptian, Syrian and Roman rule, often showing an aggressively heroic attachment to its national customs, which brought it into collision with its suzerains, until the temple was destroyed by Titus in A.D. 70, and the country laid waste in the succeeding years. But long before this period the Jews of the Dispersion had become as important as the inhabitants of Palestine. From choice or compulsion large numbers settled in Egypt in the time of the Ptolemies, and added an appreciable element to Alexandrine culture, while gradual voluntary emigration established Jewish communities in Syria, Asia Minor, Greece and Italy, who facilitated the first spread of Christianity. In spite of chronic unpopularity and recurring persecutions they have spread over nearly all Europe. At the end of the 13th century they were expelled from Spain and many of the exiles moved eastwards. At present the largest numbers are to be found in the eastern parts of Europe. It is remarkable that though the Jews live in relative peace with Asiatics, the great majority of them prefer Europe as a residence.

12. *Arabs.*—The Arabs have hardly any history before the rise of Islam, although their name is mentioned by surrounding nations from the 9th century B.C. onwards. They appear to have had few states or kings, but rather tribes and chiefs. Their relationship to the Babylonians and Jews is indicated by linguistic and ethnological data. The language and writing of the Semites who, at an unknown period, settled in what is now Abyssinia, show affinities with those of South Arabia, and these Semites may have been immigrants into Africa from that region. It is plain from early Moslem literature that Persian, Christian and especially Jewish ideas had penetrated into Arabia.

With the rise of Mahommedanism occurred a sudden effervescence of the Arabs, who during some centuries threatened to impose not only their political authority but their civilization and new religion on the whole known world. They successfully invaded India and central Asia in the east, Spain and Morocco in the west. The Caliphate under the Omayyads of Damascus, and then the Abbasids of Bagdad, became the principal power in the nearer East. It had not, however, a sufficiently coherent organization for permanence; parts of it became independent, others were first protected and then absorbed by the Turks. The Arab rule in Spain, which once threatened to overwhelm Europe and was turned back near Tours by Charles Martel, was distinguished by its tolerance and civilization, and lingered on till the 15th century.

The collapse of the political power of the Arabs was singularly complete. The Caliphate, though Arabian, was always geographically outside Arabia, and on its fall Arabia remained as it was before Islam, isolated and inaccessible. It is still one of the least known parts of the globe, and has hardly any political link with the outside, for the Arabs of northern Africa form separate states. But in spite of this total political collapse, Arabic religion and literature are still one of the greatest forces working in the western half of Asia, in northern Africa and to some extent in eastern Europe.

13. *Ceylon,* though geographically an annex of India, has not followed its fortunes historically. According to tradition it was invaded by an Aryan-speaking colony from the valley of the Ganges in the 6th century B.C. It received Buddhism from north India in the time of Asoka, and has had considerable importance as a centre of religious culture which has influenced Burma and Siam. Its medieval history consists of struggles between the native sovereigns and Tamil invaders. A powerful native dynasty reigned in the 12th century, but in 1408 the island was attacked by Chinese, and from 1505 onwards it was distracted by the attacks and squabbles of Europeans. It was partially subjugated, first by the Portuguese and then by the Dutch. In 1796 the Dutch were expelled by the English.

14. *Indo-China.*—This is an appropriate name for Burma, Siam, Cambodia, Annam, &c., for both in position and in civilization they lie between India and China. Indian influence is predominant as far as Cambodia (though with a Chinese tinge), Indian alphabets being employed and the Buddhism being of the Sinhalese type, but in Annam and Tongking the Chinese script and many Chinese institutions are in use. The population belongs to various races, and also comprises little-known wild tribes, (i.) Languages of the group known as Mōn-Annam are spoken in Annam and in Pegu, an ancient kingdom originally distinct from Burma though now confounded with it. This distribution seems to indicate that they once spread over the whole region, and were divided by the later advance of the Siamese and others. Until Annam was taken by the French, its history consisted of a struggle with the Chinese, who alternately asserted and lost their sovereignty. The Annamese are, however, a distinct race. Cochin China was once the seat of a kingdom called Champa, which appears to have had a hinduized Malay civilization and to have been subsequently absorbed by Annam. (ii.) The Burmese are linguistically allied to the Tibetans, and probably entered Burma from the north-west. The early history consists largely of conflicts between the Burmese and Talaings. The kingdom which was annexed by Britain in 1885 was founded about 1750 by Alompra, who united his countrymen and broke the power of the Talaings. He also invaded Siam. (iii.) The Khmers or Cambodians, whose languages appear to belong to the Mōn-Annam group, form a relatively ancient kingdom, much reduced in the last few centuries by the advance of the Siamese and new a French protectorate. Remarkable ruins dating from perhaps A.D. 800 to 1000 attest the former prevalence of strong Hindu influence, (iv.) The Siamese or Thai, who speak a monosyllabic language of the Chinese type, but written in an Indian alphabet, represent a late invasion from southern China, whence they descended about the 13th century.

15. *Malays.*—This widely-scattered race has no political union and its distribution is a puzzle for ethnography. At present it occupies the extremity of the Malay Peninsula, Java, Sumatra, Borneo, the Philippines and other islands of the Malay Archipelago as well as Madagascar, while the inhabitants of most islands in the South Seas, including New Zealand and Hawaii, speak languages which if not

Malay have at least undergone a strong Malay influence. It would seem from this distribution that the Malays are not continental, but a seafaring race with exceptional powers of dispersal, who have spread over the ocean from some island centre—perhaps Java. The latest theory, however, is that there is a great linguistic group (which may or may not prove to correspond to an ethnic unity) comprising the Mundā, Mōnkhmer, Malay, Polynesian and Micronesian languages, and that the stream of immigration which distributed them started from the extreme west. Three periods can be traced in the history of the Asiatic Malays. In the first (in which such tribes as the Dyaks have remained) they were semi-barbarous. In the second, Hindu civilization reached the Malay Peninsula, Java, Sumatra and other islands. The presence of Hindu ruins, as well as of numerous Indian words and customs, testifies to the strength of this influence. It was, however, superseded by Islam, which spread to the Malay Archipelago and Peninsula before the 16th century. At the present time the Arabic alphabet is used on the mainland, but Indian alphabets in Java, Sumatra, &c.

16. *Tibet.*—This remote and mountainous country has a peculiar civilization. It has entirely escaped Islam, and though it is a nominal vassal of China, direct Chinese influence has not been strong. The most striking feature is the religion, a corrupt form of late Indian Buddhism, known as Lamaism, which, largely in consequence of the favour shown by Jenghiz Khan and his successors, has attained temporal power and developed into an ecclesiastical state curiously like the papacy.

17. *Mongols.*—Such civilization as the Mongols possess is a mixture of Chinese and Indian, the latter derived chiefly through Tibet, but their alphabet is a curious instance of transplantation. It is an adaptation of the Syriac writing introduced by the early Nestorian missionaries.

Literature, art, science.

18. Almost all Asiatic countries have a literature, but it is often not indigenous and consists of foreign works, chiefly religious, read either in translations or the original. Thus with the exception of a little folklore the literature of Indo-China, Tibet, Mongolia, Korea and Manchuria is mainly Indian or Chinese. The chief original literatures are Chinese, Sanskrit, Pali, Arabic and Persian. The Japanese have produced few books of importance, and their compositions are chiefly remarkable as being lighter and more secular than is usual in Asia, but the older Chinese works take high rank both for their merits and the effect they have had. The extensive Sanskrit literature, which has reached in translations China, Japan and Java, is chiefly theological and poetical, history being conspicuously absent. India has also a considerable medieval and modern literature in various languages. Pali, though only a form of Hindu literature, has a separate history, for it died in India and was preserved in Ceylon, whence it was imported to Burma and Siam as the language of religion. The Pali versions of Buddha's discourses are among the most remarkable products of Asia. The literatures of all Moslem peoples are largely inspired by Arabic, which has produced a voluminous collection of works in prose and poetry. Persian, after being itself transformed by Arabic, has in its turn largely influenced all west Asiatic Moslem literature from Hindustani to Turkish.

If one excepts the Old Testament, which is a product of the extreme west of Asia, it is remarkable how small has been the influence of Asiatic literature on Europe. Though Greek and Slavonic almost ceased to be written languages under Turkish rule, Europeans showed no disposition to replace them by Ottoman or Arabic literature.

Without counting subdivisions there would seem to be three main schools of art in Asia at present—Chinese, Indian and Moslem. The first contains many original elements. It is feeblest in architecture and strongest in the branches demanding skill and care in a limited compass, such as painting, porcelain and enamel. It is the main inspiration of Japanese art, which, however, shows great originality in its treatment of borrowed themes. Both China and Japan have felt through Buddhism the influence of Indian art, which contains at least two elements—one indigenous and the other Greco-Persian. Unlike Chinese art it has a genius for architecture and sculpture rather than painting. Mahommedan art is also largely architectural and has affected nearly all Moslem countries. Except that the use of Arabic inscriptions is one of its principal methods of decoration, it owes little to Arabia and much to Byzantium. The Persian variety of this art is more ornate, and less averse to representations of living beings. Both Moslem and Chinese art are closely connected with calligraphy, but Hindus rarely use writing for ornament.

In both art and literature modern Asia is inferior to the past more conspicuously than Europe.

As for science, astronomy was cultivated by the Babylonians at an early period, and it is probably from them that a knowledge of the heavenly bodies and their movements spread over Asia. Grammar and prosody were studied in India with a marvellous accuracy and minuteness several centuries before Christ. Mathematics were cultivated by the Chinese, Indians and Arabs, but nearly all the sciences based on the observation of nature, including medicine, have remained in a very backward condition. Much the same, however, might have been said of Europe until two centuries ago, and the scientific knowledge of the Arabs under the earlier Caliphates was equal or superior to that of any of their contemporaries. Histories and accounts of travels have been composed both in Arabic and Chinese.

Influence of Asia on other continents.

19. It is only natural that Europe should have chiefly felt the influence of western Asia. Though Europeans may be indebted to China for some mechanical inventions, she was too distant to produce much direct effect, and the influence of India has been mainly directed towards the East. The resemblances between primitive Christianity and Buddhism appear to be coincidences, and though both early Greek philosophy and later Alexandrine ideas suggest Indian affinities, there is no clear connexion such as there is between certain aspects of Chinese thought and India.

Any general statement as to the debt owed by early European civilizations to western Asia would at present be premature, for though important discoveries have been made in Crete and Babylonia the best authorities are chary of positive conclusions as to the relations of Cretan civilization to Egypt and Babylonia. Egyptian influence within the Aegean area seems certain, and the theory that Greek writing and systems for reckoning time are Babylonian in origin has not been disproved, though the history of the alphabet is more complex than was supposed.

In historic times Asia has attempted to assert her influence over Europe by a series of invasions, most of which have been repulsed. Such were the Persian wars of Greece, and perhaps one may add Hannibal's invasion of Italy, if the Carthaginians were Phoenicians transplanted to Africa. The Roman empire kept back the Persians and Parthians, but could not prevent a series of incursions by Avars, Huns, Bulgarians, and later by Mongols and Turks. Islam has twice obtained a footing in Europe, under the Arabs in Spain and under the Turks at Constantinople. The earlier Asiatic invasions were conducted by armies operating at a distance from their bases, and had little result, for the soldiery retired after a time (like Alexander from India), or more rarely (*e.g.* the Bulgarians) settled down without keeping up any connexion with Asia. The Turks, and to some extent the Arabs in Spain, were successful because they first conquered the parts of Asia and Africa adjoining Europe, so that the final invaders were in touch with Asiatic settlements. Though the Turks have profoundly affected the whole of eastern Europe, the result of their conquests has been not so much to plant Asiatic culture in Europe as to arrest development entirely, the countries under their rule remaining in much the same condition as under the moribund Byzantine empire.

In general, Europe has in historic times shown itself decidedly hostile to Asiatic institutions and modes of thought. It is only of recent years that the writings of Schopenhauer and the researches of many distinguished orientalists have awakened some interest in Asiatic philosophy.

The influence of Asia on Africa has been considerable, and until the middle of the 10th century greater than that of Europe. Some authorities hold that Egyptian civilization came from Babylonia, and that the so-called Hamitic languages are older and less specialized members of the Semitic family. The connexion between Carthage and Phoenicia is more certain, and the ancient Abyssinian kingdom was founded by Semites from south Arabia. The traditions of the Somalis derive them from the same region. The theory that the ruins in Mashonaland were built by immigrants from south Arabia is now discredited, but there was certainly a continuous stream of Arab migration to East Africa which probably began in pre-Moslem times and founded a series of cities on the coast. The whole of the north of Africa from Egypt to Morocco has been mahommedanized, and Mahommedan influence is general and fairly strong from Timbuktu to Lake Chad and Wadai. South of the equator, Arab slave-dealers penetrated from Zanzibar to the great lakes and the Congo during the second and third quarters of the 19th century, but their power, though formidable, has disappeared without leaving any permanent traces.

The relation to Asia of the pre-European civilizations of America is another of those questions which admit of no definite answer at present, though many facts support the theory that the semi-civilized inhabitants of Mexico and Central America crossed from Asia by Bering Straits and descended the west coast. Some authorities hold that Peruvian civilization had no connexion with the north and was an entirely indigenous product, but Kechua is in structure not unlike the agglutinative languages of central and northern Asia.

Influence of Europe on

20. European influence on Asia has been specially strong at two epochs, firstly after the conquests of Alexander the Great, and secondly from the 16th century onwards. Alexander's conquests resulted in the foundation of Perso-Greek kingdoms in Asia, which not only hellenized their own area but influenced the art and religion of India and to some extent of China. Then follows a long period in which eastern Europe was mainly occupied in combating Asiatic invasions, and had little

opportunity of Europeanizing the East. Somewhat later the Crusades kept up communication with the Levant, and established there the power of the Roman Church, somewhat to the detriment of oriental Christianity, but intercourse with farther Asia was limited to the voyages of a few travellers. Looking at eastern Europe and western Asia only, one must say that Asiatic influences have on the whole prevailed hitherto (though perhaps the tide is turning), for Islam is paramount in this region and European culture at a low ebb. But the case is quite different if one looks at the two continents as a whole, for improvement in means of communication has brought about strange vicissitudes, and western Europe has asserted her power in middle and eastern Asia.

In the 16th century a new era began with the discovery by the Portuguese of the route to India round the Cape, and the naval powers of Europe started one after another on careers of oriental conquest. The movement was maritime and affected the nations in the extreme west of Europe rather than those nearer Asia, who were under the Turkish yoke. Also the parts of Asia affected were chiefly India and the extreme East. The countries west of India, being less exposed to naval invasion, remained comparatively untouched. It will thus be seen that European (excluding Russian) power in Asia is based almost entirely on improved navigation. There was no attempt to overwhelm whole empires by pouring into them masses of troops, but commerce was combined with territorial acquisition, and a continuity of European interest secured by the presence of merchants and settlers. The course of oriental conquest followed the events of European politics, and the possessions of European powers in the East generally changed hands according to the fortunes of their masters at home. Portugal was first on the scene, and in the 16th century established a considerable littoral empire on the coasts of East Africa, India and China, fragments of which still remain, especially Goa, where Portuguese influence on the natives was considerable. Before the century was out the Dutch appeared as the successful rivals of the Portuguese, but the real struggle for supremacy in southern Asia took place between France and England about 1740-1783. Both entered India as commercial companies, but the disorganized condition of the Mogul empire necessitated the use of military force to protect their interests, and allured them to conquest. The companies gradually undertook the financial control of the districts where they traded and were recognized by the natives as political powers. The ultimate victory of England seems due less to any particular aptitude for dealing with oriental problems than to a better command of the seas and to considerations of European politics. At the end of the Napoleonic wars Portugal had Macao and Goa, Holland Java, Sumatra and other islands, France some odds and ends in India, while England emerged with Hong Kong, Singapore, Ceylon and a free hand in India. Guided by such administrators as Warren Hastings, the East India Company had assumed more and more definitely the functions of government for a great part of India. In 1809 its exclusive trading rights were taken away by Parliament, but its administrative status was thus made clearer, and when after the mutiny of 1857 it was desirable to define British authority in India there seemed nothing unnatural in declaring it to be a possession of the crown.

Another category of European possessions in Asia comprises those acquired towards the end of the 19th century, such as Indo-China (France), Burma and Wei-Hai-Wei (Britain), and Kiao-Chow (Germany). Whereas the earlier conquests were mostly the results of large half-conscious national movements working out their destinies in the East, these later ones were annexations deliberately planned by European cabinets. It seemed to be assumed that Asia was to be divided among the powers of Europe, and each was anxious to get its share or more.

The advance of Russia in Asia is entirely different from that of the other powers, since it has taken place by land and not by sea. Though the geographical extent of Russian territory and influence is enormous, she has always moved along the line of least resistance. She is a moderately strong empire lying to the north of the great Moslem states, and having for neighbours a series of very weak principalities or semi-civilized tribes. The conquest of Siberia and central Asia presented no real difficulties: Persia and Constantinople were left on one side, and Russia was defeated as soon as she was opposed by a vigorous power in the Far East. As the Russian possessions in Asia are continuous with European Russia, it is only natural that they should have been russified far more thoroughly than the British possessions have been anglicized.

There has been great difference of opinion as to the extent to which Alexander's conquests influenced Asia, and it is equally hard to say what is the effect now being produced by Europe. Clearly such alterations as the construction of railways in nearly all parts of the continent, and the establishment of peace over formerly disturbed areas like India, are of enormous importance, and must change the life of the people. But the mental constitution of Asiatics is less easily modified than their institutions, and even Japan has assimilated European methods rather than European ideas.

(C. El.)

Authorities.—The modern bibliography of Asia, including the works of travellers and explorers since 1880, is voluminous. It is impossible to refer to all that has been written in the Survey Reports and Gazetteers of the government of India, or in the records of the Royal Asiatic Society, or the Asiatic Society, Bengal; but amongst the more important popular works are the following:—Richthofen, "China, Japan, and Korea," vol. iv. *Jour. R.G.S., China* (Berlin, 1877); Regel, "Upper Oxus," vol. i. *Proc. R.G.S.*, 1879; Dr Bellew, *Afghanistan and the Afghans* (London, 1879); Nicolas Prjevalski, "Explorations in Asia," see vols. i., ii., v., ix. and xi. of the *Proc. R.G.S.*, 1879-1889; W. Blunt, "A Visit to Jebel Shammar," vol ii. *Proc. R.G.S.*, 1880; Captain W Gill, *The River of Golden Sand* (London, 1880); Sir R. Temple, "Central Plateau of Asia," vol. iv. *Proc. R.G.S.* 1882; Baker, "A Journey of Exploration in Western Ssu-Chuan," vol. i. *Supplementary Papers R.G.S.*, 1882-1885; Sir C. Wilson, "Notes on Physical and Historical Geography of Asia Minor," vol. vi. *Proc. R.G.S.*, 1884; General J.T. Walker, "Asiatic Explorers of the Indian Survey," vol. viii. *Proc. R.G.S.*, 1885; Samuel Beal, *Buddhist Records of the Western World* (Boston, 1885); Charles Doughty, *Travels in Northern Arabia* (Cambridge, 1886); *Travels in Arabia Deserta* (Cambridge, 1888); Venukoff, "Explorations," vol. viii. *Proc. G.R.S.*, 1886; Ney Elias, "Explorations in Central Asia," see vols. viii. and ix. *Proc. R.G.S.*, 1886-1887; Arthur Carey, "Explorations in Turkestan," see vol. ix. *Proc. R.G.S.*, 1887; Henry Lansdell, *Through Central Asia* (London, 1887); Archibald Colquhoun, *Report on Railway Connexion between Burma and China* (London, 1887); Major C. Yate, *Northern Afghanistan* (Edinburgh, 1888); Captain F. Younghusband, *The Heart of a Continent* (London, 1893); *A Journey through Manchuria, &c.* (Lahore, 1888); also see vol. x. *Proc. R.G.S.*, and vol. v. *Jour. R.G.S.*; Dutreuil de Rhins, *L'Asie Centrale* (Paris, 1889); Pierre Bonvalot, *Through the Heart of Asia*, trans. Pitman (London, 1889); *From Paris to Tonkin*, trans. Pitman (London, 1891); Roborovski, translation from Russian *Invalide*, October 1889, vol. xii. *Proc. R.G.S.*; "Central Asia," vol. viii. *Jour. R.G.S.*, 1896; Colonel Mark Bell, "Trade Routes of Asia," vol. xii. *Proc. R.G.S.*, 1890; W.W. Rockhill, "An American in Tibet," *Century Magazine*, November 1890; *The Land of the Lamas* (London, 1891); Theodore Bent, "Hadramut," vol. iv. *Jour. R.G.S.*, 1894; "Southern Arabia," vol. vi. *Jour. R.G.S.*, 1896; "Bahrein Islands," vol. xii. *Proc. R.G.S.*, 1890; Grombcherski, "Explorations in Kuen Lun," vol. xii. *Proc. R.G.S.*, 1890; Lydekker, "The Geology of the Kashmir Valley and Chamba Territories," vols. xiii. and xiv. *Geological Survey of India*; Max Müller, *The Sacred Books of the East* (Oxford, 1890-1894); Elisée Reclus, *The Earth and its Inhabitants* (series, 1890); G.W. Leitner, *Dardistan*; H.F. Blanford, *Elementary Geography of India, Burma, and Ceylon* (London, 1890); *Guide to the Climate and Weather of India* (London, 1889); Lord Dunmore, *The Pamirs* (London, 1892); A. Tissandier, *Voyage au tour du monde* (Paris, 1892); Lord Curzon, *Persia and the Persian Question* (London, 1892); *Russia and the Anglo-Russian Question* (London, 1889); *Problems of the Far East* (London, 1894); Captain Hamilton Bower, *Diary of a Journey across Tibet* (Calcutta, 1893); Szechenyi, *Die wissenschaftlichen Ergebnisse der Reise des Grafen Béla Szechenyi in Ostasien* (Wien, 1893); R.D. Oldham, "Evolution of Indian Geology," vol. iii. *Jour. R.G.S.*, 1894; Baron Toll, "Siberia," vol. iii. *Jour. R.G.S.*, 1894; Delmar Morgan, "The Mountain Systems of Central Asia," *Scottish Geological Magazine*, No. 10, of 1894; Sir Frederick Goldsmid, "Persian Geography," vol. vi. *Jour. R.G.S.*, 1895; Warrington Smyth, "Siam," vol. vi. *Jour. R.G.S.*, 1895; "Siamese East Coast," vol xi. *Jour.* 1898; Prince Kropotkin, "Siberian Railway," vol. v. *R.G.S. Jour.*, 1895; W.R. Lawrence, *The Vale of Kashmir* (Oxford, 1895); Captain Vaughan, "Persia," vol. viii. *Jour. R.G.S.*, 1896; Prince H. d'Orleans, "Yunan to India," vol. vii. *Jour. R.G.S.*, 1896; "Tonkin to Talifu," vol. viii. *Jour. R.G.S.*, 1896; Sir T. Holdich, "Ancient and Medieval Makran," vol. vii. *Jour. R.G.S.*, 1896; *The Indian Borderland* (London, 1901); India (Oxford, 1904); Colonel Woodthorpe, "Shan States," vol. vii. *Jour. R.G.S.*, 1896; *Report of the Pamir Boundary Commission* (Calcutta, 1896); St George Littledale, "Journey Across the Pamirs from North to South," vol. iii. *Jour. R.G.S.*, 1894, and vol. vii. *Jour. R.G.S.*, 1896; Sir G. Robertson, *The Kafirs of the Hindu Kush* (London, 1896); Captain Stiffe, "Persian Gulf Trading Centres," vols. viii., ix. and x. *Jour. R.G.S.*, 1897; Ney Elias and Ross, *A History of the Moghuls of Central Asia, from the Tarskh-i-Rastisdi of Mirza Haidar* (London, 1898); Grenard, *Mission scientifique sur la Haute Asie* (Paris, 1898); Dr Sven Hedin, *Through Asia* (London, 1898); Central Asia and Tibet (1903); *Geographie des Hochlandes van Pamir* (Berlin, 1894); Captain M.S. Wellby, "Through Tibet," *R.G.S. Jour.*, September 1898; Captain P.M. Sykes, "Persian Explorations," vol. x. *Jour. R.G.S.*, 1898; *Ten Thousand Miles in Persia* (1902); Kronshin, "Old Beds of the Oxus," *Jour. R.G.S.*, September 1898; Sir W. Hunter, *History of British India*, vol. i. (London, 1898); Captain H. Deasy, "Western Tibet," vol. ix. *Jour. R.G.S.*; In Tibet and Chinese Turkestan (London, 1901); A. Little, *The Far East* (Oxford, 1905); Captain Rawling, *The Great Plateau* (London, 1905); *Journal of the Royal Geogl. Society*, vols. xv. to xxv. (1900-1905); Colonel A. Durand, *The Making of a Frontier* (London, 1899); R. Cobbold, *Innermost Asia* (London, 1900).

(T. H. H.*)

1 Authorities differ in their methods and results of computation of these and other similar measurements.

ASIA, in a restricted sense, the name of the first Roman province east of the Aegean, formed (133 B.C.) out of the kingdom left to the Romans by the will of Attalus III. Philometor, king of Pergamum. It included Mysia, Lydia, Caria and Phrygia, and therefore, of course, Aeolis, Ionia and the Troad. In 84 B.C., on the close of the Mithradatic War, Sulla reorganized the province, forming 40 *regiones* for fiscal purposes, and it was later divided into *conventus*. From 80 to 50 B.C. the upper Maeander valley and all Phrygia, except the extreme north, were detached and added to Cilicia. In 27 B.C. Asia was made a senatorial province under a pro-consul. As the wealthiest of Roman provinces it had most to gain by the *pax Romana*, and therefore welcomed the empire, and established and maintained the most devout cult of Augustus by means of the organization known as the *Koinon* or Commune, a representative council, meeting in the various *metropoleis*. In this cult the emperor came to be associated with the common worship of the Ephesian Artemis. By the reorganization of Diocletian, A.D. 297, Asia was broken up into several small provinces, and one of these, of which the capital was Ephesus, retained the name of the original province (see ASIA MINOR).

ASIA MINOR, the general geographical name for the peninsula, forming part of the empire of Turkey, on the extreme west of the continent of Asia, bounded on the N. by the Black Sea, on the W. by the Aegean, and on the S. by the Mediterranean, and at its N.W. extremity only parted from Europe by the narrow straits of the Bosporus and Dardanelles. On the east, no natural boundary separates it from the Armenian plateau; but, for descriptive purposes, it will suffice to take a line drawn from the southern extremity of the Giaour Dagh, east of the Gulf of Alexandretta along the crest of that chain, then along that of the eastern Taurus to the Euphrates near Malatia, then up the river, keeping to the western arm till Erzingan is reached, and finally bending north to the Black Sea along the course of the Churuk Su, which flows out west of Batum. This makes the Euphrates the main eastern limit, with radii to the north-east angle of the Levant and the south-east angle of the Black Sea, and roughly agrees with the popular conception of Asia Minor as a geographical region. But it must be remembered that this term was not used by classical geographers (it is first found in Orosius in the 5th century A.D.), and is not in local or official use now. It probably arose in the first instance from a vague popular distinction between the continent itself and the Roman province of "Asia" (*q.v.*), which at one time included most of the peninsula west of the central salt desert (*Axylon*). The name *Anatolia*, in the form *Anadol*, is used by natives for the western part of the peninsula (*cis Halym*) and not as including ancient Cappadocia and Pontus. Before the reconstitution of the provinces as *vilayets* it was the official title of the principal *eyalet* of Asia Minor, and was also used more generally to include all the peninsular provinces over which the beylerbey of Anadoli, whose seat was at Kutaiah, had the same paramount military jurisdiction which the beylerbey of "Rumili" enjoyed in the peninsular provinces of Europe. The term "Anatolia" appears first in the work of Constantine Porphyrogenitus (10th century).

The greatest length of Asia Minor, as popularly understood, is along its north edge, 720 m. Along the south it is about 650 m. The greatest breadth is 420 m. from *C. Kerembé* to *C. Anamur*; but at the waist of the peninsula, between the head of the Gulf of Alexandretta and the southernmost bight of the Black Sea (at Ordu), it is not quite 300 m. The greater portion of Asia Minor consists of a plateau rising gradually from east to west, 2500 ft. to 4500 ft.; east of the Kizil Irmak (Halys), the ground rises more sharply to the highlands of Armenia (*q.v.*). On the south the plateau is buttressed by the Taurus range, which stretches in a broken irregular line from the Aegean to the Persian frontier. On the north the plateau is supported by a range of varying altitude, which follows the southern coast of the Black Sea and has no distinctive name. On the west the edge of the plateau is broken by broad valleys, and the deeply indented coast-line throws out long rocky promontories towards Europe. On the north, excepting the deltas formed by the Kizil and Yeshil Irmaks, there are no considerable coast plains, no good harbours except Sinope and Vona, and no islands. On the west there are narrow coast plains of limited extent, deep gulfs, which offer facilities for trade and commerce, and a fringe of protecting islands. On the south are the isolated plains of Pamphylia and Cilicia, the almost land-locked harbours of Marmarice, Makri and Kekova, the broad bay of Adalia, the deep-seated gulf of Alexandretta (Iskanderun), and the islands of Rhodes with dependencies, Castelorizo and Cyprus.

Mountains.—The Taurus range, perhaps the most important feature in Asia Minor, runs the whole length of the peninsula on the south, springing east of Euphrates in the Armeno-Kurdish highlands, and being prolonged into the Aegean Sea by rocky promontories and islands. It attains in Lycia an altitude of 10,500 ft., and in the Bulgar Dagh (Cilicia) of over 10,000 ft. The average elevation is about 7000 ft. East of the Bulgar Dagh the range is pierced by the Sihun and Jihun rivers, and their tributaries, but its continuity is not broken. The principal passes across the range are those over which Roman or Byzantine roads ran:—(1) from Laodicea to Adalia (Attalia), by way of the Khonas pass and the valley of the Istanoz Chai; (2) from Apamea or from Pisidian Antioch to Adalia, by Isbarta and Sagalassus; (3) from Laranda, by Coropissus and the upper valley of the southern Calycadnus, to Germanicopolis and thence to Anemourium or Kelenderis; (4) from Laranda, by the lower Calycadnus, to Claudiopolis and thence to Kelenderis or Seleucia; (5) from Iconium or Caesarea Mazaca, through the Cilician Gates (Gulek Boghaz, 3300 ft.) to Tarsus; (6) from Caesarea to the valley of the Sarus and thence to Flaviopolis on the Cilician Plain; (7) from Caesarea over Anti-Taurus by the Kuru Chai to Cocvsus (Geuksun) and thence to Germanicia (Marash). Large districts on the southern slopes of the Taurus chain are covered with forests of oak and fir, and there are numerous *yailas* or grassy "alps," with abundant water, to which villagers and nomads move with their flocks during the summer months.

Anti-Taurus is a term of rather vague and doubtful application, (*a*) Some have regarded it as meaning the more or less continuous range which buttresses up the central plateau on the north, parallel to the Taurus, (*b*) Others take it to mean the line of heights and mountain peaks which separates the waters running to the Black Sea and the Anatolian plateau from those falling to the Persian Gulf and the Mediterranean. This has its origin in the high land, near the source of the Kizil Irmak, and thence runs south-west towards the volcanic district of Mt. Argaeus, which, however, can hardly be regarded as orographically one with it. After a low interval it springs up again at its southern extremity in the lofty sharp-peaked ridge of Ala Dagh (11,000 ft.), and finally joins Taurus. (*c*) South of Sivas a line of bare hills connects this chain with another range of high forest-clad mountains, which loses itself southwards in the main mass of Taurus, and is held to be the true Anti-Taurus by geographers. It throws off, in the latitude of Kaisarieh, a subsidiary range, the Binboa Dagh, which separates the waters of the Sihun from those of the Jihun. The principal passes are those followed by the old roads:—(1) from Sebasteia to Tephrike and the upper valley of the western Euphrates; (2) from Sebasteia to Melitene, by way of the pass of Delikli Tash and the basin of the Tokhma Su; (3) from Caesarea to Arabissus, by the Kuru Chai and the valley of Cocysus (Geuksun). The range of Amanus (Giaour Dagh) is separated from the mass of Taurus by the deep gorge of the Jihun, whence it runs south-south-west to Ras el-Khanzir, forming the limit between Cilicia and Syria, various parts bearing different names, as Elma Dagh above Alexandretta. It attains its greatest altitude in Kaya Duldul (6500 ft.), which rises abruptly from the bed of the Jihun, and it is crossed by two celebrated passes:—(1) the Amanides Pylae (Baghche Pass), through which ran the road from the Cilician Plain to Apamea-Zeugma, on the Euphrates; (2) the Pylae Syriae or "Syrian Gates" (Beilan Pass), through which passed the great Roman highway from Tarsus to Syria. On the western edge of the plateau several short ranges, running approximately east and west, rise above the general level:—Sultan Dagh (6500 ft.); Salbacus-Cadmus (8000 ft.); Messogis (3600 ft.); Latmus (6000 ft.); Tmolus (5000 ft.); Dindymus (8200 ft.); Ida (5800 ft.); and the Mysian Olympus (7600 ft.). The valleys of the Maeander, Hermus and Caicus facilitate communication between the plateau and the Aegean, and the descent to the Sea of Marmora along the valleys of the Tembris and Sangarius presents no difficulties. The northern border range, though not continuous, rises steadily from the west to its culmination in the Galatian Olympus (Ilkaz Dagh), south of Kastamuni. East of the Kizil Irmak there is no single mountain chain, but there are several short ranges with elevations sometimes exceeding 9000 ft. The best routes from the plateau to the Black Sea were followed by the Roman roads from Tavium and Sebasteia to Sinope and Amisus, and those from Sebasteia to Cotyora and Cerasus-Pharnacia, which at first ascend the upper Halys. Several minor ranges rise above the level of the eastern plateau, and in the south groups of volcanic peaks and cones extend for about 150 m. from Kaisarieh (Caesarea) to Karaman. The most important are Mt. Argaeus (Erjish Dagh, 13,100 ft.) above Kaisarieh itself, the highest peak in Asia Minor; Ali Dagh (6200 ft.); Hassan Dagh (8000 ft.); Karaja Dagh; and Kara Dagh (7500 ft.). On the west of the plateau evidences of volcanic activity are to be seen in the district of Kula (Katakekaumene), coated with recent erupted matter, and in the numerous hot springs of the Lycus, Maeander, and other valleys. Earthquakes are frequent all over the peninsula, but especially in the south-east and west, where the Maeander valley and the Gulf of Smyrna are notorious seismic foci. The centre of the plateau is occupied by a vast treeless plain, the *Axylon* of the Greeks, in which lies a large salt lake, Tuz Geul. The plain is fertile where cultivated, fairly supplied with deep wells, and in many places covered with good pasture. Enclosed between the Taurus and Amanus ranges and the sea are the fertile plains of Cilicia Pedias, consisting in great part of a rich, stoneless loam, out of which rise rocky crags that are crowned with the ruins of Greco-Roman and Armenian strongholds, and of Pamphylia, partly alluvial soil, partly travertine, deposited by the Taurus rivers.

Rivers.—The rivers of Asia Minor are of no great importance. Some do not flow directly to the sea; others find their way to the coast through deep rocky gorges, or are mere torrents; and a few only are navigable for boats for short distances from their mouths. They cut so deep into the limestone formation of the plateau as to over-drain it, and often they disappear into swallow holes (*duden*) to reappear lower down. The most important rivers which flow to the Black Sea are the following:—the Boas (Churuk Su) which rises near Baiburt, and flows out near Batum; the Iris (Yeshil Irmak), with its tributaries the Lycus (Kelkit Irmak), which rises on the Armenian plateau, the Chekerek Irmak, which has its source near Yuzgat, and the Tersakan Su; the Halys (Kizil Irmak) is the longest river in Asia Minor, with its tributaries the Delije Irmak (Cappadox), which flows through the eastern part of Galatia, and the Geuk Irmak, which has its sources in the

mountains above Kastamuni. With the exception of Sivas, no town of importance lies in the valley of the Kizil Irmak throughout its course of over 600 m. The Sangarius (Sakaria) rises in the Phrygian mountains and, after many changes of direction, falls into the Black Sea, about 80 m. east of the Bosporus. Its tributaries are the Pursak Su (Tembris), which has its source in the Murad Dagh (Dindymus), and, after running north to Eski-shehr, flows almost due east to the Sakaria, and the Enguri Su, which joins the Sakaria a little below the junction of the Pursak. To the Black Sea, about 40 m. east of Eregli, also flows the Billaeus (Filiyas Chai). Into the Sea of Marmora run the Rhyndacus (Edrenos Chai) and the Macestus (Susurlu Chai), which unite about 12 m. from the sea. The most celebrated streams of the Troad are the Granicus (Bigha Chai) and the Scamander (Menderes Su), both rising in Mt. Ida (Kaz Dagh). The former flows to the Sea of Marmora; the latter to the Dardanelles. The most northerly of the rivers that flow to the Aegean is the Caicus (Bakir Chai), which runs past Soma, and near Pergamum, to the Gulf of Chanderli. The Hermus (Gediz Chai) has its principal sources in the Murad Dagh, and, receiving several streams on its way, runs through the volcanic district of Katakekaumene to the broad fertile valley through which it flows past Manisa to the sea, near Lefke. So recently as about 1880 it discharged into the Gulf of Smyrna, but the shoals formed by its silt-laden waters were so obstructive to navigation that it was turned back into its old bed. Its principal tributaries are—the Phrygius (Kum Chai), which receives the waters of the Lycus (Gürduk Chai), and the Cogamus (Kuzu Chai), which in its upper course is separated from the valley of the Maeander by hills that were crossed by the Roman road from Pergamum to Laodicea. The Caystrus (Kuchuk Menderes) flows through a fertile valley between Mt. Tmolus and Messogis to the sea near Ephesus, where its silt has filled up the port. The Maeander (Menderes Chai) takes its rise in a celebrated group of springs near Dineir, and after a winding course enters the broad valley, through which it “meanders” to the sea. Its deposits have long since filled up the harbours of Miletus, and converted the islands which protected them into mounds in a swampy plain. Its principal tributaries are the Glaucus, the Senarus (Banaz Chai), and the Hippurius, on the right bank. On the left bank are the Lycus (Churuk Su), which flows westwards by Colossae through a broad open valley that affords the only natural approach to the eleated plateau, the Harpasus (Ak Chai), and the Marsyas (China Chai). The rivers that flow to the Mediterranean, with two exceptions, rise in Mt. Taurus, and have short courses, but in winter and spring they bring down large bodies of water. In Lycia are the Indus (Gereniz Chai), and the Xanthus (Eshen Chai). The Pamphylian plain is traversed by the Cestrus (Ak Su), the Eurymedon (Keupri Su), and the Melas (Menavgat Chai), which, where it enters the sea, is a broad, deep stream, navigable for about 6 m. The Calycadnus (Geuk Su) has two main branches which join near Mut and flow south-east, and enter the sea, a deep rapid river, about 12 m. below Selefke. The Cydnus (Tersous or Tarsus Chai) is formed by the junction of three streams that rise in Mt. Taurus, and one of these flows through the narrow gorge known as the Cilician Gates. After passing Tarsus, the river enters a marsh which occupies the site of the ancient harbour. The Cydnus is liable to floods, and its deposits have covered Roman Tarsus to a depth of 20 ft. The Sarus (Sihun) is formed by the junction of the Karmalas (Zamanti Su), which rises in Uzun Yaila, and the Sarus (Saris), which has its sources in the hills to the south of the same plateau. The first, after entering Mt. Taurus, flows through a deep chasm walled in by lofty precipices, and is joined in the heart of the range by the Saris. Before reaching the Cilician Plain the river receives the waters of the Kerkhun Su, which cuts through the Bulgar Dagh, and opens a way for the roads from the Cilician Gates to Konia and Kaisarieh. After passing Adana, to which point small craft ascend, the Sihun runs south-west to the sea. There are, however, indications that at one period it flowed south-east to join the Pyramus. The Pyramus (Jihun) has its principal source in a group of large springs near Albistan; but before it enters Mt. Taurus it is joined by the Sogutli Irmak, the Khurman Su and the Geuk Su. The river emerges from Taurus, about 7 m. west of Marash, and here it is joined by the Ak Su, which rises in some small lakes south of Taurus. The Jihun now enters a remarkable defile which separates Taurus from the Giaour Dagh, and reaches the Cilician Plain near Budrun. From this point it flows west, and then south-west past Missis, until it makes a bend to discharge its waters south of Ayas Bay. The river is navigable as far as Missis. The only considerable tributary of the Euphrates which comes within our region is the Tokhma Su, which rises in Uzun Yaila and flows south-east to the main river not far from Malatia. In the central and southern portions of the plateau the streams either flow into salt lakes, where their waters pass off by evaporation, or into freshwater lakes, which have no visible outlets. In the latter cases the waters find their way beneath Taurus in subterranean channels, and reappear as the sources of rivers flowing to the coast. Thus the Ak Geul supplies the Cydnus, and the Beishehr, Egirdir and Kestel lakes feed the rivers of the Pamphylian plain.

Lakes.—The salt lakes are Tuz Geul (anc. *Tatta*), which lies in the great central plain, and is about 60 m. long and 10 to 30 m. broad in winter, but in the dry season it is hardly more than a saline marsh; Buldur Geul, 2900 ft. above sea-level; and Aji-tuz Geul, 2600 ft. The freshwater lakes are Beishehr Geul (anc. *Karalis*), 3770 ft., a fine sheet of water 30 m. long, which discharges south-east to the Soghla Geul; Egirdir Geul (probably anc. *Limnae*, a name which included the two bays of Hoiran and Egirdir, forming the lake), 2850 ft., which is 30 m. long, but less broad than Beishehr and noted for the abundance and variety of its fish. In the north-west portion of Asia Minor are Isnik Geul (L. Ascania), Abulliont Geul (L. Apollonia), and Maniyas Geul (L. Miletopolis).

Springs.—Asia Minor is remarkable for the number of its thermal and mineral springs. The most important are:—Yalova, in the Ismid sanjak; Brusa, Chitli, Terje and Eskishehr, in the Brusa vilayet; Tuzla, in the Karasi; Cheshme, Ilija, Hierapolis (with enormous alum deposits), and Alashehr, in the Aidin; Terzili Hammam and Iskelib in the Angora; Boli in the Kastamuni; and Khavsa, in the Sivas. Many of these were famous in antiquity and occur in a list given by Strabo. The Maeander valley is especially noted for its hot springs.

Geology.—The central plateau of Asia Minor consists of nearly horizontal strata, while the surrounding mountain chains form a complex system, in which the beds are intensely folded. Around the coast flat-lying deposits of Tertiary age are found, and these often extend high up into the mountain region. The deposits of the central, or Lycaonian, plateau consist of freshwater marls and limestones of late Tertiary or Neogene age. Along the south-eastern margin, in front of the Taurus, stands a line of great volcanoes, stretching from Kara-Dagh to Argaeus. They are now extinct, but were probably active till the close of the Tertiary period. On its southern side the plateau is bounded by the high chains of the Taurus and the Anti-Taurus, which form a crescent with its convexity facing southwards. Devonian and Carboniferous fossils have been found in several places in the Anti-Taurus. Limestones of Eocene or Cretaceous age form a large part of the Taurus, but the interior zone probably includes rocks of earlier periods. The folding of the Anti-Taurus affects the Eocene but not the Miocene, while in the Taurus the Miocene beds have been elevated, but without much folding, to great heights. North of the Lycaonian plateau lies another zone of folding which may be divided into the East Pontian and West Pontian arcs. In the east a well-defined mountain system runs nearly parallel to the Black Sea coast from Batum to Sinope, forming a gentle curve with its convexity facing southwards. Cretaceous limestones and serpentine take a large part in the formation of these mountains, while even the Oligocene is involved in the folds. West of Sinope Cretaceous beds form a long strip parallel to the shore line. Carboniferous rocks occur at Eregli (Heraclea Pontica), where they have been worked for coal. Devonian fossils have been found near the Bosporus and Carboniferous fossils at Balia Maden in Mysia. Triassic, Jurassic and Cretaceous beds form a band south of the Sea of Marmora, probably the continuation of the Mesozoic band of the Black Sea coast. Farther south there are zones of serpentine, and of crystalline and schistose rocks, some of which are probably Palaeozoic. The direction of the folds of this region is from west to east, but on the borders of Phrygia and Mysia they meet the north-westerly extension of the Taurus folds and bend around the ancient mass of Lydia. Marine Eocene beds occur near the Dardanelles, but the Tertiary deposits of this part of Asia Minor are mostly freshwater and belong to the upper part of the system. In western Mysia they are much disturbed, but in eastern Mysia they are nearly horizontal. They are often accompanied by volcanic rocks, which are mainly andesitic, and they commonly lie unconformably upon the older beds. In the western part of Asia Minor there are several areas of ancient rocks about which very little is known. The Taurus folds here meet another system which enters the region from the Aegean Sea.

Climate.—The climate is varied, but systematic observations are wanting. On the plateau the winter is long and cold, and in the northern districts there is much snow. The summer is very hot, but the nights are usually cool. On the north coast the winter is cold, and the winds, sweeping across the Black Sea from the steppes of Russia, are accompanied by torrents of rain and heavy falls of snow. East of Samsun, where the coast is partially protected by the Caucasus, the climate is more moderate. In summer the heat is damp and enervating, and, as Trebizond is approached, the vegetation becomes almost subtropical. On the south coast the winter is mild, with occasional frosts and heavy rain; the summer heat is very great. On the west coast the climate is moderate, but the influence of the cold north winds is felt as far south as Smyrna, and the winter at that place is colder than in corresponding latitudes in Europe. A great feature of summer is the *inbat* or north wind, which blows almost daily, often with the force of a gale, off the sea from noon till near sunset.

Products, &c.—The mineral wealth of Asia Minor is very great, but few mines have yet been opened. The minerals known to exist are—alum, antimony, arsenic, asbestos, boracide, chrome, coal, copper, emery, fuller’s earth, gold, iron, kaolin, lead, lignite, magnetic iron, manganese, meerschaum, mercury, nickel, rock-salt, silver, sulphur and zinc. The vegetation varies with the climate, soil and elevation. The mountains on the north coast are clothed with dense forests of pine, fir, cedar, oak, beech, &c. On the Taurus range the forests are smaller, and there is a larger proportion of pine. On the west coast the ilex, plane, oak, valonia oak, and pine predominate. On the plateau willows, poplars and chestnut trees grow near the streams, but nine-tenths of the country is treeless, except for scrub. On the south and west coasts the fig and olive are largely cultivated. The vine yields rich produce everywhere, except in the higher districts. The apple, pear, cherry and plum thrive well in the north; the orange, lemon, citron and sugar-cane in the south; styrax and mastic in the south-west; and the wheat lands of the Sivas vilayet can hardly be surpassed. The most important vegetable productions are—cereals, cotton, gum tragacanth, liquorice, olive oil, opium, rice, saffron, salep, tobacco and yellow berries. Silk is produced in large quantities in the vicinity of Brusa and Amasia, and mohair from the Angora goat all over the plateau. The wild animals include bear, boar, chamois, fallow red and roe deer, gazelle, hyena, ibex, jackal, leopard, lynx, moufflon, panther, wild sheep and wolf. The native reports of a maneless lion in Lycia (*arslan*) are probably based on the existence of large panthers. Amongst the domestic animals are the buffalo, the Syrian camel, and a mule camel, bred from a Bactrian sire and Syrian mother. Large numbers of sheep and Angora goats are reared on the plateau, and fair

horses are bred on the Uzun Yaila; but no effort is made to improve the quality of the wool and mohair or the breed of horses. Good mules can be obtained in several districts, and small hardy oxen are largely bred for ploughing and transport. The larger birds are the bittern, great and small bustard, eagle, francolin, goose; giant, grey and red-legged partridge, sand grouse, pelican, pheasant, stork and swan. The rivers and lakes are well supplied with fish, and the mountain streams abound with small trout.

The principal manufactures are:—Carpets, rugs, cotton, tobacco, mohair and silk stuffs, soap, wine and leather. The exports are:—Cereal, cotton, cotton seed, dried fruits, drugs, fruit, gall nuts, gum tragacanth, liquorice root, maize, nuts, olive oil, opium, rice, sesame, sponges, storax, timber, tobacco, valonia, walnut wood, wine, yellow berries, carpets, cotton yarn, cocoons, hides, leather, mohair, silk, silk stuffs, rugs, wax, wool, leeches, live stock, minerals, &c. The imports are:—Coffee, cotton cloths, cotton goods, crockery, dry-salteries, fezzes, glass-ware, haberdashery, hardware, henna, ironware, jute, linen goods, manufactured goods, matches, petroleum, salt, sugar, woollen goods, yarns, &c.

Communications.—There are few metalled roads, and those that exist are in bad repair, but on the plateau light carts can pass nearly everywhere. The lines of railway now open are:—(1) From Haidar Pasha to Ismid, Eski-shehr and Angora; (2) from Mudania to Brusa; (3) from Eski-shehr to Afium-Kara-hissar, Konia and Bulgurli, east of Eregli (the first section of the Bagdad railway). These lines are worked by the German *Gesellschaft der anatolischen Eisenbahnen*. (4) From Smyrna to Manisa, Ala-shehr and Afium-Kara-hissar, with a branch line from Manisa to Soma. This line is worked by a French company. (5) From Smyrna to Aidin and Dineir, with branches to Odemish, Tireh, Sokia, Denizli, Ishekli, Seidi Keui and Bouja, constructed and worked by an English company. (6) From Mersina to Tarsus and Adana, an English line under a control mainly French. There are two competing routes for the eastern trade—one running inland from Constantinople (Haidar Pasha), the other from Smyrna. The first is connected by ferry with the European railway system; the second with the great sea routes from Smyrna to Trieste, Marseilles and Liverpool. The right to construct all railways in Armenia and north-eastern Asia Minor has been conceded to Russia, and the Germans have a virtual monopoly of the central plateau.

Ethnology.—None of the conquering races that invaded Asia Minor, whether from the east or from the west, wholly expelled or exterminated the race in possession. The vanquished retired to the hills or absorbed the victors. In the course of ages race distinction has been almost obliterated by fusion of blood; by the complete Hellenization of the country, which followed the introduction of Christianity; by the later acceptance of Islam; and by migrations due to the occupation of cultivated lands by the nomads. It will be convenient here to adopt the modern division into Moslems, Christians and Jews:—(*a*) *Moslems.* The Turks never established themselves in such numbers as to form the predominant element in the population. Where the land was unsuitable for nomad occupation the agricultural population remained, and it still retains some of its original characteristics. Thus in Cappadocia the facial type of the non-Aryan race is common, and in Galatia there are traces of Gallic blood. The Zeibeks of the west and south-west are apparently representatives of the Carians and Lycians; and the peasants of the Black Sea coast range of the people of Bithynia, Paphlagonia and Pontus. Wherever the people accepted Islam they called themselves Turks, and a majority of the so-called "Turks" belong by blood to the races that occupied Asia Minor before the Seljuk invasion. Turkish and Zaza-speaking Kurds (see Kurdistan) are found in the Angora and Sivas vilayets. There are many large colonies of Circassians and smaller ones of Noghai (Nogais), Tatars, Georgians, Lazis, Cossacks, Albanians and Pomaks. East of Boghaz Keui there is a compact population of Kizilbash, who are partly descendants of Shia Turks transplanted from Persia and partly of the indigenous race. In the Cilician plain there are large settlements of Nosairis who have migrated from the Syrian mountains (see Syria). The nomads and semi-nomads are, for the most part, representatives of the Turks, Mongols and Tatars who poured into the country during the 350 years that followed the defeat of Romanus. Turkomans are found in the Angora and Adana vilayets; Avshars, a tribe of Turkish origin, in the valleys of Anti-Taurus; and Tatars in the Angora and Brusa vilayets; Yuruks are most numerous in the Konia vilayet. They speak Turkish and profess to be Moslems, but have no mosques or imams. The Turkomans have villages in which they spend the winter, wandering over the great plains of the interior with their flocks and herds during the summer. The Yuruks on the contrary are a truly nomad race. Their tents are made of black goats' hair and their principal covering is a cloak of the same material. They are not limited to the milder districts of the interior, but when the harvest is over, descend into the rich plains and valleys near the coast. The Chepmi and Takhtaji, who live chiefly in the Aidin vilayet, appear to be derived from one of the early races. (*b*) *Christians.* The Greeks are in places the descendants of colonists from Greece, many of whom, *e.g.* in Pamphylia and the Smyrna district, are of very recent importation; but most of them belong by blood to the indigenous races. These people became "Greeks" as being subjects of the Byzantine empire and members of the Eastern Church. On the west coast, in Pontus and to some extent of late in Cappadocia, and in the mining villages, peopled from the Trebizond Greeks, the language is Romaic; on the south coast and in many inland villages (*e.g.* in Cappadocia) it is either Turkish, which is written in Greek characters, or a Greco-Turkish jargon. In and near Smyrna there are large colonies of Hellenes. Armenians are most numerous in the eastern districts, where they have been settled since the great migration that preceded and followed the Seljuk invasion. There are, however, Armenians in every large town. In central and western Asia Minor they are the descendants of colonists from Persia and Armenia (see Armenia), (*c*) The *Jews* live chiefly on the Bosporus; and in Smyrna, Rhodes, Brusa and other western towns. *Gypsies*—some Moslem, some Christian—are also numerous, especially in the south.

History.—Asia Minor owes the peculiar interest of its history to its geographical position. "Planted like a bridge between Asia and Europe," it has been from the earliest period a battleground between the East and the West. The central plateau (2500 to 4500 ft.), with no navigable river and few natural approaches, with its monotonous scenery and severe climate, is a continuation of central Asia. The west coast, with its alternation of sea and promontory, of rugged mountains and fertile valleys, its bright and varied scenery, and its fine climate, is almost a part of Europe. These conditions are unfavourable to permanence, and the history of Asia Minor is that of the march of hostile armies, and rise and fall of small states, rather than that of a united state under an independent sovereign. At a very early period Asia Minor appears to have been occupied by non-Aryan tribes or races which differed little from each other in religion, language and social system. During the past generation much light has been thrown upon one of these races—the "Hittites" or "Syro-Cappadocians," who, after their rule had passed away, were known to Herodotus as "White Syrians," and whose descendants can still be recognised in the villages of Cappadocia.[1] The centre of their power is supposed to have been Boghaz Keui (see Pteria), east of the Halys, whence roads radiated to harbours on the Aegean, to Sinope, to northern Syria and to the Cilician plain. Their strange sculptures and inscriptions have been found at Pteria, Euyuk, Fraktin, Kiz Hissar (Tyana), Ivriz, Bulgar, Muden and other places between Smyrna and the Euphrates (see Hittites). When the great Aryan immigration from Europe commenced is unknown, but it was dying out in the 11th and 10th centuries B.C. In Phrygia the Aryans founded a kingdom, of which traces remain in various rock tombs, forts and towns, and in legends preserved by the Greeks. The Phrygian power was broken in the 9th or 8th century B.C. by the Cimmerii, who entered Asia Minor through Armenia; and on its decline rose the kingdom of Lydia, with its centre at Sardis. A second Cimmerian invasion almost destroyed the rising kingdom, but the invaders were expelled at last by Alyattes, 617 B.C. (see Scythia). The last king, Croesus (? 560-546 B.C.) carried the boundaries of Lydia to the Halys, and subdued the Greek colonies on the coast. The date of the foundation of these colonies cannot be fixed; but at an early period they formed a chain of settlements from Trebizond to Rhodes, and by the 8th century B.C. some of them rivalled the splendour of Tyre and Sidon. Too jealous of each other to combine, and too demoralized by luxury to resist, they fell an easy prey to Lydia; and when the Lydian kingdom ended with the capture of Sardis by Cyrus, 546 B.C. they passed, almost without resistance, to Persia. Under Persian rule Asia Minor was divided into four satrapies, but the Greek cities were governed by Greeks, and several of the tribes in the interior retained their native princes and priest-dynasts. An attempt of the Greeks to regain their freedom was crushed, 500-494 B.C., but later the tide turned and the cities were combined with European Greeks into a league for defence against the Persians. The weakness of Persian rule was disclosed by the expedition of Cyrus and the Ten Thousand Greeks, 402 B.C.; and in the following century Asia Minor was invaded by Alexander the Great (*q.v.*), 334 B.C. (See Greece; Persia; Ionia.)

The wars which followed the death of Alexander eventually gave Asia Minor to Seleucus, but none of the Seleucid kings was able to establish his rule over the whole peninsula. Rhodes became a great maritime republic, and much of the south and west coast belonged at one time or another to the Ptolemies of Egypt. An independent kingdom was founded at Pergamum, 283 B.C., which lasted until Attalus III., 133 B.C., made the Romans his heirs. Bithynia became an independent monarchy, and Cappadocia and Paphlagonia tributary provinces under native princes. In southern Asia Minor the Seleucids founded Antioch, Apamea, Attalia, the Laodiceas and Seleuceias, and other cities as centres of commerce, some of which afterwards played an important part in the Hellenization (see Hellenism) of the country, and in the spread of Christianity. During the 3rd century, 278-277 B.C., certain Gallic tribes crossed the Bosporus and Hellespont, and established a Celtic power in central Asia Minor. They were confined by the victories of Attalus I. of Pergamum, c. 232 B.C., to a district on the Sangarius and Halys to which the name Galatia was applied; and after their defeat by Manlius, 189 B.C., they were subjected to the suzerainty of Pergamum (see Galatia).

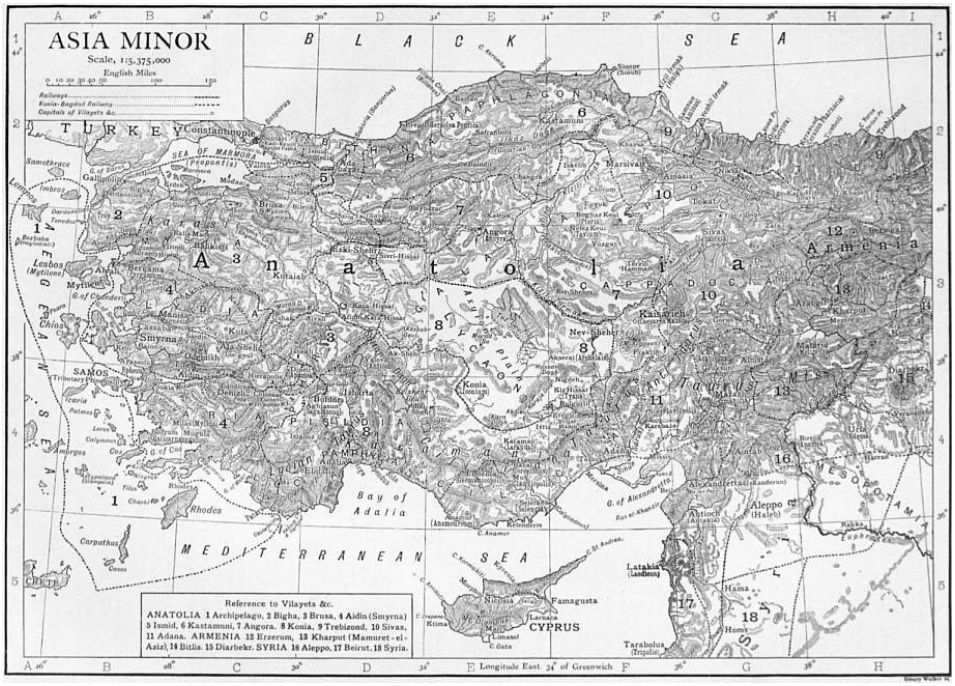
The defeat of Antiochus the Great at Magnesia, 190 B.C., placed Asia Minor at the mercy of Rome; but it was not until 133 that the first Roman province, Asia, was formed to include only western Anatolia, without Bithynia. Errors in policy and in government facilitated the rise of Pontus into a formidable power under Mithradates, who was finally driven out of the country by Pompey, and died 63 B.C. Under the settlement of Asia Minor by Pompey, Bithynia-Pontus and Cilicia became provinces, whilst Galatia and Cappadocia were allowed to retain nominal independence for over half a century more under native kings, and Lycia continued an autonomous League. A long period of tranquillity followed, during which the Roman dominion grew, and all Asia Minor was divided into two provinces. The boundaries were

often changed; and about A.D. 297, in Diocletian's reorganization of the empire, the power of the great military commands was broken, and the provinces were made smaller and united in groups called dioceses. A great change followed the introduction of Christianity, which spread first along the main roads that ran north and west from the Cilician Gates, and especially along the great trade route to Ephesus. In some districts it spread rapidly, in others slowly. With its advance the native languages and old religions gradually disappeared, and at last the whole country was thoroughly Hellenized, and the people united by identity of language and religion.

At the close of the 6th century Asia Minor had become wealthy and prosperous; but centuries of peace and over-centralization had affected the *moral* of the people and weakened the central government. During the 7th century the provincial system broke down, and the country was divided into *themes* or military districts. From 616 to 626 Persian armies swept unimpeded over the land, and Chosroes (Khosrau) II. pitched his camp on the shore of the Bosporus. The victories of Heraclius forced Chosroes to retire; but the Persians were followed by the Arabs, who, advancing with equal ease, laid siege to Constantinople, A.D. 668. It almost appeared as if Asia Minor would be annexed to the dominion of the Caliph. But the tide of conquest was stemmed by the iconoclast emperors, and the Arab expeditions, excepting those of Harun al-Rashid, 781 and 806, and of el-Motasim, 838, became simply predatory raids. In the 10th century the Arabs were expelled. They never held more than the districts along the main roads, and in the intervals of peace the country rapidly recovered itself. But a more dangerous enemy was soon to appear on the eastern border.

In 1067 the Seljuk Turks ravaged Cappadocia and Cilicia; in 1071 they defeated and captured the emperor Romanus Diogenes, and in 1080 they took Nicaea. One branch of the Seljuks founded the empire of Rum, with its capital first at Nicaea and then at Iconium. The empire, which at one time included nearly the whole of Asia Minor, with portions of Armenia and Syria, passed to the Mongols when they defeated the sultan of Rum in 1243, and the sultans became vassals of the Great Khan. The Seljuk sultans were liberal patrons of art, literature and science, and the remains of their public buildings and tombs are amongst the most beautiful and most interesting in the country. The marches of the Crusaders across Asia Minor left no permanent impression. But the support given by the Latin princes to the Armenians in Cilicia facilitated the growth of the small warlike state of Lesser Armenia, which fell in 1375 with the defeat and capture of Leo VI. by the Mameluke sultan of Egypt. The Mongols were too weak to govern the country they had conquered, and the vassalage of the last sultan of Rum, who died in 1307, was only nominal. On his death the Turkoman governors of his western provinces drove out the Mongols and asserted their independence. A contest for supremacy followed, which eventually ended in favour of the Osmanli Turks of Brusa. In 1400 Sultan Bayezid I. held all Asia Minor west of the Euphrates; but in 1402 he was defeated and made prisoner by Timur, who swept through the country to the shores of the Aegean. On the death of Timur Osmanli supremacy was re-established after a prolonged straggle, which ended with the annexation by Mahommed II. (1451-1481) of Karamania and Trebizond, and the abandonment of the last of the Italian trading settlements which had studded the coast during the 13th and 14th centuries. The later history of Asia Minor is that of the Turkish empire. The most important event was the advance (1832-1833) of an Egyptian army, under Ibrahim Pasha, through the Cilician Gates to Konia and Kutaiah.

The defeat of the emperor Romanus (1071) initiated a change in the condition of Asia Minor which was to be complete and lasting. A long succession of nomad Turkish tribes, pressing forward from central Asia, wandered over the rich country in search of fresh pastures for their flocks and herds. They did not plunder or ill-treat the people, but they cared nothing for town life or for agricultural pursuits, and as they passed onward they left the country bare. Large districts passed out of cultivation and were abandoned to the nomads, who replaced wheeled traffic by the pack horse and the camel. The peasants either became nomads themselves or took refuge in the towns or the mountains. The Mongols, as they advanced, sacked towns and laid waste the agricultural lands. Timur conducted his campaigns with a ruthless disregard of life and property. Entire Christian communities were massacred, flourishing towns were completely destroyed, and all Asia Minor was ravaged. From these disasters the country never recovered, and the last traces of Western civilization disappeared with the enforced use of the Turkish language and the wholesale conversions to Islam under the earliest Osmanli sultans. The recent large increase of the Greek population in the western districts, the construction of railways, and the growing interests of Germany and Russia on the plateau seem, however, to indicate that the tide is again turning in favour of the West.



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BIBLIOGRAPHY.—1. GENERAL AUTHORITIES:—C. Texier, *Asie Mineure* (1843); P. Tchihatcheff, *Asie Mineure* (1853-1860); C. Ritter, *Erdkunde*, vols. xviii. xix. (1858-1859); W.J. Hamilton, *Researches in Asia Minor* (1843); E. Reclus. *Nouv. Géog. Univ.* vol. ix. (1884); V. Cuinet, *La Turquie d'Asie* (1890); W.M. Ramsay, *Hist. Geog. of A. M.* (1890); Murray's *Handbook for A. M. &c.*, ed. by Sir C. Wilson (1895). For GEOLOGY see Tchihatcheff, *Asie Mineure, Géologie* (Paris, 1867-1869); Schaffer, *Cilicia, Peterm. Mitt. Ergänzungsheft*, 141 (1903); Philippson, *Sitz. k. preuss. Akad. Wiss.* (1903), pp. 112-124; English, *Quart. Journ. Geol. Soc.* (London, 1904), pp. 243-295; see also Suess, *Das Antlitz der Erde*, vol. iii. pp. 402-412, and the accompanying references.

2. A. *Western Asia Minor.*—J. Spon and G. Wheler, *Voyage du Levant* (1679); P. de Tournefort, *Voyage du Levant* (1718); F. Beaufort, *Ionian Antiquities* (1811); R. Chandler, *Travels* (1817); W.M. Leake, *Journal of a Tour in A. M.* (1820); F.V.J. Arundell, *Visit to the Seven Churches* (1828), and *Discoveries, &c.* (1834); C. Fellows, *Excursion in A. M.* (1839); C.T. Newton, *Travels* (1867), and *Discoveries at Halicarnassus, &c.* (1863); Dilettanti Society, *Ionian Antiquities* (1769-1840); J.R.S. Sterrett, *Epigr. Journey* and *Wolfe Exped.* (Papers, Amer. Arch. Inst. ii. iii.) (1888); J.H. Skene, *Anadol* (1853); G. Radet, *Lydie* (1893); O. Rayet and A. Thomas, *Milet et le Golfe Latmique* (1872); K. Buresch, *Aus Lydien* (1898); W.M. Ramsay, *Cities and Bishoprics of Phrygia* (1895), and *Impressions of Turkey* (1898).

B. *Eastern Asia Minor.*—W.F. Ainsworth, *Travels in A. M.* (1842); G. Perrot and E. Guillaume, *Expl. arch, de la Galatie* (1862-1872); E.J. Davis, *Anatolica* (1874); H.F. Tozer, *Turkish Armenia* (1881); H.J. v. Lennep, *Travels* (1870); D.G. Hogarth, *Wandering Scholar* (1896); Lord Warkworth, *Notes of a Diary, &c.* (1898); E. Sarre, *Reise* (1896); D.G. Hogarth and J.A.R. Munro, *Mod. and Anc. Roads* (R.G.S. Supp. Papers iii.) (1893); H.C. Barkley, *A Ride through A. M. and Armenia* (1891); M. Sykes, *Dar ul-Islam* (1904); E. Chantre, *Mission en Cappadocie* (1898).

C. *Southern Asia Minor.*—F. Beaufort, *Karamania* (1817); C. Fellows, *Discoveries in Lycia* (1841); T.A.B. Spratt and E. Forbes, *Travels in Lycia* (1847); V. Langlois, *Voy. dans la Cilicie* (1861); E.J. Davis, *Life in Asiatic Turkey* (1879); O. Benndorf and E. Niemann, *Lykien* (1884); C. Lanckoronski, *Villes de la Pamphylie et de la Pisidie* (1890); F. v. Luschan, *Reisen in S.W. Kleinasien* (1888); E. Petersen and F. v. Luschan, *Lykien* (1889); K. Humann and O. Puchstein, *Reisen in Kleinasien und Nordsyrien* (1890).

D. *Northern Asia Minor.*—J.M. Kinneir, *Journey through A. M.* (1818); J.G.C. Anderson and F. Cumont, *Studia Pontica* (1903); E. Naumann, *Vom Goldenen Horn, &c.* (1893).

See also G. Perrot and C. Chipiez, *Hist. de l'art dans l'antiquité*, vols. iv. v. (1886-1890); J. Strzygowski, *Kleinasien, &c.* (1903). Also numerous articles in all leading archaeological periodicals, the *Geographical Journal*, *Deutsche Rundschau*, *Petermann's Geog. Mitteilungen*, &c. &c.

3. Maps.—H. Kiepert, *Nouv. carte gén. des prov. asiat. de l'Emp. ottoman* (1894), and *Spezialkarte v. Westkleinasien* (1890); W. von Diest, *Karte des Nordwestkleinasien* (1901); R. Kiepert, *Karte von Kleinasien* (1901); E. Friederich, *Handels- und Produktenkarte von Kleinasien* (1898); J.G.C. Anderson, *Asia Minor* (Murray's Handy Class. Maps) (1903).

(C. W. W.; D. G. H.)

1 The people, Moslem and Christian, are physically one and appear to be closely related to the modern Armenians. This relationship is noticeable in other districts, and the whole original population of Asia Minor has been characterized as Proto-Armenian or Armenoid.

ASIENTO, or Assiento (from the verb *asentar*, to place, or establish), a Spanish word meaning a farm of the taxes, or contract. The farmer or contractor is called an *asentista*. The word acquired a considerable notoriety in English and American history, on account of the "Asiento Treaty" of 1713. Until 1702 the Spanish government had given the contract for the supply of negroes to its colonies in America to the Genoese. But after the establishment of the Bourbon dynasty in 1700, a French company was formed which received the exclusive privilege of the Spanish-American slave trade for ten years—from September 1702 to 1712. When the peace of Utrecht was signed the British government insisted that the monopoly should be given to its own subjects. By the terms of the Asiento treaty signed on the 16th of March 1713, it was provided that British subjects should be authorized to introduce 144,000 slaves in the course of thirty years, at the rate of 4800 per annum. The privilege was to expire on the 1st of May 1743. British subjects were also authorized to send one ship of 500 tons per annum, laden with manufactured goods, to the fairs of Porto Bello and La Vera Cruz. Import duties were to be paid for the slaves and goods. This privilege was conveyed by the British government to the South Sea Company, formed to work it. The privilege, to which an exaggerated value was attached, formed the solid basis of the notorious fit of speculative fever called the South Sea Bubble. Until 1739 the trade in blacks went on without interruption, but amid increasingly angry disputes between the Spanish and the British governments. The right to send a single trading ship to the fairs of Porto Bello or La Vera Cruz was abused. Under pretence of renewing her provisions she was followed by tenders which in fact carried goods. Thus there arose what was in fact a vast contraband trade. The Spanish government established a service of revenue boats (*guarda costas*) which insisted on searching all English vessels approaching the shores of the Spanish colonies. There can be no doubt that the smugglers were guilty of many piratical excesses, and that the *guarda costas* often acted with violence on mere suspicion. After many disputes, in which the claims of the British government were met by Spanish counterclaims, war ensued in 1739. When peace was made at Aix-la-Chapelle in 1748 Spain undertook to allow the asiento to be renewed for the four years which were to run when war broke out in 1739. But the renewal for so short a period was not considered advantageous, and by the treaty of El Retiro of 1750, the British government agreed to the recession of the Asiento treaty altogether on the payment by Spain of £100,000.

A very convenient account of the Asiento Treaty, and of the trade which arose under it, will be found in Malachy Postlethwayt's *Universal Dictionary of Trade and Commerce* (London, 1751), *s.v.*

ASIR, a district in western Arabia, lying between 17° 30′ and 21° N., and 40° 30′ and 45° E.; bounded N. by Hejaz, E. by Nejd, S. by Yemen and W. by the Red Sea. Like Yemen, it consists of a lowland zone some 20 or 30 m. in width along the coast, and of a mountainous tract, falling steeply on the west and merging into a highland plateau which slopes gradually to the N.E. towards the Nejd steppes. Its length along the coast is about 230 m., and its breadth from the coast to El Besha about 180. The lowland, or Tehama, is hot and barren; the principal places in it are Kanfuda, the chief port of the district, Marsa Hali and El Itwad, smaller ports farther south. The mountainous tract has probably an average altitude of between 6000 and 7000 ft., with a temperate climate and regular rainfall, and is fertile and populous. The valleys are well watered and produce excellent crops of cereals and dates. The best-known are the Wadi Taraba and the W. Besha, both running north-east towards the W. Dawasir in Nejd. Taraba, according to John Lewis Burckhardt, is a considerable town, surrounded by palm groves and gardens, and watered by numerous rivulets, and famous for its long resistance to Mehemet Ali's forces in 1815. Five or six days' journey to the south-east is the district of Besha, the most important position between Sana and Taif. Here Mehemet Ali's army, amounting to 12,000 men, found sufficient provisions to supply it during a fortnight's halt. The Wadi Besha is a broad valley abounding with streams containing numerous hamlets scattered over a tract some six or eight hours' journey in length. Its principal affluent, the W. Shahran, rises 120 m. to the south and runs through the fertile district of Khamis Mishet, the highest in Asir. The Zahran district lies four days west of Besha on the crest of the main range: the principal place is Makhwa, a large town and market, from which grain is exported in considerable quantities to Mecca. Farther south is the district of Shamran. Throughout the mountainous country the valleys are well watered and cultivated, with fortified villages perched on the surrounding heights. Juniper forests are said to exist on the higher mountains. Three or four days' journey east and south-east of Besha are the encampments of the Bani Kahtan, one of the most ancient tribes of Arabia; their pastures extend into the adjoining district of Nejd, where they breed camels in large numbers, as well as a few horses.

The inhabitants are a brave and warlike race of mountaineers, and aided by the natural strength of their country they have hitherto 762
preserved their independence. Since the beginning of the 19th century they have been bigoted Wahhabis, though previously regarded by their neighbours as very lax Mahommedans; during Mehemet Ali's occupation of Nejd their constant raids on the Egyptian communications compelled him to send several punitive expeditions into the district, which, however, met with little success. Since the reconquest of Yemen by the Turks, they have made repeated attempts to subjugate Asir, but beyond occupying Kanfuda, and holding one or two isolated points in the interior, of which Ibha and Manadir are the principal, they have effected nothing.

The chief sources of information regarding Asir are the notes made by J.L. Burckhardt at Taif in 1814 and those of the French officers with the Egyptian expeditions into the country from 1814 to 1837. No part of Arabia would better repay exploration.

Authorities.—J.L. Burckhardt, *Travels in Arabia* (London, 1829); F. Mengin, *Histoire de l'Égypte*, &c. (Paris, 1823); M.O. Tamisier, *Voyage en Arabie* (Paris, 1840).

(R. A. W.)

ASISIUM (mod. *Assisi*), an ancient town of Umbria, in a lofty situation about 15 m. E.S.E. of Perusia. As an independent community it had already begun to use Latin as well as Umbrian in its inscriptions (for one of these recording the chief magistrates—*marones*—see *C.I.L.* xi. 5390). It became a *municipium* in 90 B.C., but, though numerous inscriptions (*C.I.L.* xi. 5371-5606) testify to its importance in the Imperial period, it is hardly mentioned by our classical authorities. Scanty traces of the ancient city walls may be seen; within the town the best-preserved building is the so-called temple of Minerva, with six Corinthian columns of travertine, now converted into a church, erected by Gaius and Titus Caesius in the Augustan era. It fronted on to the ancient forum, part of the pavement of which, with a base for

the equestrian statues of Castor and Pollux (as the inscription upon it records) has been laid bare beneath the present Piazza Vittorio Emanuele. The remains of the amphitheatre, in *opus reticulatum*, may be seen in the north-east corner of the town; and other ancient buildings have been discovered. Asisium was probably the birthplace of Propertius.

(T. As.)

ASKABAD, or Askhabad, a town of Russian central Asia, capital of the Transcaspian province, 345 m. by rail S.E. of Krasnovodsk and 594 from Samarkand, situated in a small oasis at the N. foot of the Kopet-dagh range. It has a public library and a technical railway school; also cotton-cleaning works, tanneries, brick-works, and a mineral-water factory. The trade is valued at £250,000 a year. The population, 2500 in 1881, when the Russians seized it, was 19,428 in 1897, one-third Persians, many of them belonging to the Babi sect.

ASKAULES (Gr. ἀσκαύλης [?] from ἀσκός, bag, αὐλός, pipe), probably the Greek word for bag-piper, although there is no documentary authority for its use. Neither it nor ἄσκαυλος (which would naturally mean the bag-pipe) has been found in Greek classical authors, though J.J. Reiske—in a note on Dio Chrysostom, *Orat.* lxxi. *ad fin.*, where an unmistakable description of the bag-pipe occurs ("and they say that he is skilled to write, to work as an artist, and to play the pipe with his mouth, on the bag placed under his arm-pits")—says that ἀσκαύλης was the Greek word for bag-piper. The only actual corroboration of this is the use of *ascaules* for the pure Latin *utricularius* in Martial x. 3. 8. Dio Chrysostom flourished about A.D. 100; it is therefore only an assumption that the bag-pipe was known to the classical Greeks by the name of ἄσκαυλος. It need not, however, be a matter of surprise that among the highly cultured Greeks such an instrument as the bag-pipe should exist without finding a place in literature. It is significant that it is not mentioned by Pollux (*Onomast.* iv. 74) and Athenaeus (*Deipnos.* iv. 76) in their lists of the various kinds of pipes.

See articles Aulos and Bag-pipe; art. "Askaules" in Pauly-Wissowa, *Realencyclopadie*.

ASKE, ROBERT (d. 1537), English rebel, was a country gentleman who belonged to an ancient family long settled in Yorkshire, his mother being a daughter of John, Lord Clifford. When in 1536 the insurrection called the "Pilgrimage of Grace" broke out in Yorkshire, Aske was made leader; and marching with the banner of St Cuthbert and with the badge of the "five wounds," he occupied York on the 16th of October and on the 20th captured Pontefract Castle, with Lord Darcy and the archbishop of York, who took the oath of the rebels. He caused the monks and nuns to be reinstated, and refused to allow the king's herald to read the royal proclamation, announcing his intention of marching to London to declare the grievances of the commons to the sovereign himself, secure the expulsion of counsellors of low birth, and obtain restitution for the church. The whole country was soon in the hands of the rebels, a military organization with posts from Newcastle to Hull was established, and Hull was provided with cannon. Subsequently Aske, followed by 30,000 or 40,000 men, proceeded towards Doncaster, where lay the duke of Norfolk with the royal forces, which, inferior in numbers, would probably have been overwhelmed had not Aske persuaded his followers to accept the king's pardon, and the promise of a parliament at York and to disband. Soon afterwards he received a letter from the king desiring him to come secretly to London to inform him of the causes of the rebellion. Aske went under the guarantee of a safe-conduct and was well received by Henry. He put in writing a full account of the rising and of his own share in it; and, fully persuaded of the king's good intentions, returned home on the 8th of January 1537, bringing with him promises of a visit from the king to Yorkshire, of the holding of a parliament at York, and of free elections. Shortly afterwards he wrote to the king warning him of the still unquiet state not only of the north but of the midlands, and stating his fear that more bloodshed was impending. The same month he received the king's thanks for his action in pacifying Sir Francis Bigod's rising. But his position was now a difficult and a perilous one, and a few weeks later the attitude of the government towards him was suddenly changed. The new rising had given the court an excuse for breaking off the treaty and sending another army under Norfolk into Yorkshire. Possibly in these fresh circumstances Aske may have given cause for further suspicions of his loyalty, and in his last confession he acknowledged that communications to obtain aid had been opened with the imperial ambassador and were contemplated with Flanders. But it is more probable that the government had from the first treacherously affected to treat him with confidence to secure the secrets of the rebels and to effect his destruction. In March Norfolk congratulated Cromwell on the successful accomplishment of his task, having persuaded Aske to go to London on false assurances of security. He was arrested in April, tried before a commission at Westminster, and sentenced to death for high treason on the 17th of May; and on the 28th of June he was taken back to Yorkshire, being paraded in the towns and country through which he passed. He was hanged at York in July, expressing repentance for breaking the king's laws, but declaring that he had promise of pardon both from Cromwell and from Henry. It is related that his servant, Robert Wall, died of grief at the thought of his master's approaching execution. Aske was a real leader, who gained the affection and confidence of his followers; and his sudden rise to greatness and his choice by the people point to abilities that have not been recorded.

See *Henry VIII. and the English Monasteries*, by F.A. Gasquet (1906); *Letters and Papers of the Reign of Henry VIII.*, vols. xi. and xii.; *English Histor. Review*, v. 330, 550 (account of the rebellion, examination and answers to interrogations); *Chronicle of Henry VIII.*, tr. by M.A.S. Hume (1889); Whitaker's *Richmondshire*, i. 116 (pedigree of the Askes).

ASKEW, or Ascue, **ANNE** (1521?-1546), English Protestant martyr, born at Stallingborough about 1521, was the second daughter of Sir William Askew (d. 1540) of South Kelsey, Lincoln, by his first wife Elizabeth, daughter of Thomas Wrottesley. Her elder sister, Martha, was betrothed by her parents to Thomas Kyme, a Lincolnshire justice of the peace, but she died before marriage, and Anne was induced or compelled to take her place. She is said to have had two children by Kyme, but religious differences and incompatibility of temperament soon estranged the couple. Kyme was apparently an unimaginative man of the world, while Anne took to Bible-reading with zeal, became convinced of the falsity of the doctrine of transubstantiation, and created some stir in Lincoln by her disputations. According to Bale and Foxe her husband turned her out of doors, but in the privy council register she is said to have "refused Kyme to be her husband without any honest allegation." She had as good a reason for repudiating her husband as Henry VIII. for repudiating Anne of Cleves. In any case, she came to London and made friends with Joan Bocher, who was already known for heterodoxy, and other Protestants. She was examined for heresy in March 1545 by the lord mayor, and was committed to the Counter prison. Then she was examined by Bonner, the bishop of London, who drew up a form of recantation which he entered in his register. This fact led Parsons and other Catholic historians to state that she actually recanted but she refused to sign Bonner's form without qualification. Two months later, on the 24th of May, the privy council ordered her arrest. On the 13th of June 1545, she was arraigned as a sacramentarian under the Six Articles at the Guildhall; but no witness appeared against her; she was declared not guilty by the jury and discharged after paying her fees.

The reactionary party, which, owing to the absence of Hertford and Lisle and to the presence of Gardiner, gained the upper hand in the council in the summer of 1546, were not satisfied with this repulse; they probably aimed at the leaders of the reforming party, such as Hertford and possibly Queen Catherine Parr, who were suspected of favouring Anne, and on the 18th of June 1546 Anne was again arraigned before a commission including the lord mayor, the duke of Norfolk, St John, Bonner and Heath. No jury was empanelled and no witnesses were called; she was condemned, simply on her confession, to be burnt. On the same day she was called before the privy council with her husband. Kyme was sent home into Lincolnshire, but Anne was committed to Newgate, "for that she was very obstinate

and heady in reasoning of matters of religion." On the following day she was taken to the Tower and racked; according to Anne's own statement, as recorded by Bale, the lord chancellor, Wriothesley, and the solicitor-general, Rich, worked the rack themselves; but she "would not convert for all the pain" (Wriothesley, *Chronicle* i. 168). Her torture, disputed by Jardine, Lingard and others, is substantiated not only by her own narrative, but by two contemporary chronicles, and by a contemporary letter (*ibid.*; *Narratives of the Reformation*, p. 305; Ellis, *Original Letters*, 2nd Ser. ii. 177). For four weeks she was left in prison, and at length on the 16th of July, she was burnt at Smithfield in the presence of the same persecuting dignitaries who had condemned her to death.

AUTHORITIES.—Bale's two tracts, printed at Marburg in November 1546 and January 1547, are the basis of Foxe's account. See also *Acts of the Privy Council* (1542-1547), pp. 424-462; Wriothesley's *Chron.* i. 155, 167-169; *Narratives of the Reformation*, passim; Gough's *Index to Parker Soc. Publications*; Burnet's *Hist. of the Reformation*; Dixon's *Hist. of the Church of England*; *Dict. Nat. Biogr.*

(A. F. P.)

AṢMA'Ī [Abū Sa'īd 'Abd ul-Malik ibn Quraib] (*c.* 739-831), Arabian scholar, was born of pure Arab stock in Basra and was a pupil there of Abū 'Amr ibn ul-'Alā. He seems to have been a poor man until by the influence of the governor of Basra he was brought to the notice of Harūn al-Rashīd, who enjoyed his conversation at court and made him tutor of his son. He became wealthy and acquired property in Basra, where he again settled for a time; but returned later to Bagdad, where he died in 831. Aṣma'ī was one of the greatest scholars of his age. From his youth he stored up in his memory the sacred words of the Koran, the traditions of the Prophet, the verses of the old poets and the stories of the ancient wars of the Arabs. He was also a student of language and a critic. It was as a critic that he was the great rival of Abū 'Ubaida (*q.v.*). While the latter followed (or led) the Shu'ūbite movement and declared for the excellence of all things not Arabian, Aṣma'ī was the pious Moslem and avowed supporter of the superiority of the Arabs over all peoples, and of the freedom of their language and literature from all foreign influence. Some of his scholars attained high rank as literary men. Of Aṣma'ī's many works mentioned in the catalogue known as the *Fihrist*, only about half a dozen are extant. Of these the *Book of Distinction* has been edited by D.H. Müller (Vienna, 1876); the *Book of the Wild Animals* by R. Geyer (Vienna, 1887); the *Book of the Horse*, by A. Haffner (Vienna, 1895); the *Book of the Sheep*, by A. Haffner (Vienna, 1896).

For life of Aṣma'ī, see Ibn Khallikān, *Biographical Dictionary*, translated from the Arabic by McG. de Slane (Paris and London, 1842), vol. ii. pp. 123-127. For his work as a grammarian, G. Flügel, *Die grammatischen Schulen der Araber* (Leipzig, 1862), pp. 72-80.

(G. W. T.)

ASMARA, the capital of the Italian colony of Eritrea, N.E. Africa. It is built on the Hamasen plateau, near its eastern edge, at an elevation of 7800 ft., and is some 40 m. W.S.W. in a direct line of the seaport of Massawa. Pop. (1904) about 9000, including the garrison of 300 Italian soldiers, and some 1000 native troops. The European civil population numbers over 500; the rest of the inhabitants are chiefly Abyssinians. There is a small Mahommedan colony. The town is strongly fortified. The European quarter contains several fine public buildings, including the residence of the governor, club house, barracks and hospital. Fort Baldissera is built on a hill to the south-west of the town and is considered impregnable.

Asmara, an Amharic word signifying "good pasture place," is a town of considerable antiquity. It was included in the maritime province of northern Abyssinia, which was governed by a viceroy who bore the title of Bahar-nagash (ruler of the sea). By the Abyssinians the Hamasen plateau was known as the plain of the thousand villages. Asmara appears to have been one of the most prosperous of these villages, and to have attained commercial importance through being on the high road from Axum to Massawa. When Werner Munzinger (*q.v.*) became French consul at Massawa, he entered into a scheme for annexing the Hamasen (of which Asmara was then the capital) to France, but the outbreak of the war with Germany in 1870 brought the project to nought (cf. A.B. Wylde, *Modern Abyssinia*, 1901). In 1872 Munzinger, now in Egyptian service, annexed Asmara to the khedivial dominions, but in 1884, owing to the rise of the mahdi, Egypt evacuated her Abyssinian provinces and Asmara was chosen by Ras Alula, the representative of the negus Johannes (King John), as his headquarters. Shortly afterwards the Italians occupied Massawa, and in 1889 Asmara (see ABYSSINIA: *History*). In 1900 the seat of government was transferred from Massawa to Asmara, which in its modern form is the creation of the Italians. It is surrounded by rich agricultural lands, cultivated in part by Italian immigrants, and is a busy trading centre. A railway from Massawa to Asmara was completed as far as Ghinda, at the foot of the plateau, in 1904. At Medrizien, 6 m. north of Asmara, are gold-mines which have been partially worked.

See G. Dainelli, *In Africa. Lettere dall' Eritrea* (Bergamo, 1908); R. Perini, *Di qua dal Mareb* (Florence, 1905).

ASMODEUS, or ASHMEDAI, an evil demon who appears in later Jewish tradition as "king of demons." He is sometimes identified with Beelzebub or Apollyon (Rev. ix. 11). In the Talmud he plays a great part in the legends concerning Solomon. In the apocryphal book of Tobit (iii. 8) occurs the well-known story of his love for Sara, the beautiful daughter of Raguel, whose seven husbands were slain in succession by him on their respective bridal nights. At last Tobias, by burning the heart and liver of a fish, drove off the demon, who fled to Egypt. From the part played by Asmodeus in this story, he has been often familiarly called the genius of matrimonial unhappiness or jealousy, and as such may be compared with Lilith. Le Sage makes him the principal character in his novel *Le Diable boiteux*. Both the word and the conception seem to have been derived originally from the Persian. The name has been taken to mean "covetous." It is in any case no doubt identical with the demon Aeshma of the Zend-Avesta and the Pahlavi texts. But the meaning is not certain. It is generally agreed that the second part of the name Asmodeus is the same as the Zend *daēwa, dēw*, "demon." The first part may be equivalent to Aeshma, the impersonation of anger. But W. Baudissin (Herzog-Hauck, *Realencyklopädie*) prefers to derive it from *ish*, to drive, set in motion; whence *ish-mīn*, driving, impetuous.

The legend of Asmodeus is given fully in the *Jewish Encyclopaedia*, s.v. See also the articles in the *Encyclopaedia Biblica*, Hastings' *Dictionary of the Bible*, and Herzog-Hauck, *Realencyklopädie*.

ASMONEUS, or ASAMONAEUS (so Josephus), great-grandfather of Mattathias, the father of Judas Maccabaeus. Nothing more is known of him, and the name is only given by Josephus (not in 1 Macc. ii. 1). But the dynasty was known to Josephus and the Mishna (once) as "the sons (race) of the Asamonaeans (of A.)"; and the Targum of 1 Sam. ii. 4 has "the house of the Hashmoneans who were weak, signs were wrought for them and strength." If not the founder, Asmoneus was probably the home of the family (cf. Heshmon, Jos. xv. 27).

See Schurer, *Geschichte des jüdischen Volkes*, i. 248 N; art. "Maccabees," § 2, in *Ency. Biblica*.

(J. H. A. H.)

ASNIÈRES, a town of northern France, in the department of Seine, on the left bank of the Seine, about 1½ m. N.N.W. of the fortifications of Paris. Pop. (1906) 35,883. The town, which has grown rapidly in recent years, is a favourite boating centre for the Parisians. The industries include boat-building and the manufacture of colours and perfumery.

ASOKA, a famous Buddhist emperor of India who reigned from 264 to 228 or 227 B.C. Thirty-five of his inscriptions on rocks or pillars or in caves still exist (see INSCRIPTIONS: *Indian*), and they are among the most remarkable and interesting of Buddhist monuments (see BUDDHISM). Asoka was the grandson of Chandragupta, the founder of the Maurya (Peacock) dynasty, who had wrested the Indian provinces of Alexander the Great from the hands of Seleucus, and he was the son of Bindusāra, who succeeded his father Chandragupta, by a lady from Champā. The Greeks do not mention him and the Brahmin books ignore him, but the Buddhist chronicles and legends tell us much about him. The inscriptions, which contain altogether about five thousand words, are entirely of religious import, and their references to worldly affairs are incidental. They begin in the thirteenth year of his reign, and tell us that in the ninth year he had invaded Kalinga, and had been so deeply impressed by the horrors involved in warfare that he had then given up the desire for conquest, and devoted himself to conquest by "religion." What the religion was is explained in the edicts. It is purely ethical, independent alike of theology and ritual, and is the code of morals as laid down in the Buddhist sacred books for laymen. He further tells us that in the ninth year of his reign he formally joined the Buddhist community as a layman, in the eleventh year he became a member of the order, and in the thirteenth he "set out for the Great Wisdom" (the *Sambodhi*), which is the Buddhist technical term for entering upon the well-known, eightfold path to Nirvana. One of the edicts is addressed to the order, and urges upon its members and the laity alike the learning and rehearsal of passages from the Buddhist scriptures. Two others are proclamations commemorating visits paid by the king, one to the dome erected over the ashes of Konāgamana, the Buddha, another to the birthplace of Gotama, the Buddha (*q.v.*). Three very short ones are dedications of caves to the use of an order of recluses. The rest either enunciate the religion as explained above, or describe the means adopted by the king for propagating it, or acting in accordance with it. These means are such as the digging of wells, planting medicinal herbs, and trees for shade, sending out of missionaries, appointment of special officers to supervise charities, and so on. The missionaries were sent to Kashmir, to the Himalayas, to the border lands on the Indus, to the coast of Burma, to south India and to Ceylon. And the king claims that missions sent by him to certain Greek kingdoms that he names had resulted in the folk there conforming themselves to his religion. The extent of Asoka's dominion included all India from the thirteenth degree of latitude up to the Himalayas, Nepal, Kashmir, the Swat valley, Afghanistan as far as the Hindu Kush, Sind and Baluchistan. It was thus as large as, or perhaps somewhat larger than, British India before the conquest of Burma. He was undoubtedly the most powerful sovereign of his time and the most remarkable and imposing of the native rulers of India. "If a man's fame," says Köppen, "can be measured by the number of hearts who revere his memory, by the number of lips who have mentioned, and still mention him with honour, Asoka is more famous than Charlemagne or Caesar." At the same time it is probable that, like Constantine's patronage of Christianity, his patronage of Buddhism, then the most rising and influential faith in India, was not unalloyed with political motives, and it is certain that his vast benefactions to the Buddhist cause were at least one of the causes that led to its decline.

See also *Asoka*, by Vincent Smith (Oxford, 1901); *Inscriptions de Piyadasi*, by E. Senart (Paris, 1891); chapters on Asoka in T.W. Rhys Davids's *Buddhism* (20th ed., London, 1903), and *Buddhist India* (London, 1903); V.A. Smith, *Edicts of Asoka* (1909).

(T. W. R. D.)

ASOLO (anc. *Acelum*), a town of Venetia, Italy, in the province of Treviso, about 19 m. N.W. direct from the town of Treviso, and some 10 m. E. of Bassanoby road. Pop. (1901) 5847. It is well situated on a hill, 690 ft. above sea-level. Remains of Roman baths and of a theatre have been discovered in the course of excavation (*Notizie degli scavi*, 1877, 235; 1881, 205; 1882, 289), and the town was probably a *municipium*. It became an episcopal see in the 6th century. It was to Asolo that Catherine Cornaro, queen of Cyprus, retired on her abdication. Here she was visited by Pietro Bembo, who conceived here his *Dialoghi degli Asolani*, and by Andrea Navagero (Naugerius). Paulus Manutius was born here. The village of Maser is 4½ m. to the E., and near it is the Villa Giacomelli, erected by Palladio, containing frescoes by Paolo Veronese, executed in 1566-1568 for Marcantonio Barbaro of Venice, and ranking among his best works.

ASOR (Hebr. for "ten"), an instrument "of ten strings" mentioned in the Bible, about which authors are not agreed. The word occurs only three times in the Bible, and has not been traced elsewhere. In Psalm xxxiii. 2 the reference is to "kinnor, nebel and asor"; in Psalm xcii. 3, to "nebel and asor"; in Psalm cxliv. to "nebel-asor." In the English version *asor* is translated "an instrument of ten strings," with a marginal note "omit" applied to "instrument." In the Septuagint, the word being derived from a root signifying "ten," the Greek is ἐν δεκαχορδῷ or ψαλτήριον δεκάχορδον, in the Vulgate *in decachordo psalterio*. Each time the word *asor* is used it follows the word *nebel* (see PSALTERY), and probably merely indicates a variant of the nebel, having ten strings instead of the customary twelve assigned to it by Josephus (*Antiquities*, vii. 12. 3).

See also Mendel and Reissmann, *Musikalisches Conversations-Lexikon*, vol. i. (Berlin, 1881); Sir John Stainer, *The Music of the Bible*, pp. 35-37; Forkel, *Allgemeine Geschichte der Musik*, Bd. i. p. 133 (Leipzig, 1788).

(K. S.)

ASP (*Vipera aspis*), a species of venomous snake, closely allied to the common adder of Great Britain, which it represents throughout the southern parts of Europe, being specially abundant in the region of the Alps. It differs from the adder in having the head entirely covered with scales, shields being absent, and in having the snout somewhat turned up. The term "Asp" ἀσπίς seems to have been employed by Greek and Roman writers, and by writers generally down to comparatively recent times, to designate more than one species of serpent; thus the asp, by means of which Cleopatra is said to have ended her life, and so avoided the disgrace of entering Rome a captive, is now generally supposed to have been the cerastes, or horned viper (*Cerastes cornutus*), of northern Africa and Arabia, a snake about 15 in. long, exceedingly venomous, and provided with curious horn-like protuberances over each eye, which give it a decidedly sinister appearance. The snake, however, to which the word "asp" has been most commonly applied is undoubtedly the haje of Egypt, the *spy-slange* or spitting snake of the Boers (*Naja haje*), one of the very poisonous *Elarinae*, from 3 to 4 ft. long, with the skin of its neck loose, so as to render it dilatable at the will of the animal, as in the cobra of India, a species from which it differs only in the absence of the spectacle-like mark on the back of the neck. Like the cobra, also, the haje has its fangs extracted by the jugglers of the country, who afterwards train it to perform various tricks. The asp (*Pethen*, פתן) is mentioned in various parts of the Old Testament. This name is twice translated "adder," but as nothing is told of it beyond its poisonous character and the intractability of its disposition, it is impossible accurately to determine the species.

ASPARAGINE, $C_4H_3N_2O_3$, a naturally occurring base, found in plants belonging to the natural orders Leguminosae and Cruciferae. It occurs in two optically active forms, namely, as laevo-asparagine and dextro-asparagine. Laevo-asparagine was isolated in 1805 by L.N. Vauquelin. A. Piutti (*Gazz. chim. Ital.*, 1887, 17, p. 126; 1888, 18, p. 457) synthesized the asparagines from the monomethyl ester of inactive aspartic acid by heating it with alcoholic ammonia. In this way a mixture of the two asparagines was obtained, which were separated by picking out the hemihedral crystals.

$$HOOC{\cdot}CH{\cdot}NH_2{\cdot}CH_2{\cdot}COOC_2H_5 + NH_3 = C_2H_5OH + HOOC{\cdot}CH{\cdot}NH_2{\cdot}CH_2{\cdot}CONH_2.$$

Laevo-asparagine is slightly soluble in cold water and readily soluble in hot water. It crystallizes in prisms, containing one molecule of water of crystallization, the anhydrous form melting at 234-235° C. Nitrous acid converts it into malic acid, $HOOC{\cdot}CHOH{\cdot}CH_2{\cdot}COOH$. It is laevo-rotatory in aqueous or in alkaline solution, and dextro-rotatory in acid solution (L. Pasteur, *Ann. Chim. Phys.*, 1851 [2], 31, p. 67). Dextro-asparagine was first found in 1886 in the shoots of the vetch (Piutti). It forms rhombic crystals possessing a sweet taste. It is dextro-rotatory in aqueous or alkaline solution, and laevo-rotatory in acid solution.

Hydrolysis by means of acids or alkalis converts the asparagines into aspartic acid; whilst on heating with water in a sealed tube they are converted into ammonium aspartate. The constitution of the asparagines has been determined by A. Piutti (*Gazz. chim. Ital.*, 1888, 18, p. 457).

ASPARAGUS, a genus of plants (nat. ord. Liliaceae) containing more than 100 species, and widely distributed in the temperate and warmer parts of the Old World; it was introduced from Europe into America with the early settlers. The name is derived from the Greek ἀσπάραγος or ἀσφάραγος, the origin of which is obscure. *Sperage* or *sparage* was the form in use from the 16th to 18th centuries, cf. the modern Italian *sparagio*. The vulgar corruption *sparrow-grass* or *sparagrass* was in accepted popular use during the 18th century, “asparagus” being considered pedantic. The plants have a short, creeping, underground stem from which spring slender, branched, aerial shoots. The leaves are reduced to minute scales bearing in their axils tufts of green, needle-like branches (the so-called *cladodes*), which simulate, and perform the functions of, leaves. In one section of the genus, sometimes regarded as a distinct genus *Myrsiphyllum*, the cladodes are flattened. The plants often climb or scramble, in which they are helped by the development of the scale-leaves into persistent spines. The flowers are small, whitish and pendulous; the fruit is a berry.

Several of the climbing species are grown in greenhouses for their delicate, often feathery branches, which are also valuable for cutting; the South African *Asparagus plumosus* is an especially elegant species. The so-called smilax, much used for decoration, is a species of the *Myrsiphyllum* section, *A. medeoloides*, also known as *Myrsiphyllum asparagoides*. The young shoots of *Asparagus officinalis* have from very remote times been in high repute as a culinary vegetable, owing to their delicate flavour and diuretic virtues. The plant, which is a native of the north temperate zone of the Old World, grows wild on the south coast of England; and on the waste steppes of Russia it is so abundant that it is eaten by cattle like grass. In common with the marsh-mallow and some other plants, it contains asparagine or aspartic acidamide. The roots of asparagus were formerly used as an aperient medicine, and the fruits were likewise employed as a diuretic. Under the name of Prussian asparagus, the spikes of an allied plant, *Ornithogalum pyrenaicum*, are used in some places. The diuretic action is extremely feeble, and neither the plant nor asparagine is now used medicinally.

Asparagus is grown extensively in private gardens as well as for market. The asparagus prefers a loose, light, deep, sandy soil; the depth should be 3 ft., the soil being well trenched, and all surplus water got away. A considerable quantity of well-rotted dung or of recent seaweed should be laid in the bottom of the trench, and another top-dressing of manure should be dug in preparatory to planting or sowing. The beds should be 3 ft. or 5 ft. wide, with intervening alleys of 2 ft., the narrower beds taking two rows of plants, the wider ones three rows. The beds should run east and west, so that the sun’s rays may strike against the side of the bed. In some cases the plants are grown in equidistant rows 3 to 4 ft. apart. Where the beds are made with plants already prepared, either one-year-old or two-year-old plants may be used, for which a trench should be cut sufficient to afford room for spreading out the roots, the crowns being all kept at about 2 in. below the surface. Planting is best done in April, after the plants have started into growth. To prevent injury to the roots, it is, however, perhaps the better plan to sow the seeds in the beds where the plants are to remain. To experience the finest flavour of asparagus, it should be eaten immediately after having been gathered; if kept longer than one day, or set into water, its finer flavour is altogether lost. If properly treated, asparagus beds will continue to bear well for many years. The asparagus grown at Argenteuil, near Paris, has acquired much notoriety for its large size and excellent quality. The French growers plant in trenches instead of raised beds. The most common method of forcing asparagus is to prepare, early in the year, a moderate hot-bed of stable litter with a bottom heat of 70°, and to cover it with a common frame. After the heat of fermentation has somewhat subsided, the surface of the bed is covered with a layer of light earth or exhausted tan-bark, and in this the roots of strong mature plants are closely placed. The crowns of the roots are then covered with 3 to 6 in. of soil. A common three-light frame may hold 500 or 600 plants, and will afford a supply for several weeks. After planting, linings are applied when necessary to keep up the heat, but care must be taken not to scorch the roots; air must be occasionally admitted. Where there are pits heated by hot water or by the tank system, they may be advantageously applied to this purpose. A succession of crops must be maintained by annually sowing or planting new beds.

The “asparagus-beetle” is the popular name for two beetles, the “common asparagus beetle” (*Crioceris asparagi*) and the “twelve-spotted” (*C. duodecimpunctata*), which feed on the asparagus plant. *C. asparagi* has been known in Europe since early times, and was introduced into America about 1856; the rarer *C. duodecimpunctata* (sometimes called the “red” to distinguish it from the “blue” species) was detected in America in 1881. For an admirable account of these pests see F.H. Chittenden, *Circular 102 of the U.S. Dep. of Agriculture, Bureau of Entomology*, May 1908.

The “asparagus-stone” is a form of apatite, simulating asparagus in colour.

ASPASIA, an Athenian courtesan of the 5th century B.C., was born either at Miletus or at Megara, and settled in Athens, where her beauty and her accomplishments gained for her a great reputation. Pericles, who had divorced his wife (445), made her his mistress, and, after the death of his two legitimate sons, procured the passing of a law under which his son by her was recognized as legitimate. It was the fashion, especially among the comic poets, to regard her as the adviser of Pericles in all his political actions, and she is even charged with having caused the Samian and Peloponnesian wars (Aristoph. *Acharn.* 497). Shortly before the latter war, she was accused of impiety, and nothing but the tears and entreaties of Pericles procured her acquittal. On the death of Pericles she is said to have become the mistress of one Lysicles, whom, though of ignoble birth, she raised to a high position in the state; but, as Lysicles died a year after Pericles (428), the story is unconvincing. She was the chief figure in the dialogue *Aspasia* by Aeschines the Socratic, in which she was represented as criticizing the manners and training of the women of her time (for an attempted reconstruction of the dialogue see P. Natorp in *Philologus*, li. p. 489, 1892); in the *Menexenus* (generally ascribed to Plato) she is a teacher of rhetoric, the instructress of Socrates and Pericles, and a funeral oration in honour of those Athenians who had given their lives for their country (the authorship of which is attributed to Aspasia) is repeated by Socrates; Xenophon (*Oecon.* lii. 14) also speaks of her in favourable terms, but she is not mentioned by Thucydides. In opposition to this view, Wilamowitz-Möllendorff (*Hermes*, xxxv. 1900) regards her simply as a courtesan, whose personality would readily become the subject of rumour, favourable or unfavourable. There is a bust bearing her name in the Pio Clementino Museum in the Vatican.

See Le Conte de Bièvre, *Les Deux Aspasies* (1736); J.B. Capefigue, *Aspasie et le siècle de Périclès* (1862); L. Becq de Fouquières. *Aspasie de Milet* (1872); H. Houssaye, *Aspasie, Cléopâtre, Théodora* (1899); R. Hamerling, *Aspasia* (a romance; Eng. trans. by M.J. Safford, New York, 1882); J. Donaldson, *Woman* (1907). Also Pericles.

ASPASIUS, a Greek peripatetic philosopher, and a prolific commentator on Aristotle. He flourished probably towards the close of the 1st century A.D., or perhaps during the reign of Antoninus Pius. His commentaries on the *Categories, De Interpretatione, De Sensu*, and other works of Aristotle are frequently referred to by later writers, but have not come down to us. Commentaries on Plato, mentioned by Porphyry in his life of Plotinus, have also been lost. Commentaries on books 1-4, 7 (in part), and 8 of the *Nicomachean Ethics* are preserved; that on book 8 was printed with those of Eustratius and others by Aldus Manutius at Venice in 1536. They were partly (2-4) translated into Latin by Felicianus in 1541, and have frequently been republished, but their authenticity has been disputed. The most recent edition is by G. Heylbut in *Commentaria in Aristotelem Graeca*, xix. 1 (Berlin, 1889).

Another Aspasius, in the 3rd century A.D., was a Roman sophist and rhetorician, son or pupil of the rhetorician Demetrianus. He taught rhetoric in Rome, and filled the chair of rhetoric founded by Vespasian. He was secretary to the emperor Maximin. His orations, which are praised for their style, are lost.

ASPEN, an important section of the poplar genus (*Populus*) of which the common aspen of Europe, *P. tremula*, may be taken as the type,—a tall fast-growing tree with rather slender trunk, and grey bark becoming rugged when old. The roundish leaves, toothed on the margin, are slightly downy when young, but afterwards smooth, dark green on the upper and greyish green on the lower surface; the long slender petioles, much flattened towards the outer end, allow of free lateral motion by the lightest breeze, giving the foliage its well-known tremulous character. By their friction on each other the leaves give rise to a rustling sound. It is supposed that the mulberry trees (*Becaim*) mentioned in 1 Chronicles xiv. 14, 15 were really aspen trees. The flowers, which appear in March and April, are borne on pendulous hairy catkins, 2-3 in. long; male and female catkins are, as in the other species of the genus, on distinct trees.

The aspen is found in moist places, sometimes at a considerable elevation, 1600 ft. or more, in Scotland. It is an abundant tree in the northern parts of Britain, even as far as Sutherland, and is occasionally found in the coppices of the southern counties, but in these latter habitats seldom reaches any large size; throughout northern Europe it abounds in the forests,—in Lapland flourishing even in 70° N. lat., while in Siberia its range extends to the Arctic Circle; in Norway its upper limit is said to coincide with that of the pine; trees exist near the western coast having stems 15 ft. in circumference. The wood of the aspen is very light and soft, though tough; it is employed by coopers, chiefly for pails and herring-casks; it is also made into butchers' trays, pack-saddles, and various articles for which its lightness recommends it; sabots are also made of it in France, and in medieval days it was valued for arrows, especially for those used in target practice; the bark is used for tanning in northern countries; cattle and deer browse greedily on the young shoots and abundant suckers. Aspen wood makes but indifferent fuel, but charcoal prepared from it is light and friable, and has been employed in gunpowder manufacture. The powdered bark is sometimes given to horses as a vermifuge; it possesses likewise tonic and febrifugal properties, containing a considerable amount of salicin. The aspen is readily propagated either by cuttings or suckers, but has been but little planted of late years in Britain. *P. trepida*, or *tremuloides*. is closely allied to the European aspen, being chiefly distinguished by its more pointed leaves; it is a native of most parts of Canada and the United States, extending northwards as far as Great Slave Lake. The wood is soft and neither strong nor durable; it burns better in the green state than that of most trees, and is often used by the hunters of the North-West as fuel; split into thin layers, it was formerly employed in the United States for bonnet and hat making. It is largely manufactured into wood-pulp for paper-making. The bark is of some value as a tonic and febrifuge. *P. grandidentata*, the large-leaved American aspen, has ovate or roundish leaves deeply and irregularly serrated on the margin. The wood is light, soft and close-grained, but not strong. In northern New England and Canada it is largely manufactured into wood-pulp; it is occasionally used in turnery and for wooden-ware.

ASPENDUS (mod. *Balkis Kalé*, or, more anciently in the native language, Estvedys (whence the adjective *Estvedijys* on coins), an ancient city of Pamphylia, very strongly situated on an isolated hill on the right bank of the Eurymedon at the point where the river issues from the Taurus. The sea is now about 7 m. distant, and the river is navigable only for about 2 m. from the mouth; but in the time of Thucydides ships could anchor off Aspendus. Really of pre-Hellenic date, the place claimed to be an Argive colony. It derived wealth from great *salines* and from a trade in oil and wool, to which the wide range of its admirable coinage bears witness from the 5th century B.C. onwards. There Alcibiades met the satrap Tissaphernes in 411 B.C., and thence succeeded in getting the Phoenician fleet, intended to co-operate with Sparta, sent back home. The Athenian, Thrasybulus, after obtaining contributions from Aspendus in 389, was murdered by the inhabitants. The city bought off Alexander in 333, but, not keeping faith, was forcibly occupied by the conqueror. In due course it passed from Pergamene to Roman dominion, and according to Cicero, was plundered of many artistic treasures by Verres. It was ranked by Philostratus the third city of Pamphylia, and in Byzantine times seems to have been known as Primopolis, under which name its bishop signed at Ephesus in A.D. 431. In medieval times it was evidently still a strong place, but it has now sunk, in the general decay of Pamphylia, to a wretched hamlet.

The ruins still extant are very remarkable, and, with the noble Roman theatre, the finest in the world, have earned for the place (as is the case with certain other great monuments) a legendary connexion with Solomon's Sheban queen. On the summit of the hillock, surrounded by a wall with three gates, lie the remains of the city. The public buildings round the forum can all be traced, and parts of them are standing to a considerable height. They consist of a fine nympheum on the north with a covered theatre behind it, covered market halls on the west, and a peristyle hall and a basilica on the east. In the plain below are large thermae, and ruins of a splendid aqueduct. But all else seems insignificant beside the huge theatre, half hollowed out of the north-east flank of the hill. This was first published by C.F.M. Texier in 1849, and has now been completely planned, &c., by Count Lanckoronski's expedition in 1884. It is built of local conglomerate and is in marvellous preservation. Erected to the honour of the emperors Marcus Aurelius and L. Verus by the architect Zeno, for the heirs of a local Roman citizen (as an inscription repeated over both portals attests), its auditorium has a circuit of 313.17 feet. There are forty tiers of seating, divided by one *diazoma*, and crowned by an arched gallery of rather later date, repaired in places with brick. This auditorium held 7500 spectators. The seats are not perfect, but so nearly so as to appear practically intact. The wooden stage has, of course, perished, but all its supporting structures are in place, and the great scena wall stands to its full height, and produces a magnificent impression whether from within or from without. Inwardly it was decorated with two orders of columns one above the other, with rich entablatures, much of which survives. In the *tympanum* is a relief of Bacchus (wrongly supposed to be of a female, and called the Bal-Kis, *i.e.* "Honey Girl"). The position of the sounding board above the stage is apparent. Under the forepart of the auditorium, built out from the hill, are immense vaults. The whole structure was enclosed within one great wall, pierced with numerous windows. This structure was probably put to some ecclesiastical Byzantine use, as certain mutilated heads of saints appear upon it; and later it became a fortress and received certain additions. It is now under the care of the local *aghá* and not allowed to be plundered for building stone.

See C. Lanckoronski, *Villes de la Pamphylie et de la Pisidie*, i. (1890).

(D. G. H.)

ASPER, AEMILIUS, Latin grammarian, possibly lived in the 2nd century A.D. He wrote commentaries on Terence, Sallust and Virgil. Numerous fragments of the last show that as both critic and commentator he possessed good judgment and taste. They are printed in Keil, *Probi in Vergilii Bucolica Commentarius* (1848); see also Suringar, *Historia Critica Scholiastarum Latinorum* (1834); Gräfenhan, *Geschichte der klassischen Philologie im Alterthum.* iv. (1843-1850). Two short grammatical treatises, extant under the name of Asper, and of very little value, have nothing to do with the commentator, but belong to a much later date—the time of Priscian (6th century). Both are printed in Keil, *Grammatici Latini*. See also Schanz, *Geschichte der römischen Litteratur*, § 598.

ASPER, HANS (1499-1571), Swiss painter, was born and died at Zürich. He wrought in a great variety of styles, but excelled chiefly in flower and fruit pieces, and in portrait-painting. Many of his pictures have perished, but his style may be judged from the illustrations to Gessner's *Historia Animalium*, for which he is said to have furnished the designs, and from portraits of Zwingli and his daughter Regula Gwalter, which are preserved in the public library of Zürich. It has been usual to class Asper among the pupils and imitators of Holbein, but an inspection of his works is sufficient to show that this is a mistake. Though Asper was held in high reputation by his fellow-citizens, who elected him a member of the Great Council, and had a medal struck in his honour, he seems to have died in poverty.

ASPERGES ("thou wilt sprinkle," from the Latin verb *aspergere*), the ceremony of sprinkling the people with holy water before High Mass in the Roman Catholic Church, so called from the first word of the verse (Ps. iv. 9) *Asperges me, Domini, hyssopo et mundabor*, with which the priest begins the ceremony. The brush used for sprinkling is an aspergill (*aspergillum*), or aspersoir, and the vessel for this water an *aspersorium*. The act of sprinkling the water is called *aspersion*.

ASPERN-ESSLING, Battle of (1809), a battle fought on the 21st and 22nd of May 1809 between the French and their allies under Napoleon and the Austrians commanded by the archduke Charles (see Napoleonic Campaigns). At the time of the battle Napoleon was in possession of Vienna, the bridges over the Danube had been broken, and the archduke's army was on and about the Bisamberg, a mountain near Korneuburg, on the left bank of the river. The first task of the French was the crossing of the Danube. Lobau, one of the numerous islands which divide the river into minor channels, was selected as the point of crossing, careful preparations were made, and on the night of the 19th-20th of May the French bridged all the channels from the right bank to Lobau and occupied the island. By the evening of the 20th great masses of men had been collected there and the last arm of the Danube, between Lobau and the left bank, bridged. Massena's corps at once crossed to the left bank and dislodged the Austrian outposts. Undeterred by the news of heavy attacks on his rear from Tirol and from Bohemia, Napoleon hurried all available troops to the bridges, and by daybreak on the 21st, 40,000 men were collected on the Marchfeld, the broad open plain of the left bank, which was also to be the scene of the battle of Wagram. The archduke did not resist the passage; it was his intention, as soon as a large enough force had crossed, to attack it before the rest of the French army could come to its assistance. Napoleon had, of course, accepted the risk of such an attack, but he sought at the same time to minimize it by summoning every available battalion to the scene. His forces on the Marchfeld were drawn up in front of the bridges facing north, with their left in the village of Aspern (Gross-Aspern) and their right in Essling (or Esslingen). Both places lay close to the Danube and could not therefore be turned; Aspern, indeed, is actually on the bank of one of the river channels. But the French had to fill the gap between the villages, and also to move forward to give room for the supports to form up. Whilst they were thus engaged the archduke moved to the attack with his whole army in five columns. Three under Hiller, Bellegarde and Hohenzollern were to converge upon Aspern, the other two, under Rosenberg, to attack Essling. The Austrian cavalry was in the centre, ready to move out against any French cavalry which should attack the heads of the columns. During the 21st the bridges became more and more unsafe, owing to the violence of the current, but the French crossed without intermission all day and during the night.

The battle began at Aspern; Hiller carried the village at the first rush, but Masséna recaptured it, and held his ground with the same tenacity as he had shown at Genoa in 1800. The French infantry, indeed, fought on this day with the old stubborn bravery which it had failed to show in the earlier battles of the year. The three Austrian columns fighting their hardest through the day were unable to capture more than half the village; the rest was still held by Masséna when night fell. In the meanwhile nearly all the French infantry posted between the two villages and in front of the bridges had been drawn into the fight on either flank. Napoleon therefore, to create a diversion, sent forward his centre, now consisting only of cavalry, to charge the enemy's artillery, which was deployed in a long line and firing into Aspern. The first charge of the French was repulsed, but the second attempt, made by heavy masses of cuirassiers, was more serious. The French horsemen, gallantly led, drove off the guns, rode round Hohenzollern's infantry squares, and routed the cavalry of Lichtenstein, but they were unable to do more, and in the end they retired to their old position. In the meanwhile Essling had been the scene of fighting almost as desperate as that of Aspern. The French cuirassiers made repeated charges on the flank of Rosenberg's force, and for long delayed the assault, and in the villages Lannes with a single division made a heroic and successful resistance, till night ended the battle. The two armies bivouacked on their ground, and in Aspern the French and Austrians lay within pistol shot of each other. The latter had fought fully as hard as their opponents, and Napoleon realized that they were no longer the professional soldiers of former campaigns. The spirit of the nation was in them and they fought to kill, not for the honour of their arms. The emperor was not discouraged, but on the contrary renewed his efforts to bring up every available man. All through the night more and more French troops were put across.

At the earliest dawn of the 22nd the battle was resumed. Masséna swiftly cleared Aspern of the enemy, but at the same time Rosenberg stormed Essling at last. Lannes, however, resisted desperately, and reinforced by St Hilaire's division, drove Rosenberg out. In Aspern Masséna had been less fortunate, the counter-attack of Hiller and Bellegarde being as completely successful as that of Lannes and St Hilaire. Meantime Napoleon had launched a great attack on the Austrian centre. The whole of the French centre, with Lannes on the right and the cavalry in reserve, moved forward. The Austrian line was broken through, between Rosenberg's right and Hohenzollern's left, and the French squadrons poured into the gap. Victory was almost won when the archduke brought up his last reserve, himself leading on his soldiers with a colour in his hand. Lannes was checked, and with his repulse the impetus of the attack died out all along the line. Aspern had been lost, and graver news reached Napoleon at the critical moment. The Danube bridges, which had broken down once already, had at last been cut by heavy barges, which had been set adrift down stream for the purpose by the Austrians. Napoleon at once suspended the attack. Essling now fell to another assault of Rosenberg, and though again the French, this time part of the Guard, drove him out, the Austrian general then directed his efforts on the flank of the French centre, slowly retiring on the bridges. The retirement was terribly costly, and but for the steadiness of Lannes the French must have been driven into the Danube, for the archduke's last effort to break down their resistance was made with the utmost fury. Only the complete exhaustion of both sides put an end to the fighting. The French lost 44,000 out of 90,000 successively engaged, and amongst the killed were Lannes and St Hilaire. The Austrians, 75,000 strong, lost 23,360. Even this, the first great defeat of Napoleon, did not shake his resolution. The beaten forces were at last withdrawn safely into the island. On the night of the 22nd the great bridge was repaired, and the army awaited the arrival of reinforcements, not in Vienna, but in Lobau.

See sketch map in article Wagram.

ASPHALT, or Asphaltum. The solid or semi-solid kinds of bitumen (*q.v.*) were termed ἄσφαλτος by the Greeks; and by some ancient classical writers the name of *pissasphaltum* (πίσσα, pitch) was also sometimes employed. The asphalt of the Dead Sea (known as *Lacus Asphaltites*) received considerable notice from early travellers, and Diodorus the historian states that the inhabitants of the surrounding parts were accustomed to collect it for use in Egypt for embalming. In common with other forms of bitumen, asphalt is very widely distributed geographically and occurs in greater or less quantity in rocks of all ages. There is some divergence in the views expressed as to the precise manner of its production, but it may certainly be said that the principal asphalt deposits are merely the result of the evaporation and oxidation of liquid petroleum which has escaped from outcropping strata. The celebrated Pitch Lake of Trinidad was long regarded as the largest deposit of asphalt in existence, but it is said to be exceeded in area, if not in depth also, by one in Venezuela. The Trinidad "Lake" has an area of 99.3 acres, and is sufficiently firm in places to support a team of horses. The deposit is worked with picks to a depth of a foot or two, and the excavations soon become filled up by the plastic material flowing in from below and hardening. The depth of the deposit is not accurately known. The surface is not level but is composed of irregularly tumescent masses of various sizes, each said to be subject to independent motion, whereby the interior of each rises and flows centrifugally towards the edges. As the

spaces between them are always filled with water, these masses are prevented from coalescing. The softer parts of the lake constantly evolve gas, which is stated to consist largely of carbon dioxide and sulphuretted hydrogen, and the pitch, which is honeycombed with gas-cavities, continues to exhibit this action for some time after its removal from the lake. The working of the deposit is in the hands of the New Trinidad Asphalt Company, who hold the concession up to the year 1930 on payment to the government of a minimum royalty of £10,000 a year. A circular line of tramway, supported on palm-leaves, has been laid on the lake to facilitate the removal of the asphalt. Very large quantities are exported for paving and other purposes, the annual shipments amounting to about 130,000 tons from the lake and about 30,000 tons from other properties. The amount of asphalt in the lake has been estimated at 158,400 tons for each foot of depth, and if the average depth be taken at 20 ft. this would give a total of 3,168,000 tons; but in 1908, though 1,885,600 tons had been removed in the previous thirty-five years, there was but little evidence of reduction in the quantity. The Venezuelan deposit already referred to is in the state of Bermudez, and the area of it is reported to be more than 1000 acres. The asphalt of Cuba is a well-known article of commerce, of which 7252 tons was exported to the United States in 1902. The principal deposits are near the harbour of Cardenas (70 ft. thick), in the Pinar del Rio, near Havana (18 ft. thick), at Canas Tomasita (105 ft. thick); and a specially pure variety near Vuelta.

The comparative composition of Trinidad and Cuba asphalt is given in the following table:—

	Refined Trinidad, Melting point 185° F.	Refined Cuba (soft), Melting point 115° F.	Refined Cuba (hard), Melting point 160° F.
Water.	0.17	0.13	0.11
Volatile bitumen.	51.81	64.03	8.34
Sulphur.	10.00	8.35	8.92
Ash (earthy matter).	28.30	19.51	16.60
Fixed carbon.	9.72	7.98	66.03
	100.00	100.00	100.00

The chemical composition of Trinidad asphalt has been given as:—

C.	H.	N.	O.	S.
80.32	6.30	0.50	1.40	11.48

The following is a comparison of Trinidad and Venezuela (Bermudez) asphalt:—

	Refined Trinidad.	Refined Bermudez.
Specific gravity at 60° F.	1.373	1.071
Bitumen soluble in carbon bisulphide	61.507%	92.22%
Mineral matter (ash)	34.51%	1.50%
Non-bituminous organic matter	3.983%	1.28%
Portion of total bitumen soluble in alcohol	8.24%	11.66%
Portion of total bitumen soluble in ether	80.01%	81.63%
Loss at 212° F.	0.65%	1.37%
Loss at 400° F. in ten hours	7.98%	17.80%
Loss at 400° on total bitumen	12.811%	18.308%
Evolution of sulphuretted hydrogen at	410° F.	none at 437° F.
Softening-point	160° F.	none at 113° F.
Flowing-point	192° F.	none at 150° F.

Asphalt in its purest forms is generally black or blackish brown in colour, and is frequently brittle at ordinary temperatures. Apart from its principal use in the manufacture of paving materials, it is largely employed in building as a “damp-course” and as a water-excluding coating for concrete floors, as well as in the manufacture of roofing-felt. It also enters largely into the composition of black varnish. The material chiefly used in the construction of asphalt roadways is an asphaltic or bituminous limestone found in the Val de Travers, canton of Neuchâtel; in the neighbourhood of Seyssel, department of Ain; at Limmer, near the city of Hanover; and elsewhere. The proportion of bitumen present in asphalt rock usually ranges from 7 to 20%, but it is found that rock containing more than 11% cannot be satisfactorily used for street pavements, and it is accordingly customary to mix the richer and poorer varieties in fine powder in such respective quantities that the proportion of bitumen present is from 9 to 10%. The richer rock is utilized as a source of asphalt “mastic,” which is employed for footpaths, floors, roofs, &c. Excellent foundations for steam-hammers, dynamos and high-speed engines are made of asphaltic concrete.

(B. R.)

ASPHODEL (*Asphodelus*), a genus of the lily order (Liliaceae), containing seven species in the Mediterranean region. The plants are hardy herbaceous perennials with narrow tufted radical leaves and an elongated stem bearing a handsome spike of white or yellow flowers. *Asphodelus albus* and *A. fistulosus* have white flowers and grow from 1½ to 2 ft. high; *A. ramosus* is a larger plant, the large white flowers of which have a reddish-brown line in the middle of each segment. Bog-asphodel (*Narthecium ossifragum*), a member of the same family, is a small herb common in boggy places in Britain, with rigid narrow radical leaves and a stem bearing a raceme of small golden yellow flowers.

In Greek legend the asphodel is the most famous of the plants connected with the dead and the underworld. Homer describes it as covering the great meadow (ἀσφόδελος λειμών), the haunt of the dead (*Od.* xi. 539, 573; xxiv. 13). It was planted on graves, and is often connected with Persephone, who appears crowned with a garland of asphodels. Its general connexion with death is due no doubt to the greyish colour of its leaves and its yellowish flowers, which suggest the gloom of the underworld and the pallor of death. The roots were eaten by the poorer Greeks; hence such food was thought good enough for the shades (cf. Hesiod, *Works and Days*, 41; Pliny, *Nat. Hist.* xxi. 17 [68]; Lucian, *De luctu*, 19). The asphodel was also supposed to be a remedy for poisonous snake-bites and a specific against sorcery; it was fatal to mice, but preserved pigs from disease. The Libyan nomads made their huts of asphodel stalks (cf. Herod. iv. 190).

No satisfactory derivation of the word is suggested. The English word “daffodil” is a perversion of “asphodel,” formerly written “affodil.” The *d* may come from the French *fleur d’affodille*. It is no part of the word philologically.

See Pauly-Wissowa, *Realencyclopädie*, s.v.; H.O. Lenz, *Botanik der alten Griechen und Römer* (1859); J. Murr, *Die Pflanzenwelt in der griechischen Mythologie* (1890).

ASPHYXIA (Gr. ἀ- priv., σφύξις, a pulse), a term in medicine, literally signifying loss of pulsation, which is applied to describe the arrestment of the function of respiration from some hindrance to the entrance of air into the lungs. (See Respiratory System: *Pathology*.)

ASPIC (French, from Lat. *aspis*), an asp or viper found in Egypt whose bite is supposed to cause a swift and easy death, hence poetically a term for any venomous snake. From association, perhaps, with the coldness of the aspic (as in the French proverb, *froid comme un aspic*), the word is used for a savoury jelly containing meat, fish or eggs, &c. It is also the botanical name of the *Lavandula spica*, or spikenard, from which a white, aromatic and highly inflammable oil is distilled, called *huile d'aspic*.

ASPIDISTRA, a small genus of the lily order (Liliaceae), native of the Himalayas, China and Japan. *Aspidistra lurida* is a favourite pot-plant, bearing large green or white-striped leaves on an underground stem, and small dark purplish, cup-shaped flowers close to the ground.

ASPIROTRICHACEAE (O. Bütschli), an order of Ciliate Infusoria, characterized by an investment, general or partial, of nearly uniform cilia, without any distinct adoral wreath, and one or two adoral endoral undulating membranes. With the Gymnostomaceae it formed the Holotricha of Stein.

ASPIROZ, MANUEL DE (1836-1905), Mexican statesman and diplomatist, was born at Puebla, and educated at the university of Mexico, where he took his degree in 1855. He took part in the war against the emperor Maximilian, and in 1867, on the establishment of the republic, was appointed assistant secretary of state for foreign affairs. In 1873 he became Mexican consul at San Francisco, where he remained till his election to the Senate in 1875. He was professor of jurisprudence at the college of Puebla from 1883 to 1890, when he was again appointed assistant secretary of foreign affairs. From 1899 till he died in 1905 he was Mexican ambassador to the United States. Among his writings may be mentioned; *Código de extranjeria de los Estados-Unidos Mexicanos* (1876), and *La liberdad civil como base del derecho internacional privado* (1896).

ASPROMONTE, a mountain of Calabria, Italy, rising behind Reggio di Calabria, the west extremity of the Sila range. The highest point is 6420 ft. and the slopes are clad with forest. Here Garibaldi was wounded and taken prisoner by the Italian troops under Pallavicini in 1862.

ASQUITH, HERBERT HENRY (1852-), English statesman, son of Joseph Dixon Asquith, was born at Morley, Yorkshire, on the 12th of September 1852. He came of a middle-class Yorkshire family of pronounced Liberal and Nonconformist views, and was educated under Dr Edwin Abbott at the City of London school, from which he went as a scholar to Balliol, Oxford; there he had a distinguished career, taking a first-class in classics, winning the Craven scholarship and being elected a fellow of his college. He was president of the Union, and impressed all his contemporaries with his intellectual ability, Dr Jowett himself confidently predicting his signal success in any career he adopted. On leaving Oxford he went to the bar, and as early as 1890 became a K.C. In 1887 he unsuccessfully defended Mr R.B. Cunninghame Graham and Mr John Burns for their share in the riot in Trafalgar Square; and in 1889 he was junior to Sir Charles (afterwards Lord) Russell as counsel for the Irish Nationalists before the Parnell Commission—an association afterwards bitterly commented upon by Mr T. Healy in the House of Commons (March 30, 1908). But though he attained a fair practice at the bar, and was recognized as a lawyer of unusual mental distinction and clarity, his forensic success was not nearly so conspicuous as that of some of his contemporaries. His ambitions lay rather in the direction of the House of Commons. He had taken a prominent part in politics as a Liberal since his university days, especially in work for the Eighty Club, and in 1886 was elected member of parliament for East Fife, a seat which he retained in subsequent elections. Mr Gladstone was attracted by his vigorous ability as a speaker, and his evidence of sound political judgment; and in August 1892, though comparatively unknown to the general public, he was selected to move the vote of want of confidence which overthrew Lord Salisbury's government, and was made home secretary in the new Liberal ministry. At the Home Office he proved his capacity as an administrator; he was the first to appoint women as factory inspectors, and he was responsible for opening Trafalgar Square to Labour demonstrations; but he firmly refused to sanction the proposed amnesty for the dynamiters, and he was violently abused by extremists on account of the shooting of two men by the military at the strike riot at Featherstone in August 1893. It was he who coined the phrase (Birmingham, 1894) as to the government's "ploughing the sands" in their endeavour to pass Liberal legislation with a hostile House of Lords. His Employers' Liability Bill 1893 was lost because the government refused to accept the Lords' amendment as to "contracting-out." His suspensory bill, with a view to the disestablishment of the church in Wales, was abortive (1895), but it served to recommend him to the Welsh Nationalists as well as to the disestablishment party in England and Scotland. During his three years of office he more than confirmed the high opinion formed of his abilities.

The Liberal defeat in 1895 left him out of office for eleven years. He had married Miss Helen Melland in 1877, and was left with a family when she died in 1891; in 1894, however, he had married again, his second wife being the accomplished Miss Margaret ("Margot") Tennant, daughter of the wealthy ironmaster, Sir Charles Tennant, Bart., a lady well known in London society as a member of the coterie known as "Souls," and commonly identified as the original of Mr E.F. Benson's *Dodo* (1893). On leaving the Home Office in 1895, Mr Asquith decided to return to his work at the bar, a course which excited much comment, since it was unprecedented that a minister who had exercised judicial functions in that capacity should take up again the position of an advocate; but it was obvious that to maintain the tradition was difficult in the case of a man who had no sufficient independent means. During the years of Unionist ascendancy Mr Asquith divided his energies between his legal work and politics; but his adhesion to Lord Rosebery (*q.v.*) as a Liberal Imperialist at the time of the Boer War, while it strengthened his position in the eyes of the public, put him in some difficulty with his own party, led as it was by Sir Henry Campbell-Bannerman (*q.v.*), who was identified with the "pro-Boer" policy. He was one of the founders of the Liberal League, and his courageous definiteness of view and intellectual vigour marked him out as Lord Rosebery's chief lieutenant if that statesman should ever return to power. He thus became identified with the Roseberyite attitude towards Irish Home Rule; and, while he continued to uphold the Gladstonian policy in theory, in practice the Irish Nationalists felt that very little could be expected from his advocacy. In spite of his Imperialist views, however, he did much to smooth over the party difficulties, and when the tariff-reform movement began in 1903, he seized the opportunity for rallying the Liberals to the banner of free-trade and championing the "orthodox" English political economy, on which indeed he had been a lecturer in his younger days. During the critical years of Mr Chamberlain's crusade (1903-1906) he made himself the chief spokesman of the Liberal party, delivering a series of speeches in answer to those of the tariff-reform leader; and his persistent following and answering of Mr Chamberlain had undoubted effect. He also made useful party capital out of the necessity for financial retrenchment, owing to the large increase in public expenditure, maintained by the Unionist government even after the Boer War was over; and his mastery of statistical detail and argument made his appointment as chancellor of the exchequer part of the natural order of things when in December 1905 Mr Balfour resigned and Sir Henry Campbell-Bannerman (*q.v.*) became prime minister.

During Sir Henry Campbell-Bannerman's premiership, Mr Asquith gradually rose in political importance, and in 1907 the prime minister's ill-health resulted in much of the leadership in the Commons devolving on the chancellor of the exchequer. At first the party as a whole had regarded him somewhat coldly. And his unbending common-sense, and sobriety of criticism in matters which deeply interested the less academic Radicals who were enthusiasts for extreme courses, would have made the parliamentary situation difficult but for the exceptional popularity of the prime minister. In the autumn of 1907, however, as the latter's retention of office became more and more improbable, it became evident that no other possible successor had equal qualifications. The session of 1908 opened with Mr Asquith acting avowedly as the prime minister's deputy, and the course of business was itself of a nature to emphasize his claims. After two rather humdrum budgets he was pledged to inaugurate a system of old-age pensions (forming the chief feature of the budget of 1908, personally introduced by him at the beginning of May), and his speech in April on the Licensing Bill was a triumph of clear exposition, though later in the year, after passing the Commons, it was thrown out by the Lords. On the 5th of April it was announced that Sir Henry Campbell-Bannerman had resigned and Mr Asquith been sent for by the king. As the latter was staying at Biarritz, the unprecedented course was followed of Mr Asquith journeying there for the purpose, and on the 8th he resigned the chancellorship of the exchequer and kissed hands as prime minister. The names of the new cabinet were announced on the 13th. The new appointments were: Lord Tweedmouth as lord president of the council (instead of the admiralty); Lord Crewe as colonial secretary (instead of lord president of the council); Mr D. Lloyd George, chancellor of the exchequer (transferred from the Board of Trade); Mr R. McKenna, first lord of the admiralty (instead of minister of education); Mr Winston Churchill, president of the Board of Trade; and Mr Walter Runciman, minister of education. Lord Elgin ceased to be colonial secretary, but Lord Loreburn (lord chancellor), Lord Ripon (lord privy seal), Mr H. Gladstone (Home Office), Sir E. Grey (foreign affairs), Mr Haldane (War Office), Mr Sinclair (secretary for Scotland; created in 1909 Lord Pentland), Mr Burns (Local Government Board), Lord Carrington (Board of Agriculture), Mr Birrell (Irish secretary), Mr S. Buxton (postmaster-general), Mr L. Harcourt (commissioner of works), Mr John Morley (India) and Sir Henry Fowler (duchy of Lancaster) retained their offices, the two latter being created peers. The Budget (see Lloyd George) was the sole feature of political interest in 1909, and its rejection in December by the Lords led to the general election of January 1910, which left the Liberals and Unionists practically equal, with the Labour and Irish parties dominating the situation (L. 275, U. 273, Lab. 40, I. 82). Mr Asquith was in a difficult position, but the ministry remained in office; and he had developed a concentration of forces with a view to attacking the veto of the House of Lords (see Parliament), when the death of the king in May caused a suspension of hostilities. A conference between the leaders on both sides was arranged, to discuss whether any compromise was possible, and controversy was postponed to an autumn session.

(H. Ch.)

ASS (O.E. *assa*; Lat. *asinus*), a common name (the synonym "donkey" is supposed to be derived either by analogy from "monkey," or from the Christian name Duncan; cf. Neddy, Jack, Dicky, &c.) for different varieties of the sub-genus *Asinus*, belonging to the horse tribe, and especially for the domestic ass; it differs from the horse in its smaller size, long ears, the character of its tail, fur and markings, and its proverbial dulness and obstinacy. The ancient Egyptians symbolized an ignorant person by the head and ears of an ass, and the Romans thought it a bad omen to meet one. In the middle ages the Germans of Westphalia made the ass the symbol of St Thomas, the incredulous apostle; the boy who was last to enter school on St Thomas' day was called the "Ass Thomas" (Gubernatis's *Zoological Mythology*, i. 362). The foolishness and obstinacy of the ass has caused the name to be transferred metaphorically to human beings; and the fifth proposition of Book i. of Euclid is known as the *Pons Asinorum*, bridge of asses.

ASS, FEAST OF THE, formerly a festival in northern France, primarily in commemoration of the biblical flight into Egypt, and usually held on the 14th of January. A girl with a baby at her breast and seated on an ass splendidly caparisoned was led through the town to the church, and there placed at the gospel side of the altar while mass was said. The ceremony degenerated into a burlesque in which the ass of the flight became confused with Balaam's ass. So scandalous became the popular revels associated with it, that the celebration was prohibited by the church in the 15th century. (See Fools, Feast of.)

ASSAB, a bay and port on the African shore of the Red Sea, 60 m. N. of the strait of Bab-el Mandeb. Assab Bay was the first territory acquired by Italy in Africa. Bought from the sultan of Raheita in 1870, it was not occupied until 1880. (See Eritrea, and Italy: *History*.)

ASSAM, a former province of British India, which was amalgamated in 1905 with "Eastern Bengal and Assam" (*q.v.*). Area 56,243 sq. m.; pop. (1901) 6,126,343. The province of Assam lies on the N.E. border of Bengal, on the extreme frontier of the Indian empire, with Bhutan and Tibet beyond it on the N., and Burma and Manipur on the E. It comprises the valleys of the Brahmaputra and Surma rivers, together with the mountainous watershed which intervenes between them. It is situated between 24° 0′ and 28° 17′ N. lat., and between 89° 46′ and 97° 5′ E. long. It is bounded on the N. by the eastern section of the great Himalayan range, the frontier tribes from west to east being successively Bhutias, Akas, Daphlas, Miris, Abors and Mishmis; on the N.E. by the Mishmi hills, which sweep round the head of the Brahmaputra valley; on the E. by the unexplored mountains that mark the frontier of Burma, by the hills occupied by the independent Naga tribes and by the state of Manipur; on the S. by the Lushai hills, the state of Hill Tippera, and the Bengal district of Tippera; and on the W. by the Bengal districts of Mymensingh and Rangpur, the state of Kuch Behar and Jalpaiguri district.

Natural Divisions.—Assam is naturally divided into three distinct tracts, the Brahmaputra valley, the Surma valley and the hill ranges between the two. The Brahmaputra valley is an alluvial plain, about 450 m. in length, with an average breadth of 50 m., lying almost east and west. To the north is the main chain of the Himalayas, the lower ranges of which rise abruptly from the plain; to the south is the great elevated plateau or succession of plateaus known as the Assam range. The various portions of this range are called by the names of the tribes who inhabit them—the Garo, the Khasi, the Jaintia, the North Cachar and the Naga hills. The range as a whole is joined at its eastern extremity by the Patkai to the Himalayan system, and by the mountains of Manipur to the Arakan Yoma. The highest points in the range are Nokrek peak (4600 ft.) in the Garo hills, Shillong peak (6450 ft.) in the Khasi-Jaintia hills, and Japva peak (nearly 10,000 ft.) in the Naga hills. South of the range comes the third division of the province, the Surma valley, comprising the two districts of Cachar and Sylhet. The Surma valley is much smaller than the Brahmaputra valley, covering only 7506 against 24,283 sq. m.; its mean elevation is much lower and its rivers are more sluggish.

Physical Aspects.—Assam is a fertile series of valleys, with the great channel of the Brahmaputra (literally, the *Son of Brahma*) flowing down its middle, and an infinite number of tributaries and watercourses pouring into it from the mountains on either side. The Brahmaputra spreads out in a sheet of water several miles broad during the rainy season, and in its course through Assam forms a number of islands in its bed. Rising in the Tibetan plateau, far to the north of the Himalayas, and skirting round their eastern passes not far from the Yang-tsze-kiang and the great river of Cambodia, it enters Assam by a series of waterfalls and rapids, amid vast boulders and accumulations of rocks. The gorge, situated in Lakhimpur district, through which the southernmost branch of the Brahmaputra enters, has from time immemorial been held in reverence by the Hindus. It is called the Brahmakunda or Parasuramkunda; and although the journey to it is both difficult and dangerous, it is annually visited by thousands of devotees. After a rapid course westwards down the whole length of the Assam valley, the Brahmaputra turns sharply to the south, spreading itself over the alluvial districts of the Bengal delta, and, after several changes of name, ends its course of 1800 m. in the Bay of Bengal. Its first tributaries in Assam, after crossing the

frontier, are the Kundil and the Digaru, flowing from the Mishmi hills on the north, and the Tengapani and Dihing, which take their rise on the Singpho hills to the south-east. Shortly afterwards it receives the Dihang, flowing from the north-east; but its principal confluent is the Dihong, which, deriving its origin, under the name of the Tsangpo, from a spot in the vicinity of the source of the Sutlej, flows in a direction precisely opposite to that river, and traversing the table-land of Tibet, at the back of the great Himalaya range, falls into the Brahmaputra in 27° 48′ N. lat., 95° 26′ E. long., after a course of nearly 1000 m. Doubts were long entertained whether the Dihong could be justly regarded as the continuation of the Tsangpo, but these were practically set at rest by the voyage of F.J. Needham in 1886. Below the confluence, the united stream flows in a south-westerly direction, forming the boundary between the districts of Lakhimpur and Darrang, situated on its northern bank, and those of Sibsagar and Nowgong on the south; and finally bisecting Kamrup, it crosses over the frontier of the province and passes into Bengal. In its course it receives on the left side the Dihing, a river having its rise at the south-eastern angle of the province; and lower down, on the opposite side, it parts with a considerable offset termed the Buri Lohir, which, however, reunites with the Brahmaputra 60 m. below the point of divergence, bearing with it the additional waters of the Subansiri, flowing from Tibet. A second offset, under the name of the Kalang river, rejoins the parent stream a short distance above the town of Gauhati. The remaining rivers are too numerous to be particularized. The streams of the south are not rapid, and have no considerable current until May or June. Among the islands formed by the intersection and confluence of the rivers is Majuli, or the Great Island, as it is called by way of pre-eminence. This island extends 55 m. in length by about 10 in breadth, and is formed by the Brahmaputra on the south-east and the Buri Lohit river on the north-west. In the upper part of the valley, towards the gorge where the Brahmaputra enters, the country is varied and picturesque, walled in on the north and east by the Himalayas, and thickly wooded from the base to the snow-line. On either bank of the Brahmaputra a long narrow strip of plain rises almost imperceptibly to the foot of the hills. Gigantic reeds and grasses occupy the low lands near the banks of the great river; expanses of fertile rice-land come next; a little higher up, dotted with villages encircled by groves of bamboos and fruit trees of great size and beauty, the dark forests succeed, covering the interior table-land and mountains. The country in the vicinity of the large rivers is flat, and impenetrable from dense tangled jungle, with the exception of some very low-lying tracts which are either permanent marshes or are covered with water during the rains. Jungle will not grow on these depressions, and they are covered either with water, reeds, high grasses or rice cultivation. On or near such open spaces are collected all the villages. As the traveller proceeds farther down the valley, the country gradually opens out into wide plains. In the western district of Kamrup the country forms one great expanse, with a few elevated tracts here and there, varying from 200 to 800 ft. in height.

Soils.—The soil is exceedingly rich and well adapted to all kinds of agricultural purposes, and for the most part is composed of a rich black loam reposing on a grey sandy clay, though occasionally it exhibits a light yellow clayey texture. The land may be divided into three great classes. The first division is composed of hills, the largest group within the valley being that of the Mikir Mountains, which stand out upon the plain. Another set of hills project into the valley at Gauhati. But these latter are rather prolongations of spurs from the Khasi chain than isolated groups belonging to the plains. The other hills are all isolated and of small extent. The second division of the lands is the well-raised part of the valley whose level lies above the ordinary inundations of the Brahmaputra. The channels of some of the hill streams, however, are of so little depth that the highest lands in their neighbourhood are liable to sudden floods. On the north bank of the great river, lands of this sort run down the whole length of the valley, except where they are interrupted by the beds of the hill streams. The breadth of these plains is in some places very trifling, whilst in others they comprise a tract of many miles, according to the number and the height of the rocks or hills that protect them from the aberrations of the river. The alluvial deposits of the Brahmaputra and of its tributary streams may be considered as the third general division of lands in Assam. These lands are very extensive, and present every degree of fertility and elevation, from the vast *chars* of pure sand, subject to annual inundations, to the firm islands, so raised by drift-sand and the accumulated remains of rank vegetable matter, as no longer to be liable to flood. The rapidity with which wastes, composed entirely of sand newly washed forward by the current during floods, become converted into rich pasture is astonishing. As the freshets begin to lessen and retire into the deeper channels, the currents form natural embankments on their edges, preventing the return of a small portion of water which is thus left stagnant on the sands, and exposed to the action of the sun’s rays. It slowly evaporates, leaving a thin crust of animal and vegetable matter. This is soon impregnated with the seeds of the *Saccharum spontaneum* and other grasses that have been partly brought by the winds and partly deposited by the water. Such places are frequented by numerous flocks of aquatic birds, which resort thither in search of fish and mollusca. As vegetation begins to appear, herds of wild elephants and buffaloes are attracted by the supply of food and the solitude of the newly-formed land, and in their turn contribute to manure the soil.

Geology.—Geographically the Assam hills lie in the angle between the Himalayas and the Burmese ranges, but geologically they belong to neither. The older rocks are like those of Bengal, and the newer beds show no sign of either the Himalayan or the Burmese folding—on the top of the plateau they are nearly horizontal, but along the southern margin they are bent sharply downwards in a simple monoclinal fold. The greater part of the mass is composed of gneiss and schists. The Sylhet traps near the southern margin are correlated with the Rajmahal traps of Bengal. The older rocks are overlaid unconformably by Cretaceous beds, consisting chiefly of sandstones with seams of coal, the whole series thinning rapidly towards the north and thus indicating the neighbourhood of the old shore-line. The fossils are very similar to those of the South Indian Cretaceous, but very different from those of the corresponding beds in the Nerbudda valley. The overlying Tertiary series includes nummulitic beds and valuable seams of coal.

The border ranges of the east and south of Assam belong to the Burmese system of mountain chains (see Burma), and consist largely of Tertiary beds, including the great coal seams of Upper Assam. The Assam valley is covered by the alluvial deposits of the Brahmaputra.

Of the mineral productions by far the most valuable is coal. Compared with the Gondwana coal of the peninsula of India the Tertiary coal seams of Assam are remarkable for their purity and their extraordinary thickness. The “Thick Seam” of Margherita, in Upper Assam, averages 50 ft., and in some places reaches as much as 80 ft. The average percentage of ash in 27 assays of Assam coal was 3.8 as against 16.3 in 17 assays of Raniganj coal. The coal seams are commonly associated with petroleum springs. Gold is found in the alluvial deposits, but the results of exploration have not been very promising.

Earthquakes.—Assam is liable to earthquakes. There was a severe earthquake in Cachar on the 10th of January 1869, a severe shock in Shillong and Gauhati in September 1875, and one in Silchar in October 1882; but by far the severest shock known is that which occurred on the evening of 12th June 1897. The area of this seismic disturbance extended over north-eastern India, from Manipur to Sikkim; but the focus was in the Khasi and Garo hills. In the station of Shillong every masonry building was levelled to the ground. Throughout the country bridges were shattered, roads were broken up like ploughed fields, and the beds of rivers were dislocated. In the hills there were terrible landslips, which wrecked the little Cherrapunji railway and caused 600 deaths. The total mortality recorded was 1542, including two Europeans at Shillong. The levels of the country were so affected that the towns of Goalpara and Barpeta became almost uninhabitable during the rains.

Fauna.—The zoology of Assam presents some interesting features. Wild elephants abound and commit many depredations, entering villages in large herds, and consuming everything suitable to their tastes. Many are caught by means of female elephants previously tamed, and trained to decoy males into the snares prepared for subjecting them to captivity. A considerable number are tamed and exported from Assam every year. Many are killed every year in the forests for the sake of the ivory which they furnish. The government *keddah* establishment from Dacca captures large numbers of elephants in the province, and the right of hunting is also sold by auction to private bidders. The annual catch of the latter averages about two hundred. The rhinoceros is found in the denser parts of the forests and generally in swampy places. This animal is hunted and killed for its skin and its horn. The skin affords the material for the best shields. The horn is sacred in the eyes of the natives. Contrary to the usual belief, it is stated that, if caught young, the rhinoceros is easily tamed and becomes strongly attached to his keeper. Tigers abound, and though many are annually destroyed for the sake of the government reward, their numbers seem scarcely, if at all, to diminish. Leopards and bears are numerous; and the sand-badger, the *Arctonyx collaris* of Cuvier, a small animal somewhat resembling a bear, but having the snout, eyes and tail of a hog, is found. Among the most formidable animals known is the wild buffalo or *gaur* which is of great size, strength and fierceness. The fox and the jackal exist, and the wild hog is very abundant. Goats, deer of various kinds, hares, and two or three species of antelope are found, as are monkeys in great variety. The porcupine, the squirrel, the civet cat, the ichneumon and the otter are common. The birds are too various to admit of enumeration. Wild game is plentiful; pheasants, partridges, snipe and water-fowl of many descriptions make the country a tempting field for the sportsman. Vultures and other birds of prey are met with. Crocodiles (commonly called alligators) swarm in all parts of the Brahmaputra, and are very destructive to the fish, of which hundreds of varieties are found, and which supply a valuable article of food. The most destructive of the *ferae naturae*, as regards human life, are, however, the snakes. Of these, several poisonous species exist, including the cobra and karait (*Naja tripudians* and *Bungarus caeruleus*). The bite of a fairly-grown healthy serpent of either of these species is deadly; and it is ascertained that more deaths occur from snake-bite than from all the other wild beasts put together. Among the non-poisonous serpents the python ranks first. This is an enormous boa-constrictor of great length and weight, which drops upon his prey from the branch of a tree, or steals upon it in the thick grass. He kills his victim by rolling himself round the body till he breaks its ribs, or suffocates it by one irresistible convolution round its throat. He seldom or never attacks human beings unless in self-defence, and loss of life from this cause is scarcely ever reported.

Agriculture.—The principal and almost the only food-grain of the plains portion of the province is rice. The production of this staple is carried on generally under the same conditions as in Bengal; but the times of sowing and reaping and the names given to the several crops vary much in different parts of the province. In 1901-1902 out of a total cultivated area of 1,736,000 acres, there were 1,194,000 acres under rice. In addition jute is grown to a considerable extent in Goalpara and Sylhet; cotton is grown in large quantities along the slopes of the Assam range. Rubber is grown in government plantations and is also brought in by the hill tribes; while lac, mustard and

potatoes are also produced.

Tea Plantations.—The most important article of commerce produced in Assam is tea. The rice crop covers a very great proportion of the cultivated land, but it is used for local consumption, and the Brahmaputra valley does not produce enough for its own consumption, large quantities being imported for the coolies. The tea plantations are the one great source of wealth to the province, and the necessities of tea cultivation are the chief stimulants to the development of Assam. The plant was discovered in 1823 by Mr Robert Bruce, who had proceeded thither on a mercantile exploration. The country, however, then formed part of the Burmese dominions. But war with this monarchy shortly afterwards broke out, and a brother of the first discoverer, happening to be appointed to the command of a division of gunboats employed in some part of the operations, followed up the pursuit of the subject, and obtained several hundred plants and a considerable quantity of seed. Some specimens were ultimately forwarded to the superintendent of the botanic garden at Calcutta. In 1832 Captain F. Jenkins was deputed by the governor-general of India, Lord William Bentinck, to report upon the resources of the country, and the tea plant was brought to his especial notice by Mr Bruce; in 1834 a minute was recorded by the governor-general on the subject, in which it is stated that his attention had been called to it in 1827 before his departure from England. In accordance with the views of that minute, a committee was appointed to prosecute inquiries, and to promote the cultivation of the plant. Communications were opened with China with a view to obtain fresh plants and seeds, and a deputation, composed of gentlemen versed in botanical studies, was despatched to Assam. Some seeds were obtained from China; but they proved to be of small importance, as it was clearly ascertained by the members of the Assam deputation that both the black and the green tea plants were indigenous here, and might be multiplied to any extent; another result of the Chinese mission, that of procuring persons skilled in the cultivation and manufacture of black tea, was of more material benefit. Subsequently, under Lord Auckland, a further supply of Chinese cultivators and manufacturers was obtained—men well acquainted with the processes necessary for the production of green tea, as the former set were with those requisite for black. In 1838 the first twelve chests of tea from Assam were received in England. They had been injured in some degree on the passage, but on samples being submitted to brokers, and others of long experience and tried judgment, the reports were highly favourable. It was never, however, the intention of government to carry on the trade, but to resign it to private adventure as soon as the experimental course could be fairly completed. Mercantile associations for the culture and manufacture of tea in Assam began to be formed as early as 1839; and in 1849 the government disposed of their establishment, and relinquished the manufacture to the ordinary operation of commercial enterprise. In 1851 the crop of the principal company was estimated to produce 280,000 lb. Since then the enterprise has rapidly developed. Tea is now cultivated in all the plains district of the provinces. When the industry was first established, the land which was supposed to be best for the plant was hill or undulating ground; but now it has been found in the Surma valley that with good drainage the heaviest crops of tea can be raised from low-lying land, even such as formerly supported rice cultivation. At the close of the year 1905 there were 942 gardens in all, with 422,335 acres, and employing 464,912 coolies. The majority of gardens are owned by Europeans, 405,486 acres belonging to them as against 16,849 to Indians. The total out-turn for the province in 1905 was 193,556,047 lb. Between 1893 and 1898 there was a great extension of tea cultivation, with the result that the industry began to suffer from the congestion that follows over-production. Also to meet the requirements of the industry, an enormous number of coolies had to be brought into the province from other parts of India, and in recent years the supply of labour has begun to fall off, causing a rise in the cost of production. For these reasons there was a crisis in the tea industry of Assam, which was relieved to some extent by the reduction of the English duty on tea in 1906.

Tea-Garden Coolies.—The labour required on the tea gardens is almost entirely imported, as the natives of the province are too prosperous to do such work. During the decade 1891-1901, 596,856 coolies were imported, or about a tenth of the total population of the province. The importation of coolies is controlled by an elaborate system of legislation, which provides for the registration of contracts, the medical inspection of coolies during the journey, and supervision over rates of pay, &c., on the gardens. The first labour act was passed in 1863, and since then the law on the subject has been changed by successive enactments. The measure now in force is called Act VI. of 1901. Under this act the maximum term of the labour contract is fixed at four years, and a minimum monthly wage is laid down, the payment of which, however, is contingent on the completion of a daily task by the labourer. Labourers under contract deserting are liable to fine and imprisonment, and, subject to certain restrictions, may be arrested without warrant by their employers. In addition to the labourers engaged under this act, a large number are employed under contract enforceable by Act XIII, of 1859, which provides penalties for breach of the contract, but does not allow of the arrest of deserters without warrant. Neither does this act regulate in any way the terms of the contract, nor contain any special provisions for the protection of the labourer. Many labourers on the conclusion of their first engagement under Act VI. of 1901 enter into renewed contracts under Act XIII. of 1859. In 1905 there were in all 664,296 labourers, and 24,209 fresh importations, of whom 62% chose the old act.

Railways.—The Assam-Bengal railway runs from the seaport of Chittagong to the Surma valley, and thence across the hills to Dibrugarh, at the head of the Brahmaputra valley, with a branch to Gauhati lower down the Brahmaputra. The hill section of this line was found exceedingly difficult of construction, and extensive damage was done by the earthquake of 1897; but it is now complete. This railway is financed by the government, though worked by a company, and therefore ranks as a state line. At the end of 1904 its open mileage was 576 m. There are several short lines of light railway or tramway in the province. The most important is the Dibru-Sadiya railway, at the head of the Brahmaputra valley, with a branch to the coal-fields.

Trade.-The external trade of Assam is conducted partly by steamer, partly by native boat, and to a small extent by rail. In the Brahmaputra valley steamers carry as much as 86% of the exports, and 94% of the imports. In the Surma valley native boats carry about 43% of both. In 1904-1905 the total exports were valued at 726 lakhs of rupees. The chief items were tea, rice in the husk, oil-seeds, tea-seed, timber, coal and jute. The imports were valued at 457 lakhs of rupees. The chief items were cotton piece-goods, rice not in the husk, sugar, grain and pulse, salt, iron and steel, tobacco, cotton twist and yarn, and brass and copper. No less than two-thirds of the total trade is conducted with Calcutta. The trans-frontier trade is insignificant; and most of it is conducted with the Bengal state of Hill Tippera. The trade through Chittagong is increasing owing to the opening of the hill-section of the Assam-Bengal railway, which gives direct communication between the districts of Upper Assam and the port of Chittagong, and the incorporation of that port in the new province of Eastern Bengal and Assam.

Inhabitants.—The total population of Assam, according to the census of 1901, was 6,126,343, of whom 3,429,099 were Hindus, 1,581,317 Mahommedans and 1,068,334 Animists. The number of foreigners in the population due to immigration by the tea-garden coolies was 775,844. But in spite of this immigration the rate of increase in the population was only 5.9% in the decade, and with the immigrants deducted 1.36%. Amongst native-born Assamese during the decade there was a serious decrease in Nowgong and some other districts, due to *kalaazar* and other diseases. The Assamese are an interesting race, of distinct origin from the neighbouring Bengalis. A large proportion of them derive their origin from tribes who came from the Himalayan ranges, from Burma or from the Chinese frontier. The most important of these are the Ahoms or Ahams, an offshoot of the Shan race of northern Burma. They were the last conquerors of Assam before the Burmese, and they long preserved their ancient traditions, habits and institutions. Hinduism first made its encroachments among their kings and nobility. Several generations ago they gave up eating beef, and they are now completely Hinduized, except in a few remote recesses of Assam. Hinduism has also impressed its language upon the province, and the vernacular Assamese possesses a close affinity to Bengali, with the substitution of *s* for the Bengali *ch*, of a guttural *h* for the Bengali *h* or *sh*, and a few other dialectic changes. Indeed, so close was the resemblance that for a time Bengali was used as the court and official language of the province under British rule. But with the development of the country the Assamese tongue asserted its claims to be treated as a distinct vernacular, and a resolution of government (1873) re-established it as the language of official life and public business.

The Assam peasant, living in a half-populated province, and surrounded by surplus land, is indolent, good-natured and, on the whole, prosperous. He raises sufficient food for his wants with very little labour, and, with the exception of a few religious ceremonies, he has no demand made upon him for money, saving the light rental of his fields. Under the peaceful influences of British rule, he has completely lost his ancient warlike instincts, and forgotten his predatory habits. In complexion he is a shade or two fairer than the Bengali. His person is in general short and robust, but devoid of the grace and flexibility of the Hindu. A flat face, with high cheek-bones, presents a physiognomy resembling the Chinese, and suggests no idea of beauty. His hair is abundant, black, lank and coarse, but the beard is scanty, and usually plucked out, which gives him an effeminate appearance. The women form a striking contrast to the men; there is more of feminine beauty in them than is commonly seen in the women of Bengal, with a form and feature somewhat approaching the European. The habits of life of the Assamese peasantry are pre-eminently domestic. Great respect is paid to old age; when parents are no longer capable of labour they are supported by their children, and scarcely any one is allowed to become a burden to the public. They have also in general a very tender regard for their offspring, and are generous and kind to their relations. They are hospitable to people of their own caste, but to no others. The use of opium is very general.

Hill Tribes.—The hill and frontier tribes of Assam include the Nagas, Singphos, Daphlas, Miris, Khamtis, Mishmis, Abors, &c., nearly all of whom, excepting the Nagas, are found near the frontiers of Lakhimpur district. The principal of these, in point of numbers, are the Nagas, who inhabit the hills and forests along the eastern and south-eastern frontier of Assam. They reside partly in the British district of the Naga hills and partly in independent territory under the political control of the deputy-commissioner of the adjoining districts. They cultivate rice, cotton, yams and Indian corn, and prepare salt from the brine springs in their hills. The different tribes of Nagas are independent of and unconnected with one another, and are often at war with each other. The Singphos are another of the main

population of the same race, who occupy in force the hilly country between the Patkai and Chindwin rivers, and are nominally subject to Burma. The Akas, Daphlas, Miris, Abors, Mishmis and Khamtis are described under separate headings. Under regulation V. of 1873, an inner line has been laid down in certain districts, up to which the protection of British authority is guaranteed, and beyond which, except by special permission, it is not lawful for British subjects to go. This inner line has been laid down in Darrang towards the Bhutias, Akas and Daphlas; in Lakhimper towards the Daphlas, Miris, Abors, Mishmis, Khamtis, Singphos and Nagas; and in Sibsagar towards the Nagas. The inner line formerly maintained along the Lushai border has since 1895 been allowed to fall into desuetude, but Lushais visiting Cachar are required to take out passes from the superintendent of the Lushai hills. The line is marked at intervals by frontier posts held by military police and commanding the roads of access to the tract beyond; and any person from the plains who has received permission to cross the line has to present his pass at these posts.

History.—Assam was the province of Bengal which remained most stubbornly outside the limits of the Mogul empire and of the Mahommedan polity in India. Indeed, although frequently overrun by Mussulman armies, and its western districts annexed to the Mahommedan vice-royalty of Bengal, the province maintained an uncertain independence till its invasion by the Burmese towards the end of the 18th century, and its final cession to the British in 1826. It seems to have been originally included, along with the greater part of north-eastern Bengal, in the old Hindu territory of Kamrup. Its early legends point to great religious revolutions between the rival rites of Krishna and Siva as a source of dynastic changes. Its roll of kings extends deep into prehistoric times, but the first rajah capable of indentification flourished about the year 76 A.D. Kamrup, the Pragjotishpur of the ancient Hindus, was the capital of a legendary king Narak, whose son Bhagadatta distinguished himself in the great war of the *Mahābhārata*.

When Hsüan Tsang visited the country in A.D. 640, a prince named Kumar Bhaskara Barman was on the throne. The people are described as being of small stature with dark yellow complexions; they were fierce in appearance, but upright and studious. Hinduism was the state religion, and the number of Buddhists was very small. The soil was deep and fertile, and the towns were surrounded by moats with water brought from rivers or banked-up lakes. Subsequently we read of Pal rulers in Assam. It is supposed that these kings were Buddhist and belonged to the Pal dynasty of Bengal. Although the whole of Kamrup appears from time to time to have been united into one kingdom under some unusually powerful monarch, it was more often split up into numerous petty states; and for several centuries the Koch, the Ahom and the Chutia powers contested for the Assam valley. In the early part of the 13th century the Ahoms or Ahams, from northern Burma and the Chinese frontiers, poured into the eastern districts of Assam, founded a kingdom, and held it firmly for several centuries. The Ahoms were Shans from the ancient Shan kingdom of Pong. Their manners, customs, religion and language were, and for a long time continued to be, different from those of the Hindus; but they found themselves compelled to respect the superior civilization of this race, and slowly adopted its customs and language. The conversion of their king Chuchengpha to Hinduism took place in the year A.D. 1655, and all the Ahoms of Assam gradually followed his example. In medieval history, the Assamese were known to the Mussulman population as a warlike, predatory race, who sailed down the Brahmaputra in fleets of innumerable canoes, plundered the rich districts of the delta, and retired in safety to their forests and swamps. As the Mahommedan power consolidated itself in Bengal, repeated expeditions were sent out against these river pirates of the north-east. The physical difficulties which an invading force had to contend with in Assam, however, prevented anything like a regular subjugation of the country; and after repeated efforts, the Mussulmans contented themselves with occupying the western districts at the mouth of the Assam valley. The following details will suffice for the history of a struggle in which no great political object was attained, and which left the Assamese still the same wild and piratical people as when their fleets of canoes first sallied forth against the Bengal delta. In 1638, during the reign of the emperor Shah Jahan, the Assamese descended the Brahmaputra, and pillaged the country round the city of Dacca; they were expelled by the governor of Bengal, who retaliated upon the plunderers by ravaging Assam. During the civil wars between the sons of Shah Jahan, the king of Assam renewed his predatory incursions into Bengal; upon the termination of the contest, Aurangzeb determined to avenge these repeated insults, and despatched a considerable force for the regular invasion of the Assamese territory (1660-1662). His general, Mir Jumla, defeated the rajah, who fled to the mountains, and most of the chiefs made their submission to the conqueror. But the rains set in with unusual violence, and Mir Jumla's army was almost annihilated by famine and sickness. Thus terminated the last expedition against Assam by the Mahommedans, whose fortunes in this country were never prosperous. A writer of the Mahommedan faith says:—"Whenever an invading army has entered their territories, the Assamese have sheltered themselves in strong posts, and have distressed the enemy by stratagems, surprises and alarms, and by cutting off their provisions. If these means failed, they have declined a battle in the field, but have carried the peasants into the mountains, burned the grain and left the country desert. But when the rainy season has set in upon the advancing enemy, they have watched their opportunity to make excursions and vent their rage; the famished invaders have either become their prisoners or been put to death. In this manner powerful and numerous armies have been sunk in that whirlpool of destruction, and not a soul has escaped." The same writer states that the country was spacious, populous and hard to be penetrated; that it abounded in dangers; that the paths and roads were beset with difficulties; and that the obstacles to conquest were more than could be expressed. The inhabitants, he says, were enterprising, well-armed and always prepared for battle. Moreover, they had lofty forts, numerously garrisoned and plentifully provided with warlike stores; and the approach to them was opposed by thick and dangerous jungles, and broad and boisterous rivers. The difficulties in the way of successful invasion are of course not understated, as it was the object of the writer to exalt the prowess and perseverance of the faithful. He accounts for their temporary success by recording that "the Mussulman hordes experienced the comfort of fighting for their religion, and the blessings of it reverted to the sovereignty of his just and pious majesty." The short-lived triumph of the Mussulmans might, however, have warranted a less ambitious tone. About the middle of the 17th century the chief became a convert to Hinduism. By what mode the conversion was effected does not clearly appear, but whatever were the means employed, it seems that the decline of the country commenced about the same period. Internal dissensions, invasion and disturbances of every kind convulsed the province, and neither prince nor people enjoyed security. Late in the 18th century some interference took place on the part of the British government, then conducted by Lord Cornwallis; but the successor of that nobleman, Sir John Shore, adopting the non-intervention policy, withdrew the British force, and abandoned the country to its fate. Its condition encouraged the Burmese to depose the rajah, and to make Assam a dependency of Ava. The extension of their encroachments on a portion of the territory of the East India Company compelled the British government to take decisive steps for its own protection. Hence arose the series of hostilities with Ava known in Indian history as the first Burmese War, on the termination of which by treaty in February 1826, Assam remained a British possession. In 1832 that portion of the province denominated Upper Assam was formed into an independent native state, and conferred upon Purandhar Singh, the ex-rajah of the country; but the administration of this chief proved unsatisfactory, and in 1838 his principality was reunited with the British dominions. After a period of successful administration and internal development, under the lieutenant-governor of Bengal, it was erected into a separate chief-commissionership in 1874.

In 1886 the eastern Dwars were annexed from Bhutan; and in 1874 the district of Goalpara, the eastern Dwars and the Garo hills were incorporated in Assam. In 1898 the southern Lushai hills were transferred from Bengal to Assam, and the north and south Lushai hills were amalgamated as a district of Assam, and placed under the superintendent of the Lushai hills. Frontier troubles occasionally occur with the Akas, Daphlas, Abors and Mishmis along the northern border, arising out of raids from the independent territory into British districts. In October 1905 the whole province of Assam was incorporated in the new province of Eastern Bengal and Assam.

See E.A. Gait, *The History of Assam* (1906).

ASSAMESE, the Indo-Aryan language spoken in the Assam valley. In 1901 the number of its speakers was 1,350,846. It is closely related to Bengali and Oriya, forming with them and with Bihari the Eastern Group of the Indo-Aryan vernaculars. For further particulars see Bengali.

ASSAROTTI, OTTAVIO GIOVANNI BATTISTA (1753-1829), the founder of schools for the education of deaf-mutes in Italy, was born at Genoa in 1753. After qualifying himself for the church, he entered the society of the Pietists, "Scuole Pie," who devoted themselves to the training of the young. His superior learning caused him to be appointed to lecture on theology to the students of the order. In 1801 he heard of the Abbé Sicard's training of deaf-mutes in Paris, and resolved to try something similar in Italy. He began with one pupil, and had by degrees collected a small number round him, when, in 1805, Napoleon, hearing of his endeavours, ordered a convent to be given

him for a school-house, and funds for supporting twelve scholars to be taken from the convent revenues. This order was scarcely attended to till 1811, when it was renewed, and in the following year Assarotti, with a considerable number of pupils, took possession of the new school. Here he continued, with the exception of a short interval in 1814, till his death in 1829. A pension, which had been awarded him by the king of Sardinia, he bequeathed to his scholars.

ASSARY, or Assarion, a Roman copper coin, the "farthing" of Matthew x. 29.

ASSASSIN (properly *Hashīshīn*, from *Hashish*, the opiate made from the juice of hemp leaves), a general term for a secret murderer, originally the name of a branch of the Shiite sect (see Shiites), known as Isma'ílites, founded by Ḥassan (ibn) Ṣabbāḥ at the end of the 11th century, and from that time active in Syria and Persia until crushed in the 13th century by the Mongols under Hulaku (Hulagu) in Persia, and by the Mameluke Bibars in Syria. The father of Ḥassan Ṣabbāḥ, a native of Khorasan, and a Shiite, had been frequently compelled to profess Sunnite orthodoxy, and from prudential motives had sent his son to study under an orthodox doctor at Nishapur. Here Ḥassan made the acquaintance of Nizām-ul-Mulk, afterwards vizier of the sultan Malik-Shah (see Seljuks). During the reign of Alp-Arslan he remained in obscurity, and then appeared at the court of Malik-Shah, where he was at first kindly received by his old friend the vizier. Ḥassan, who was a man of great ability, tried to supplant him in the favour of the sultan, but was outwitted and compelled to take his departure from Persia. He went to Egypt (1078-79), and, on account of his high reputation, was received with great honour by the lodge at Cairo. He soon stood so high in the caliph Mostanṣir's favour as to excite against him the jealousy of the chief general, and a cause of open enmity soon arose. The caliph had nominated first one and then another of his sons as his successor, and in consequence a party division took place among the leading men. Ḥassan, who adopted the cause of Nizār, the eldest son, found his enemies too strong for him, and was forced to leave Egypt. After many adventures he reached Aleppo and Damascus, and after a sojourn there, settled near Kuhistan (Kohistan). He gradually spread his peculiar modification of Isma'ílite doctrine, and, having collected a considerable number of followers, formed them into a secret society. In 1090 he obtained, by stratagem, the strong mountain fortress of Alamūt in Persia, and, removing there with his followers, settled as chief of the famous society afterwards called the Assassins.

The speculative principles of this body were identical with those of the Isma'ílites, but their external policy was marked by one peculiar and distinctive feature—the employment of secret "assassination" against all enemies. This practice was introduced by Ḥassan, and formed the essential characteristic of the sect. In organization they closely resembled the western lodge at Cairo. At the head was the supreme ruler, the *Sheik-al-Jabal* (*Jebel*), *i.e.* Chief, or, as it is commonly translated, Old Man of the Mountains. Under him were three *Dā'í-al-Kirbāl*, or, as they may be called, grand priors, who ruled the three provinces over which the sheik's power extended. Next came the body of *Dā'ís*, or priors, who were fully initiated into all the secret doctrines, and were the emissaries of the faith. Fourth were the *Refīqs*, associates or fellows, who were in process of initiation, and who ultimately advanced to the dignity of *dā'ís*. Fifth came the most distinctive class, the *Fedais* (*i.e.* the devoted ones), who were the guards or assassins proper. These were all young men, and from their ranks were selected the agents for any deed of blood. They were kept uninitiated, and the blindest obedience was exacted from and yielded by them. When the sheik required the services of any of them, the selected *fedais* were intoxicated with the *hashīsh*. When in this state they were introduced into the splendid gardens of the sheik, and surrounded with every sensual pleasure. Such a foretaste of paradise, only to be granted by their supreme ruler, made them eager to obey his slightest command; their lives they counted as nothing, and would resign them at a word from him. Finally, the sixth and seventh orders were the *Lāsiqs*, or novices, and the common people. Hassan well knew the efficacy of established law and custom in securing the obedience of a mass of people; accordingly, upon all but the initiated, the observances of Islam were rigidly enforced. As for the initiated, they knew the worthlessness of positive religion and morality; they believed in nothing, and scoffed at the practices of the faithful.

The Assassins soon began to make their power felt. One of their first victims was Hassan's former friend, Nizam-ul-Mulk, whose son also died under the dagger of a secret murderer. The death by poison of the sultan Malik-Shah was likewise ascribed to this dreaded society, and contributed to increase their evil fame. Sultan Sinjar, his successor, made war upon them, but he was soon glad to come to terms with enemies against whose operations no precaution seemed available. After a long and prosperous rule Hassan died at an advanced age in 1124. He had previously slain both his sons, one on suspicion of having been concerned in the murder of a *dā'í* at Kuhistan, the other for drinking wine, and he was therefore compelled to name as his successor his chief *dā'í*, Kia-Busurg-Omid.

During the fourteen years' reign of this second leader, the Assassins were frequently unfortunate in the open field, and their castles were taken and plundered; but they acquired a stronghold in Syria, while their numerous murders made them an object of dread to the neighbouring princes, and spread abroad their evil renown. A long series of distinguished men perished under the daggers of the *fedais*; even the most sacred dignity was not spared. The caliph Mostarshid was assassinated in his tent, and not long after, the caliph Rashid suffered a similar fate. Busurg-Omid was succeeded by his son Mahommed I., who, during the long period of twenty-five years, ruthlessly carried out his predecessor's principles. In his time Massiat became the chief seat of the Syrian branch of the society. Mahommed's abilities were not great, and the affections of the people were drawn towards his son Hassan, a youth of great learning, skilled in all the wisdom of the initiated, and popularly believed to be the promised Imam become visible on earth. The old sheik prevented any attempt at insurrection by slaying 250 of Hassan's adherents, and the son was glad to make submission. When, however, he attained the throne, he began to put his views into effect. On the 17th of the month Ramadan, 1164, he assembled the people and disclosed to them the secret doctrines of the initiated; he announced that the doctrines of Islam were now abolished, that the people might give themselves up to feasting and joy. Soon after, he announced that he was the promised Imam, the caliph of God upon earth. To substantiate these claims he gave out that he was not the son of Mahommed, but was descended from Nizār, son of the Egyptian caliph Mostansir, and a lineal descendant of Isma'íl. After a short reign of four years Hassan was assassinated by his brother-in-law, and his son Mahommed II. succeeded. One of his first acts was to slay his father's murderer, with all his family and relatives; and his long rule, extending over a period of forty-six years, was marked by many similar deeds of cruelty. He had to contend with many powerful enemies, especially with the great Atabeg sultan Nureddin, and his more celebrated successor, Saladin, who had gained possession of Egypt after the death of the last Fatimite caliph, and against whom even secret assassination seemed powerless. During his reign, also, the Syrian branch of the society, under their *dā'í*, Sinan, made themselves independent, and remained so ever afterwards. It was with this Syrian branch that the Crusaders made acquaintance; and it appears to have been their emissaries who slew Count Raymund of Tripoli and Conrad of Montferrat.

Mahommed II. died from the effects of poison, administered, it is believed, by his son, Jelaleddin Hassan III., who succeeded. He restored the old form of doctrine—secret principles for the initiated, and Islam for the people—and his general piety and orthodoxy procured for him the name of the new Mussulman. During his reign of twelve years no assassinations occurred, and he obtained a high reputation among the neighbouring princes. Like his father, he was removed by poison, and his son, 'Ala-ed-dīn Mahommed III., a child of nine years of age, weak in mind and body, was placed on the throne. Under his rule the mild principles of his father were deserted, and a fresh course of assassination entered on. In 1255, after a reign of thirty years, 'Ala-ed-dīn was slain, with the connivance of his son, Rukneddin, the last ruler of the Assassins. In the following year Hulaku (Hulagu), brother of the Tatar, Mangu Khan, invaded the hill country of Persia, took Alamūt and many other castles, and captured Rukneddīn (see Mongols). He treated him kindly, and, at his own request, sent him under escort to Mangu. On the way, Rukneddīn treacherously incited the inhabitants of Kirdkuh to resist the Tatars. This breach of good faith was severely punished by the khan, who ordered Rukneddīn to be put to death, and sent a messenger to Hulaku (Hulagu) commanding him to slay all his captives. About 12,000 of the Assassins were massacred, and their power in Persia was completely broken. The Syrian branch flourished for some years longer, till Bibars, the Mameluke sultan of Egypt, ravaged their country and nearly extirpated them. Small bodies of them lingered about the mountains of Syria, and are believed still to exist there. Doctrines somewhat similar to theirs are still to be met with in north Syria.

See J. von Hammer, *Geschichte der Assassinen* (1818); S. de Sacy, *Mémoires de l'Institut*, iv. (1818), who discusses the etymology fully; *Calcutta Review*, vols. lv., lvi.; A. Jourdain in Michaud's *Histoire des Croisades*, ii. pp. 465-484, and trans. of the Persian historian Mirkhond in *Notices et extraits des manuscrits*, xiii. pp. 143 sq.; cf. R. Dozy, *Essai sur l'histoire de l'Islamisme* (Leiden and Paris, 1879);

(G. W. T.)

ASSAULT (from Lat. *ad*, to or on, and *saltare*, to leap), in English law, “an attempt or offer with force or violence to do corporal hurt to another, as by striking at another with a stick or other weapon, or without a weapon, though the party misses his aim.” Notwithstanding ancient opinions to the contrary, it is now settled that mere words, be they ever so provoking, will not constitute an assault. Coupled with the attempt or threat to inflict corporal injury, there must in all cases be the means of carrying the threat into effect. A *battery* is more than a threat or attempt to injure the person of another; the injury must have been inflicted, but it makes no difference however small it may be, as the law does not “draw the line between degrees of violence,” but “totally prohibits the first and lowest stage of it.” Every battery includes an assault. A common assault is a misdemeanour, and is punishable by imprisonment with or without hard labour to the extent of one year, and if it occasions bodily harm, with penal servitude for three years, or imprisonment to the extent of two years, with or without hard labour. There are various different kinds of assaults which are provided against by particular enactments of parliament, such as the Offences against the Person Act 1861, the Prevention of Crimes Act 1871, &c.; and there are also certain aggravated assaults for which the punishment is severer than for common assault, as an assault with intent to murder, with intent to commit a rape, &c. In certain cases an assault and battery is sometimes justifiable, as in the case where a person in authority, as a parent or schoolmaster, inflicts moderate punishment upon a child, or in certain cases of self-defence, or in defence of one’s goods and chattels. An assault may be both a tort and a crime, giving a civil action for damages to the person injured, as well as being the subject of a criminal prosecution.

United States.—The general principles applicable throughout the United States are the same as in England. Riding a horse threateningly near a person; or riding a bicycle against another (*Mercer* v. *Corbin*, 117 Indiana Rep. 450); waking one from sleep to present a milk bill (*Richmond* v. *Fiske*, 160 Mass. 34), are assaults. A minor is liable for damages for an assault (*Hildreth* v. *Hancock*, 156 Illinois Rep. 618). In Texas it has been held that an assault with a knife is not necessarily an aggravated assault (*Warren* v. *State*, 3 S.W. 776 240), and an axe is not necessarily a “deadly weapon” with which to assault (*Gladney* v. *State*, 12 S.W. 868), and the State must prove that it would be likely to produce death or serious bodily injury (*Melton* v. *State*, 17 S.W. 257). Neither a pistol nor brass knuckles are necessarily deadly weapons; the State must show their size or manner of use in making the assault (*Ballard* v. *State*, 13 S.W. 674; *Miles* v. *State*, 5 S.W. 250). But in 1903 a pistol was held by the Texas Supreme Court to be a deadly weapon if not used simply as a club (*Lockland* v. *State*, 73 S.W. 1054), and the same court held in 1904 that a pistol is a deadly weapon (*Pace* v. *State*, 79 S.W. 531), and so the assault was an aggravated assault. In North Carolina it has been held that an axe is *ex vi termini* a “deadly weapon” (*State* v. *Shields*, 110 N.C. 49).

ASSAYE, a village of Hyderabad or the Nizam’s Dominions, in southern India, just beyond the Berar frontier. The place is celebrated as the site of a battle fought on the 23rd of September 1803 between the combined Mahratta forces Under Sindhia and the rajah of Berar and the British under Major-General Wellesley, afterwards the duke of Wellington. The Mahratta force consisted of 50,000 men, supported by 100 pieces of cannon served by French artillerymen, and entrenched in a strong position. Against this the English had but a force of 4500 men, which, however, after a severe struggle, gained the most complete victory that ever crowned British valour in India. Of the enemy 12,000 were killed and wounded; and General Wellesley lost 1657—one-third of his little force—killed and wounded. Assaye is 261 m. north-west of Hyderabad.

ASSAYING. To “assay” (or “essay”; Fr. *essayer*) is in general to try, or attempt, so to make trial or test. In a restricted sense the term assaying is applied in metallurgy to the determination of the amount of gold or silver in ores or alloys; in this article, however, it will be used in a wider technical signification, and will include a description of the methods for the quantitative determination of those elements in ores which affect their value in metallurgical operations. It would be impossible to give in detail here all the precautions necessary for the successful use of the methods, and the descriptions will therefore be confined to the principles involved and the general manner in which they are applied to secure the desired results.

Gold and Silver.—Ores containing gold or silver are almost invariably assayed in the dry way; that is, by fusion with appropriate fluxes and ultimate separation of the elements in the metallic form. One of the customs which has grown out of our peculiar system of weights is the form of statement of the results of such an assay. Instead of expressing the amounts of gold and silver in percentages of the weight of ore, they are expressed in ounces to the ton, the ounce being the troy ounce and the ton that of 2000 avoirdupois pounds. To simplify calculation and to enable the assayer to use the metric system of weights employed in all chemical calculations, the “assay ton” (“A.T.” = 29.166 grammes) has been devised, which bears the same relation to the ton of 2000 lb avoirdupois that one milligram does to the troy ounce; when one assay ton of ore is used, each milligram of gold or silver found represents one ounce to the ton.

The assay of an ore for gold or silver consists of two operations. In the first the gold or silver is made to combine or alloy with metallic lead, the other constituents of the ore being separated from the lead as slag. In the second, the lead button containing the gold or silver is cupelled and the resulting gold or silver button is weighed. The first is conducted in one of two ways, known respectively as the crucible method and the scorification method. The crucible method is generally used for ores containing gold in small amounts and for certain classes of silver ores. The amount of ore taken for assay is generally one-half “A.T.,” but in very low-grade ores one, two, and sometimes even four “A.T.s” are used. In the scorification method one-tenth of an “A.T.” is the amount commonly taken. While in both methods the same result is sought, the means employed are quite different. In the scorification method the ore is mixed in the scorifier (a shallow dish of burned clay) with from ten to twenty times its weight of granulated metallic lead (test lead) and a little borax glass, and heated in a muffle, the front of which is at first closed. When the lead melts and begins to oxidize, the lead oxide, or so-called litharge, combines with or dissolves the non-metallic and readily oxidizable constituents of the ore, while the gold and silver alloy with the lead. As the slag thus formed flows off to the sides of the scorifier, the assay clears and the melted metallic lead forms an “eye” in the middle. The door of the muffle is then opened and the current of air which is drawn over the scorifier rapidly oxidizes the lead, while the melted litharge gradually closes over the metal. When the “eye” has quite disappeared the door is closed and the temperature raised to make the slag very liquid. The scorifier is taken from the muffle in a pair of tongs and the contents poured into a mould, the lead forming a button in the bottom while the slag floats on top. When cold, the contents of the mould are taken out and the lead button hammered into the form of a cube, the slag, which is glassy and brittle, separating readily from the metal, which is then ready for cupellation. In the crucible method the ore is mixed with from once to twice its weight of flux, which varies in composition, but of which the following may be taken as a type:—

Sodium bicarbonate	8 parts.
Potassium carbonate	3 ”
Powdered borax	4 ”
Flour	1 ”
Litharge	9 ”

The mixture is charged into a round clay crucible from 100 mm. to 125 mm. high, and heated either in a muffle or in a crucible furnace at a gradually increasing heat for forty or fifty minutes. At the expiration of this time, when the charge should be perfectly liquid and in a tranquil state of fusion, the crucible is removed from the furnace and the contents are poured into a mould. The resulting lead button hammered into shape and carefully cleansed from slag is ready for the cupel. If the button is too large for cupellation, or if it is hard, it may be scorified either alone or mixed with test lead before cupellation. The character and amount of the flux necessarily depend upon

the character of the ore, the object being to concentrate in the lead button all the gold and silver while dissolving and carrying off in the slag the other constituents of the ore. Under the most favourable conditions there is a slight loss of gold and silver in the fusion, the scorification and the cupellation, both by absorption in the slag and by actual volatilization and absorption in the cupel. In ores containing much copper, this metal is largely concentrated in the lead button, making it hard, and necessitating repeated scorifications and, in some cases, a preliminary removal of the copper by solution of the ore in nitric acid. This leaves the gold in the insoluble residue, which is filtered off, and the silver in the solution is thrown down by hydrochloric acid. The resulting precipitate of silver chloride is filtered, and the residue and the precipitate are scorified together. Ores containing much arsenic or sulphur are generally roasted at a low heat and the assay is made on the roasted material.

The process of cupellation is briefly as follows:—The gold alloy is fused with a quantity of lead, and a little silver if silver is already present. The resulting alloy, which is called the *lead button*, is then submitted to fusion on a very porous support, made of bone-ash, and called a *cupel*. The fusion being effected in a current of air, the lead oxidizes. The heat is sufficient to keep the resulting lead oxide fused, and the porous cupel has the property of absorbing melted lead oxide without taking up any of the metallic globule, exactly in the same way that blotting-paper will absorb water whilst it will not touch a globule of mercury. The heat being continued, and the current of air always passing over the surface of the melted lead button, and the lead oxide being sucked up by the cupel as fast as it is formed, the metallic globule rapidly diminishes in size until at last all the lead has been got rid of. Now, if this were the only action, little good would have been gained, for we should simply have put lead into the gold alloy, and then taken it out again; but another action goes on whilst the lead is oxidizing in the current of air. Other metals, except the silver and gold, also oxidize, and are carried by the melted litharge 777
into the cupel. If the lead is therefore rightly proportioned to the standard of alloy, the resulting button will consist of only gold and silver, and these are separated by the operation of *parting*, which consists in boiling the alloy (after rolling it to a thin plate) in strong nitric acid, which dissolves the silver and leaves the gold as a coherent sponge. To effect this parting properly, the proportion of silver to gold should be as 3 to 1. The operation by which the alloy is brought to this standard is termed *quartation* or *inquartation*, and consists in fusing the alloy in a cupel with lead and the quantity of fine silver or fine gold necessary to bring it to the desired composition.

Lead.—The "dry" or fire assay for lead is largely used for the valuation of lead ores, although it is being gradually replaced by volumetric methods. One part of the ore is mixed with from three to five parts of a flux of the following composition:—

Potassium carbonate	40.6%
Sodium bicarbonate	31.3%
Borax	15.6%
Flour	12.5%

The mixture is charged into a clay crucible and heated for twenty minutes at a good red heat. When the mixture has been in a tranquil state of fusion for a few minutes it is poured into a mould. When cold, the button is hammered, cleaned carefully from slag, and weighed. The proportion is calculated from the amount of ore used, and the result is expressed in parts in a hundred or percentage of the ore. Various impurities, such as copper, antimony and sulphur, go into the lead button, so that the result is generally too high. The most accurate method for the determination of lead in ores is the gravimetric method, in which it is weighed as lead sulphate after the various impurities have been separated. Nearly all lead ores contain more or less sulphur; and as in the process of solution in nitric acid this is oxidized to sulphuric acid which unites with the lead to form the very insoluble lead sulphate, it is simpler to add sulphuric acid to convert all the lead into sulphate and then evaporate until the nitric acid is expelled. The salts of iron, copper, &c., are then dissolved in water and filtered from the insoluble silica, lead sulphate, and calcium sulphate, which are washed with dilute sulphuric acid. The insoluble matter is treated with a hot solution of alkaline ammonium acetate, which dissolves the lead sulphate, the other materials being separated by filtration. The lead sulphate, re-precipitated in the filtrate by an excess of sulphuric acid and alcohol, is then filtered on an asbestos felt in a Gooch crucible, washed with dilute sulphuric acid and alcohol, ignited, and weighed. Lead sulphate contains 68.30% of metallic lead.

There are several volumetric methods for assaying lead ores, but the best known is that based on the precipitation of lead by ammonium molybdate in an acetic acid solution. The lead sulphate, obtained as described above and dissolved in ammonium acetate, is acidulated with acetic acid diluted with hot water and heated to boiling-point. A standardized solution of ammonium molybdate is then added from a burette. As long as the solution contains lead, the addition of the molybdate solution causes a precipitation of white lead molybdate. An excess of the precipitant is shown by a drop of the solution imparting a yellow colour to a solution of tannin, prepared by dissolving one part of tannin in 300 of water; drops of this solution are placed on a white porcelain plate, and as the precipitant is added to the lead solution a drop of the latter is removed from time to time on a glass stirring-rod and added to one of the drops on the porcelain plate. The appearance of a yellow colour shows that all the lead has been precipitated and that the solution contains an excess of molybdate. From the reading of the burette the lead is calculated. The molybdate solution should be of such a strength that 1 cc. will precipitate 0.01 gramme of lead. It is standardized by dissolving a weighed amount of lead sulphate in ammonium acetate and proceeding as described above.

Zinc.—Chemically the ores of zinc consist of the silicates, carbonates, oxides, and sulphides of zinc associated with other metals, some of which complicate the methods of assay. The most modern and the most generally accepted method is volumetric, and is based on the reaction between zinc chloride and potassium ferrocyanide, by which insoluble zinc ferrocyanide and soluble potassium chloride are formed; the presence of the slightest excess of potassium ferrocyanide is shown by a brownish tint being imparted by the solution to a drop of uranium nitrate. The ore (0.5 gramme) is digested with a mixture of potassium nitrate and nitric acid. A saturated solution of potassium chlorate in strong nitric acid is added, and the mass evaporated to dryness. It is then heated with a mixture of ammonium chloride and ammonia, filtered and washed with a hot dilute solution of the same mixture. The filtrate diluted to 200 cc. is carefully neutralized with hydrochloric acid, and excess of 6 cc. of the strong acid is added, and the solution saturated with hydrogen sulphide, which precipitates the copper and cadmium, metals which would otherwise interfere. Without filtering, the standard solution is added from a burette, and from time to time a drop of the solution is removed on the glass stirring-rod and added to a drop or two of a strong solution of uranium nitrate, previously placed on a white porcelain plate. The appearance of a brown tint in one of these tests shows the end of the reaction. When cadmium is not present the copper may be precipitated by boiling the acidulated ammoniacal solution with test lead and titrating, as before described, without removing the lead and copper from the solution. The ferrocyanide solution is standardized by dissolving 1 gramme of pure zinc in 6 cc. of hydrochloric acid, adding ammonium chloride, and titrating as before. This method is modified in practice by the character of the ores, carbonates and silicates free from sulphides being decomposed by hydrochloric acid, with the addition of a little nitric acid.

Copper.—The fire assay for copper ores was abandoned years ago and the electrolytic method took its place; this in turn is now largely replaced by volumetric methods. In the electrolytic method from 0.5 to 5 grammes of ore are treated in a flask or beaker, with a mixture of 10 cc. of nitric and 10 cc. of sulphuric acid, until thoroughly decomposed. When this liquid is cold it is diluted with cold water, heated until all the soluble salts are dissolved, transferred to a tall, narrow beaker, and diluted to about 150 cc. The electrodes are attached to a frame connected with the battery and the beaker is placed on a stool, which can be raised so that the electrodes are immersed in the liquid and reach the bottom of the beaker. The electrodes consist of two cylinders of platinum (placed one inside the other) about 75 mm. high, the smaller of the two 37 mm. and the larger 50 mm. in diameter, both pierced with 10 to 12 holes 5 mm. in diameter, evenly distributed over the surfaces to facilitate diffusion of the liquids. The surfaces of the cylinders are roughened with a sand blast to increase the areas and make the deposited metals adhere more firmly. Each cylinder has a platinum wire fused to the upper circumference to connect with a clamp from which a wire leads to the proper pole of the battery. The smaller cylinder is generally the negative electrode on which the copper is deposited. The framework carrying the clamps is arranged so that a number of determinations may be made at one time, the wires from the clamps running from a rheostat, so arranged that currents of any strength may be used simultaneously. The cylinder, having been carefully weighed, is placed in position, the beaker containing the solution is adjusted, and the current passed until all the copper is precipitated. This generally requires from two to twelve hours. The cylinders are then removed from the solution and washed with distilled water, the one holding the deposited copper being washed with alcohol, dried and weighed; the increase in weight represents the copper contents of the ore. The deposited copper should be firmly adherent and bright rosy red in colour. Silver, arsenic and cadmium, if present, are precipitated with the copper and affect the accuracy of the results; they should be removed by special methods.

Volumetric methods are more expeditious and require less apparatus. The potassium cyanide method is based on the fact that, when potassium cyanide is added to an ammoniacal solution of a salt of copper, the insoluble copper cyanide is formed, the end of the reaction 778
being indicated by the disappearance of the blue colour of the solution. One gramme of the ore is treated in a flask with a mixture of nitric and sulphuric acids and evaporated until all the nitric acid is expelled. After cooling a little, water is added, and then a few grammes of aluminium foil free from copper. On this foil the copper in the solution is all precipitated by electrolytic action in a few minutes, and the aluminium is dissolved by the addition of an excess of sulphuric acid. Water is added, and as soon as the gangue and

copper particles have settled the clear solution is decanted, and the residue washed several times in the same way. The copper is then dissolved in 5 cc. of nitric acid; if silver is present a drop or two of hydrochloric acid is added, the solution diluted to about 50 cc., and filtered. To the filtrate (or, if no silver is present, to the diluted nitric acid solution) 10 cc. of ammonia are added, and a standard solution of potassium cyanide is run in from a burette until the blue colour has nearly disappeared. The solution is filtered to get rid of the precipitate, and the titration is finished in the nearly clear nitrate, which should be always about 200 cc. in volume. The titration is complete when the blue colour is so faint that it is almost imperceptible after the flask has been vigorously shaken. The potassium cyanide solution is standardized by dissolving 0.5 gramme of pure copper in 5 cc. of nitric acid, diluting, adding 10 cc. of ammonia, and titrating exactly as described above.

When potassium iodide is added to a solution of cupric acetate, the reaction $Cu(C_2H_3O_2)_2 + 2KI = CuI + 2K(C_2H_3O_2) + I$ takes place; that is, for each atom of copper one atom of iodine is liberated. If a solution of sodium thiosulphate (hyposulphite) is added to this solution, hydriodic acid, sodium iodide and tetrathionate are formed; and if a little starch solution has been added, the end of the reaction is indicated by the disappearance of the blue colour, due to the iodide of starch. The amount of iodine liberated is therefore a measure of the copper in the solution, and when the sodium thiosulphate has been carefully standardized the method is extremely accurate. The ore is treated as described in the cyanide method until the copper precipitated by the aluminium foil has been washed and dissolved in 5 cc. of nitric acid; then 0.25 gramme of potassium chlorate is added, and the solution boiled nearly dry to oxidize any arsenic present to arsenic acid. The solution is cooled, 50 cc. water added, then 5 cc. ammonia, and the solution is boiled for five minutes. Next 5 cc. of glacial acetic acid are added, the solution cooled, and 5 cc. of a solution of potassium iodide (300 grammes to the litre) and the standard solution of sodium thiosulphate run in from a burette until the brown colour has nearly disappeared. A few drops of starch solution are then added, and when the blue colour has nearly vanished a drop or two of methyl orange makes the end reaction very sharp. The thiosulphate solution is standardized by dissolving 0.3 to 0.5 gramme of pure copper in 3 cc. of nitric acid, adding 50 cc. of water and 5 cc. of ammonia, and titrating as above after the addition of 5 cc. of glacial acetic acid and 5 cc. of the potassium iodide solution.

Iron.—The methods used in the assay for iron are volumetric, and are all based on the property possessed by certain reagents of oxidizing iron from the ferrous to the ferric state. Two salts are in common use for this purpose, potassium permanganate and potassium bichromate. It is necessary in the first place, after the ore is in solution, to reduce all the iron to the ferrous condition; then the carefully standardized solution of the oxidizing reagent is added until all the iron is in the ferric state, the volume of the standard solution used being the measure of the iron contained in the ore. The end of the reaction when potassium permanganate is employed is known by the change in colour of the solution. As the solution of potassium permanganate, which is deep red in colour, is dropped into the colourless iron solution, it is quickly decolorized while the iron solution gradually assumes a yellowish tinge, the first drop of the permanganate solution in excess giving it a pink tint. With potassium bichromate solution, which is yellow, the iron solution becomes green from the chromium chloride or sulphate formed, and the end of the reaction is determined by removing a drop of the solution on the stirring-rod and adding it to a drop of a dilute solution of potassium ferricyanide on a white tile. So long as the solution contains a ferrous salt, the drop on the tile changes to blue; hence the absence of a blue coloration indicates the complete oxidation of all the ferrous salt and the end of the reaction. One gramme of ore is usually taken for assay and treated in a small flask or beaker with 10 cc. of hydrochloric acid. All the iron in the ore generally dissolves upon heating, and a white residue is left. Occasionally this residue contains a small amount of iron in a difficultly soluble form; in that case the solution is slightly diluted with water and filtered into a larger flask. The residue in the filter is ignited and fused with a little sodium carbonate and nitrate, or with sodium peroxide. The product is treated with water, filtered, and the residue dissolved in hydrochloric acid and added to the main solution. This solution, which should not exceed 50 cc. or 75 cc. in volume, contains the iron in the ferric state and is ready for reduction.

In the reduction by metallic zinc, about 3 grammes of granulated or foliated zinc are placed in the flask, which is closed with a small funnel; when the iron is reduced, add 10 cc. of sulphuric acid, and as soon as all the zinc is dissolved the solution is ready for titration. In the reduction by stannous chloride the solution of the ore in the flask is heated to boiling, and a strong solution of stannous chloride is added until the solution is completely decolorized; then 60 cc. of a solution of mercuric chloride (50 grammes to the litre) are run in and the contents of the flask poured into a dish containing 600 cc. of water and 60 cc. of a solution containing 200 grammes of manganous sulphate, 1 litre of phosphoric acid (1.3 sp. gr.), 400 cc. of sulphuric acid, and 1600 cc. of water. The solution is then ready for titration with the standard permanganate solution.

The permanganate or bichromate solution is standardized by dissolving 0.5 of a gramme of pure iron wire in a flask, in hydrochloric acid, oxidizing it with a little potassium chlorate, boiling off all traces of chlorine, deoxidizing by one of the methods described above, and titrating with the solution. As the wire always contains impurities, the absolute amount of iron in the wire must be determined and the correction made accordingly. Pure oxalic acid may also be used, which, in the presence of sulphuric acid, is oxidized by the standard solution according to the reaction:—

$$5(H_2C_2O_42H_2O) + 3H_2SO_4 + 2KMnO_4 = 10CO_2 + 2MnSO_4 + K_2SO_4 + 18H_2O$$

The reaction in case of ferrous sulphate is:—

$$10FeSO_4 + 2KMnO_4 + 8H_2SO_4 = 5Fe_2(SO_4)_3 + K_2SO_4 + 2MnSO_4 + 8H_2O;$$

that is, the same amount of potassium permanganate is required to oxidize 5 molecules of oxalic acid that is necessary to oxidize 10 molecules of iron in the form of ferrous sulphate to ferric sulphate, or 63 parts by weight of oxalic acid equal 56 parts by weight of metallic iron. Ammonium ferrous sulphate may also be used; it contains one-seventh of its weight of iron.

(A. A. B.)

ASSEGAI, or Assagai (from Berber-Arab *as-zahayah*, through Portuguese *azagaia*), a weapon for throwing or hurling, a light spear or javelin made of wood and pointed with iron, particularly the spear used by the Zulu and other Kaffir tribes of South Africa. In addition to the long-handled assegai there is a shorter weapon for use at close quarters.

ASSELIJN, HANS (1610-1660), Dutch painter, was born at Diepen, near Amsterdam. He received instruction from Esaias Vandevelde (1587-1630), and distinguished himself particularly in landscape and animal painting, though his historical works and battle pieces are also admired. He travelled much in France and Italy, and modelled his style greatly after Bamboccio (Peter Laer). He was one of the first Dutch painters who introduced a fresh and clear manner of painting landscapes in the style of Claude Lorraine, and his example was speedily followed by other artists. Asselijn's pictures were in high estimation at Amsterdam, and several of them are in the museums of that city. Twenty-four, painted in Italy, were engraved.

ASSEMANI, the name of a Syrian Maronite family of famous Orientalists.

1. Joseph Simon, a Maronite of Mount Lebanon, was born in 1687. When very young he was sent to the Maronite college in Rome, and was transferred thence to the Vatican library. In 1717 he was sent to Egypt and Syria to search for valuable MSS., and returned with about 150 very choice ones. The success of this expedition induced the pope to send him again to the East in 1735, and he returned with a still more valuable collection. On his return he was made titular archbishop of Tyre and librarian of the Vatican library. He instantly began to carry into execution most extensive plans for editing and publishing the most valuable MS. treasures of the Vatican. His two great works are the *Bibliotheca Orientalis Clementino-Vaticana rec. manuscr. codd. Syr., Arab., Pers., Turc., Hebr., Samarit., Armen.,*

Aethiop., Graec., Aegypt., Iber., et Malab., jussu et munif. Clem. XI. (Rome, 1719-1728), 9 vols. folio, and *Ephraemi Syri opera omnia quae extant, Gr., Syr., et Lat.*, 6 vols. folio (Rome, 1737-1746). Of the *Bibliotheca* the first three vols. only were completed. The work was to have been in four parts—(1) Syrian and allied MSS., orthodox, Nestorian and Jacobite; (2) Arabian MSS., Christian and Mahommedan; (3) Coptic, Aethiopic, Persian and Turkish MSS.; and (4) Syrian and Arabian MSS. not distinctively theological; only the first part was completed, but extensive preparations were made for the others. There is a German abridgment by A.F. Pfeiffer.

2. Joseph Aloysius, brother of Joseph Simon, and professor of Oriental languages at Rome. He died in 1782. Besides aiding his brother in his literary labours, he published, in 1749-1760, *Codex Liturgicus Ecclesiae Universae in xv. libris* (this is incomplete), and *Comment. de Catholicis sive Patriarchis Chaldaeorum et Nestorianorum* (Rome, 1775).

3. Stephen Evodius, nephew of Joseph Simon and Joseph Aloysius, was the chief assistant of his uncle Joseph Simon in his work in the Vatican library. He was titular archbishop of Apamea in Syria, and held several rich prebends in Italy. His literary labours were very extensive. His two most important works were a description of certain valuable MSS. in his *Bibliotheae Mediceo-Laurentianae et Palatinae codd. manuscr. Orientalium Catalogus* (Flor. 1742), fol., and his *Acta SS. Martyrum Orientalium.* He made several translations from the Syrian, and in conjunction with his uncle he began the *Bibliothecae Apostol. Vatic. codd. manusc. Catal., in tres partes distributus*. Only three vols. were published, and the fire in the Vatican library in 1768 consumed the manuscript collections which had been prepared for the continuation of the work.

4. Simon, grandnephew of Joseph Simon, was born at Tripoli in 1752, and was professor of Oriental languages in Padua. He died in 1820. He is best known by his masterly detection of the literary imposture of Vella, which claimed to be a history of the Saracens in Syria.

ASSEMBLY, UNLAWFUL, the term used in English law for an assembly of three or more persons with intent to commit a crime by force, or to carry out a common purpose (whether lawful or unlawful), in such a manner or in such circumstances as would in the opinion of firm and rational men endanger the public peace or create fear of immediate danger to the tranquillity of the neighbourhood. In the Year Book of the third year of Henry VII.'s reign assemblies were referred to as not punishable unless *in terrorem populi domini regis*. It has been suggested (Criminal Code Commission, 1879) that legislation first became necessary at a time when it was usual for those landed proprietors who were on bad terms with one another to go to market at the head of bands of armed retainers (Statute of Northampton, 1328, 2 Edw. III. c. 3). An assembly, otherwise lawful, is not made unlawful if those who take part in it know beforehand that there will probably be organized opposition to it, and that it may cause a breach of the peace (*Beatty* v. *Gillbanks*, 1882, 9 Q.B.D. 308). All persons may, and must if called upon to do so, assist in dispersing an unlawful assembly (*Redford* v. *Birley*, 1822, 1 St. Tr. n.s. 1215; *R.* v. *Pinney*, 1831, 3 St. Tr. n.s. 11). An assembly which is lawful cannot be rendered unlawful by proclamation unless the proclamation is one authorized by statute (*R.* v. *Fursey*, 1833, 3 St. Tr. n.s. 543, 567; *R.* v. *O'Connell*, 1831, 2 St. Tr. n.s. 629, 656; see also the Prevention of Crimes [Ireland] Act 1887). Meetings for training or drilling, or military movements, are unlawful assemblies unless held under lawful authority from the crown, the lord-lieutenant, or two justices of the peace (Unlawful Drilling Act 1820, s. 11).

An unlawful assembly which has made a motion towards its common purpose is termed a *rout*, and if the unlawful assembly should proceed to carry out its purpose, *e.g.* begin to demolish a particular enclosure, it becomes a riot (*q.v.*). All three offences are misdemeanours in English law, punishable by fine and imprisonment. The common law as to unlawful assembly extends to Ireland, subject to the special legislation referred to under the title Riot. The law of Scotland includes unlawful assembly under the same head as rioting.

British Dominions Abroad.—The law of the British colonies as a general rule as to unlawful assemblies follows the common law of England. The definitions in the Criminal Codes of Canada (1892, s. 79) and Queensland (1899, s. 61) are substantially the same as the common-law definition above given. Under the Indian Penal Code (s. 141) an assembly of five or more persons is designated an unlawful assembly if the common object of the persons composing that assembly is—(1) to overawe by criminal force, or show of criminal force, the legislative or executive government of India, or the government of any presidency or any lieutenant-governor, or any public servant in the exercise of the lawful power of such public servant; (2) to resist the execution of any law or of any legal process; (3) to commit any mischief or "criminal trespass" or other offence; (4) by means of criminal force or show of criminal force to any person, to take or obtain possession of any property, or to deprive any person of the enjoyment of a right of way, or of the use of water, or other corporeal right of which he is in possession or enjoyment, or to enforce any right or supposed right; or (5) by means of criminal force or show of criminal force, to compel any person to do what he is not legally bound to do, or to omit to do what he is legally entitled to do (see Mayne, *Ind. Cr. Law*, ed. 1896, p. 480). In South Africa and Mauritius the law on this subject is derived from the Roman Dutch and French law (see Riot.)

United States.—The common-law definition of unlawful assembly is accepted in the United States subject to the special legislation of the constituent states. The New York Penal Code (s. 451) declares that whenever three or more persons being assembled attempt or threaten any act tending towards a breach of the peace or injury to person or property, or any unlawful act, such assembly is unlawful (see Bishop, *Amer. Crim. Law*, 8th ed., 1892, vol. i. s. 534, vol. ii. s. 1256).

ASSEN, the capital of the province of Drente, Holland, 16 m. by rail S. of Groningen, at the junction of the two canals which run north and south to Groningen and Meppel respectively. Pop. (1900) 11,329. It is partly surrounded by a small forest belonging to the state. Assen possesses schools (a gymnasium and burgher school), a chamber of commerce, a museum of antiquities and a court-house. Peat-cutting forms a considerable industry. Many prehistoric remains found in the neighbourhood are in the museum at Leiden. Until the 19th century Assen was a small place built round the convent in which Otto II. (of Lippe), bishop of Utrecht, was murdered after being taken prisoner at Koevorden in 1237.

ASSER, or Asserius Menevensis (d. *c.* 910), English bishop, and author of a life of Alfred the Great, was a native of the western part of Wales, and was related to Nobis, bishop of St David's. He became a monk at St David's, and having acquired some reputation for learning, he was invited by King Alfred to his court. The king met the monk at Denu (probably East or West Dean, near Seaford in Sussex), but Asser did not at once accept the invitation of Alfred, and returned to Wales to consult his colleagues. He then agreed to spend six months of each year with the king and six months in his own land; but his first stay at the royal court extended to eight months, and it is probable that the annual visit to Wales was curtailed if not altogether discontinued. It is difficult to fix the date of Asser's arrival in England, but it was probably about 885. He assisted the king in his studies, received from him the monasteries of Congresbury and Banwell, and sometime later "Exeter and its diocese in Saxonland and Cornwall." He became bishop of Sherborne before 900, and his death is recorded in the Anglo-Saxon Chronicle under the date 910, although it is possible that it occurred a year or two earlier. The scanty details of Asser's life are taken from his biography of Alfred, from which it is inferred that he was acquainted with one or two Frankish biographies, and possibly had visited the continent of Europe.

Asser's work, *Annales rerum gestarum Alfredi magni*, was written about 893, and consists of a chronicle of English history from 849 to 887, and an account of Alfred's life, largely drawn from personal knowledge, down to 887. The only manuscript of which there is any record dates from about 1000, and was destroyed by fire in 1731. From this manuscript an edition was printed in 1574 under the direction of Matthew Parker, archbishop of Canterbury; but this contained many interpolations and alterations which were copied by subsequent editors. The text has since been the subject of careful study, and the edition edited by W.H. Stevenson (Oxford, 1904) distinguishes between the original work of Asser and the later additions. Some doubt has been cast upon the authenticity of the work, especially by T. Wright in the *Biographia Britannica literaria* (London, 1842), who ascribes the life to a monk of St Neots; but the latest

scholarship regards it as the work of Asser, although all the difficulties which surround the authorship have not been removed. The life was largely used by subsequent chroniclers, among others by Florence of Worcester, Simeon of Durham, Roger of Hoveden, and William of Malmesbury.

See W.H. Stevenson, Introduction to Asser's *Life of King Alfred* (Oxford, 1904); R. Pauli, Introduction to *König Aelfred* (Berlin, 1851).

ASSESSMENT, (from Lat. *assessare*, to sit beside, to judge), a term expressing either an official valuation of income or property for purposes of taxation, or the amount so determined (see TAXATION and VALUATION). It is also applied to the amount of damages fixed by a jury in a court of law (see DAMAGES).

An *assessment committee* is a statutory committee appointed under the Union Assessment Acts 1862, 1880, for the purpose of making out the valuation lists upon which the poor-law rate is based.

An *assessment policy*, in life insurance, is a policy issued at a fixed premium, the excess of which over the portion necessary to meet current claims and expenses goes to form a reserve fund which is devoted to various forms of benefit for the policy-holders. See INSURANCE and FRIENDLY SOCIETIES.

ASSESSOR (Lat. *assessare, assidere*, to sit by), a Roman term originally applied to a trained lawyer who sat beside a governor of a province or other magistrate, to instruct him in the administration of the laws (see Roll, *De assessoribus magistratuum Romanorum*, Leipzig, 1872). The system is still exemplified in Scotland, where it is usual in the larger towns for municipal magistrates, in the administration of their civil jurisdiction, to have the aid of professional assessors. In England, by the Judicature Act 1873, the court of appeal and the High Court may in any cause or matter call in the aid of assessors. The Patents Act 1907 makes special provision for assessors in patent and trade-mark cases. By the Supreme Court of Judicature Act 1891 the House of Lords may, in appeals in admiralty actions, call in the aid of assessors, while in the admiralty division of the High Court it is usual for the Elder Brethren of Trinity House to assist as nautical assessors. In admiralty cases in the county courts, too, the judge is frequently assisted by assessors of "nautical skill and experience" (County Court Admiralty Jurisdiction Act 1868). In the ecclesiastical courts assessors assist the bishop in proceedings under the Church Discipline Act 1840, s. 11, while under the Clergy Discipline Act 1892, s. 2, they assist the chancellor in determining questions of fact. By the Appellate Jurisdiction Act 1876, s. 14, the king in council may make rules for the attendance of archbishops and bishops as assessors in the hearing of ecclesiastical cases by the judicial committee of the privy council.

The term "assessor" is also very generally applied to persons appointed to ascertain and fix the value of rates, taxes, &c., and in this sense the word is used in the United States.

In France and in all European countries where the civil law system prevails, the term *assesseur* is applied to those assistant judges who, with a president, compose a judicial court.

In Germany an *Assessor*, or *Beisitzer*, is a member of the legal profession who has passed four years in actual practice and become qualified for the position of a judge.

ASSETS (from the O. Nor. Fr. *assetz*, mod. Fr. *assez*, "enough"), in English law, strictly the property of a debtor in the hands of his representative sufficient for the satisfaction of his creditors or legatees. Thus the property of a bankrupt is termed his assets and is the fund out of which his liabilities must be paid. All property of the debtor is assets, and it is not necessary that it should have been reduced into possession by him.

The creditors of a debtor are either secured or unsecured. A secured creditor, *e.g.* a mortgagee, has a prior claim to be paid his debt out of his security. If on realization of the security there is a balance after paying the debt, such balance becomes assets for the unsecured creditors; if there is a deficit, then the creditor becomes an unsecured creditor for such deficit. The unsecured creditors were formerly divided into creditors by specialty and by simple contract, the first being creditors secured by instrument under seal who ranked in priority to simple contract creditors. But by Hinde Palmer's Act [the Executors Act] 1869 all unsecured creditors rank alike.

Assets are divisible into legal assets and equitable assets, and the former class is again divisible into assets real and personal. These distinctions, though formerly of great importance, have now lost most of their meaning, but it is necessary briefly to describe the nature of these divisions and their consequences. The distinction between assets legal and equitable depends entirely upon the remedy open to the creditor to recover his debt and in no way upon the nature of the property from which the debt is sought to be recovered. If the creditor had to sue the executor of a debtor at law to obtain payment out of the property, that property was legal assets; but if the only remedy open to the creditor to get at the property was to bring an action in chancery for the administration of the estate, then the assets were equitable.

Legal assets, as has been said, were divided into real and personal assets. The personal assets were those which devolved *virtute officii* on the executor or administrator; such assets are since Hinde Palmer's Act available equally for specialty and simple contract creditors. The real assets consisted of those descending to the heir or devised to a devisee, and were at law only liable for specialty debts. However, by the Land Transfer Act 1897 it is provided that the real estate of a deceased shall devolve upon the executor and "shall be administered in the same manner ... and with the same incidents as if it were personal estate." The distinction, therefore, between assets real and personal has practically ceased to exist, and only continues in regard to such property as is not included in the act, the most important of which is land held in copyhold.

The equitable assets were treated otherwise. In the eyes of equity all unsecured creditors stand upon the same footing, and a creditor suing for administration of the estate sued on behalf of himself and all other creditors of the estate, and the distinction between specialty and simple contract creditors was ignored. Land was not at law liable to satisfy simple contract creditors; but if a testator expressly charged it with payment of his debts or devised it to his executors upon trust to pay his debts, equity treated it as equitable assets and so made it available to satisfy simple contract creditors; and finally by an act of 1833 it was provided that real estate should in all cases be assets to be administered by equity for the benefit of simple contract creditors as well as creditors by specialty. It will be seen therefore that, generally speaking, all creditors have now the same remedies against the executors either at law or in equity. The only property as to which these distinctions at all survive is that not touched by the Land Transfer Act 1897.

The act of 1833 just mentioned does not, however, deal with legacies, which continue to be payable only out of personalty unless they are expressly charged upon the realty by the testator; it has been contended that the effect of the Land Transfer Act 1897 has been to alter this and make the realty assets for the purpose of paying legacies, but this view is believed to be unsound.

It is necessary for the representative so to distribute the assets that any fund primarily liable shall bear its proper burden, and that as far as possible all debts and legacies may be paid; this is said to be "marshalling the assets," and a few examples of the principal cases of marshalling will make this clear. If the personalty is exhausted in satisfying the creditors the legatees are left without a fund from which to be paid. But inasmuch as the creditor could have got paid out of the realty, as well as the personalty, it is not fair that the legatee should suffer by the creditor's choice, and he will therefore get payment from the real estate. So again if one legacy is charged upon the real estate and another is not, then if the former be paid out of the personalty the latter will stand in its place and be paid from the real estate.

Finally it shall be noticed that an insolvent estate may be administered in bankruptcy. In such a case the law of bankruptcy regulates the order in which the assets are divided among the creditors (see Bankruptcy), but by the Judicature Act 1875, it is provided that an insolvent estate may be administered in the chancery division, and in such a case "the same rules shall prevail and be observed as to the respective rights of secured and unsecured creditors and as to the debts and liabilities provable and as to the valuation of annuities and future and contingent liabilities respectively as may be in force for the time being under the law of bankruptcy." This clause must be construed strictly, and it is only in the three cases specifically mentioned that the rules of bankruptcy will be imported into the administration of an insolvent estate by the chancery division.

In a less strict sense, the term "assets," or "an asset," is used derivatively as a synonym for any property, or as opposed to "liabilities." Cecil Rhodes once spoke of the British flag as a "great commercial asset" in South Africa, meaning merely that the imperial connexion was a source of strength and credit.

ASSIDEANS (the Anglicized form, derived through the Greek, of the Hebrew *Ḥasidim*, "the pious"), the name of a party or sect which stood out against the Hellenization of the Jews in the 2nd century B.C. After the massacre of those who fled from the forces of Antiochus Epiphanes and would not resist on the sabbath, Mattathias (or Judas) decided to set aside the law and was joined by a company of Assideans, brave men of Israel every one, who offered themselves willingly for the law (1 Macc. ii. 42, cf. 2 Macc. viii. 1). On the appointment of Alcimus (162 B.C.), "a descendant of Aaron" as high-priest, "the Assideans were the first who sought peace" (1 Macc. vii. 13 f.); but the treacherous murder of sixty of them (ib. 16) threw them back into the arms of Judas. According to 2 Macc. xiv., Alcimus identified them with the whole party of the rebels, of which they were only one, though the most important, section.

See Schurer, *Geschichte des jüdischen Volkes*, i. 203; art. in *Jewish Encyclopaedia*, s.v. "Ḥasidim" (S.M. Dubnow).

(J. H. A. H.)

ASSIGNATS (from Lat. *assignatus*, assigned), a form of paper-money issued in France from 1789 to 1796. Assignats were so termed, as representing land *assigned* to the holders.

The financial strait of the French government in 1789 was extreme. Coin was scarce, loans were not taken up, taxes had ceased to be productive, and the country was threatened with imminent bankruptcy. In this emergency assignats were issued to provide a substitute for a metallic currency. They were originally of the nature of mortgage bonds on the national lands. These lands consisted of the church property confiscated, on the motion of Mirabeau, by the Constituent Assembly on the 2nd of November 1789, and the crown lands, which had been taken over by the nation on the 7th of October (see French Revolution).

The assignats were first to be paid to the creditors of the state. With these the creditors could purchase national land, the assignats having, for this purpose, the preference over other forms of money. If the creditor did not care to purchase land, it was supposed that he could obtain the face-value for them from those who desired land. Those assignats which were returned to the state as purchase-money were to be cancelled, and the whole issue, it was argued, would consequently disappear as the national lands were distributed.

A first issue was made of 400,000,000 francs' worth of assignats, each note being of 100 francs' value and bearing interest daily at a rate of 5%. They were to be redeemed by the product of the sales, and from certain other sources, at the rate of 120,000,000 francs in 1791, 100,000,000 francs in 1792, 80,000,000 francs in 1793 and 1794, and the surplus in 1795. The success of the issue was undoubted, and, possibly, if the assignats had been restricted, as Mirabeau at first desired, to the extent of one-half the value of the lands sold, they would not have shared the usual fate of inconvertible paper money. Mirabeau was a strenuous advocate of the assignats. "They represent," he said, "real property, the most secure of all possessions, the soil on which we tread." "There cannot be a greater error than the fear so generally prevalent as to the over-issue of assignats ... reabsorbed progressively in the purchase of the national domains, this paper-money can never become redundant."

In 1790 the interest was reduced to 3%, and as the treasury had again become exhausted, a further issue was decided upon; it was also decreed that the assignats were to be accepted as legal tender, all public departments being instructed to receive them as the equivalent of metallic money. This second issue amounted to 800,000,000 francs and carried no interest. It was solemnly declared in the decree authorizing the issue that the maximum issue was never to exceed twelve hundred millions. This pledge, however, was soon broken, and further issues brought the total up to 3,750,000,000 francs. The consequence of these further issues was instant depreciation, and the note of 100 francs nominal value sank to less than 20 francs coin. Recourse was then had to protective legislation. The first step was to decree the penalty of six years' imprisonment against any person who should sell specie for a more considerable quantity of assignats, or who should stipulate a different price for commodities according as the payment was to be made in specie or in assignats. For the second offence the penalty was to be twenty years' imprisonment (August 1, 1793), for which the death penalty was ultimately substituted (May 10, 1794). This severe provision was, however, repealed after the fall of Robespierre. Notwithstanding these precautions, the value of assignats still declined, till the proportion to specie had become that of six to one. Then came the passing by the Convention on the 3rd of May 1793 of the absurd "maximum." The decree required all farmers and corn-dealers to declare the quantity of corn in their possession and to sell it only in recognized markets. No person was to be allowed to lay in more than one month's supply. A maximum price was fixed, above which no one was to buy or sell under severe penalties. These measures were soon stultified by further issues, and by June 1794 the total number of assignats aggregated nearly 8,000,000,000, of which only 2,464,000,000 had returned to the treasury and been destroyed. The extension of the "maximum" to all commodities only increased the confusion. Trade was paralysed and all manufacturing establishments were closed down. Attempts by the Convention to increase the value of the assignats were of no avail. Too many causes operated in favour of their depreciation: the enormous issue, the uncertainty as to their value if the Revolution should fail, the relation they bore to both specie and commodities, which retained their value and refused to be exchanged for a money of constantly diminishing purchasing power. Even between the assignats themselves there were differences. The royal assignats, which had been issued under Louis XVI., had depreciated less than the republican ones. They were worth from 8 to 15% more, a fact due to the hope that in case of a counter-revolution they would be less likely to be discredited.

The Directory was guilty of even greater abuses in dealing with the assignats. By 1796 the issues had reached the enormous figure of 45,500,000,000 francs, and even this gigantic total was swollen still more by the numerous counterfeits introduced into France from the neighbouring countries. The assignats had now become totally valueless—the abolition of the "maximum" the previous year (1795) had produced no effect, and, though, by various payments into the treasury, the total number had been reduced to about 24,000,000,000 francs, their face-value was about 30 to 1 of coin. At this value they were converted into 800,000,000 francs of land-warrants, or *mandats territoriaux*, which were to constitute a mortgage on all the lands of the republic. These *mandats* were no more successful than the assignats, and even on the day of their issue were at a discount of 82%. They had an existence of six months, and were finally received back by the state at about the seventieth part of their face-value in coin.

Authorities.—L.A. Thiers, *Histoire de la révolution française*, gives a full and graphic account of the assignats, the causes of their depreciation, &c.; J. Garnier, *Traité des Finances* (1862); J. Bresson, *Histoire financière de la France* (1829); R. Stourm, *Les Finances de l'ancien régime et de la révolution* (1885); F.A. Walker, *Money* (1891); Henry Higgs, in the *Cambridge Modern History*, vol. viii. (1904).

(T. A. I.)

ASSIGNMENT, Assignation, Assignee (from Lat. *assignare*, to mark out), terms which, as derivatives of the verb "to assign," are of frequent technical use in law. To assign is to make over, and the term is generally used to express a transference by writing, in

contradistinction to a transference by actual delivery. In England the usual expression is assignment, in Scotland it is assignation. The person making over is called the *assignor* or *cedent*; the recipient, the *assign* or *assignee*. An assignee may be such either *by deed*, as when a lessee assigns his lease to another, or *in law*, as when property devolves upon an executor. The law as to assignment in connexion with each particular subject, as the assignment of a chose in action, assignment in contract, of dower, of errors, of a lease, &c., will be found under the respective headings. In a colloquial sense, "assignation" means a secretly contrived meeting between lovers.

ASSINIBOIA, a name formerly applied to two districts of Canada, but not now held by any. (1) A district formed in 1835 by the Hudson's Bay Company, having in it Fort Garry at the junction of the Red and Assiniboine rivers in Rupert's Land, North America. It extended over a circular area, with a radius of 50 m. from Fort Garry. It was governed by a local council nominated by the Hudson's Bay Company. It ceased to exist when Rupert's Land was transferred to Canada in 1870. (2) A district of the North-west Territories, which was given definite existence by an act of the Dominion parliament in 1875. Assiniboia extended from the western boundary of Manitoba (99° W. in 1875, and 101° 25′ W. in 1881) to 111° W., and from 49° N. to 52° N. The name was a misnomer, as it barely touched the Assiniboine river. To the north of the district lay the district of Saskatchewan, so that when the two were united by the Dominion act of 1905, they were somewhat changed in boundaries and the name Saskatchewan was given to the new province. The derivation of Assiniboia is from two Ojibway words, *assini* meaning a stone, and the termination "to cook by roasting"; from these came a name first applied to a Dakota or Sioux tribe living on the Upper Red river; afterwards when this tribe separated from the Dakotas, its name was given to the branch of the Red river which the tribe visited, the river being known as the Assiniboine and the tribe as Assiniboin.

ASSINIBOIN ("Stone-Cookers"), a tribe of North American Indians of Siouan stock. Their name (see above) is said to refer to their method of boiling water by dropping red-hot stones into it. Their former range was between the Missouri and the middle Saskatchewan on both sides of the Canadian frontier. In 1904 there were 1234 in the United States, all on reservations in Montana; and in 1902 there were 1371 in Canada.

See *Handbook of American Indians*, ed. F.W. Hodge (Washington, 1907).

ASSISE (from the Fr., derived from Lat. *assidere*, to sit beside), a geological term for two or more beds of rock united by the occurrence of the same characteristic species or genera.

ASSISI (anc. *Asisium*), a town and episcopal see of Umbria, Italy, in the province of Perugia, 15 m. E.S.E. by rail from the town of Perugia. Pop. (1901) town, 5338; commune, 17,240. The town occupies a fine position on a mountain (1345 ft. above sea-level) with a view over the valleys of the Tiber and Topino. It is mainly famous in connexion with St Francis, who was born here in 1182, and returned to die in 1226. The Franciscan monastery and the lower and upper church of St Francis were begun immediately after his canonization in 1228, and completed in 1253, being fine specimens of Gothic architecture. The crypt was added in 1818, when the sarcophagus containing his remains was discovered. The lower church contains frescoes by Cimabue, Giotto and others, the most famous of which are those over the high altar by Giotto, illustrating the vows of the Franciscan order; while the upper church has frescoes representing scenes from the life of St Francis (probably by Giotto and his contemporaries) on the lower portion of the walls of the nave, and scenes from Old and New Testament history by pupils of Cimabue on the upper. The church of Santa Chiara (St Clare), the foundress of the Poor Clares, with its massive lateral buttresses, fine rose-window, and simple Gothic interior, was begun in 1257, four years after her death. It contains the tomb of the saint and 13th-century frescoes and pictures. Santa Maria Maggiore is also a good Gothic church. The cathedral (San Rufino) has a fine façade with three rose-windows of 1140; the interior was modernized in 1572. The town is dominated by the medieval castle (1655 ft.), built by Cardinal Albornoz (1367) and added to by Popes Pius II. and Paul III. Two miles to the east in a ravine below Monte Subasio is the hermitage *delle Carceri* (2300 ft.), partly built, partly cut out of the solid rock, given to St Francis by Benedictine monks as a place of retirement. Below the town to the south-west, close to the station, is the large pilgrimage church of Santa Maria degli Angeli, begun in 1569 by Pope Pius V., with Vignola as architect; but not completed until 1640. It contains the original oratory of St Francis and the cell in which he died. Adjacent is the garden in which the saint's thornless roses bloom in May. Half a mile outside the town to the south-east is the convent of San Damiano, erected by St Francis, of which St Clare was first abbess.

In the early middle ages Assisi was subject to the dukes of Spoleto; but in the 11th century it seems to have been independent. It became involved, however, in the disputes of Guelphs and Ghibellines, and was frequently at war with Perugia. It was sacked by Perugia and the papal troops in 1442, and even after that continued to be the prey of factions. The place is now famous as a resort of pilgrims, and is also important for the history of Italian art. The poet Metastasio was born here in 1698.

See L. Duff-Gordon, *Assisi* ("Mediaeval Towns" series, London, 1900). For ancient history see Asisium.

(T. As.)

ASSIUT, or Siut, capital of a province of Upper Egypt of the same name, and the largest and best-built town in the Nile Valley south of Cairo, from which it is distant 248 m. by rail. The population rose from 32,000 in 1882 to 42,000 in 1900. Assiut stands near the west bank of the Nile across which, just below the town, is a barrage, completed in 1902, consisting of an open weir, 2733 ft. long, and over 100 bays or sluices, each 16½ ft. wide, which can be opened or closed at will. At the western end of the barrage begins the Ibrahimia canal, the feeder of the Bahr Yusuf, the largest irrigation canal of Egypt. The Ibrahimia canal is skirted by a magnificent embankment planted with shady trees leading from the river to the town. There are several bazaars, baths and handsome mosques, one noted for its lofty minaret, and here the American Presbyterian mission has established a college for both sexes. Assiut is famous for its red and black pottery and for ornamental wood and ivory work, which find a ready market all over Egypt. It is one of the chief centres of the Copts. Here also is the northern terminus of the caravan route across the desert, which, passing through the Kharga oasis, goes south-west to Darfur. It is known as the Arbain, or forty days road, from the time occupied on the journey. Assiut (properly Asyūt) is the successor of the ancient Lycopolis (Eg. Siöout), capital of the 13th nome of Upper Egypt. Here were worshipped two canine gods (see Anubis), Ophoïs (Wepwoi) being the principal god of the city, while Anubis apparently presided over the necropolis. No ruins are visible, the mounds of the old city being for the most part hidden under modern buildings; but the slopes of the limestone hills behind it are pierced with an infinity of rock-cut tombs, some of which were large and decorated with sculptures, paintings and long inscriptions. The archaeological commission of the *Description de l'Égypte* visited them in 1799, when the walls of many of the large tombs were still almost intact; in the first half of the 19th century (and to some extent later) an immense amount of destruction was caused by blasting for stone. Three of the tombs illustrate one of the darkest periods in Egypt's history, when the princes of Siut played a leading part in the struggle between

Heracleopolis and Thebes (Dyns. IX.-XI.); another, of the XIIth Dynasty, contains a remarkable inscription detailing the contracts made by the nomarch with the priests of the temples of Ophoïs and Anubis for perpetual services at his tomb (see Breasted, *Ancient Records of Egypt, Historical Documents*, vol. i. pp. 179, 258). Remains of the mummies of dogs and similar animals sacred to these deities are scattered among the débris on the hillside in abundance. Lycopolis was the birthplace of Plotinus, the founder of Neo-Platonism (A.D. 205-270). From the 4th century onwards its grottoes were the dwellings of Christian hermits, amongst whom John of Lycopolis was the most celebrated.

(F. Ll. G.)

ASSIZE, or Assise (Lat. *assidere*, to sit beside; O. Fr. *assire*, to sit, *assis*, seated), a legal term, meaning literally a "session," but in fact, as Littleton has styled it, a *nomen aequivocum*, meaning sometimes a jury, sometimes the sittings of a court, and sometimes the ordinances of a court or assembly.

It originally signified the form of trial by a jury of sixteen persons, which eventually superseded the barbarous judicial combat; this jury was named the grand assize and was sworn to determine the right of seisin of land (see Evidence). The grand assize was abolished in 1833; but the term assize is still applicable to the jury in criminal causes in Scotland.

In the only sense in which the word is not now almost obsolete, assize means the periodical session of the judges of the High Court of Justice, held in the various counties of England, chiefly for the purposes of gaol delivery and trying causes at *nisi prius*. Previous to Magna Carta (1215) writs of assize had all to be tried at Westminster, or to await trial in the locality in which they had originated at the septennial circuit of the justices in eyre; but, by way of remedy for the great consequent delay and inconvenience, it was provided by this celebrated act that the assizes of *mort d'ancestor* and *novel disseisin* should be tried annually by the judges in every county. By successive enactments, the civil jurisdiction of the justices of assize was extended, and the number of their sittings increased, till at last the necessity of repairing to Westminster for judgment in civil actions was almost obviated to country litigants by an act, passed in the reign of Edward I., which provided that the writ summoning the jury to Westminster should also appoint a time and place for hearing such causes within the county of their origin. The date of the alternative summons to Westminster was always subsequent to the former date, and so timed as to fall in the vacation preceding the Westminster term, and thus "*Unless before*," or *nisi prius*, issues came to be dealt with by the judges of assize before the summons to Westminster could take effect. The *nisi prius* clause, however, was not then introduced for the first time. It occurs occasionally in writs of the reign of Henry III. The royal commissions to hold the assizes are—(1) general, (2) special. The general commission is issued twice a year to the judges of the High Court of Justice, and two judges are generally sent on each circuit. It covers commissions—(1) of oyer and terminer, by which they are empowered to deal with treasons, murders, felonies, &c. This is their largest commission; (2) of *nisi prius* (*q.v.*) (3) of gaol delivery, which requires them to try every prisoner in gaol, for whatsoever offence committed; (4) of the peace, by which all justices must be present at their county assizes, or else suffer a fine. Special commissions are granted for inquest in certain causes and crimes. See also the articles Circuit; Jury.

Assizes, in the sense of ordinances or enactments of a court or council of state, as the "assize of bread and ale," the "assize of Clarendon," the "assize of arms," are important in early economic history. As early as the reign of John the observance of the *assisae venalium* was enforced, and for a period of 500 years thereafter it was considered no unimportant part of the duties of the legislature to regulate by fixed prices, for the protection of the lieges, the sale of bread, ale, fuel, &c. (see Adulteration). Sometimes in city charters the right to assize such articles is specially conceded. Regulations of this description were beneficial in the repression of fraud and adulteration. Assizes are sometimes used in a wider legislative connexion by early chroniclers and historians—the "assisae of the realme," *e.g.* occasionally meaning the organic laws of the country. For the "assizes of Jerusalem" see Crusades.

The term assize, originally applying to an assembly or court, became transferred to actions before the court or the writs by which they were instituted. The following are the more important.

Assize of darrien presentment, or last presentation, was a writ directed to the sheriff to summon an assize or jury to enquire who was the last patron that presented to a church then vacant, of which the plaintiff complained that he was deforced or unlawfully deprived by the defendant. It was abolished in 1833 and the action of *quare impedit* (*q.v.*) substituted. But by the Common Law Procedure Act 1860, no *quare impedit* can be brought, so that an action in the king's bench of the High Court was substituted for it.

Assize of *mort d'ancestor* was a writ which lay where a plaintiff complained of an "abatement" or entry upon his freehold, effected by a stranger on the death of the plaintiff's father, mother, brother, sister, uncle, aunt, &c. It was abolished in 1833.

Assize of *novel disseisin* was an action to recover lands of which the plaintiff had been "disseised" or dispossessed. It was abolished in 1833. See Pollock and Maitland, *Hist. Eng. Law.*

Assize, clerk of, an officer "who writes all things judicially done by the justices of assizes in their circuits." He has charge of the commission, and takes recognizances, records, judgments and sentences, grants certificates of conviction, draws up orders, &c. By the Clerks of Assize Act 1869 he must either have been for three years a barrister or solicitor in actual practice, or have acted for three years in the capacity of subordinate officer of a clerk of assize on circuit.

United States.—There are no assize courts in the United States; it is not the custom for supreme court judges of the states to go on circuit, but the judges of the United States Supreme Court do sit as members of the United States circuit courts in the several states periodically throughout the year. These courts are not assize courts, but are federal as distinguished from state courts, and have a special and limited jurisdiction. In the several states the highest court is divided into departments, in each of which there are courts presided over by supreme court judges residing in that department, thus avoiding the assize court or circuit-going system.

ASSMANNSHAUSEN, a village of Germany, in the Prussian province of Hesse-Nassau, on the right bank of the Rhine and the railway from Frankfort-on-Main to Niederlahnstein. Pop. 1100. It has a lithium spring, baths and a *Kurhaus*, and is famed for its red wine (Assmannshäuser), which resembles light Burgundy. From here a railway ascends the Niederwald.

ASSOCIATE (Lat. *associatus*, from *ad*, to, and *sociare* to join). one who is united with another, and so generally a companion—in particular a subordinate member of an institution or society, as an associate of the Royal Academy, or one holding a degree in a learned society lower than that of fellow. In English law the associates are officers of the supreme court, whose duties are to draw up the list of causes, enter verdicts, hand the records to the parties, &c., and generally to conduct the business of trials. By the Judicature (Officers) Act 1879 they were styled masters of the supreme court, but the office is now amalgamated with the crown office department, of which they are clerks.

ASSOCIATION OF IDEAS, or Mental Association, a term used in psychology to express the conditions under which representations arise in consciousness, and also for a principle put forward by an important historical school of thinkers to account generally for the facts

of mental life. Modern physiological psychology has so altered the approach to this subject that much of the older discussion has become antiquated, but it may be recapitulated here for historical purposes.

Earlier Theory.—In the long and erudite Note D**, appended by Sir W. Hamilton to his edition of Reid's Works, many anticipations of modern statements on association are cited from the works of ancient or medieval thinkers; and for Aristotle, in particular, the glory is claimed of having at once originated the doctrine and practically brought it to perfection.[1] As translated by Hamilton, but without his interpolations, the classical passage from the *De Memoria et Reminiscentia* runs as follows:—

"When, therefore, we accomplish an act of reminiscence, we pass through a certain series of precursive movements, until we arrive at a movement on which the one we are in quest of is habitually consequent. Hence, too, it is that we hunt through the mental train, excogitating from the present or some other, and from similar or contrary or coadjacent. Through this process reminiscence takes place. For the movements are, in these cases, sometimes at the same time, sometimes parts of the same whole, so that the subsequent movement is already more than half accomplished."

The passage is obscure, but it does at all events indicate the various principles commonly termed contiguity, similarity and contrast. Similar principles are stated by Zeno the Stoic, by Epicurus (see Diog. Laert. vii. § 52, x. § 32), and by St Augustine (*Confessions*, x. e. 19). Aristotle's doctrine received a more or less intelligent expansion and illustration from the ancient commentators and the schoolmen, and in the still later period of transition from the age of scholasticism to the time of modern philosophy, prolonged in the works of some writers far into the 17th century, Hamilton adduced not a few philosophical authorities who gave prominence to the general fact of mental association—the Spaniard Ludovicus Vives (1492-1540) especially being most exhaustive in his account of memory.

In Hobbes's psychology much importance is assigned to what he called, variously, the succession, sequence, series, consequence, coherence, train of imaginations or thoughts in mental discourse. But not before Hume is there express question as to what are the distinct principles of association. John Locke had, meanwhile, introduced the phrase "Association of Ideas" as the title of a supplementary chapter incorporated with the fourth edition of his *Essay*, meaning it, however, only as the name of a principle accounting for the mental peculiarities of individuals, with little or no suggestion of its general psychological import. Of this last Hume had the strongest impression; he reduced the principles of association to three—Resemblance, Contiguity in time and place, Cause and (or) Effect. Dugald Stewart put forward Resemblance, Contrariety, and Vicinity in time and place, though he added, as another obvious principle, accidental coincidence in the sounds of words, and further noted three other cases of relation, namely, Cause and Effect, Means and End, Premisses and Conclusion, as holding among the trains of thought under circumstances of special attention. Reid, preceding Stewart, was rather disposed to make light of the subject of association, vaguely remarking that it seems to require no other original quality of mind but the power of habit to explain the spontaneous recurrence of trains of thinking, when become familiar by frequent repetition (*Intellectual Powers*, p. 387).

Hamilton's own theory of mental reproduction, suggestion or association is a development, greatly modified, of the doctrine expounded in his *Lectures on Metaphysics* (vol. ii. p. 223, seq.), which reduced the principles of association first to two—Simultaneity and Affinity, and these further to one supreme principle of Redintegration or Totality. In the ultimate scheme he posits no less than four general laws of mental succession concerned in reproduction: (1) *Associability* or possible co-suggestion (all thoughts of the same mental subject are associable or capable of suggesting each other); (2) *Repetition* or direct remembrance (thoughts coidentical in modification, but differing in time, tend to suggest each other); (3) *Redintegration*, direct remembrance or reminiscence (thoughts once coidentical in time, are, however, different as mental modes, again suggestive of each other, and that in the mutual order which they originally held); (4) *Preference* (thoughts are suggested not merely by force of the general subjective relation subsisting between themselves, they are also suggested in proportion to the relation of interest, from whatever source, in which they stand to the individual mind). Upon these follow, as special laws:—A, Primary—modes of the laws of Repetition and Redintegration—(1) law of Similars (Analogy, Affinity); (2) law of Contrast; (3) law of Coadjacency (Cause and Effect, &c.); B, Secondary—modes of the law of Preference, under the law of Possibility—(1) laws of Immediacy and Homogeneity; (2) law of Facility.

The Associationist School.—This name is given to the English psychologists who aimed at explaining all mental acquisitions, and the more complex mental processes generally under laws not other than those which have just been set out as determining simple reproduction. Hamilton, though professing to deal with reproduction only, formulates a number of still more general laws of mental succession—law of Succession, law of Variation, law of Dependence, law of Relativity or Integration (involving law of Conditioned), and, finally, law of Intrinsic or Objective Relativity—as the highest to which human consciousness is subject; but it is in a sense quite different that the psychologists of the so-called Associationist School intend their appropriation of the principle or principles commonly signalized. As far as can be judged from imperfect records, they were anticipated to some extent by the experientialists of ancient times, both Stoic and Epicurean (cf. Diogenes Laertius, as above). In the modern period, Hobbes is the first thinker of permanent note to whom this doctrine may be traced. Though, in point of fact, he took anything but an exhaustive view of the phenomena of mental succession, yet, after dealing with trains of imagination, or what he called mental discourse, he sought in the higher departments of intellect to explain reasoning as a discourse in words, dependent upon an arbitrary system of marks, each associated with, or standing for, a variety of imaginations; and, save for a general assertion that reasoning is a reckoning—otherwise, a compounding and resolving—he had no other account of knowledge to give. The whole emotional side of mind, or, in his language, the passions, he, in like manner, resolved into an expectation of consequences, based on past experience of pleasures and pains of sense. Thus, though he made no serious attempt to justify his analysis in detail, he is undoubtedly to be classed with the associationists of the next century. They, however, were wont to trace their psychological theory no further back than to Locke's *Essay*. Bishop Berkeley was driven to posit expressly a principle of suggestion or association in these terms:—"That one idea may suggest another to the mind, it will suffice that they have been observed to go together, without any demonstration of the necessity of their coexistence, or so much as knowing what it is that makes them so to coexist" (*New Theory of Vision*, § 25); and to support the obvious application of the principle to the case of the sensations of sight and touch before him, he constantly urged that association of sound and sense of language which the later school has always put in the foreground, whether as illustrating the principle in general or in explanation of the supreme importance of language for knowledge. It was natural, then, that Hume, coming after Berkeley, and assuming Berkeley's results, though he reverted to the larger inquiry of Locke, should be more explicit in his reference to association; but he was original also, when he spoke of it as a "kind of attraction which in the mental world will be found to have as extraordinary effects as in the natural, and to show itself in as many and as various forms" (*Human Nature*, i. 1, § 4). Other inquirers about the same time conceived of association with this breadth of view, and set themselves to track, as psychologists, its effects in detail.

David Hartley in his *Observations on Man*, published in 1749 (eleven years after the *Human Nature*, and one year after the better-known *Inquiry*, of Hume), opened the path for all the investigations of like nature that have been so characteristic of English psychology. A physician by profession, he sought to combine with an elaborate theory of mental association a minutely detailed hypothesis as to the corresponding action of the nervous system, based upon the suggestion of a vibratory motion within the nerves thrown out by Newton in the last paragraph of the *Principia*. So far, however, from promoting the acceptance of the psychological theory, this physical hypothesis proved to have rather the opposite effect, and it began to be dropped by Hartley's followers (as F. Priestley, in his abridged edition of the *Observations*, 1775) before it was seriously impugned from without. When it is studied in the original, and not taken upon the report of hostile critics, who would not, or could not understand it, no little importance must still be accorded to the first attempt, not seldom a curiously felicitous one, to carry through that parallelism of the physical and psychical, which since then has come to count for more and more in the science of mind. Nor should it be forgotten that Hartley himself, for all his paternal interest in the doctrine of vibrations, was careful to keep separate from its fortunes the cause of his other doctrine of mental association. Of this the point lay in no mere restatement, with new precision, of a principle of coherence among "ideas," but in its being taken as a clue by which to follow the progressive development of the mind's powers. Holding that mental states could be scientifically understood only as they were analysed, Hartley sought for a principle of synthesis to explain the complexity exhibited not only in trains of representative images, but alike in the most involved combinations of reasonings and (as Berkeley had seen) in the apparently simple phenomena of objective perception, as well as in the varied play of the emotions, or, again, in the manifold conscious adjustments of the motor system. One principle appeared to him sufficient for all, running, as enunciated for the simplest case, thus: "Any sensations A, B, C, &c., by being associated with one another a sufficient number of times, get such a power over the corresponding ideas (called by Hartley also vestiges, types, images) *a, b, c*, &c., that any one of the sensations A, when impressed alone, shall be able to excite in the mind *b, c*, &c., the ideas of the rest." To render the principle applicable in the cases where the associated elements are neither sensations nor simple ideas of sensations, Hartley's first care was to determine the conditions under which states other than these simplest ones have their rise in the mind, becoming the matter of ever higher and higher combinations. The principle itself supplied the key to the difficulty, when coupled with the notion, already implied in Berkeley's investigations, of a coalescence of simple ideas of sensation into one complex idea, which may cease to bear any obvious relation to its constituents. So far from being content, like Hobbes, to make a rough generalization to all mind from the phenomena of developed memory, as if these might be straightway assumed, Hartley made a point of referring them, in a subordinate place of their own, to his universal principle of mental synthesis. He expressly put forward the law of association, endued with such scope, as supplying what was wanting to Locke's doctrine in its more strictly psychological aspect, and thus marks by his work a distinct advance on the line of development of the experiential philosophy.

The new doctrine received warm support from some, as Law and Priestley, who both, like Hume and Hartley himself, took the principle

of association as having the like import for the science of mind that gravitation had acquired for the science of matter. The principle began also, if not always with direct reference to Hartley, yet, doubtless, owing to his impressive advocacy of it, to be applied systematically in special directions, as by Abraham Tucker (1768) to morals, and by Archibald Alison (1790) to aesthetics. Thomas Brown (d. 1820) subjected anew to discussion the question of theory. Hardly less unjust to Hartley than Reid or Stewart had been, and forward to proclaim all that was different in his own position, Brown must yet be ranked with the associationists before and after him for the prominence he assigned to the associative principle in sense-perception (what he called external affections of mind), and for his reference of all other mental states (internal affections) to the two generic capacities or susceptibilities of Simple and Relative Suggestion. He preferred the word Suggestion to Association, which seemed to him to imply some prior connecting process, whereof there was no evidence in many of the most important cases of suggestion, nor even, strictly speaking, in the case of contiguity in time where the term seemed least inapplicable. According to him, all that could be assumed was a general constitutional tendency of the mind to exist successively in states that have certain relations to each other, of itself only, and without any external cause or any influence previous to that operating at the moment of the suggestion. Brown's chief contribution to the general doctrine of mental association, besides what he did for the theory of perception, was, perhaps, his analysis of voluntary reminiscence and constructive imagination—faculties that appear at first sight to lie altogether beyond the explanatory range of the principle. In James Mill's *Analysis of the Phenomena of the Human Mind* (1829), the principle, much as Hartley had conceived it, was carried out, with characteristic consequence, over the psychological field. With a much enlarged and more varied conception of association, Alexander Bain re-executed the general psychological task, while Herbert Spencer revised the doctrine from the new point of view of the evolution-hypothesis. John Stuart Mill made only occasional excursions into the region of psychology proper, but sought, in his *System of Logic* (1843), to determine the conditions of objective truth from the point of view of the associationist theory, and, thus or otherwise being drawn into general philosophical discussion, spread wider than any one before him its repute.

The Associationist School has been composed chiefly of British thinkers, but in France also it has had distinguished representatives. Of these it will suffice to mention Condillac, who professed to explain all knowledge from the single principle of association (*liaison*) of ideas, operating through a previous association with signs, verbal or other. In Germany, before the time of Kant, mental association was generally treated in the traditional manner, as by Wolff. Kant's inquiry into the foundations of knowledge, agreeing in its general purport with Locke's, however it differed in its critical procedure, brought him face to face with the newer doctrine that had been grafted on Locke's philosophy; and to account for the fact of synthesis in cognition, in express opposition to associationism, as represented by Hume, was, in truth, his prime object, starting, as he did, from the assumption that there was that in knowledge which no mere association of experiences could explain. To the extent, therefore, that his influence prevailed, all inquiries made by the English associationists were discounted in Germany. Notwithstanding, under the very shadow of his authority a corresponding, if not related, movement was initiated by J.F. Herbart. Peculiar, and widely different from anything conceived by the associationists, as Herbart's metaphysical opinions were, he was at one with them, and at variance with Kant, in assigning fundamental importance to the psychological investigation of the development of consciousness, nor was his conception of the laws determining the interaction and flow of mental presentations and representations, when taken in its bare psychological import, essentially different from theirs. In F.E. Beneke's psychology also, and in more recent inquiries conducted mainly by physiologists, mental association has been understood in its wider scope, as a general principle of explanation.

The associationists differ not a little among themselves in the statement of their principle, or, when they adduce several principles, in their conception of the relative importance of these. Hartley took account only of Contiguity, or the repetition of impressions synchronous or immediately successive; the like is true of James Mill, though, incidentally, he made an express attempt to resolve the received principle of Similarity, and through this the other principle of Contrast, into his fundamental law—law of Frequency, as he sometimes called it, because upon frequency, in conjunction with vividness of impressions, the strength of association, in his view, depended. In a sense of his own, Brown also, while accepting the common Aristotelian enumeration of principles, inclined to the opinion that "all suggestion may be found to depend on prior coexistence, or at least on such proximity as is itself very probably a modification of coexistence," provided account be taken of "the influence of emotions and other feelings that are very different from ideas, as when an analogous object suggests an analogous object by the influence of an emotion which each separately may have produced before, and which is, therefore, common to both." To the contrary effect, Spencer maintained that the fundamental law of all mental association is that presentations aggregate or cohere with their like in past experience, and that, besides this law, there is in strictness no other, all further phenomena of association being incidental. Thus in particular, he would have explained association by Contiguity as due to the circumstance of imperfect assimilation of the present to the past in consciousness. A. Bain regarded Contiguity and Similarity logically, as perfectly distinct principles, though in actual psychological occurrence blending intimately with each other, contiguous trains being started by a first (it may be, implicit) representation through Similarity, while the express assimilation of present to past in consciousness is always, or tends to be, followed by the revival of what was presented in contiguity with that past.

The highest, philosophical interest, as distinguished from that which is more strictly psychological, attaches to the mode of mental association called Inseparable. The coalescence of mental states noted by Hartley, as it had been assumed by Berkeley, was farther formulated by James Mill in these terms:—

"Some ideas are by frequency and strength of association so closely combined that they cannot be separated; if one exists, the other exists along with it in spite of whatever effort we make to disjoin them."—(*Analysis of the Human Mind*, 2nd ed. vol. i. p. 93.)

J.S. Mill's statement is more guarded and particular:—

"When two phenomena have been very often experienced in conjunction, and have not, in any single instance, occurred separately either in experience or in thought, there is produced between them what has been called inseparable, or, less correctly, indissoluble, association; by which is not meant that the association must inevitably last to the end of life—that no subsequent experience or process of thought can possibly avail to dissolve it; but only that as long as no such experience or process of thought has taken place, the association is irresistible; it is impossible for us to think the one thing disjoined from the other."—(*Examination of Hamilton's Philosophy*, 2nd ed. p. 191.)

It is chiefly by J.S. Mill that the philosophical application of the principle has been made. The first and most obvious application is to so-called necessary truths—such, namely, as are not merely analytic judgments but involve a synthesis of distinct notions. Again, the same thinker sought to prove Inseparable Association the ground of belief in an external objective world. The former application, especially, is facilitated, when the experience through which the association is supposed to be constituted is understood as cumulative in the race, and transmissible as original endowment to individuals—endowment that may be expressed either, subjectively, as latent intelligence, or, objectively, as fixed nervous connexions. Spencer, as before suggested, is the author of this extended view of mental association.

Modern Criticism.—Of recent years the associationist theory has been subjected to searching criticism, and it has been maintained by many writers that the laws are both unsatisfactorily expressed and insufficient to explain the facts. Among the most vigorous and comprehensive of these investigations is that of F.H. Bradley in his *Principles of Logic* (1883). Having admitted the psychological fact of mental association, he attacks the theories of Mill and Bain primarily on the ground that they purport to give an account of mental life as a whole, a metaphysical doctrine of existence. According to this doctrine, mental activity is ultimately reducible to particular feelings, impressions, ideas, which are disparate and unconnected, until chance Association brings them together. On this assumption the laws of Association naturally emerge in the following form:—(1) The *law of Contiguity*.—"Actions, sensations and states of feeling, occurring together or in close connexion, tend to grow together, or cohere, in such a way that, when any one of them is afterwards presented to the mind, the others are apt to be brought up in idea" (A. Bain, *Senses and Intellect*, p. 327). (2) The *law of Similarity*.—"Present actions, sensation, thoughts or emotions tend to revive their like among previous impressions or states" (A. Bain, *ibid.* 457. Compare J.S. Mill, *Logic*, ii. p. 440, 9th ed.). The fundamental objection to (1) is that ideas and impressions once experienced do not recur; they are particular existences, and, as such, do not persevere to recur or be presented. So Mill is wrong in speaking of two impressions being "frequently experienced." Bradley claims thus to reduce the law to "When we have experienced (or even thought of) several pairs of impressions (simultaneous or successive), which pairs are like one another; then whenever an idea occurs which is like all the impressions on one side of these pairs, it tends to excite an idea which is like all the impressions on the other side." This statement is destructive of the title of the law, because it appears that what were contiguous (the impressions) are not associated, and what are associated (the ideas) were not contiguous; in other words, the association is not due to contiguity at all.

Proceeding to the law of Similarity (which in Mill's view is at the back of association by contiguity), and having made a similar criticism of its phrasing, Bradley maintains that it involves an even greater absurdity; if two ideas are to be recognized as similar, they must both be present in the mind; if one is to call up the other, one must be absent. To the obvious reply that the similarity is recognized *ex post facto*, and not while the former idea is being called up, Bradley replies simply that such a view reduces the law to the mere statement of a phenomenon and deprives it of any explanatory value, though he hardly makes it clear in what sense this necessarily invalidates the law from a psychological point of view. He further points out with greater force that in point of fact mere similarity is not the basis of ordinary cases of mental reproduction, inasmuch as in any given instance there is more difference than similarity between the ideas associated.

Bradley himself bases association on identity plus contiguity:—"Any part of a single state of mind tends, if reproduced, to re-instate the remainder," or "any element tends to reproduce those elements with which it has formed one state of mind." This law he calls by the

name "redintegration," understood, of course, in a sense different from that in which Hamilton used it. The radical difference between this law and those of Mill and Bain is that it deals not with particular units of thoughts but with universals or identity between individuals. In any example of such reproduction the universal appears in a particular form which is more or less different from that in which it originally existed.

Psychophysical Researches.—Bradley's discussion deals with the subject purely from the metaphysical side, and the total result practically is that association occurs only between universals. From the point of view of empirical psychologists Bradley's results are open to the charge which he made against those who impugned his view of the law of similarity, namely that they are merely a statement—not in any real sense an explanation. The relation between the mental and the physical phenomena of association has occupied the attention of all the leading psychologists (see PSYCHOLOGY). William James holds that association is of "objects" not of "ideas," is between "things thought of"—so far as the word stands for an effect. "So far as it stands for a cause it is between processes in the brain." Dealing with the law of Contiguity he says that the "most natural way of accounting for it is to conceive it as a result of the laws of habit in the nervous system; in other words to ascribe it to a physiological cause." Association is thus due to the fact that when a nerve current has once passed by a given way, it will pass more easily by that way in future; and this fact is a physical fact. He further seeks to maintain the important deduction that the only primary or ultimate law of association is that of neural habit.

The objections to the associationist theory are summed up by G.F. Stout (*Analytic Psychol.*, vol. ii. pp. 47 seq.) under three heads. Of these the first is that the theory as stated, *e.g.* by Bain, lays far too much stress on the mere connexion of elements hitherto entirely separate; whereas, in fact, every new mental state or synthesis consists in the development or modification of a pre-existing state or psychic whole. Secondly, it is quite false to regard an association as merely an aggregate of disparate units; in fact, the *form* of the new idea is quite as important as the elements which it comprises. Thirdly, the phraseology used by the associationists seems to assume that the parts that go to form the whole retain their identity unimpaired; in fact, each part or element is *ipso facto* modified by the very fact of its entering into such combination.

The experimental methods now in vogue have to a large extent removed the discussion of the whole subject of association of ideas, depending in the case of the older writers on introspection, into a new sphere. In such a work as E.B. Titchener's *Experimental Psychology* (1905), association is treated as a branch of the study of mental reactions, of which association reactions are one division.

BIBLIOGRAPHY.—See PSYCHOLOGY; and the works of Bradley, Stout, and James, above quoted, and general works on psychology: articles in *Mind* (passim); A. Bain, *Senses and Intellect* (4th ed., 1894), and in *Mind*, xii. (1887) pp. 237-249; John Watson, *An Outline of Philosophy* (1898); H. Höffding, *Hist. of Mod. Philos.* (Eng. trans., Lond., 1900), *Psychologie in Umrissen auf Grundlage der Erfahrung* (2nd ed., Leipzig, 1893); Jas. Sully, *The Human Mind* (1892), and *Outlines of Psych.* (Lond., 1892); E.B. Titchener, *Outline of Psych.* (New York, 1896), and in his trans. of O. Külpe's *Outlines of Psych.* (New York, 1895,); Jas. Ward in *Mind*, viii. (1883), xii. (1887), new series ii. (1893), iii. (1894); G.T. Ladd, *Psychology, Descriptive and Explanatory* (Lond., 1894); C.L.C. Morgan, *Introd. to Comparative Psych.* (Lond., 1894); W. Wundt, *Princip. of Physiol. Psych.* (Eng. trans., 1904), *Human and Animal Psych.* (Eng. trans., 1894), pp. 282-307; *Outlines of Psych.* (Eng. trans., 1897); E. Claparède, *L'Association des idées* (1903). For associationism in Greek philosophy see J.I. Beare, *Greek Theories of Elementary Cognition* (Oxford, 1906), part iii. §§ 14, 43 seq.

1 There are, however, distinct anticipations of the theory in Plato (*Phaedo*), as part of the doctrine of ἀνάμνησις; thus we find the idea of Simmias recalled by the picture of Simmias (similarity), and that of a friend by the sight of the lyre on which he played (contiguity).

ASSONANCE (from Lat. *adsonare* or *assonare*, to sound to or answer to), a term defined, in its prosodical sense, as "the corresponding or riming of one word with another in the accented vowel and those which follow it, but not in the consonants" (*New English Dictionary*, Oxford). In other words, assonance is an improper or imperfect form of rhyme, in which the ear is satisfied with the incomplete identity of sound which the vowel gives without the aid of consonants. Much rustic or popular verse in England is satisfied with assonance, as in such cases as

"And pray who gave thee that jolly red *nose*?
Cinnamon, Ginger, Nutmeg and *Cloves*,"

where the agreement between the two *o's* permits the ear to neglect the discord between *s* and *v*. But in English these instances are the result of carelessness or blunted ear. It is not so in several literatures, such as in Spanish, where assonance is systematically cultivated as a literary ornament. It is an error to confound alliteration,—which results from the close juxtaposition of words beginning with the same sound or letter,—and assonance, which is the repetition of the same vowel-sound in a syllable at points where the ear expects a rhyme. The latter is a more complicated and less primitive employment of artifice than the former, although they have often been used to intensify the effect of each other in a single couplet. Assonance appears, nevertheless, to have preceded rhyme in several of the European languages, and to have led the way towards it. It is particularly observable in the French poetry which was composed before the 12th century, and it reached its highest point in the "Chanson de Roland," where the sections are distinguished by the fact that all the lines in a *laisse* or stanza close with the same vowel-sound. When the ear of the French became more delicate, and pure rhyme was introduced, about the year 1120, assonance almost immediately retired before it and was employed no more, until recent years, when several French poets have re-introduced assonance in order to widen the scope of their effects of sound. It held its place longer in Provençal and some other Romance literatures, while in Spanish it has retained its absolute authority over rhyme to the present day. It has been observed that in the Romance languages the ear prefers the correspondence of vowels, while in the Teutonic languages the preference is given to consonants. This distinction is felt most strongly in Spanish, where the satisfaction in *rimas asonantes* is expressed no less in the most elaborate works of the poets and dramatists than in the rough ballads of the people. The nature of the language here permits the full value of the corresponding vowel-sounds to be appreciated, whereas in English—and even in German, where, however, a great deal of assonant poetry exists—the divergence of the consonants easily veils or blunts the similarity of sound. Various German poets of high merit, and in particular Tieck and Heine, have endeavoured to obviate this difficulty, but without complete success. Occasionally they endeavour, as English rhymers have done, to mix pure rhyme with assonance, but the result of this in almost all cases is that the assonances, &c., which make a less strenuous appeal to the ear, are drowned and lost in the stress of the pure rhymes. Like alliteration, assonance is a very frequent and very effective ornament of prose style, but such correspondence in vowel-sound is usually accidental and involuntary, an instinctive employment of the skill of the writer. To introduce it with a purpose, as of course must be done in poetry, has always been held to be a most dangerous practice in prose. Assonance as a conscious art, in fact, is scarcely recognized as legitimate in English literature. 787

(E. G.)

ASSUAN, or ASWAN, a town of Upper Egypt on the east bank of the Nile, facing Elephantine Island below the First Cataract, and 590 m. S. of Cairo by rail. It is the capital of a province of the same name—the southernmost province of Egypt. Population (1907) 16,128. The principal buildings are along the river front, where a broad embankment has been built. Popular among Europeans as a winter health resort and tourist centre, Assuan is provided with large modern hotels (one situated on Elephantine Island), and there is an English church. South-east of the railway station are the ruins of a temple built by Ptolemy Euergetes, and still farther south are the famous granite quarries of Syene. On Elephantine Island are an ancient nilometer and other remains, including a granite gateway built under Alexander the Great at the temple of the local ram-headed god Chnubis or Chnumis (Eg. Khnum), perhaps on account of his connexion with Ammon (*q.v.*); two small but very beautiful temples of the XVIIIth Dynasty were destroyed there about 1820. In the hill on the opposite side of the river are tombs of the VIth to XIIth dynasties, opened by Lord Grenfell in 1885-1886. The inscriptions show that they belonged to frontier-prefects whose expeditions into Nubia, &c., are recorded in them. Three and a half miles above the town, at the beginning of the Cataract, the Assuan Dam stretches across the Nile. This great engineering work was finished in December 1902 (see IRRIGATION: *Egypt*; and NILE). Above the dam the Nile presents the appearance of a vast lake. Consequent on the rise of the water-level several islands have been wholly and others partly submerged, among the latter Philae (*q.v.*). On the east bank opposite Philae is the

village of Shellal, southern terminus of the Egyptian railway system and the starting point of steamers for the Sudan.

In ancient times the chief city, called Yeb, capital of the frontier nome, the first of the Upper Country, was on the island of Elephantine, guarding the entrance to Egypt. But, owing to the cataract, the main route for traffic with the south was by land along the eastern shore. Here, near the granite quarries—whence was obtained the material for many magnificent monuments—there grew up another city, at first dependent on and afterwards successor to the island town. This city was called *Swan*, the Mart, whence came the Greek *Syene* and Arabic *Aswan*. Syene is twice mentioned (as Seveneh) in the prophecies of Ezekiel, and papyri, discovered on the island, and dated in the reigns of Artaxerxes and Darius II, (464-404 B.C.), reveal the existence of a colony of Jews, with a temple to Yahu (Yahweh, Jehovah), which had been founded at some time before the conquest of Egypt by Cambyses in 523 B.C. They also mention the great frontier garrison against the Ethiopians, referred to by Herodotus. Syene was one of the bases used by Eratosthenes in his calculations for the measurement of the earth. In Roman times Syene was strongly garrisoned to resist the attacks of the desert tribes. Thither, in virtual banishment, Juvenal was sent as prefect by Domitian. In the early days of Christianity the town became the seat of a bishopric, and numerous ruins of Coptic convents are in the neighbourhood. Syene appears also to have flourished under its first Arab rulers, but in the 12th century was raided and ruined by Bedouin and Nubian tribes. On the conquest of Egypt by the Turks in the 16th century, Selim I. placed a garrison here, from whom, in part, the present townsmen descend. As the southern frontier town of Egypt proper, Assuan in times of peace was the entrepôt of a considerable trade with the Sudan and Abyssinia, and in 1880 its trade was valued at £2,000,000 annually. During the Mahdia (1884-1898) Assuan was strongly garrisoned by Egyptian and British troops. Since the defeat of the khalifa at Omdurman and the fixing (1899) of the Egyptian frontier farther south, the military value of Assuan has declined.

For the Jewish colony see A.H. Sayce and A.E. Cowley, *Aramaic Papyri discovered at Assuan* (Oxford, 1906); E. Sachau, *Drei Aramaische papyrus-Urkunden aus Elephantine* (Berlin, 1907). For the dam see W. Willcocks, *The Nile Reservoir Dam at Assuan* (London, 1901).

(F. Ll. G.)

ASSUMPSIT ("he has undertaken," from Lat. *assumere*), a word applied to an action for the recovery of damages by reason of the breach or non-performance of a simple contract, either express or implied, and whether made orally or in writing. *Assumpsit* was the word always used in pleadings by the plaintiff to set forth the defendant's undertaking or promise, hence the name of the action. Claims in actions of *assumpsit* were ordinarily divided into (*a*) common or *indebitatus assumpsit*, brought usually on an implied promise, and (*b*) special *assumpsit*, founded on an express promise. *Assumpsit* as a form of action became obsolete after the passing of the Judicature Acts 1873 and 1875. (See further Contract; Pleading and Tort.)

ASSUMPTION, FEAST OF. The feast of the "Assumption of the blessed Virgin Mary" (Lat. *festum assumptionis, dormitionis, depositionis, pausationis B. V. M.*; Gr. κοίμησις or ἀνάληψις τῆς θεοτόκου) is a festival of the Christian Church celebrated on the 15th of August, in commemoration of the miraculous ascent into heaven of the mother of Christ. The belief on which this festival rests has its origin in apocryphal sources, such as the εἰς τὴν κοίμησιν τῆς ὑπεραγίας δεσποίνης ascribed to the Apostle John, and the *de transitu Mariae*, assigned to Melito, bishop of Sardis, but actually written about A.D. 400. Pope Gelasius I. (492-496) included them in the list of apocryphal books condemned by the *Decretum de libris recipiendis et non recipiendis*; but they were accepted as authentic by the pseudo-Dionysius (*de nominbus divinis c. 3*), whose writings date probably from the 5th century, and by Gregory of Tours (d. 593 or 594). The latter in his *De gloria martyrum* (i. 4) gives the following account of the miracle: As all the Apostles were watching round the dying Mary, Jesus appeared with His angels and committed the soul of His Mother to the Archangel Michael. Next day, as they were carrying the body to the grave, Christ again appeared and carried it with Him in a cloud to heaven, where it was reunited with the soul. This story is much amplified in the account given by St John of Damascus in the homilies *In dormitionem Mariae*, which are still read in the Roman Church as the lesson during the octave of the feast. According to this the patriarchs and Adam and Eve also appear at the death-bed, to praise their daughter, through whom they had been rescued from the curse of God; a Jew who touches the body loses both his hands, which are restored to him by the Apostles; and the body lies three days in the grave without corruption before it is taken up into heaven.

The festival is first mentioned by St Andrew of Crete (*c.* 650), and, according to the Byzantine historian Nicephorus Callistus (*Hist. Eccles.* xvii. 28), was first instituted by the Emperor Maurice in A.D. 582. From the East it was borrowed by Rome, where there is evidence of its existence so early as the 7th century. In the Gallican Church it was only adopted at the same time as the Roman liturgy. But though the festival thus became incorporated in the regular usage of the Western Church, the belief in the resurrection and bodily assumption of the Virgin has never been defined as a dogma and remains a "pious opinion," which the faithful may reject without imperilling their immortal souls, though not apparently—to quote Melchior Cano (*De Locis Theolog.* xii. 10)—without "insolent temerity," since such rejection would be contrary to the common agreement of the Church. By the reformed Churches, including the Church of England, the festival is not observed, having been rejected at the Reformation as being neither primitive nor founded upon any "certain warrant of Holy Scripture."

See Herzog-Hauck, *Realencyklopädie* (ed. 3), s. "Maria"; Mgr. L. Duchesne, *Christian Worship* (Eng. trans., London, 1904); Wetzer and Welte, *Kirchenlexikon*, s. "Marienfeste"; The *Catholic Encyclopaedia* (London and New York, 1907, &c.), s. "Apocrypha," "Assumption."

ASSUR (Auth. Vers. *Asshur*), a Hebrew name, occurring in many passages of the Old Testament, for the land and dominion of Assyria.[1] The *country* of Assyria, which in the Assyro-Babylonian literature is known as *mat Aššur* (*ki*), "land of Assur," took its name from the ancient city of *Aššur*, situated at the southern extremity of Assyria proper, whose territory, soon after the first Assyrian settlement, was bounded on the N. by the Zagros mountain range in what is now Kurdistan and on the S. by the lower Zab river. The kingdom of Assyria, which was the outgrowth of the primitive settlement on the site of the city of Assur, was developed by a probably gradual process of colonization in the rich vales of the middle Tigris region, a district watered by the Tigris itself and also by several tributary streams, the chief of which was the lower Zab.[2]

It seems quite evident that the *city* of Assur was originally founded by Semites from Babylonia at quite an early, but as yet undetermined date. In the prologue to the law-code of the great Babylonian monarch Khammurabi (*c.* 2250 B.C.), the cities of Nineveh and Assur are both mentioned as coming under that king's beneficent influence. Assur is there called *A-usar* (*ki*),[3] in which combination the ending *-ki* ("land territory") proves that even at that early period there was a province of Assur more extensive than the city proper. It is probable that this non-Semitic form *A-usar* means "well watered region,"[4] a most appropriate designation for the river settlements of Assyria. The problem as to the meaning of the name Assur is rendered all the more confusing by the fact that the city and land are also called *Aššur* (as well as *A-usar*), both by the Khammurabi records[5] and generally in the later Assyrian literature. Furthermore, the god- and country-name *Assur* also occurs at a late date in Assyrian literature in the forms *An-šar, An-šar* (*ki*), which form[6] was presumably read *Assur*. In the Creation tablet, the heavens personified collectively were indicated by this term *An-šar*, "host of heaven," in contradistinction to the earth = *Ki-šar*, "host of earth." In view of this fact, it seems highly probable that the late writing *An-sar* for *Assur* was a more or less conscious attempt on the part of the Assyrian scribes to identify the peculiarly Assyrian deity *Asur* (see Assur, the god, below) with the Creation deity An-sar. On the other hand, there is an epithet *Ašir* or Ashir ("overseer") applied to several gods and particularly to the deity *Ašur*, a fact which introduced a third element of confusion into the discussion of the name *Assur*. It is probable then that there is a triple popular etymology in the various forms of writing the name *Aššur*; viz. *A-usar*,[7] *An-šar* and the stem *ašāru*, all of which is quite in harmony with the methods followed by the ancient Assyro-Babylonian philologists.[8]

See also A.H. Layard, *Discoveries in the Ruins of Nineveh and Babylon* (1853); G. Smith, *Assyrian Discoveries* (1875); R.W. Rogers,

History of Babylonia and Assyria, i. 297; ii. 13; ii. 30, 76, 102; J.F. M'Curdy, *History, Prophecy and the Monuments*, §§ 74, 171 f., 247, 258, 283; 57, 59 f. (on the god).

(J. D. Pr.)

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1 The name Assur is not connected with the Asshur of 1 Chron. ii. 24; ii. 45. Note that it is customary to spell the god-name *Ašur* and the country-name *Aššur*.

2 Cf. Rassam, *Asshur and the Land of Nimrod*, 250-251, and many other works.

3 Robert Harper, *Code of Hammurabi*, pp. 6-7, lines 55-58.

4 Thus already Delitzsch, *Wo lag das Paradies?* p. 252. The element *a* means "water," and in *u-sar* it is probable that *u* also means "water," while *sar* is "park, district." See Prince, *Materials for a Sumerian Lexicon*, s.v. *usar*.

5 The name appears as *Aš-šur* (*ki*) and *Aš-šu-ur* (*ki*). See King, *Letters and Inscriptions of Hammurabi*, iv. p. 23, obv. 27; and Nägel, *Beiträge zur Assyriologie*, iv. p. 404; also *Cun. Texts from Bab. Tablets*, vi. pl. 19, line 7.

6 Meissner-Rost, *Bauinschrift Sanheribs*, K. 5413a; K. 1306, rev. 16.

7 See on this entire subject, Morris Jastrow, Jr., *Journal Amer. Orient. Soc.*, xxiv. pp. 282-311; also *Die Religion Bab. u. Assyr.*, pp. 207 ff.

8 On the philological methods of the ancient Babylonian priesthood, see Prince, *Materials for a Sumerian Lexicon*, Introduction.

ASSUR, the primitive capital of Assyria, now represented by the mounds of Kaleh Sherghat (Qal'at Shergat) on the west bank of the Tigris, nearly midway between the Upper and Lower Zab. It is still doubtful (see discussion on the name in the preceding article) whether the national god of Assyria took his name from that of the city or whether the converse was the case. It is most probable, however, that it was the city which was deified (see Sayce, *Religion of Ancient Egypt and Babylonia*, 1902, pp. 366, 367). Sir A.H. Layard, through his assistant Hormuzd Rassam, devoted two or three days to excavating on the site, but owing to the want of pasturage and the fear of Bedouin attacks he left the spot after finding a broken clay cylinder containing the annals of Tiglath-Pileser I., and for many years no subsequent efforts were made to explore it. In 1904, however, a German expedition under Dr W. Andrae began systematic excavations, which have led to important results. The city originally grew up round the great temple of the god Assur, the foundation of which was ascribed to the High-priest Uspia. For many centuries Assur and the surrounding district, which came accordingly to be called the land of Assur (*Assyria*), were governed by high-priests under the suzerainty of Babylonia. With the decay of the Babylonian power the high-priests succeeded in making themselves independent kings, and Assur became the capital of an important kingdom. It was already surrounded by a wall of crude brick, which rested on stone foundations and was strengthened at certain points by courses of burnt brick. A deep moat was dug outside it by Tukulti-Inaristi or Tukulti-Masu (about 1270 B.C.), and it was further defended on the land side by a *salkhu* or outwork. In the 15th century B.C. it was considerably extended to the south in order to include a "new town" which had grown up there. The wall was pierced by "the gate of Assur," "the gate of the Sun-god," "the gate of the Tigris," &c., and on the river side was a quay of burnt brick and limestone cemented with bitumen. The temples were in the northern part of the city, together with their lofty towers, one of which has been excavated. Besides the temple of Assur there was another great temple dedicated to Anu and Hadad, as well as the smaller sanctuaries of Bel, Ishtar, Merodach and other deities. After the rise of the kingdom, palaces were erected separate from the temples; the sites of those of Hadad-nirari I., Shalmaneser I., and Assur-nazir-pal have been discovered by the German excavators, and about a dozen more are referred to in the inscriptions. Even after the rise of Nineveh as the capital of the kingdom and the seat of the civil power, Assur continued to be the religious centre of the country, where the king was called on to reside when performing his priestly functions. The city survived the fall of Assyria, and extensive buildings as well as tombs of the Parthian age have been found upon the site.

See *Mitteilungen der deutschen Orient-Gesellschaft* (1904-1906).

(A. H. S.)

ASSUR, Asur, or Ashur, the chief god of Assyria, was originally the patron deity of the city of Assur on the Tigris, the ancient capital of Assyria from which as a centre the authority of the *patesis* (as the rulers were at first called) spread in various directions. The history of Assyria (*q.v.*) can now be traced back approximately to 2500 B.C., though it does not rise to political prominence until c. 2000 B.C. The name of the god is identical with that of the city, though an older form A-shir, signifying "leader," suggests that a differentiation between the god and the city was at one time attempted. Though the origin of the form Ashur (or Assur) is not certain, it is probable that the name of the god is older than that of the city (see discussion on the name above).

The title *Ashir* was given to various gods in the south, as Marduk and Nebo, and there is every reason to believe that it represents a direct transfer with the intent to emphasize that Assur is the "leader" or head of the pantheon of the north. He is in fact to all intents and purposes of the north. Originally like Marduk a solar deity with the winged disk—the disk always typifying the sun—as his symbol, he becomes as Assyria develops into a military power a god of war, indicated by the attachment of the figure of a man with a bow to the winged disk.[1] While the cult of the other great gods and goddesses of Babylonia was transferred to Assyria, the worship of Assur so overshadowed that of the rest as to give the impression of a decided tendency towards the absorption of all divine powers by the one god. Indeed, the other gods, Sin, Shamash (Samas), Adad, Ninib and Nergal, and even Ea, take on the warlike traits of Assur in the epithets and descriptions given of them in the annals and votive inscriptions of Assyrian rulers to such an extent as to make them appear like little Assurs by the side of the great one. Marduk alone retains a large measure of his independence as a concession on the part of the Assyrians to the traditions of the south, for which they always manifested a profound respect. Even during the period that the Assyrian monarchs exercised complete sway over the south, they rested their claims to the control of Babylonia on the approval of Marduk, and they or their representatives never failed to perform the ceremony of "taking the hand" of Marduk, which was the formal method of assuming the throne in Babylonia. Apart from this concession, it is Assur who pre-eminently presides over the fortunes of Assyria.[2] In his name, and with his approval as indicated by favourable omens, the Assyrian armies march to battle. His symbol is carried into the thick of the fray, so that the god is actually present to grant assistance in the crisis, and the victory is with becoming humility invariably ascribed by the kings "to the help of Assur." With the fall of Assyria the rule of Assur also comes to an end, whereas it is significant that the cult of the gods of Babylonia—more particularly of Marduk—survives for several centuries the loss of political independence through Cyrus' capture of Babylonia in 539 B.C. The name of Assur's temple at Assur, represented by the mounds of Kaleh Sherghat, was known as E-khar-sag-gal-kur-kurra, *i.e.* "House of the great mountain of the lands." Its exact site has been determined by excavations conducted at Kaleh Sherghat since 1903 by the German Oriental Society. The name indicates the existence of the same conception regarding sacred edifices in Assyria as in Babylonia, where we find such names as E-Kur ("mountain house") for the temple of Bel (*q.v.*) at Nippur, and E-Saggila ("lofty house") for Marduk's (*q.v.*) temple at Babylon and that of Ea (*q.v.*) at Eridu, and in view of the general dependence of Assyrian religious beliefs as of Assyrian culture in general, there is little reason to doubt that the name of Assur's temple represents a direct adaptation of such a name as E-Kur, further embellished by epithets intended to emphasize the supreme control of the god to whom the edifice was dedicated. The foundation of the edifice can be traced back to Uspia (Ushpia), *c.* 2000 B.C., and may turn out to be even older. Besides the chief temple, the capital contained temples and chapels to Anu, Adad, Ishtar, Marduk, Gula, Sin, Shamash, so that we are to assume the existence of a sacred precinct in Assur precisely as in the religious centres of the south. On the removal of the seat of residence of the Assyrian kings to Calah (*c.* 1300 B.C.), and then in the 8th century to Nineveh, the centre of the Assur cult was likewise transferred, though the sanctity of the old seat at Assur continued to be recognized. At Nineveh, which remained the capital till the fall of the Assyrian empire in 606 B.C., Assur had as his rival Ishtar, who was the real patron deity of the place, but a reconciliation was brought about by making Ishtar the consort of the chief god. The combination was, however, of an artificial character, and the consciousness that Ishtar was in reality an independent goddess never entirely died out. She too, like Assur, was viewed as a war deity, and to such an extent was this the case that at times it would appear that she, rather than Assur, presided over the fortunes of the Assyrian armies.

(M. Ja.)

1 See Prince, *Journ. Bibl. Lit.*, xxii. 35.

2 As essentially a *national* god, he is almost identical in character with the early Yahweh of Israel. See Sayce, Hibbert Lectures, *Religion of Ancient Babylonia*, p. 129.

ASSUR-BANI-PAL ("Assur creates a son"), the *grand monarque* of Assyria, was the prototype of the Greek Sardanapalus, and appears probably in the corrupted form of Asnapper in Ezra iv. 10. He had been publicly nominated king of Assyria (on the 12th of Iyyar) by his father Esar-haddon, some time before the latter's death, Babylonia being assigned to his twin-brother Samas-sum-yukin, in the hope of gratifying the national feeling of the Babylonians. After Esar-haddon's death in 668 B.C. the first task of Assur-bani-pal was to finish the Egyptian campaign. Tirhakah, who had reoccupied Egypt, fled to Ethiopia, and the Assyrian army spent forty days in ascending the Nile from Memphis to Thebes. Shortly afterwards Necho, the satrap of Sais, and two others were detected intriguing with Tirhakah; Necho and one of his companions were sent in chains to Nineveh, but were there pardoned and restored to their principalities. Tirhakah died 667 B.C., and his successor Tandaman (Tanuat-Amon) entered Upper Egypt, where a general revolt against Assyria took place, headed by Thebes. Memphis was taken by assault and the Assyrian troops driven out of the country. Tyre seems to have revolted at the same time. Assur-bani-pal, however, lost no time in pouring fresh forces into the revolted province. Once more the Assyrian army made its way up the Nile, Thebes was plundered, and its temples destroyed, two obelisks being carried to Nineveh as trophies (see Nahum iii. 8). Meanwhile the siege of insular Tyre was closely pressed; its water-supply was cut off, and it was compelled to surrender. Assur-bani-pal was now at the height of his power. The land of the Manna (Minni), south-east of Ararat, had been wasted, its capital captured by the Assyrians, and its king reduced to vassalage. A war with Teumman of Elam had resulted in the overthrow of the Elamite army; the head of Teumman was sent to Nineveh, and another king, Umman-igas, appointed by the Assyrians. The kings of Cilicia and the Tabal offered their daughters to the harem of Assur-bani-pal; embassies came from Ararat, and even Gyges of Lydia despatched envoys to "the great king" in the hope of obtaining help against the Cimmerians. Suddenly the mighty empire began to totter. The Lydian king, finding that Nineveh was helpless to assist him, turned instead to Egypt and furnished the mercenaries with whose help Psammetichus drove the Assyrians out of the country and suppressed his brother satraps. Egypt was thus lost to Assyria for ever (660 B.C.). In Babylonia, moreover, discontent was arising, and finally Samas-sum-yukin put himself at the head of the national party and declared war upon his brother. Elamite aid was readily forthcoming, especially when stimulated by bribes, and the Arab tribes joined in the revolt. The resources of the Assyrian empire were strained to their utmost. But thanks in some measure to the intestine troubles in Elam, the Babylonian army and its allies were defeated and driven into Babylon, Sippara, Borsippa and Cutha. One by one the cities fell, Babylon being finally starved into surrender (648 B.C.) after Samas-sum-yukin had burnt himself in his palace to avoid falling into the conqueror's hands. It was now the turn of the Arabs, some of whom had been in Babylon during the siege, while others had occupied themselves in plundering Edom, Moab and the Hauran. Northern Arabia was traversed by the Assyrian forces, the Nabataeans were almost exterminated, and the desert tribes terrorized into order. Elam was alone left to be dealt with, and the last resources of the empire were therefore expended in preventing it from ever being again a thorn in the Assyrian side.

But the effort had exhausted Assyria. Drained of men and resources it was no longer able to make head against the Cimmerian and Scythian hordes who now poured over western Asia. The Cimmerian Dugdamme (Lygdamis in Strabo i. 3, 16), whom Assur-bani-pal calls "a limb of Satan," after sacking Sardis, had been slain in Cilicia, but other Scythian invaders came to take his place. When Assur-bani-pal died in 626 (?) B.C. his empire was already in decay, and within a few years the end came. He was luxurious and indolent, entrusting the command of his armies to others whose successes he appropriated, cruel and superstitious, but a magnificent patron of art and literature. The great library of Nineveh was to a considerable extent his creation, and scribes were kept constantly employed in it copying the older tablets of Babylonia, though unfortunately their patron's tastes inclined rather to omens and astrology than to subjects of more modern interest. The library was contained in the palace that he built on the northern side of the mound of Kuyunjik and lined with sculptured slabs which display Assyrian art at its best. Whether Kandalanu (Kinela-danos), who became viceroy of Babylonia after the suppression of the revolt, was Assur-bani-pal under another name, or a different personage, is still doubtful (see SARDANAPALUS).

AUTHORITIES.—George Smith, *History of Assurbanipal* (1871); S.A. Smith, *Die Keilschrifttexte Asurbanipals* (1887-1889); P. Jensen in E. Schrader's *Keilinschriftliche Bibliothek*, ii. (1889); J.A. Knudtzon, *Assyrische Gebete an den Sonnengott* (1893); C. Lehmann, *Schamashschumukin* (1892).

(A. H. S.)

ASSUS [mod. *Behram*], an ancient Greek city of the Troad, on the Adramyttian Gulf. The situation is one of the most magnificent in all the Greek lands. The natural cleavage of the trachyte into joint planes had already scarped out shelves which it was comparatively easy for human labour to shape; and so, high up this cone of trachyte, the Greek town of Assus was built, tier above tier, the summit of the crag being crowned with a Doric temple of Athena. The view from the summit is very beautiful and of great historical interest. In front is Lesbos, one of whose towns, Methymna, is said to have sent forth the founders of Assus, as early, perhaps, as 1000 or 900 B.C. The whole south coast-line of the Troad is seen, and in the south-east the ancient territory of Pergamum, from whose masters the possession of Assus passed to Rome by the bequest of Attalus III. (133 B.C.). The great heights of Ida rise in the east. Northward the Tuzla is seen winding through a rich valley. This valley was traversed by the road which St Paul must have followed when he came overland from Alexandria Troas to Assus, leaving his fellow-travellers to proceed by sea. The north-west gateway, to which this road led, is still flanked by two massive towers, of Hellenic work. On the shore below, the ancient mole can still be traced by large blocks under the clear water. Assus affords the only harbour on the 50 m. of coast between Cape Lectum and the east end of the Adramyttian Gulf; hence it must always have been the chief shipping-place for the exports of the southern Troad. The great natural strength of the site protected it against petty assailants; but, like other towns in that region, it has known many masters—Lydians, Persians, the kings of Pergamum, Romans and Ottoman Turks. From the Persian wars to about 350 B.C. Assus enjoyed at least partial independence. It was about 348-345 B.C. that Aristotle spent three years at Assus with Hermeas, an ex-slave who had succeeded his former master Eubulus as despot of Assus and Atarneus. Aristotle has left some verses from an invocation to Arete (Virtue), commemorating the worth of Hermeas, who had been seized by Persian treachery and put to death.

Under its Turkish name of Behram, Assus is still the commercial port of the southern Troad, being the place to which loads of valonia are conveyed by camels from all parts of the country. Explorations were conducted at Assus in 1881-1883 by Mr J.T. Clarke for the Archaeological Institute of America. The main object was to clear the Doric temple of Athena, built about 470 B.C. This temple is remarkable for a sculptured architrave which took the place of the ordinary frieze. The scenes are partly mythological (labours of Heracles), partly purely heraldic. Eighteen panels were transported to the Louvre in 1838; other fragments rewarded the Americans, and a scientific ground-plan was drawn. The well-preserved Hellenistic walls were also studied.

See J.T. Clarke, *Assos*, 2 vols., 1882 and 1898 (Papers of Arch. Inst. of America, i. ii.); and authorities under TROAD.

(D. G. H.)

ASSYRIA. The two great empires, Assyria and Babylon, which grew up on the banks of the Tigris and Euphrates, can be separated as little historically as geographically. From the beginning their history is closely intertwined; and the power of the one is a measure of the weakness of the other. This interdependence of Assyrian and Babylonian history was recognized by ancient writers, and has been confirmed by modern discovery. But whereas Assyria takes the first place in the classical accounts to the exclusion of Babylonia, the decipherment of the inscriptions has proved that the converse was really the case, and that, with the exception of some seven or eight centuries, Assyria might be described as a province or dependency of Babylon. Not only was Babylonia the mother country, as the tenth

chapter of Genesis explicitly states, but the religion and culture, the literature and the characters in which it was contained, the arts and the sciences of the Assyrians were derived from their southern neighbours. They were similar in race and language. (See Babylonia and Assyria.)

AST, GEORG ANTON FRIEDRICH (1778-1841), German philosopher and philologist, was born at Gotha. Educated there and at the university of Jena, he became privat-docent at Jena in 1802. In 1805 he became professor of classical literature in the university of Landshut, where he remained till 1826, when it was transferred to Munich. There he lived till his death on the 31st of October 1841. In recognition of his work he was made an aulic councillor and a member of the Bavarian Academy of Sciences. He is known principally for his work during the last twenty-five years of his life on the dialogues of Plato. His *Platon's Leben und Schriften* (1816) was the first of those critical inquiries into the life and works of Plato which originated in the *Introductions* of Schleiermacher and the historical scepticism of Niebuhr and Wolf. Distrusting tradition, he took a few of the finest dialogues as his standard, and from internal evidence denounced as spurious not only those which are generally admitted to be so (*Epinomis, Minos, Theages, Arastae, Clitophon, Hipparchus, Eryxias, Letters and Definitions*), but also the *Meno, Euthydemus, Charmides, Lysis, Laches, First and Second Alcibiades, Hippias Major and Minor, Ion, Euthyphro, Apology, Crito*, and even (against Aristotle's explicit assertion) *The Laws*. The genuine dialogues he divides into three series:—(1) the earliest, marked chiefly by the poetical and dramatic element, *i.e. Protagoras, Phaedrus, Gorgias, Phaedo*; (2) the second, marked by dialectic subtlety, *i.e. Theaetetus, Sophist, Statesman, Parmenides, Cratylus*; (3) the third group, combining both qualities harmoniously, *i.e.* the *Philebus, Symposium, Republic, Timaeus, Critias*. The work was followed by a complete edition of Plato's works (11 vols., 1819-1832) with a Latin translation and commentary. His last work was the *Lexicon Platonicum* (3 vols., 1834-1839), which is both valuable and comprehensive. In his works on aesthetics he combined the views of Schelling with those of Winckelmann, Lessing, Kant, Herder, Schiller and others. His histories of philosophy are marked more by critical scholarship than by originality of thought, though they are interesting as asserting the now familiar principle that the history of philosophy is not the history of opinions, but of reason as a whole; he was among the first to attempt to formulate a principle of the development of thought. Beside his works on Plato, he wrote, on aesthetics, *System der Kunstlehre* (1805) and *Grundriss der Aesthetik* (1807); on the history of philosophy, *Grundlinien der Philosophie* (1807, republished 1809, but soon forgotten), *Grundriss einer Geschichte der Philosophie* (1807 and 1825), and *Hauptmomente der Geschichte der Philosophie* (1829); in philology, *Grundlinien der Philologie* (1808), and *Grundlinien der Grammatik, Hermeneutik und Kritik* (1808).

ASTARA, a port of Russian Transcaucasia, government of Baku, on the Caspian, in 38° 27′ N. lat. and 48° 53′ E. long., on the river of the same name, which forms the frontier between Persia and Russia. Russian merchandize is landed there and forwarded to Azerbáiján and Tabriz via Ardebil.

ASTARABAD, a province of Persia bounded N. by the Caspian Sea and Russian Transcaspian, S. by the Elburz Mountains, W. by Mazandaran, and E. by Khorasan. The country, mountainous in its southern portion, possesses extensive forests, fertile valleys, producing rice, wheat and other grains in abundance, and rich pasturages. The soil, even with little culture, is exceedingly productive, owing to the abundance of water which irrigates and fertilizes it. But while the province in many parts presents a landscape of luxuriant beauty, it is a prey to the ravages of disease, principally malarial fevers due to the extensive swamps formed by waters stagnating in the forests, and to the frequent incursions of the Goklan and Yomut Turkomans, who have their camping-grounds in the northern part of the province, and until about 1890 plundered caravans sometimes at the very gates of Astarabad city, and carried people off into slavery and bondage. The province has a population of about 100,000 and pays a yearly revenue of about £30,000. The inhabitants, notwithstanding the unhealthiness of their climate, are a strong and athletic race, belying their yellow and sickly appearance. The province has the following bulúk (administrative divisions):—(1) Astarabad town; (2) Astarabad rustak (villages); (3) Sadan rustak; (4). Anazan; (5) Katúl; (6) Findarisk, with Kuhsar and Nodeh; (7) Shahkuh Sávar.

Astarabad, the capital of the province, is situated on the Astar, a small tributary of the Kara Su (Black river), which flows into the Caspian Sea 20 m. W. of the city, and about 18 m. S. of the Gurgan river, in 36° 51′ N. lat. and 54° 26′ E. long. It is surrounded by a mud wall about 30 ft. in height and about 3½ m. in circuit, but much of the enclosed space is occupied by gardens, mounds of refuse, and ruins. At one time of greater size, it was reduced by Nadir Shah within its present limits. Astarabad owes its origin to Yazid ibn Mohallab, who occupied the province early in the 8th century for Suleiman, the seventh of the Omayyad caliphs (715-717), and was destroyed by Timur (Tamerlane) in 1384. Jonas Hanway, the philanthropist (d. 1786), visited the place in 1744, and attempted to open a direct trade through it between Europe and central Asia. Owing to the noxious exhalations of the surrounding forests the town is so extremely unhealthy during the hot weather as to have acquired the title of the "Abode of the Plague." It has post and telegraph offices, and a population of about 10,000. Since 1890 the Turkomans who impeded trade by their perpetual raids have been kept more in check, and with the decrease of insecurity the commercial activity of Astarabad has increased considerably.

ASTARTE, a Semitic goddess whose name appears in the Bible as Ashtoreth.[1] She is everywhere the great female principle, answering to the Baal of the Canaanites and Phoenicians[2] and to the Dagon of the Philistines. She had temples at Sidon and at Tyre (whence her worship was transplanted to Carthage), and the Philistines probably venerated her at Ascalon (1 Sam. xxxi. 10). Solomon built a high-place for her at Jerusalem which lasted until the days of King Josiah (1 Kings xi. 5; 2 Kings xxiii. 13), and the extent of her cult among the Israelites is proved as much by the numerous biblical references as by the frequent representations of the deity turned up on Palestinian soil.[3] The Moabites formed a compound deity, Ashtar-Chemosh (see Moab), and the absence of the feminine termination occurs similarly in the Babylonian and Assyrian prototype Ishtar. The old South Arabian phonetic equivalent 'Athtar is, however, a male deity. Another compound, properly of mixed sex, appears in the Aramaean Atargatis ('At[t]ar-'athe), worn down to Derketo, who is specifically associated with sacred pools and fish (Ascalon, Hierapolis-Mabog). (See Atargatis.)

The derivation of the name Ishtar is uncertain, and the original attributes of the goddess are consequently unknown. She assumes various local forms in the old Semitic world, and this has led to consequent fusion and identification with the deities of other nations. As the great nature-goddess, the attributes of fertility and reproduction are characteristically hers, as also the accompanying immorality which originally, perhaps, was often nothing more than primitive magic. As patroness of the hunt, later identification with Artemis was inevitable. Hence the consequent fusion with Aphrodite, Artemis, Diana, Juno and Venus, and the action and reaction of one upon the other in myth and legend. Her star was the planet Venus, and classical writers give her the epithet Caelestis and Urania. Whether Astarte was also a lunar goddess has been questioned. As the female counterpart of the Phoenician Baal (viewed as a sun-god), and on the testimony of late writers (Lucian, Herodian) that she was represented with horns, the place-name Ashteroth-Karnaim in Gilead ("Ashteroth of the horns") has been considered ample proof in favour of the theory. But it is probable that the horns were primarily ram's horns,[4] and that Astarte the moon-goddess is due to the influence of the Egyptian Isis and Hathor. Robertson Smith, too, argues that Astarte was originally a sheep-goddess, and points to the interesting use of "Astartes of the flocks" (Deut. vii. 13, see the comm.) to denote the offspring. To nomads, Astarte may well have been a sheep-goddess, but this, if her earliest, was not her only type, as is clear

from the sacred fish of Atargatis, the doves of Ascalon (and of the Phoenician sanctuary of Eryx), and the gazelle or antelope of the goddess of love (associated also with the Arabian Athtar).

The literature is vast; see G.A. Barton, *Amer. Journ. of Sem. Lang.* vols. ix. x., and his *Semitic Origins*; Driver, Hastings' *Dict. Bible*, i. pp. 167-171; Zimmern, *Keilinschr. und das alte Test.*[3] pp. 420 sqq.; Lagrange, *Études d. Relig. Sem.* pp. 123-140; and the articles Adonis, Aphrodite, Artemis, Baal.

(S. A. C.)

1 The vocalization suggests the Heb. bōsheth, "shame"; see Baal.

2 Add also the Hittites; for Sutekh, the Egyptian equivalent of the male partner, see W.M. Müller, *Mitt. d. vorderasiat. Gesell.* (1902), v. pp. 11, 38. Astarte was introduced also into Egypt and had her temple at Memphis. See also S.A. Cook, *Religion of Ancient Palestine, Index*, s.v.

3 Such figurines are in a sense the prototypes of the Venus of Medici. On the influence of her cult upon that of the Virgin Mary, see Rösch, *Studien u. Krit.* (1888), pp. 265 sqq.

4 A model of an Astarte with ram's horns was unearthed by R.A.S. Macalister at Gezer (*Pal. Explor. Fund, Quart. Statement*, 1903, p. 227 with figure facing).

ASTELL, MARY (1668-1731), English author, was born at Newcastle-upon-Tyne. She was instructed by her uncle, a clergyman, in Latin and French, logic, mathematics and natural philosophy. In her twentieth year she went to London, where she continued her studies. She published, in 1697, a work entitled *A Serious Proposal to the Ladies, wherein a Method is offered for the Improvement of their Minds*. With the same end in view she elaborated a scheme for a ladies' college, which was favourably entertained by Queen Anne, and would have been carried out had not Bishop Burnet interfered. The most important of her other works was *The Christian Religion, as professed by a Daughter of the Church of England*, published in 1705.

ASTER (Gr. ἀστήρ, a star), the name of a genus of plants, given from the fact of the flowers having a radiated or star-like appearance (see below). The Greek word also provides many derivatives: *e.g. asterism* (Gr. ἀστερισμός), a constellation (*q.v.*); *asteroid* (Gr. ἀστεροειδής, star-like), an alternative name for planetoids or minor planets (see Planet).

The genus of composite plants named aster (natural order *Compositae*) is found largely in North America, and scattered sparingly over Asia, Europe and South America. They are usually herbaceous perennials; their flowers arranged in numerous heads (*capitula*) recall those of the daisy, whence they are popularly known in England as Michaelmas daisies, since many are in bloom about that time. They are valuable plants in a garden, the various species flowering from late summer right on to November or December. The only British species is *Aster Tripolium*, found abundantly in saline marshes near the sea. One of the species, *Aster alpinus*, grows at a considerable height on the mountains of Europe. Some of them, such as *Aster spectabilis* of North America, are very showy. They are mostly easy to cultivate in ordinary garden soil, and are readily propagated by dividing the roots in early spring. The following are some of the better known forms:—*A. alpinus*, barely 1 ft. high, and *A. Amellus*, 1½ ft., with its var. *bessarabicus*, have broadish blunt leaves and large starry bluish flowers; *A. longifolius* var. *formosus*, 2 ft., bright rosy lilac; *A. acris*, 2 to 3 ft., with blue flowers in August; *A. ericoides*, 3 ft., with heath-like leaves and masses of small white flowers; *A. puniceus*, 4 to 6 ft., blue or rosy-lilac; *A. turbinellus*, 2 to 3 ft., mauve-coloured, are showy border plants; and *A. Novae-Angliae*, 5 to 6 ft., rosy-violet; *A. Novi-Belgii*, 3 to 6 ft., pale blue; *A. laevis*, 2 to 6 ft., blue-lilac; and *A. grandiflorus*, 3 ft., violet, are especially useful from their late-flowering habit.

The China aster (*Callistephus chinensis*) is also a member of the order *Compositae*. It is a hardy annual, a native of China, which by cultivation has yielded a great variety of forms. Some of the best for ornamental gardening are the chrysanthemum-flowered, the paeony-flowered, the crown or cockade, the comet, and the globe-quilled. Crown asters have a white centre, and dark crimson or purple circumference, and are very beautiful. The colours range from white and blush through pink and rose to crimson, and from lilac through blue to purple, in various shades. They should be sown early in March in pans, in a gentle heat, the young plants being quickly transferred to a cool pit, and there pricked out in rich soil as soon as large enough, and eventually planted out in the garden in May or June, in soil which has been well worked and copiously manured, where they grow from 8 to 18 in. high, and flower towards the end of summer. They also make handsome pot plants for the conservatory.

ASTERIA, or Star-stone (from Gr. ἀστήρ, star), a name applied to such ornamental stones as exhibit when cut *en cabochon* a luminous star. The typical asteria is the star-sapphire, generally a bluish-grey corundum, milky or opalescent, with a star of six rays. (See Sapphire.) In red corundum the stellate reflexion is less common, and hence the star-ruby occasionally found with the star-sapphire in Ceylon is among the most valued of "fancy stones." When the radiation is shown by yellow corundum, the stone is called star-topaz. Cymophane, or chatoyant chrysoberyl, may also be asteriated. In all these cases the asterism is due to the reflexion of light from twin-lamellae or from fine tubular cavities or thin enclosures definitely arranged in the stone. The *astrion* of Pliny is believed to have been our moonstone, since it is described as a colourless stone from India having within it the appearance of a star shining with the light of the moon. All star-stones were formerly regarded with much superstition.

ASTERID, a group of starfish. They are the starfish proper, and have the typical genus *Asterias* (see Starfish).

ASTERISK (from Gr. ἀστερίσκος, a little star), the sign * used in typography. The word is also used in its literal meaning in old writers, and as a description of an ornamental form (star-shaped) in one of the utensils in the Greek Church.

ASTERIUS, of Cappadocia, sophist and teacher of rhetoric in Galatia, was converted to Christianity about the year 300, and became the disciple of Lucian, the founder of the school of Antioch. During the persecution under Maximian (304) he relapsed into paganism, and thus, though received again into the church by Lucian and supported by the Eusebian party, never attained to ecclesiastical office. He is

best known as an able defender of the semi-Arian position, and was styled by Athanasius the “advocate” of the Arians. His chief work was the *Syntagmation*, but he wrote many others, including commentaries on the Gospels, the Psalms, and Romans. He attended many synods, and we last hear of him at the synod of Antioch in 341.

ASTERIUS, bishop of Amasia, in Pontus, *c.* 400. He was partly contemporary with the emperor Julian (d. 363) and lived to a great age. His fame rests chiefly on his *Homilies*, which were much esteemed in the Eastern Church. Most of these have been lost, but twenty-one are given in full by Migne (*Patrol. Ser. Gr.* xl. 164-477), and there are fragments of others in Photius (*Cod.* 271). Asterius was a man of much culture, and his works are a valuable contribution to our knowledge of the history of preaching.

ASTHMA (Gr. ἆσθμα, gasping, whence ἀσθμαίνω, I gasp for breath), a disorder of respiration characterized by severe paroxysms of difficult breathing (*dyspnoea*) usually followed by a period of complete relief, with recurrence of the attacks at more or less frequent intervals. The term is often loosely employed in reference to states of embarrassed respiration, which are plainly due to permanent organic disease of the respiratory organs (see Respiratory System: *Pathology*).

The attacks occur quite suddenly, and in some patients at regular, in others at irregular intervals. They are characterized by extreme difficulty both in inspiration and expiration, but especially in the latter, the chest becoming distended and the diaphragm immobile. In the case of “pure,” “idiopathic” or “nervous” asthma, there is no fever or other sign of inflammation. But where the asthma is secondary to disease of some organ of the body, the symptoms will depend largely on that organ and the disease present. Such secondary forms may be bronchitic, cardiac, renal, peptic or thymic.

The mode of onset differs very markedly in different cases. In some the attack begins quite suddenly and without warning, but in others various sensations well known to the patient announce that an attack is imminent. According to the late Dr Hyde Salter the commonest warning is that of an intense desire for sleep, so overpowering that though the patient knows his only chance of warding off the attack is to keep awake, he is yet utterly unable to fight against his drowsiness. Among other patients, however, a condition of unwonted mental excitement presages the attack. Again the secondary forms of the disease may be ushered in by flatulence, constipation and loss of appetite, and a symptom which often attends the onset, though it is not strictly premonitory, is a profuse diuresis, the urine being watery and nearly colourless, as in the condition of hysterical diuresis. In the majority of instances the attack begins during the night, sometimes abruptly but often by degrees. The patient may or may not be aware that his asthma is threatening. A few hours after midnight he is aroused from sleep by a sense of difficult breathing. In some cases this is a slowly increasing condition, not becoming acute for some hour or more. But in others the attack is so sudden, so severe, that the patient springs from his bed and makes his way at once to an open window, apparently struggling for breath. Most asthmatics have some favourite attitude which best enables them to use all the auxiliary muscles of respiration in their struggle for breath, and this attitude they immediately assume, and guard fixedly until the attack begins to subside. The picture is characteristic and a very painful one to watch. The face is pale, anxious, and it may be livid. The veins of the forehead stand out, the eyes bulge, and perspiration bedews the face. The head is fixed in position, and likewise the powerful muscles of the back to aid the attempt at respiration. The breath is whistling and wheezing, and if it becomes necessary for the patient to speak, the words are uttered with great difficulty. If the chest be watched it is seen to be almost motionless, and the respirations may become extraordinarily slowed. Inspiration is difficult as the chest is already over-distended, but expiration is an even far greater struggle. The attack may last any time from an hour to several days, and between the attacks the patient is usually quite at ease. But notwithstanding the intensely distressing character of the attacks, asthma is not one of the diseases that shorten life.

In the child, asthma is usually periodic in its recurrence, but as he ages it tends to become more erratic in both its manifestations and time of appearance. Also, though at first it may be strictly “pure” asthma, later in life it becomes attended by chronic bronchitis, which in its turn gives rise to emphysema.

As to the underlying cause of the disease, one has only to read the many utterly different theories put forward to account for it, to see how little is really known. But it has now been clearly shown that in the asthmatic state the respiratory centre is in an unstable and excitable condition, and that there is a morbid connexion between this and some part of the nasal apparatus. Dr Alexander Francis has shown, however, that the disease is not directly due to any mechanical obstruction of the nasal passages, and that the nose comparatively rarely supplies the immediate exciting cause of the asthmatic attack. Paroxysmal sneezing is another form in which asthma may show itself, and, curiously enough, this form occurs more frequently in women, asthma of the more recognized type in men. In infants and young children paroxysmal bronchitis is another form of the same disease. Dr James Goodhart notes the connexion between asthma and certain skin troubles, giving cases of the alternation of asthma and psoriasis, and also of asthma and eczema. The disease occurs in families with a well-marked neurotic inheritance, and twice as frequently in men as in women. The immediate cause of an attack may be anything or nothing. Dr Hyde Salter notes that 80% of cases in the young date from an attack of whooping cough, bronchitis or measles.

In the general treatment of asthma there are two methods of dealing with the patient, either that of hardening the individual, widening his range of accommodation, and thus making him less susceptible, or that of modifying and adapting the environment to the patient. These two methods correspond to the two methods of drug treatment, tonic or sedative. During the last few years the method of treatment first used by Dr Alexander Francis has come into prominence. His plan is to restore the stability of the respiratory centre, by cauterizing the septal mucous membrane, and combining with this general hygienic measures. In his own words the operation, which is entirely painless and insignificant, is performed as follows:—“After painting one side of the septum nasi with a few drops of cocaine and resorcin, I draw a line with a galvano-cautery point from a spot opposite the middle turbinated body, forwards and slightly downwards for a distance of rather less than half an inch. In about one week’s time I repeat the operation on the other side.” In his monograph on the subject, he classifies a large number of cases treated in this manner, most of which resulted in complete relief, some in very great improvement, and a very few in slight or no relief.

ASTI (anc. *Hasta*), a town and episcopal see of Piedmont, Italy, in the province of Alessandria, situated on the Tanaro; it is 22 m. W. by rail from Alessandria. Pop. (1901) town, 19,787; commune, 41,047. Asti has still numerous medieval towers, a fine Gothic cathedral of the 14th century, the remains of a Christian basilica of the 6th century, and the octagonal baptistery of S. Pietro (11th century). It was the birthplace of the poet Vittorio Alfieri. In ancient times it manufactured pottery. It is now famous for its sparkling wine (*Asti spumante*), and is a considerable centre of trade.

ASTLEY, JACOB ASTLEY, Baron (1570-1652), royalist commander in the English Civil War, came of a Norfolk family. In 1598 he joined Counts Maurice and Henry of Orange in the Netherlands, where he served with distinction, and afterwards fought under the elector palatine Frederick V. and Gustavus Adolphus in the Thirty Years’ War. He was evidently thought highly of by the states-general, for when he was absent, serving under the king of Denmark, his company in the Dutch army was kept open for him. Returning to England with a well-deserved reputation, he was in the employment of Charles I. in various military capacities. As “sergeant-major,” or general of the infantry, he went north in 1639 to organize the defence against the expected Scottish invasion. Here his duties were as much

diplomatic as military, as the discontent which ended in the Civil War was now coming to a head. In the ill-starred “Bishops’ War,” Astley did good service to the cause of the king, and he was involved in the so-called “Army Plot.” At the outbreak of the Great Rebellion (1642) he at once joined Charles, and was made major-general of the foot. His characteristic battle-prayer at Edgebill has become famous: “O Lord, Thou knowest how busy I must be this day. If I forget Thee, do not forget me. March on, boys!” At Gloucester he commanded a division, and at the first battle of Newbury he led the infantry of the royal army. With Hopton, in 1644, he served at Arundel and Cheriton. At the second battle of Newbury he made a gallant and memorable defence of Shaw House. He was made a baron by the king, and at Naseby he once more commanded the main body of the foot. He afterwards served in the west, and with 1500 men fought stubbornly but vainly the last battle for the king at Stow-on-the-Wold (March 1646). His remark to his captors has become as famous as his words at Edgehill, “You have now done your work and may go play, unless you will fall out amongst yourselves.” His scrupulous honour forbade him to take any part in the Second Civil War, as he had given his parole at Stow-on-the-Wold; but he had to undergo his share of the discomforts that were the lot of the vanquished royalists. He died in February 1651/2. The barony became extinct in 1668.

ASTLEY, SIR JOHN DUGDALE, Bart. (1828-1894), English soldier and sportsman, was a descendant of Lord Astley, and son of the 2nd baronet (cr. 1821). From 1848 to 1859 he was in the army, serving in the Crimean War and retiring as lieutenant-colonel. He married an heiress in 1858, and thenceforth devoted himself to horse-racing, pugilism and sport in general. He succeeded to the baronetcy in 1873, and from 1874 to 1880 was Conservative M.P. for North Lincolnshire. He was a popular figure on the turf, being familiarly known as “the Mate,” and won and lost large sums of money. Just before his death, on the 10th of October 1894, he published some entertaining reminiscences, under the title of *Fifty Years of my Life*.

ASTON, ANTHONY (fl. 1712-1731), English actor and dramatist, began to be known on the London stage in the early years of the 18th century. He had tried the law and other professions, which he finally abandoned for the theatre. He had some success as a dramatic author, writing *Love in a Hurry*, performed in Dublin about 1709, and *Pastora, or the Coy Shepherdess*, an opera (1712). For many years he toured the English provinces with his wife and son, producing pieces which he himself wrote, or medleys from various plays fitted together with songs and dialogues of his own.

ASTON MANOR, a municipal and parliamentary borough of Warwickshire, England, adjoining Birmingham on the north-east. Pop. (1901) 77,326. There are extensive manufactures, including those of motors and cycles with their accessories, also paper-mills, breweries, &c., and the population is largely industrial. Aston Hall, erected by Sir Thomas Holte in 1618-1635, is an admirable architectural example of its period, built of red brick. It stands in a large park, the whole property being acquired by the corporation of Birmingham in 1864, when the mansion became a museum and art gallery. It contains the panelling of a room from the house of Edmund Hector, which formerly stood in Old Square, Birmingham, where Dr Samuel Johnson was a frequent visitor. Aston Lower Grounds, adjoining the park, contain an assembly hall, and the playing field of the Aston Villa Football Club, where the more important games are witnessed by many thousands of spectators. Aston Manor was incorporated in 1903. The parliamentary borough returns one member. The corporation consists of a mayor, 6 aldermen and 18 councillors. Area, 960 acres.

ASTOR, JOHN JACOB (1763-1848), American merchant, was born at the village of Walldorf, near Heidelberg, Germany, on the 17th of July 1763. Until he was sixteen he worked in the shop of his father, a butcher; he then joined an elder brother in London, and there for four years was employed in the piano and flute factory of an uncle, of the firm of Astor & Broadwood. In 1783 he emigrated to America, and settled in New York, whither one of his brothers had previously gone. On the voyage he became acquainted with a fur-trader, by whose advice he devoted himself to the same business, buying furs directly from the Indians, preparing them at first with his own hands for the market, and selling them in London and elsewhere at a great profit. He was also the agent in New York of the firm of Astor & Broadwood. By his energy, industry and sound judgment he gradually enlarged his operations, did business in all the fur markets of the world, and amassed an enormous fortune,—the largest up to that time made by any American. He devoted many years to carrying out a project for organizing the fur trade from the Great Lakes to the Pacific Ocean, and thence by way of the Hawaiian Islands to China and India. In 1811 he founded at the mouth of the Columbia river a settlement named after him Astoria, which was intended to serve as the central depot; but two years later the settlement was seized and occupied by the English. The incidents of this undertaking are the theme of Washington Irving’s *Astoria*. A series of disasters frustrated the gigantic scheme. Astor made vast additions to his wealth by investments in real estate in New York City, and erected many buildings there, including the hotel known as the Astor House. The last twenty-five years of his life were spent in retirement in New York City, where he died on the 29th of March 1848, his fortune then being estimated at about $30,000,000. He made various charitable bequests by his will, and among them a gift of $50,000 to found an institution, opened as the “Astor House” in 1854, for the education of poor children and the relief of the aged and the destitute in his native village in Germany. His chief benefaction, however, was a bequest of $400,000 for the foundation and endowment of a public library in New York City, since known as the Astor library, and since 1895 part of the New York public library.

See Parton’s *Life of John Jacob Astor* (New York, 1865).

His eldest son, William Backhouse Astor (1792-1875), inherited the greater part of his father’s fortune, and chiefly by judicious investments in real estate greatly increased it. He was sometimes known as the “Landlord of New York.” Under his direction the building for the Astor library was erected, and to the library he gave about $550,000, including a bequest of $200,000. His son, John Jacob Astor (1822-1890), was also well known as a capitalist and philanthropist, giving liberally to the Astor library.

The son of the last named, William Waldorf Astor (1848-), served in the New York assembly in 1877, and in the state senate in 1880-81. He was United States minister to Italy from 1882 to 1885. He published two romances, *Valentine* (1885) and *Sforza* (1889). His wealth, arising from property in New York, where also he built the New Netherland hotel and the Waldorf hotel, was enormous. In 1890 he removed to England, and in 1899 was naturalized. In 1893 he became proprietor of the *Pall Mall Gazette*, and afterwards started the *Pall Mall Magazine*.

ASTORGA, EMANUELE D’ (1681-1736), Italian musical composer, was born at Naples on the 11th of December 1681. No authentic account of Astorga’s life can be successfully constructed from the obscure and confusing evidence that has been until now handed down, although historians have not failed to indulge many pleasant conjectures. According to some of these, his father, a baron of Sicily, took an active part in the attempt to throw off the Spanish yoke, but was betrayed by his own soldiers and publicly executed. His wife and son were compelled to be spectators of his fate; and such was the effect upon them that his mother died on the spot, and Emanuele fell into a

state of gloomy despondency, which threatened to deprive him of reason. By the kindness of the princess Ursini, the unfortunate young man was placed in a convent at Astorga, in Leon, where he completed a musical education which is said to have been begun in Palermo under Francesco Scarlatti. Here he recovered his health, and his admirable musical talents were cultivated under the best masters. On the details of this account no reliance can safely be placed, nor is there any certainty that in 1703 he entered the service of the duke of Parma. Equally untrustworthy is the story that the duke, suspecting an attachment between hi? niece Elizabeth Farnese and Astorga, dismissed the musician. The established facts concerning Astorga are indeed few enough. They are: that the opera *Dafne* was written and conducted by the composer in Barcelona in 1709; that he visited London, where he wrote his *Stabat Mater*, possibly for the society of "Antient Musick"; that it was performed in Oxford in 1713; that in 1712 he was in Vienna, and that he retired at an uncertain date to Bohemia, where he died on the 21st of August 1736, in a castle which had been given to him in the domains of Prince Lobkowitz, in Raudnitz. Astorga deserves remembrance for his dignified and pathetic *Stabat Mater*, and for his numerous chamber-cantatas for one or two voices. He was probably the last composer to carry on the traditions of this form of chamber-music as perfected by Alessandro Scarlatti.

ASTORGA, a city of N.W. Spain, in the province of Leon; situated near the right bank of the river Tuerto, and at the junction of the Salamanca-Corunna and Leon-Astorga railways. Pop. (1900) 5573. Astorga was the Roman Asturica Augusta, a provincial capital, and the meeting-place of four military roads. Though sacked by the Goths in the 5th century, and later by the Moors, it is still surrounded by massive walls of Roman origin. A ruined castle, near the city, recalls its strategic importance in the 8th century, when Asturias, Galicia and Leon were the headquarters of resistance to the Moors. Astorga has been the see of a bishop since the 3rd century, and was formerly known as the City of Priests, from the number of ecclesiastics resident within its walls. Its Gothic cathedral dates from the 15th century. The city confers the title of marquis on the Osorio family, the ruins of whose palace, sacked in 1810 by the French, are still an object of interest.

For the history, especially the ecclesiastical history, of Astorga, see the anonymous *Historia de la ciudad de Astorga* (Valladolid, 1840); with *Fundación de la ... iglesia ... de Astorga*, by P.A. Ezpeleta (Madrid, 1634); and *Fundación, nombre y armas de ... Astorga*, by P. Junco (Pamplona, 1635).

ASTORIA, a city, port of entry, and the county-seat of Clatsop county, Oregon, U.S.A., on the Columbia river, 8 m. from its mouth. Pop. (1890) 6184; (1900) 8381, of whom 3779 were foreign-born (many being Finns,—a Finnish weekly was established here in 1905), and 601 were Chinese; (1910, census) 9599. It is served by the Astoria & Columbia River railroad (Northern Pacific System), and by several coastwise and foreign steamship lines (including that of the Oregon Railway & Navigation Co.). The river here is about 6 m. wide, and the city has a water-front of about 5 m. and a deep, spacious and placid harbour. By dredging and the construction of jetties the Federal government has since 1885 greatly improved the channel at the mouth of the river. The business portion of the city occupies the low ground of the river bottom; the residence portion is on the hillsides overlooking the harbour. Astoria is the port of entry for the Oregon Customs District, Oregon; in 1907 its imports were valued at $21,262, and its exports at $329,103. The city is especially important as a salmon fishing and packing centre (cod, halibut and smaller fish also being abundant); it has also an extensive lumber trade, important lumber manufactories, pressed brick and terra-cotta factories, and dairy interests. In 1905 the value of the factory product was $3,092,628 (of which $1,759,871 was the value of preserved and canned fish), being an increase of 41.8% in five years. Astoria is the oldest American settlement in the Columbia Valley. It was founded in 1811, as a depot for the fur trade, by John Jacob Astor, in whose honour it was named. It was seized by the British in 1813, but was restored in 1818. In 1821, while occupied by the North-West Fur Company, it was burned and practically abandoned, only a few settlers remaining. It was chartered as a city in 1876.

See Washington Irving's *Astoria; or Anecdotes of an Enterprise beyond the Rocky Mountains* (Philadelphia, 1836).

ASTRAEA, in Greek legend, the "star maiden," daughter of Zeus and Themis, or of Astraeus the Titan and Eos, in which case she is identified with Dikē. During the golden age she remained among men distributing blessings, but when the iron (or bronze) age came on, she was forced to withdraw, being the last of the goddesses to quit the earth. In the heavens she is amongst the signs of the zodiac as the constellation Virgo. She is usually represented with a pair of scales and a crown of stars.

Ov. *Met.* i. 150; Juv. vi. 19; Aratus, *Phaenomena*, 96.

ASTRAGAL (from the Gr. ἀστράγαλος, the ankle-joint), an architectural term for a convex moulding. This term is generally applied to small mouldings, "torus" (*q.v.*) to large ones of the same form. The Lesbian astragal referred to by Vitruvius, bk. iv. ch. vi., was in all probability an astragal carved with a bead and reel enrichment.

ASTRAKHAN, a government of S.E. Russia, on the lower Volga, bounded N. by the governments of Samara and Saratov, W. by Saratov and the government of the Don Cossacks, S. by Stavropol and Terek, and E. by the Caspian Sea and the government of the Urals. Area, 91,327 sq. m., of which 6730 sq. m. belong to the delta of the Volga and its brackish lagoons, and 62,290 sq. m. are covered by the Kalmuck and Kirghiz Steppes. The surface is a low-lying plain, except that in the west the Ergeni Hills (500-575 ft.) form the water-parting between the Volga basin and that of the Don. The climate is very hot and dry, the average temperature for the year being 50° Fahr., for January 21°, and for July 78°, rainfall 7.3 in., but often there is no rain at all in the summer. Pop. (1897) 1,005,460, of whom 132,383 were urban. The Kalmucks (138,580 in 1897) and Kirghiz (260,000) are semi-nomads. In addition to them the population includes nearly 44,000 Tatars, 4270 Armenians, with Poles and Jews. Fishing off the mouth of the Volga gives occupation to 50,000 persons; the fish, chiefly herrings and sturgeon, together with the caviare prepared from the latter, are sold for the most part at Nizhniy-Novgorod. Over 300,000 tons of salt are extracted annually from the lakes, principally those of Baskunchak and Elton. Cattle-breeding is an important industry. Market-gardening (mustard, water-melons, fruit) is on the increase; but pure agriculture is relatively not much developed. The government is divided into five districts, the chief towns of which are Astrakhan, Enotayevsk (pop. 2810 in 1897), Krasnyi-yar (4680), Chernyi-yar (5140), and Tsarev (8900). The Kalmucks and Kirghiz have their own local administrations, and so have the Astrakhan Cossacks (25,600).

ASTRAKHAN, a town of E. Russia, capital of the government of Astrakhan, on the left bank of the main channel of the Volga, 50 m. from the Caspian Sea, in 46° 21′ N. lat. and 48° 5′ E. long. Since the growth of the petroleum industry of Baku and the construction of the Transcaspian railway, Astrakhan has become an important commercial centre, exporting fish, caviare, sugar, metals, naphtha, cottons and woollens, and importing grain, cotton, fruit and timber, to the aggregate value of £8,250,000 with foreign countries and of £14,500,000 with the interior of Russia. The town gives its name to the "fur" called "astrakhan," the skin of the new-born Persian lamb, and so to an imitation in rough woollen cloth. There is some tanning, shipbuilding and brewing, and making of soap, tar and machinery. Astrakhan is the chief port on the Caspian Sea and the headquarters of the Russian Caspian fleet. The city consists of (1) the *kreml* or citadel (1550), crowning a hill, on which stand also the spacious brick cathedral containing the tombs of two Georgian princes, the archbishop's palace and the monastery of the Trinity; (2) the Byelogorod or White Town, containing the administrative offices and the bazaars; and (3) the suburbs, where most of the population resides. The buildings in the first two quarters are of stone, in the third of wood, irregularly arranged along unpaved, dirty streets. The city is the see of a Greek Catholic archbishop and of an Armenian archbishop, and contains a Lamaist monastery, as well as technical schools, an ichthyological museum, the Peter museum, with ethnographical, archaeological and natural history collections, a botanical garden, an ecclesiastical seminary, and good squares and public gardens, one of which is adorned with a statue (1884) of Alexander II. Vineyards surround the city. Astrakhan was anciently the capital of a Tatar state, and stood some 7 m. farther north. After this was destroyed by the Mongol prince Timur the Great in 1395, the existing city was built. The Tatars were expelled about 1554 by Ivan IV. of Russia. In 1569 the city was besieged by the Turks, but they were defeated with great slaughter by the Russians. In 1670 it was seized by the rebel Stenka Razin; early in the following century Peter the Great constructed here a shipbuilding yard and made Astrakhan the base for his hostilities against Persia, and later in the same century Catherine II. accorded the city important industrial privileges. In 1702, 1718 and 1767, it suffered severely from fires; in 1719 was plundered by the Persians; and in 1830 the cholera swept away a large number of its people. In the middle ages the city was known also as Jitarkhan and Ginterkhan. Pop. (1867) 47,839; (1900) 121,580. Eight miles above Astrakhan, on the right bank of the Volga, are the ruins of two ancient cities superimposed one upon the other. In the upper, which may represent the city of Balanjar (Balansar, Belenjer), have been found gold and silver coins struck by Mongol rulers, as well as ornaments in the same metals. The older and scantier underlying ruins are supposed to be those of the once large and prosperous city of Itil or Atel (Etel, Idl) of the Arab geographers, a residence of the khan of the Khazars, destroyed by the Russians in 969.

(P. A. K.)

ASTROLABE (from Gr. ἄστρον, star, and λαβῖν, to take), an instrument used not only for stellar, but for solar and lunar altitude-taking. The principle of the astrolabe is explained in fig. 2. There were two kinds,—spherical and planispheric. The earliest forms were "armillae" and spherical. Gradually, from Eratosthenes to Tycho, Hipparchus playing the most important part among ancient astronomers, the complex astrolabe was evolved, large specimens being among the chief observatory instruments of the 15th, 16th and even 17th centuries; while small ones were in use among travellers and learned men, not only for astronomical, but for astrological and topographical purposes. Nearly every one of the modern instruments used for the observations of physical astronomy is a part of the perfected astrolabe. A collection of circles such as is the armillary sphere, if each circle were fitted with a view-tube, might be considered a complete astrolabe. Tycho's armillae were astrolabes. In fact the modern equatorial, and the altitude and azimuth circle are astrolabes in the strictest and oldest meaning of the term; and Tycho in one of his astrolabes came so near the modern equatorial that it may be taken as the first of the kind.

PLATE.

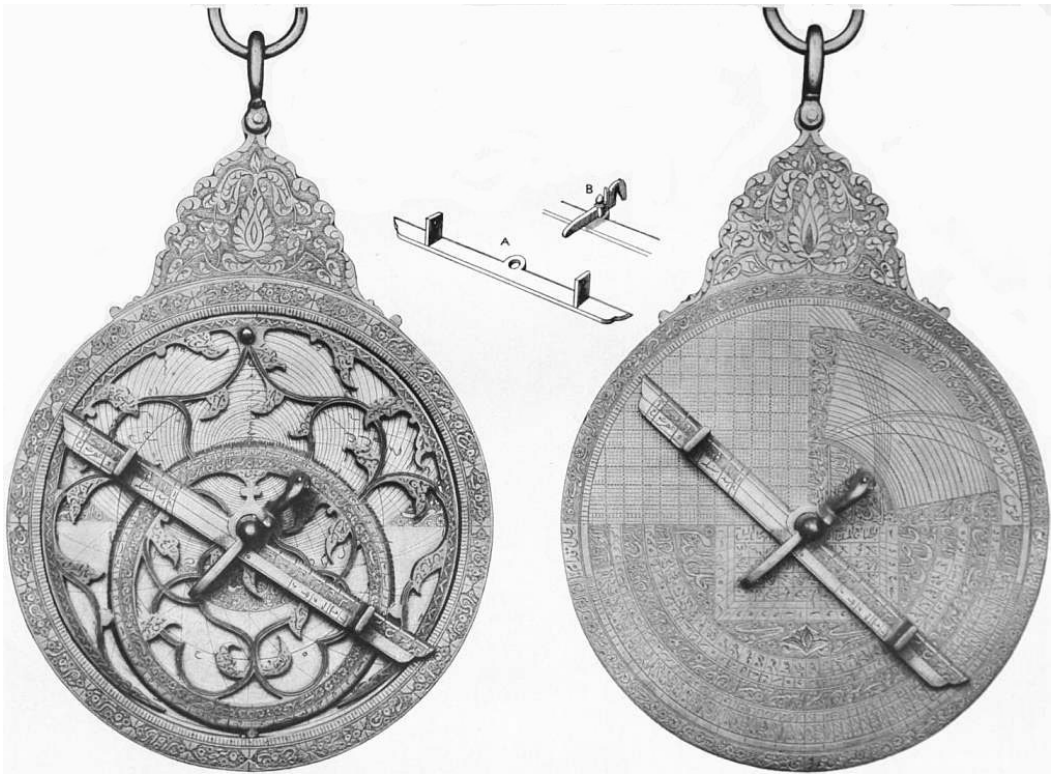


FIG. 1.—PERSIAN ASTROLABE (*c.* 1712) INSCRIBED IN ARABIC.

FRONT, showing the *Rete* or *Spider*, a network of star pointers. Beneath the *Rete*, in a hollow, are four thin brass discs, called Tables or Climates, engraved with projections of the sphere for different latitudes.

BACK, showing graduations, parallelogram for measuring heights; and other tables, together with the *Rule* with sights (A) held by a moveable pin (B), known as the *Horse* or *Wedge*.

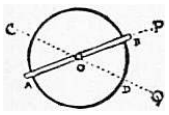


FIG. 2.—Principle of the Astrolabe. If a solid circle be fixed in any one position and a tube be pivoted on its centre so as to move; and if the line C D be drawn upon the circle pointing towards any object Q in the heavens which lies in the plane of the circle, by turning the tube A B towards any other object P in the plane of the circle, the angle BOD will be the angle subtended by the two objects P and Q at the eye.

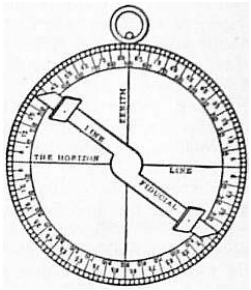
The two forms of the planispheric astrolabe most widely known and used in the 15th, 16th and even 17th centuries were: (1) the *portable astrolabe* shown in fig. 1 (Plate). This originated in the East, and was in early use in India, Persia and Arabia, and was introduced into Europe by the Arabs, who had perfected it—perhaps as early as A.D. 700. It combines the planisphere and armillae of Hipparchus and others, and the theodolite of Theon, and was usually of brass, varying in diameter from a couple of

inches to a foot or more. It was used for taking the altitudes of sun, moon and stars; for calculating latitude; for determining the points of the compass, and time; for ascertaining heights of mountains, &c.; and for construction of horoscopes. The instrument was a marvel of convenience and ingenuity, and was called "the mathematical jewel." Nevertheless it passed out of use, because incapable of any great precision.

(2) The *mariner's astrolabe*, fig. 3, was adapted from that of astronomers by Martin Behaim, *c.* 1480. This was the instrument used by Columbus. With the tables of the sun's declination then available, he could calculate his latitude by meridian altitudes of the sun taken with his astrolabe. The mariner's astrolabe was superseded by John Hadley's quadrant of 1731.

AUTHORITIES.—Chaucer, *Treatise on the Astrolabe* (Skeat's edition of Chaucer); J.J. Stöffler, *Elucidatio Fabrice ususque Astrolabii*, &c.; Thomas Blundeville, *His Exercises* (1594); F. Ritter, *Astrolabium*; W.H. Morley, *Description of Astrolabe of Shah Husain*; M.L. Huggins, "The Astrolabe" (*Astrophysical Journal*, 1894); *Penny Cyclopaedia*, article "Astrolabe;" R. Grant, *History of Physical Astronomy*.

(M. L. H.)



From *Exercises*, by T. Blundeville.

FIG. 3.—Mariner's Astrolabe, A.D. 1594. Made of brass, or of heavy wood: it varied in size from a few inches to 1 ft. in diameter.

ASTROLOGY, the ancient art or science of divining the fate and future of human beings from indications given by the positions of the stars (sun, moon and planets). The belief in a connexion between the heavenly bodies and the life of man has played an important part in human history. For long ages astronomy and astrology (which might be called astromancy, on the same principle as "chiromancy") were identified; and a distinction is made between "natural astrology," which predicts the motions of the heavenly bodies, eclipses, &c., and "judicial astrology," which studies the influence of the stars on human destiny. Isidore of Seville (d. 636) is one of the first to distinguish between astronomy and astrology; nor did astronomy begin to rid itself of astrology till the 16th century, when, with the system of Copernicus, the conviction that the earth itself is one of the heavenly bodies was finally established. The study of astromancy and the belief in it, as part of astronomy, is found in a developed form among the ancient Babylonians, and directly or indirectly through the Babylonians spread to other nations. It came to Greece about the middle of the 4th century B.C., and reached Rome before the opening of the Christian era. In India and China astronomy and astrology are largely reflections of Greek theories and speculations; and similarly with the introduction of Greek culture into Egypt, both astronomy and astrology were actively cultivated in the region of the Nile during the Hellenistic and Roman periods. Astrology was further developed by the Arabs from the 7th to the 13th century, and in the Europe of the 14th and 15th centuries astrologers were dominating influences at court.

Even up to the present day men of intellectual eminence like Dr Richard Garnett have convinced themselves that astromancy has a foundation of truth, just as there are still believers in chiromancy or other forms of divination. Dr Garnett ("A.G. Trent") insisted indeed that it was a mistake to confuse astrology with fortune-telling, and maintained that it was a "physical science just as much as geology," depending like them on ascertained facts, and grossly misrepresented by being connected with magic. Dr Garnett himself looked upon the study of biography in relation to the casting of horoscopes as an empirical investigation, but it is difficult in practice to keep the distinction clear, to judge by present-day text-books such as those of Dr Wilde (*Primer of Astrology*, &c.). Dr Wilde insists on there being "nothing incongruous with the laws of nature in the theory that the sun, moon and stars influence men's physical bodies and conditions, seeing that man is made up of a physical part of the earth." There is an obvious tendency, however, for astromancy to be employed, like palmistry, as a means of imposing on the ignorant and credulous. How far the more serious claim is likely to be revived in connexion with the renewal of research into the "occult" sciences generally, it is still too early to speculate; and it has to be recognized that such a point of view is opposed to the generally established belief that astrology is either mere superstition or absolute imposture, and that its former vogue was due either to deception or to the tyranny of an unscientific environment. But if the progress of physical science has not prevented the rehabilitation of much of ancient alchemy by the later researches into chemical change, and if psychology now finds a place for explanations of spiritualism and witchcraft which involve the admission of the empirical facts under a new theory (as in the case of the divining-rod, &c.), it is at least conceivable that some new synthesis might once more justify part at all events of ancient and medieval astromancy, to the extent of admitting the empirical facts where provable, and substituting for the supposed influence of the stars as such, some deeper theory which would be consistent with an application to other forms of prophecy, and thus might reconcile the possibility of dipping into futurity with certain interrelations of the universe, different indeed from those assumed by astrological theory, but underlying and explaining it. If this is ever accomplished it will need the patient investigation of a number of empirical observations by competent students unbiassed by any *parti pris*—a difficult set of conditions to obtain; and even then no definite results may be achieved.

The history of astrology can now be traced back to ancient Babylonia, and indeed to the earliest phases of Babylonian history, *i.e.* to about 3000 B.C. In Babylonia as well as in Assyria as a direct offshoot of Babylonian culture (or as we might also term it "Euphratean" culture), astrology takes its place in the official cult as one of the two chief means at the disposal of the priests (who were called *bārē* or "inspectors") for ascertaining the will and intention of the gods, the other being through the inspection of the liver of the sacrificial animal (see OMEN). Just as this latter method of divination rested on a well-defined theory, to wit, that the liver was the seat of the soul of the animal and that the deity in accepting the sacrifice identified himself with the animal, whose "soul" was thus placed in complete accord with that of the god and therefore reflected the mind and will of the god, so astrology is based on a theory of divine government of the world, which in contrast to "liver" divination assumes at the start a more scientific or pseudo-scientific aspect. This theory must be taken into consideration as a factor in accounting for the persistent hold which even at the present day astrology still maintains on many minds. Starting with the indisputable fact that man's life and happiness are largely dependent upon phenomena in the heavens, that the fertility of the soil is dependent upon the sun shining in the heavens as well as upon the rains that come from heaven, that on the other hand the mischief and damage done by storms and inundations, to both of which the Euphratean Valley was almost regularly subject, were to be traced likewise to the heavens, the conclusion was drawn that all the great gods had their seats in the heavens. In that early age of culture known as the "nomadic" stage, which under normal conditions precedes the "agricultural" stage, the moon cult is even more prominent than sun worship, and with the moon and sun cults thus furnished by the "popular" faith it was a natural step for the priests, who correspond to the "scientists" of a later day, to perfect a theory of a complete accord between phenomena observed in the heavens and occurrences on earth.

If moon and sun, whose regular movements conveyed to the more intelligent minds the conception of the reign of law and order in the universe as against the more popular notion of chance and caprice, were divine powers, the same held good of the planets, whose movements, though more difficult to follow, yet in the course of time came to be at least partially understood. Of the planets five were recognized—Jupiter, Venus, Saturn, Mercury and Mars—to name them in the order in which they appear in the older cuneiform literature; in later texts Mercury and Saturn change places. These five planets were identified with the great gods of the pantheon as follows:—Jupiter with Marduk (*q.v.*), Venus with the goddess Ishtar (*q.v.*), Saturn with Ninib (*q.v.*), Mercury with Nebo (*q.v.*), and Mars with Nergal (*q.v.*). The movements of the sun, moon and five planets were regarded as representing the activity of the five gods in question, together with the moon-god Sin (*q.v.*) and the sun-god Shamash (*q.v.*), in preparing the occurrences on earth. If, therefore, one could correctly read and interpret the activity of these powers, one knew what the gods were aiming to bring about. The Babylonian priests accordingly applied themselves to the task of perfecting a system of interpretation of the phenomena to be observed in the heavens, and it was natural that the system was extended from the moon, sun and five planets to the more prominent and recognizable fixed stars. That system involved not merely the movements of the moon, sun and planets, but the observation of their relative position to one another and to all kinds of peculiarities noted at any point in the course of their movements: in the case of the moon, for instance, the exact appearance of the new crescent, its position in the heavens, the conditions at conjunction and opposition, the appearance of the horns, the halo frequently seen with the new moon, which was compared to a "cap," the ring round the full moon, which was called a "stall" (*i.e.* "enclosure"), and more of the like. To all these phenomena some significance was attached, and this significance was naturally intensified in the case of such a striking phenomenon as an eclipse of the moon. Applying the same method of careful observation to the sun and planets, and later to some of the constellations and to many of the fixed stars, it will be apparent that the body of observations noted must have grown in the course of time to large and indeed to enormous proportions, and correspondingly the interpretations assigned to the nearly endless variations in the phenomena thus observed. The interpretations themselves were based (as in the case of divination through the liver) chiefly on two factors:—(1) on the recollection or on written records of what in the past had taken place when the phenomenon or phenomena in question had been observed, and (2) association of ideas—involving sometimes merely a play upon words—in connexion with the phenomenon or phenomena observed. Thus if on a certain occasion the rise of the new moon in a

cloudy sky was followed by victory over an enemy or by abundant rain, the sign in question was thus proved to be a favourable one and its recurrence would be regarded as a good omen, though the prognostication would not necessarily be limited to the one or the other of those occurrences, but might be extended to apply to other circumstances. On the other hand, the appearance of the new moon earlier than was expected was regarded as an unfavourable omen—prognosticating in one case defeat, in another death among cattle, in a third bad crops—not necessarily because these events actually took place after such a phenomenon, but by an application of the general principle resting upon association of ideas whereby anything premature would suggest an unfavourable occurrence. A thin halo seen above the new moon was pictured as a cap, and the association between this and the symbol of royalty, which was a conical-shaped cap, led to interpreting the phenomenon as an indication that the ruler would have a successful reign. In this way a mass of traditional interpretation of all kinds of observed phenomena was gathered, and once gathered became a guide to the priests for all times.

Astrology in this its earliest stage is, however, marked by two characteristic limitations. In the first place, the movements and position of the heavenly bodies point to such occurrences as are of public import and affect the general welfare. The individual's interests are not in any way involved, and we must descend many centuries and pass beyond the confines of Babylonia and Assyria before we reach that phase which in medieval and modern astrology is almost exclusively dwelt upon—genethliology or the individual horoscope. In Babylonia and Assyria the cult centred largely and indeed almost exclusively in the public welfare and the person of the king, because upon his well-being and favour with the gods the fortunes of the country were dependent in accordance with the ancient conception of kingship (see J.G. Frazer, *The Early History of Kingship*). To some extent, the individual came in for his share in the incantations and in the purification ritual through which one might hope to rid oneself of the power of the demons and of other evil spirits, but outside of this the important aim of the priests was to secure for the general benefit the favour of the gods, or, as a means of preparing oneself for what the future had in store, to ascertain in time whether that favour would be granted in any particular instance or would be continued in the future. Hence in "liver" divination, as in astrology, the interpretations of the signs noted all have reference to public affairs and events and not to the individual's needs or desires. In the second place, the astronomical knowledge presupposed and accompanying early Babylonian astrology is essentially of an empirical character. While in a general way the reign of law and order in the movements of the heavenly bodies was recognized, and indeed must have exercised an influence at an early period in leading to the rise of a methodical divination that was certainly of a much higher order than the examination of an animal's liver, yet the importance that was laid upon the endless variations in the form of the phenomena and the equally numerous apparent deviations from what were regarded as normal conditions, prevented for a long time the rise of any serious study of astronomy beyond what was needed for the purely practical purposes that the priests as "inspectors" of the heavens (as they were also the "inspectors" of the sacrificial livers) had in mind. True, we have, probably as early as the days of Khammurabi, *i.e. c.* 2000 B.C., the combinations of prominent groups of stars with outlines of pictures fantastically put together, but there is no evidence that prior to 700 B.C. more than a number of the constellations of our zodiac had become part of the current astronomy. The theory of the ecliptic as representing the course of the sun through the year, divided among twelve constellations with a measurement of 30° to each division, is also of Babylonian origin, as has now been definitely proved; but it does not appear to have been perfected until after the fall of the Babylonian empire in 539 B.C. Similarly, the other accomplishments of Babylonian astronomers, such as their system or rather systems of moon calculations and the drawing up of planetary tablets, belong to this late period, so that the golden age of Babylonian astronomy belongs not to the remote past, as was until recently supposed, but to the Seleucid period, *i.e.* after the advent of the Greeks in the Euphrates Valley. From certain expressions used in astrological texts that are earlier than the 7th century B.C. it would appear, indeed, that the beginnings at least of the calculation of sun and moon eclipses belong to the earlier period, but here, too, the chief work accomplished was after 400 B.C., and the defectiveness of early Babylonian astronomy may be gathered from the fact that as late as the 6th century B.C. an error of almost an entire month was made by the Babylonian astronomers in the attempt to determine through calculation the beginning of a certain year.

The researches of Bouché-Leclercq, Cumont and Boll have enabled us to fix with a considerable degree of definiteness the middle of the 4th century B.C. as the period when Babylonian astrology began its triumphal march to the west, invading the domain of Greek and Roman culture and destined to exercise a strong hold on all nations and groups—more particularly in Egypt—that came within the sphere of Greek and Roman influence. It is rather significant that this spread of astrology should have been concomitant with the intellectual impulse that led to the rise of a genuine scientific phase of astronomy in Babylonia itself, which must have weakened to some extent the hold that astrology had on the priests and the people. The advent of the Persians, bringing with them a conception of religion of a far higher order than Babylonian-Assyrian polytheism (see Zoroaster), must also have acted as a disintegrating factor in leading to the decline of the old faith in the Euphrates Valley, and we thus have the interesting though not entirely exceptional phenomenon of a great civilization bequeathing as a legacy to posterity a superstition instead of a real achievement. "Chaldaean wisdom" became among Greeks and Romans the synonym of divination through the planets and stars, and it is not surprising that in the course of time to be known as a "Chaldaean" carried with it frequently the suspicion of charlatanry and of more or less wilful deception. The spread of astrology beyond Babylonia is thus concomitant with the rise of a truly scientific astronomy in Babylonia itself, which in turn is due to the intellectual impulse afforded by the contact with new forms of culture from both the East and the West.

In the hands of the Greeks and of the later Egyptians both astrology and astronomy were carried far beyond the limits attained by the Babylonians, and it is indeed a matter of surprise to observe the harmonious combination of the two fields—a harmony that seems to grow more complete with each age, and that is not broken until we reach the threshold of modern science in the 16th century. To the Greek astronomer Hipparchus belongs the credit of the discovery (*c.* 130 B.C.) of the theory of the precession of the equinoxes, for a knowledge of which among the Babylonians we find no definite proof; but such a signal advance in pure science did not prevent the Greeks from developing in a most elaborate manner the theory of the influence of the planets upon the fate of the individual. The endeavour to trace the horoscope of the individual from the position of the planets and stars at the time of birth (or, as was attempted by other astrologers, at the time of conception) represents the most significant contribution of the Greeks to astrology. The system was carried to such a degree of perfection that later ages made but few additions of an essential character to the genethliology or drawing up of the individual horoscope by the Greek astrologers. The system was taken up almost bodily by the Arab astronomers, it was embodied in the Kabbalistic lore of Jews and Christians, and through these and other channels came to be the substance of the astrology of the middle ages, forming, as already pointed out, under the designation of "judicial astrology," a pseudo-science which was placed on a perfect footing of equality with "natural astrology" or the more genuine science of the study of the motions and phenomena of the heavenly bodies.

Partly in further development of views unfolded in Babylonia, but chiefly under Greek influences, the scope of astrology was enlarged until it was brought into connexion with practically all of the known sciences, botany, chemistry, zoology, mineralogy, anatomy and medicine. Colours, metals, stones, plants, drugs and animal life of all kinds were associated with the planets and placed under their tutelage. In the system that passes under the name of Ptolemy, Saturn is associated with grey, Jupiter with white, Mars with red, Venus with yellow, while Mercury, occupying a peculiar place in Greek as it did in Babylonian astrology (where it was at one time designated as *the* planet *par excellence*), was supposed to vary its colour according to changing circumstances. The sun was associated with gold, the moon with silver, Jupiter with electrum, Saturn with lead, Venus with copper, and so on, while the continued influence of astrological motives is to be seen in the association of quicksilver, upon its discovery at a comparatively late period, with Mercury, because of its changeable character as a solid and a liquid. In the same way stones were connected with both the planets and the months; plants, by diverse association of ideas, were connected with the planets, and animals likewise were placed under the guidance and protection of one or other of the heavenly bodies. By this curious process of combination the entire realm of the natural sciences was translated into the language of astrology with the single avowed purpose of seeing in all phenomena signs indicative of what the future had in store. The fate of the individual, as that feature of the future which had a supreme interest, led to the association of the planets with parts of the body. Here, too, we find various systems devised, in part representing the views of different schools, in part reflecting advancing conceptions regarding the functions of the organs in man and animals. In one system the seat of Mercury, representing divine intelligence as the source of all knowledge—a view that reverts to Babylonia where Nebo (corresponding to Mercury) was regarded as the divine power to whom all wisdom is due—was placed in the liver as the primeval seat of the soul (see Omen), whereas in other systems this distinction was assigned to Jupiter or to Venus. Saturn, taking in Greek astrology the place at the head of the planets which among the Babylonians was accorded to Jupiter-Marduk, was given a place in the brain, which in later times was looked upon as the centre of soul-life; Venus, as the planet of the passion of love, was supposed to reign supreme over the genital organs, the belly and the lower limbs; Mars, as the violent planet, is associated with the bile, as well as with the blood and kidneys. Again, the right ear is associated with Saturn, the left ear with Mars, the right eye in the case of the male with the sun and the left eye with the moon, while in the case of the female it was just the reverse. From the planets the same association of ideas was applied to the constellations of the zodiac, which in later phases of astrology are placed on a par with the planets themselves, so far as their importance for the individual horoscope is concerned. The fate of the individual in this combination of planets with the zodiac was made dependent not merely upon the planet which happened to be rising at the time of birth or of conception, but also upon its local relationship to a special sign or to certain signs of the zodiac. The zodiac was regarded as the prototype of the human body, the different parts of which all had their corresponding section in the zodiac itself. The head was placed in the first sign of the zodiac—the Ram; and the feet in the last sign—the Fishes. Between these two extremes the other

parts and organs of the body were distributed among the remaining signs of the zodiac, the neck being assigned to the Bull, the shoulders and arms to the Gemini (or twins), the breast to Cancer, the flanks to Leo, the bladder to Virgo, the buttocks to the Balance, the pubis to the Scorpion, the thighs to Sagittarius, the knees to Capricorn, and the limbs to Aquarius. Not content with this, we find the late Egyptian astrologers setting up a correspondence between the thirty-six *decani* recognized by them and the human body, which is thus divided into thirty-six parts; to each part a god was assigned as a controlling force. With human anatomy thus connected with the planets, with constellations, and with single stars, medicine became an integral part of astrology, or, as we might also put it, astrology became the handmaid of medicine. Diseases and disturbances of the ordinary functions of the organs were attributed to the influence of planets or explained as due to conditions observed in a constellation or in the position of a star; and an interesting survival of this bond between astrology and medicine is to be seen in the use up to the present time of the sign of Jupiter ♃, which still heads medicinal prescriptions, while, on the other hand, the influence of planetary lore appears in the assignment of the days of the week to the planets, beginning with Sunday, assigned to the sun, and ending with Saturday, the day of Saturn. Passing on into still later periods, Saturn's day was associated with the Jewish sabbath, Sunday with the Lord's Day, Tuesday with Tiw, the god of war, corresponding to Mars of the Romans and to the Nergal of the Babylonians. Wednesday was assigned to the planet Mercury, the equivalent of the Germanic god Woden; Thursday to Jupiter, the equivalent of Thor; and Friday to Friga, the goddess of love, who is represented by Venus among the Romans and among the Babylonians by Ishtar. Astrological considerations likewise already regulated in ancient Babylonia the distinction of lucky and unlucky days, which passing down to the Greeks and Romans (*dies fasti* and *nefasti*) found a striking expression in Hesiod's *Works and Days*. Among the Arabs similar associations of lucky and unlucky days directly connected with the influence of the planets prevailed through all times, Tuesday and Wednesday, for instance, being regarded as the days for blood-letting, because Tuesday was connected with Mars, the lord of war and blood, and Wednesday with Mercury, the planet of humours. Even in modern times travellers relate how, when an auspicious day has been proclaimed by the astrologers, the streets of Bagdad may be seen running with blood from the barbers' shops.

It is unnecessary here to give a detailed analysis of the methods of judicial astrology as an art, or directions for the casting of a horoscope, or "nativity," *i.e.* a map of the heavens at the hour of birth, showing, according to the Ephemeris, the position of the heavenly bodies, from which their influence may be deduced. Each of the twelve signs of the zodiac (*q.v.*) is credited with its own characteristics and influence, and is the controlling sign of its "house of life." The sign exactly rising at the moment of birth is called the ascendant. The benevolent or malignant influence of each planet, together with the sun and moon, is modified by the sign it inhabits at the nativity; thus Jupiter in one house may indicate riches, fame in another, beauty in another, and Saturn similarly poverty, obscurity or deformity. The calculation is affected by the "aspects," *i.e.* according as the planets are near or far as regards one another (in conjunction, in semi-sextile, semi-square, sextile, quintile, square, trine, sesqui-quadrate, bi-quintile, opposition or parallel acclination). Disastrous signs predominate over auspicious, and the various effects are combined in a very elaborate and complicated manner.

Judicial astrology, as a form of divination, is a concomitant of natural astrology, in its purer astronomical aspect, but mingled with what is now considered an unscientific and superstitious view of world-forces. In the *Janua aurea reserata quatuor linguarum* (1643) of J.A. Comenius we find the following definition:—"*Astronomus siderum meatus seu motus considerat: Astrologus eorundem efficaciam, influxum, et effectum.*" Kepler was more cautious in his opinion; he spoke of astronomy as the wise mother, and astrology as the foolish daughter, but he added that the existence of the daughter was necessary to the life of the mother. Tycho Brahe and Gassendi both began with astrology, and it was only after pursuing the false science, and finding it wanting, that Gassendi devoted himself to astronomy. In their numerous allusions to the subtle mercury, which the one makes when treating of a means of measuring time by the efflux of the metal, and the other in a treatise on the transit of the planet, we see traces of the school in which they served their first apprenticeship. Huygens, moreover, in his great posthumous work, *Cosmotheoros, seu de terris coelestibus*, shows himself a more exact observer of astrological symbols than Kircher himself in his *Iter exstaticum*. Huygens contends that between the inhabitants of different planets there need not be any greater difference than exists between men of different types on the earth. "There are on the earth," continues this rational interpreter of the astrologers and chiromancers, "men of cold temperament who would thrive in Saturn, which is the farthest planet from the sun, and there are other spirits warm and ardent enough to live in Venus."

Those were indeed strange times, according to modern ideas, when astrologers were dominant by the terror they inspired, and sometimes by the martydom they endured when their predictions were either too true or too false. Faith, to borrow their own language, was banished to Virgo, and rarely shed her influence on men. Cardan (1501-1576), for instance, hated Luther, and so changed his birthday in order to give him an unfavourable horoscope. In Cardan's times, as in those of Augustus, it was a common practice for men to conceal the day and hour of their birth, till, like Augustus, they found a complaisant astrologer. But, as a general rule, medieval and Renaissance astrologers did not give themselves the trouble of reading the stars, but contented themselves with telling fortunes by faces. They practised chiromancy (see Palmistry), and relied on afterwards drawing a horoscope to suit. As physiognomists (see Physiognomy) their talent was undoubted, and according to Vanini there was no need to mount to the house-top to cast a nativity. "Yes," he says, "I can read his face; by his hair and his forehead it is easy to guess that the sun at his birth was in the sign of Libra and near Venus. Nay, his complexion shows that Venus touches Libra. By the rules of astrology he could not lie."

A few salient facts may be added concerning the astrologers and their predictions, remarkable either for their fulfilment or for the ruin and confusion they brought upon their authors. We may begin with one taken from Bacon's *Essay of Prophecies*:—"When I was in France, I heard from one Dr Pena, that the queen mother, who was given to curious arts, caused the king her husband's nativitie to be calculated, under a false name; and the astrologer gave a judgment, that he should be killed in a duell; at which the queene laughed, thinking her husband to be above challenges and duels; but he was slaine, upon a course at tilt, the splinters of the staffe of Mongomery going in at his bever." A favourite topic of the astrologers of all countries has been the immediate end of the world. As early as 1186 the earth had escaped one threatened cataclysm of the astrologers. This did not prevent Stöffler from predicting a universal deluge for the year 1524—a year, as it turned out, distinguished for drought. His aspect of the heavens told him that in that year three planets would meet in the aqueous sign of Pisces. The prediction was believed far and wide, and President Aurial, at Toulouse, built himself a Noah's ark—a curious realization, in fact, of Chaucer's merry invention in the *Miller's Tale*.

Tycho Brahe was from his fifteenth year devoted to astrology, and adjoining his observatory at Uranienburg the astronomer-royal of Denmark had a laboratory built in order to study alchemy, and it was only a few years before his death that he finally abandoned astrology. We may here notice one very remarkable prediction of the master of Kepler. That he had carefully studied the comet of 1577 as an astronomer, we may gather from his adducing the very small parallax of this comet as disproving the assertion of the Aristotelians that a solid sphere enveloped the heavens. But besides this, we find him in his character of astrologer drawing a singular prediction from the appearance of this comet. It announced, he tells us, that in the north, in Finland, there should be born a prince who should lay waste Germany and vanish in 1632. Gustavus Adolphus, it is well known, was born in Finland, overran Germany, and died in 1632. The fulfilment of the details of this prophecy suggests that Tycho Brahe had some basis of reason for his prediction. Born in Denmark of a noble Swedish family, a politician, as were all his contemporaries of distinction, Tycho, though no conjuror, could foresee the advent of some great northern hero. Moreover, he was doubtless well acquainted with a very ancient tradition, that heroes generally came from the northern frontiers of their native land, where they are hardened and tempered by the threefold struggle they wage with soil, climate and barbarian neighbours.

Kepler explained the double movement of the earth by the rotation of the sun. At one time the sun presented its friendly side, which attracted one planet, sometimes its adverse side, which repelled it. He also peopled the planets with souls and genii. He was led to his three great laws by musical analogies, just as William Herschel afterwards passed from music to astronomy. Kepler, who in his youth made almanacs, and once prophesied a hard winter, which came to pass, could not help putting an astrological interpretation on the disappearance of the brilliant star of 1572, which Tycho had observed. Theodore Beza thought that this star, which in December 1573 equalled Jupiter in brilliancy, predicted the second coming of Christ. Astronomers were only then beginning to study variable and periodic stars, and disturbances in that part of the heavens, which had till then, on the authority of Aristotle, been regarded as incorruptible, combined with the troubles of the times, must have given a new stimulus to belief in the signs in heaven. Montaigne (*Essais*, lib. i. chap, x.) relates a singular episode in the history of astrology. Charles V. and Francis I., who both bid for the friendship of the infamous Aretino, surnamed the divine, both likewise engaged astrologers to fight their battles. In Italy those who prophesied the ruin of France were sure to be listened to. These prophecies affected the public funds much as telegrams do nowadays. "At Rome," Montaigne tells us, "a large sum of money was lost on the Change by this prognostication of our ruin." The marquis of Saluces, notwithstanding his gratitude to Francis I. for the many favours he had received, including his marquisate, of which the brother was despoiled for his benefit, was led in 1536 to betray his country, being scared by the glorious prophecies of the ultimate success of Charles V. which were then rife. The influence of the Medici made astrologers popular in France. Richelieu, on whose council was Jacques Gaffarel (1601-1681), the last of the Kabbalists, did not despise astrology as an engine of government. At the birth of Louis XIV. a certain Morin de Villefranche was placed behind a curtain to cast the nativity of the future autocrat. A generation back the astrologer would not have been hidden behind a curtain, but have taken precedence of the doctor. La Bruyère dares not pronounce against such beliefs, "for

there are perplexing facts affirmed by grave men who were eye-witnesses." In England William Lilly and Robert Fludd were both dressed in a little brief authority. The latter gives us elaborate rules for the detection of a thief, and tells us that he has had personal experience of their efficacy. "If the lord of the sixth house is found in the second house, or in company with the lord of the second house, the thief is one of the family. If Mercury is in the sign of the Scorpion he will be bald, &c." Francis Bacon abuses the astrologers of his day no less than the alchemists, but he does so because he has visions of a reformed astrology and a reformed alchemy. Sir Thomas Browne, too, while he denies the capacity of the astrologers of his day, does not venture to dispute the reality of the science. The idea of the souls of men passing at death to the stars, the blessedness of their particular sphere being assigned them according to their deserts (the metempsychosis of J. Reynaud), may be regarded as a survival of religious astrology, which, even as late as Descartes's day, assigned to the angels the task of moving the planets and the stars. Joseph de Maistre believed in comets as messengers of divine justice, and in animated planets, and declared that divination by astrology is not an absolutely chimerical science. Lastly, we may mention a few distinguished men who ran counter to their age in denying stellar influences. Aristarchus of Samos, Martianus Capella (the precursor of Copernicus), Cicero, Favorinus, Sextus Empiricus, Juvenal, and in a later age Savonarola and Pico della Mirandola, and La Fontaine, a contemporary of the neutral La Bruyère, were all pronounced opponents of astrology.

In England Swift may fairly claim the credit of having given the death-blow to astrology by his famous squib, entitled *Prediction for the Year 1708, by Isaac Bickerstaff, Esq*. He begins, by professing profound belief in the art, and next points out the vagueness and the absurdities of the philomaths. He then, in the happiest vein of parody, proceeds to show them a more excellent way:—"My first prediction is but a trifle, yet I mention it to show how ignorant these sottish pretenders to astrology are in their own concerns: it refers to Partridge the almanac-maker. I have consulted the star of his nativity by my own rules, and find he will infallibly die upon the 29th of March next about eleven at night of a raging fever. Therefore I advise him to consider of it and settle his affairs in time." Then followed a letter to a person of quality giving a full and particular account of the death of Partridge on the very day and nearly at the hour mentioned. In vain the wretched astrologer protested that he was alive, got a literary friend to write a pamphlet to prove it, and published his almanac for 1709. Swift, in his reply, abused him for his want of manners in giving a gentleman the lie, answered his arguments *seriatim*, and declared that the evidence of the publication of another almanac was wholly irrelevant, "for Gadbury, Poor Robin, Dove and Way do yearly publish their almanacs, though several of them have been dead since before the Revolution." Nevertheless a field is found even to this day for almanacs of a similar type, and for popular belief in them.

To astrological politics we owe the theory of heaven-sent rulers, instruments in the hands of Providence, and saviours of society. Napoleon, as well as Wallenstein, believed in his star. Many passages in the older English poets are unintelligible without some knowledge of astrology. Chaucer wrote a treatise on the astrolabe; Milton constantly refers to planetary influences; in Shakespeare's *King Lear*, Gloucester and Edmund represent respectively the old and the new faith. We still *contemplate* and consider; we still speak of men as *jovial*, *saturnine* or *mercurial*; we still talk of the *ascendancy* of genius, or a *disastrous* defeat. In French *heur*, *malheur*, *heureux*, *malheureux*, are all derived from the Latin *augurium*; the expression *né sous une mauvaise étoile*, born under an evil star, corresponds (with the change of *étoile* into *astre*) to the word *malôtru*, in Provençal *malastrue*; and *son étoile pâlit*, his star grows pale, belongs to the same class of illusions. The Latia *ex augurio* appears in the Italian *sciagura*, *sciagurato*, softened into *sciaura*, *sciaurato*, wretchedness, wretched. The influence of a particular planet has also left traces in various languages; but the French and English *jovial* and the English *saturnine* correspond rather to the gods who served as types in chiromancy than to the planets which bear the same names. In the case of the expressions *bien* or *mal luné*, well or ill mooned, *avoir un quartier de lune dans la tetê*, to have the quarter of the moon in one's head, the German *mondsüchtig* and the English *moonstruck* or *lunatic*, the fundamental idea lies in the strange opinions formerly held about the moon.

Bibliography.—For the history of astrology with its affinities to astronomy on the one hand, and to other forms of popular belief on the other, the following works out of a large number that might be mentioned are specially recommended:—A. Bouché-Leclercq, *L'Astrologie grecque* (Paris, 1899), with a full bibliography; Franz Boll, *Sphaera* (Leipzig, 1903); Franz Cumont, *Catalogus Codicum Astrologorum Graecorum* (Brussels, 1898; 7 parts published up to 1909); Franz Boll, "Die Erforschung der antiken Astrologie" (in *Neue Jahrbucher fur das klassische Altertum*, Band xxi. Heft 2, pp. 103-126); Franz Cumont, *Les Religions orientates dans le paganisme romain* (Paris, 1907) (ch. vii. "L'Astrologie et la magie"); Alfred Maury, *La Magie et l'astrologie à l'antiquité et au moyen âge* (4th ed., Paris, 1877); R.C. Thompson, *Reports of the Magicians and Astrologers of Nineveh and Babylon* (2 vols., London, 1900); F.X. Kugler, *Sternkunde und Sterndienst in Babel* (Freiburg, 1907;—to be completed in 4 vols.); Ch. Virolleaud, *L'Astrologie chaldéenne* (Paris, 1905—to be completed in 8 parts—transliteration and translations of cuneiform texts); Jastrow, *Religion Babyloniens und Assyriens* (Parts 13 and 14); also certain sections in Bouché-Leclercq, *Histoire de la divination dans l'antiquité* (Paris, 1879), vol. i. pp. 205-257; in Marcellin Berthelot, *Les Origines de l'alchimie* (Paris, 1885), pp. 1-56; Ferd. Höfer, *Histoire de l'astronomie* (Paris, 1846), pp. 1-90; in Rudolf Wolf, *Geschichte der Astronomie* (Munich, 1877), ch. i. See also the article by Ernst Riess on Astrology in Pauly-Wissowa, *Realencyclopädie der klassischen Altertumswissenschaft*, vol. ii. (Stuttgart, 1896). For modern and practical astrology the following works may be found useful in different ways: E.M. Bennett, *Astrology* (New York, 1894); J.M. Pfaff, *Astrologie* (Bamberg, 1816); G. Wilde, *Chaldaean Astrology up to date* (1901); R. Garnett ("A.G. Trent"), "The Soul and the Stars," in the *University Magazine*, 1880 (reprinted in Dobson and Wilde, *Natal Astrology*, 1893); Abel Haatan, *Traité d'astrologie judiciaire* (Paris, 1825); Fomalhaut, *Manuel d'astrologie sphérique el judiciaire* (Paris, 1897).

(M. Ja.)

ASTRONOMY (from Gr. ἄστρον, a star, and νέμειν, to classify or arrange). The subject matter of astronomical science, considered in its widest range, comprehends all the matter of the universe which lies outside the limit of the earth's atmosphere. The seeming anomaly of classifying as a single branch of science all that we know in a field so wide, while subdividing our knowledge of things on our own planet into an indefinite number of separate sciences, finds its explanation in the impossibility of subjecting the matter of the heavens to that experimental scrutiny which yields such rich results when applied to matter which we can handle at will. Astronomy is of necessity a science of observation in the pursuit of which experiment can directly play no part. It is the most ancient of the sciences because, before the era of experiment, it was the branch of knowledge which could be most easily systematized, while the relations of its phenomena to day and night, times and seasons, made some knowledge of the subject a necessity of social life. In recent times it is among the more progressive of the sciences, because the new and improved methods of research now at command have found in its cultivation a field of practically unlimited extent, in which the lines of research may ultimately lead to a comprehension of the universe impossible of attainment before our time.

The field we have defined is divisible into at least two parts, that of Astronomy proper, or "Astrometry," which treats of the motions, mutual relations and dimensions of the heavenly bodies; and that of Astrophysics (*q.v.*), which treats of their physical constitution. While it is true that the instruments and methods of research in these two branches are quite different in their details, there is so much in common in the fundamental principles which underlie their application, that it is unprofitable to consider them as completely distinct sciences.

Speaking in the most comprehensive way, and making an exception of the ethereal medium (see Aether), which, being capable of experimental study, is not included in the subject of astronomy, we may say that the great masses of matter which make up the universe are of two kinds:—(1) incandescent bodies, made visible to us by their own light; (2) dark bodies, revolving round them or round each other. These dark bodies are known to us in two ways: (*a*) by becoming visible through reflecting the light from incandescent bodies in their neighbourhood, (*b*) by their attraction upon such bodies.

The incandescent bodies are of two classes: stars and nebulae. Among the stars our sun is to be included, as it has no properties which distinguish it from the great mass of stars except our proximity to it. The stars are supposed to be generally spherical, like the sun, in form, and to have fairly well-defined boundaries; while the nebulae are generally irregular in outline and have no well-defined limits. It is, however, probable that the one class runs into the other by imperceptible gradations. In the relation of the universe to us there is yet another separation of its bodies into two classes, one comprising the solar system, the other the remainder of the universe. The former consists of the sun and the bodies which move round it. Considered as a part of the universe, our solar system is insignificant in extent, though, for obvious reasons, great in practical importance to us, and in the facility with which we may gain knowledge relating to it.

Referring to special articles, Solar System, Star, Sun, Moon, &c. for a description of the various parts of the universe, we confine ourselves, at present, to setting forth a few of the most general modern conceptions of the universe. As to extent, it may be said, in a general way, that while no definite limits can be set to the possible extent of the universe, or the distance of its farthest bodies, it seems probable, for reasons which will be given under Star, that the system to which the stars that we see belong, is of finite extent.

As the incandescent bodies of the universe are visible by their own light, the problem of ascertaining their existence and position is mainly one of seeing, and our facilities for attacking it have constantly increased with the improvement of our optical appliances. But such is not the case with the dark bodies. Such a body can be made known to us only when in the neighbourhood of an incandescent body; and even then, unless its mass or its dimensions are considerable, it will evade all the scrutiny of our science. The question of the possible number and magnitude of such bodies is therefore one that does not admit of accurate investigation. We can do no more than 801
balance vague estimates of probability. What we do know is that these bodies vary widely in size. Those known to be revolving round certain of the stars are far larger in proportion to their central bodies than our planets are in respect to the sun; for were it otherwise we should never be able to detect their existence. At the other extreme we know that innumerable swarms of minute bodies, probably little more than particles, move round the sun in orbits of every degree of eccentricity, making themselves known to us only in the exceptional cases when they strike the earth's atmosphere. They then appear to us as "shooting stars" (see Meteor).

A general idea of the relation of the solar system to the universe may be gained by reflecting that the average distance between any two neighbouring stars is several thousand times the extent of the solar system. Between the orbit of Neptune and the nearest star known to us is an immense void in which no bodies are yet known to exist, except comets. But although these sometimes wander to distances considerably beyond the orbit of Neptune, it is probable that the extent of the void which separates our system from the nearest star is hundreds of times the distance of the farthest point to which a comet ever recedes.

We may conclude this brief characterization of astronomy with a statement and classification of the principal lines on which astronomical researches are now pursued. The most comprehensive problem before the investigator is that of the constitution of the universe. It is known that, while infinite diversity is found among the bodies of the universe, there are also common characteristics throughout its whole extent. In a certain sense we may say that the universe now presents itself to the thinking astronomer, not as a heterogeneous collection of bodies, but as a unified whole. The number of stars is so vast that statistical methods can be applied to many of the characters which they exhibit—their spectra, their apparent and absolute luminosity, and their arrangement in space. Thus has arisen in recent times what we may regard as a third branch of astronomical science, known as *Stellar Statistics*. The development of this branch has infused life and interest into what might a few years ago have been regarded as the most lifeless mass of figures possible, expressing merely the positions and motions of innumerable individual stars, as determined by generations of astronomical observers. The development of this new branch requires great additions to this mass, the product of perhaps centuries of work on the older lines of the science. To the statistician of the stars, catalogues of spectra, magnitude, position and proper motions are of the same importance that census tables are to the student of humanity. The measurement of the speed with which the individual stars are moving towards or from our system is a work of such magnitude that what has yet been done is scarcely more than a beginning. The discovery by improved optical means, and especially by photography, of new bodies of our system so small that they evaded all scrutiny in former times, is still going on, but does not at present promise any important generalization, unless we regard as such the conclusion that our solar system is a more complex organism than was formerly supposed.

One characteristic of astronomy which tends to make its progress slow and continuous arises out of the general fact that, except in the case of motions to or from us, which can be determined by a single observation with the spectroscope, the motion of a heavenly body can be determined only by comparing its position at two different epochs. The interval required between these two epochs depends upon the speed of the motion. In the case of the greater number of the fixed stars this is so slow that centuries may have to elapse before motion can be deduced. Even in the case of the planets, the variations in the form and position of the orbits are so slow that long periods of observation are required for their correct determination.

The process of development is also made slow and difficult by the great amount of labour involved in deriving the results of astronomical observations. When an astronomer has made an observation, it still has to be "reduced," and this commonly requires more labour than that involved in making it. But even this labour may be small compared with that of the theoretical astronomer, who, in the future, is to use the result as the raw material of his work. The computations required in such work are of extreme complexity, and the labour required is still further increased by the fact that cases are rather exceptional in which the results reached by one generation will not have to be revised and reconstructed by another; processes which may involve the repetition of the entire work. We may, in fact, regard the fabric of astronomical science as a building in the construction of which no stone can be added without a readjustment of some of the stones on which it has to rest. Thus it comes about that the observer, the computer, and the mathematician have in astronomical science a practically unlimited field for the exercise of their powers.

In treating so comprehensive a subject we may naturally distinguish between what we know of the universe and the methods and processes by which that knowledge is acquired. The former may be termed general, and the latter practical, astronomy. When we descend more minutely into details we find these two branches of the subject to be connected by certain principles, the application of which relates to both subjects. Considering as general or descriptive astronomy a description of the universe as we now understand it, the other branches of the subject generally recognized are as follows:—

Geometrical or *Spherical Astronomy*, by the principles of which the positions and the motions of the heavenly bodies are defined.

Theoretical Astronomy, which may be considered as an extension of geometrical astronomy and includes the determination of the positions and motions of the heavenly bodies by combining mathematical theory with observation. Modern theoretical astronomy, taken in the most limited sense, is based upon *Celestial Mechanics*, the science by which, using purely deductive mechanical methods, the laws of motion of the heavenly bodies are derived by deductive methods from their mutual gravitation towards each other.

Practical Astronomy, which comprises a description of the instruments used in astronomical observation, and of the principles and methods underlying their application.

Spherical or Geometrical Astronomy.

In astronomy, as in analytical geometry, the position of a point is defined by stating its distance and its direction from a point of reference taken as known. The numerical quantities by which the distance and direction, and therefore the position, are defined, are termed *co-ordinates* of the point. The latter are measured or defined with regard to a fixed system of lines and planes, which form the basis of the system.

The following are the fundamental concepts of such a system.

(*a*) An origin or point of reference. The points most generally taken for this purpose in astronomical practice are the following:—

(1) The position of a point of observation on the earth's surface. We conceive its position to be that occupied by an observer. The position of a heavenly body is then defined by its direction and distance from the supposed observer.

(2) The centre of the earth. This point, though it can never be occupied by an observer, is used because the positions of the heavenly bodies in relation to it are more readily computed than they can be from a point on the earth's surface.

(3) The centre of the sun.

(4) In addition to these three most usual points, we may, of course, take the centre of a planet or that of a star in order to define the position of bodies in their respective neighbourhoods.

Co-ordinates referred to a point of observation as the origin are termed "apparent," those referred to the centre of the earth are "geocentric," those referred to the centre of the sun, "heliocentric."

(*b*) The next concept of the system is a fundamental plane, regarded as fixed, passing through the origin. In connexion with it is an axis perpendicular to it, also passing through the origin. We may consider the axis and the plane as a single concept, the axis determining the plane, or the plane the axis. The fundamental concepts of this class most in use are:—

(1) When a point on the earth's surface is taken as the origin, the fundamental axis may be the direction of gravity at that point. This direction defines the vertical line. The fundamental plane which it determines is horizontal and is termed the plane of the horizon. Such a plane is realized in the surface of a liquid, a basin of quicksilver, for example.

(2) When the centre of the earth is taken as origin, the most natural fundamental axis is that of the earth's rotation. This axis cuts the 802
earth's surface at the North and South Poles. The fundamental plane perpendicular to it is the plane of the equator. This plane intersects the earth's surface in the terrestrial equator. Co-ordinates referred to this system are termed equatorial. A system of equatorial co-ordinates may also be used when the origin is on the earth's surface. The fundamental axis, instead of being the earth's axis itself, is then a line parallel to it, and the fundamental plane is the plane passing through the point, and parallel to the plane of the equator.

(3) In the system of heliocentric co-ordinates, the plane in which the earth moves round the sun, which is the plane of the ecliptic, is taken as the fundamental one. The axis of the ecliptic is a line perpendicular to this plane.

(*c*) The third concept necessary to complete the system is a fixed line passing through the origin, and lying in the fundamental plane. This line defines an initial direction from which other directions are counted.

The geometrical concepts just defined are shown in fig. 1. Here O is the origin, whatever point it may be; OZ is the fundamental axis passing through it. In order to represent in the figure the position of the fundamental plane, we conceive a circle to be drawn round O, lying in that plane. This circle, projected in perspective as an ellipse, is shown in the figure. OX is the fixed initial line by which directions are to be defined.

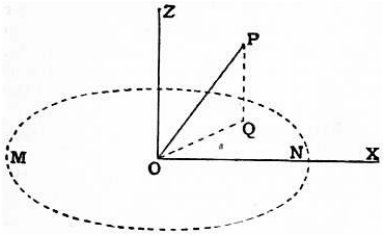


Fig. 1.

Now let P be any point in space, say the centre of a heavenly body. Conceive a perpendicular PQ to be dropped from this point on the fundamental plane, meeting the latter in the point Q; PQ will then be parallel to OZ. The co-ordinates of P will then be the following three quantities:—

(1) The length of the line OP, or the distance of the body from the origin, which distance is called the radius vector of the body.

(2) The angle XOQ which the projection of the radius vector upon the fundamental plane makes with the initial line OX. This angle is called the Longitude, Right Ascension or Azimuth of the body, in the various systems of co-ordinates. We may term it in a general way the longitudinal co-ordinate.

(3) The angle QOP, which the radius vector makes with the fundamental plane. This we may call the latitudinal co-ordinate. Instead of it is frequently used the complementary angle ZOP, known as the polar distance of the body. Since ZOQ is a right angle, it follows that the sum of the polar distance and the latitudinal co-ordinates is always 90°. Either may be used for astronomical purposes.

It is readily seen that the position of a heavenly body is completely defined when these co-ordinates are given.

One of the systems of co-ordinates is familiar to every one, and may be used as a general illustration of the method. It is our system of defining the position of a point on the earth's surface by its latitude and longitude. Regarding O (fig. 1) as the centre of the earth, and P as a point on the earth's surface, a city for example, it will be seen that OZ being the earth's axis, the circle MN will be the equator. The initial line OX then passes through the foot of the perpendicular dropped from Greenwich upon the plane of the equator, and meets the surface at N. The angle QOP is the latitude of the place and the angle NOQ its longitude. The longitudes and latitudes thus defined are geocentric, and the latitude is slightly different from that in ordinary use for geographic purposes. The difference arises from the oblateness of the earth, and need not be considered here.

The conception of the co-ordinates we have defined is facilitated by introducing that of the celestial sphere. This conception is embodied in our idea of the vault of heaven, or of the sky. Taking as origin the position of an observer, the direction of a heavenly body is defined by the point in which he sees it in the sky; that is to say, on the celestial sphere. Imagining, as we may well do, that the radius of this sphere is infinite—then every direction, whatever the origin, may be represented by a point on its surface. Take for example the vertical line which is embodied in the direction of the plumb line. This line, extended upwards, meets the celestial sphere in the zenith. The earth's axis, continued indefinitely upwards, meets the sphere in a point called the Celestial Pole. This point in our middle latitudes is between the zenith and the north horizon, near a certain star of the second magnitude familiarly known as the Pole Star. As the earth revolves from west to east the celestial sphere appears to us to revolve in the opposite direction, turning on the line joining the Celestial Poles as on a pivot.

As we conceive of the sky, it does not consist of an entire sphere but only as a hemisphere bounded by the horizon. But we have no difficulty in extending the conception below the horizon, so that the earth with everything upon it is in the centre of a complete sphere. The two parts of this sphere are the visible hemisphere, which is above the horizon, and the invisible, which is below it. Then the plumb line not only defines the zenith as already shown, but in a downward direction it defines the nadir, which is the point of the sphere directly below our feet. On the side of this sphere opposite to the North Celestial is the South Pole, invisible in the Northern Terrestrial Hemisphere but visible in the Southern one.

The relation of geocentric to apparent co-ordinates depends upon the latitude of the observer. The changes which the aspect of the heaven undergoes, as we travel North and South, are so well known that they need not be described in detail here; but a general statement of them will give a luminous idea of the geometrical co-ordinates we have described. Imagine an observer starting from the North Pole to travel towards the equator, carrying his zenith with him. When at the pole his zenith coincides with the celestial pole, and as the earth revolves on its axis, the heavenly bodies perform their apparent diurnal revolutions in horizontal circles round the zenith. As he travels South, his zenith moves along the celestial sphere, and the circles of diurnal rotation become oblique to the horizon. The obliquity continually increases until the observer reaches the equator. His zenith is then in the equator and the celestial poles are in the North and South horizon respectively. The circles in which the heavenly bodies appear to revolve are then vertical. Continuing his journey towards the south, the north celestial pole sinks below the horizon; the south celestial pole rises above it; or to speak more exactly, the zenith of the observer approaches that pole. The circles of diurnal revolution again become oblique. Finally, at the south pole the circles of diurnal revolution are again apparently horizontal, but are described in a direction apparently (but not really) the reverse of that near the north pole. The reader who will trace out these successive concepts and study the results of his changing positions will readily acquire the notions which it is our subject to define.

We have next to point out the relation of the co-ordinates we have described to the annual motion of the earth around the sun. In consequence of this motion the sun appears to us to describe annually a great circle, called the ecliptic, round the celestial sphere, among the stars, with a nearly uniform motion, of somewhat less than 1° in a day. Were the stars visible in the daytime in the immediate neighbourhood of the sun, this motion could be traced from day to day. The ecliptic intersects the celestial equator at two opposite points, the equinoxes, at an angle of 23° 27′. The vernal equinox is taken as the initial point on the sphere from which co-ordinates are measured in the equatorial and ecliptic systems. Referring to fig. 1, the initial line OX is defined as directed toward the vernal equinox, at which point it intersects the celestial sphere.

The following is an enumeration of the co-ordinates which we have described in the three systems:—

Apparent System.

Latitudinal Co-ordinate; Altitude or Zenith Distance.
Longitudinal ” Azimuth.

Equatorial System.

Latitudinal Co-ordinate; Declination or Polar Distance.
Longitudinal ” Right Ascension.

Ecliptic System.

Latitudinal Co-ordinate; Latitude or Ecliptic Polar Distance.
Longitudinal ” Longitude.

Relation of the Diurnal Motion to Spherical Co-ordinates.—The vertical line at any place being the fundamental axis of the apparent system of co-ordinates, this system rotates with the earth, and so seems to us as fixed. The other two systems, including the vernal equinox, are fixed on the celestial sphere, and so seem to us to perform a diurnal revolution from east towards west. Regarding the period of the revolution as 24 hours, the apparent motion goes on at the rate of 15° per hour. Here we have to make a distinction of fundamental importance between the diurnal motions of the sun and of the stars. Owing to the unceasing apparent motion of the sun toward the east, the interval between two passages of the same star over the meridian is nearly four minutes less than the interval between consecutive passages of the sun. The latter is the measure of the day as used in civil life. In astronomical practice is introduced a day, termed "sidereal," determined, not by the diurnal revolution of the sun, but of the stars. The year, which comprises 365.25 solar days, contains 366.25 sidereal days. The latter are divided into sidereal hours, minutes and seconds as the solar day is. The conception of a revolution through 360° in 24 hours is applicable to each case. The sun apparently moves at the rate of 15° in a solar hour; the stars at the rate of 15° in a sidereal hour. The latter motion leads to the use, in astronomical practice, of time instead of angle, as the unit in which the right ascensions are to be expressed. Considering the position of the vernal equinox, and also of a star on the celestial sphere, it will be seen that the interval between the transits of these two points across the meridian may be used to measure the right ascension of a star, since the latter amounts to 15° for every sidereal hour of this interval. For example, if the right ascension of a star is exactly 15°, it will pass the meridian one sidereal hour after the vernal equinox. For the relations thus arising, and their practical applications, see Time, Measurement

OF.

Theoretical Astronomy.

Theoretical Astronomy is that branch of the science which, making use of the results of astronomical observations as they are supplied by the practical astronomer, investigates the motions of the heavenly bodies. In its most important features it is an offshoot of celestial mechanics, between which and theoretical astronomy no sharp dividing line can be drawn. While it is true that the one is concerned altogether with general theories, it is also true that these theories require developments and modifications to apply them to the numberless problems of astronomy, which we may place in either class.

Among the problems of theoretical astronomy we may assign the first place to the determination of orbits (*q.v.*), which is auxiliary to the prediction of the apparent motions of a planet, satellite or star. The computations involved in the process, while simple in some cases, are extremely complex in others. The orbit of a newly-discovered planet or comet may be computed from three complete observations by well-known methods in a single day. From the resulting elements of the orbit the positions of the body from day to day may be computed and tabulated in an ephemeris for the use of observers. But when definitive results as to the orbits are required, it is necessary to compute the perturbations produced by such of the major planets as have affected the motions of the body. With this complicated process is associated that of combining numerous observations with a view of obtaining the best definitive result. Speaking in a general way, we may say that computations pertaining to the orbital revolutions of double stars, as well as the bodies of our solar system, are to a greater or less extent of the classes we have described. The principal modification is that, up to the present time, stellar astronomy has not advanced so far that a computation of the perturbations in each case of a system of stars is either necessary or possible, except in exceptional cases.

Celestial Mechanics.

Celestial Mechanics is, strictly speaking, that branch of applied mathematics which, by deductive processes, derives the laws of motion of the heavenly bodies from their gravitation towards each other, or from the mutual action of the parts which form them. The science had its origin in the demonstration by Sir Isaac Newton that Kepler's three laws of planetary motion, and the law of gravitation, in the case of two bodies, could be mutually derived from each other. A body can move round the sun in an elliptic orbit having the sun in its focus, and describing equal areas in equal times, only under the influence of a force directed towards the sun, and varying inversely as the square of the distance from it. Conversely, assuming this law of attraction, it can be shown that the planets will move according to Kepler's laws.

Thus celestial mechanics may be said to have begun with Newton's *Principia*. The development of the science by the successors of Newton, especially Laplace and Lagrange, may be classed among the most striking achievements of the human intellect. The precision with which the path of an eclipse is laid down years in advance cannot but imbue the minds of men with a high sense of the perfection reached by astronomical theories; and the discovery, by purely mathematical processes, of the changes which the orbits and motions of the planets are to undergo through future ages is more impressive the more fully one apprehends the nature of the problem. The purpose of the present article is to convey a general idea of the methods by which the results of celestial mechanics are reached, without entering into those technical details which can be followed only by a trained mathematician. It must be admitted that any intelligent comprehension of the subject requires at least a grasp of the fundamental conceptions of analytical geometry and the infinitesimal calculus, such as only one with some training in these subjects can be expected to have. This being assumed, the hope of the writer is that the exposition will afford the student an insight into the theory which may facilitate his orientation, and convey to the general reader with a certain amount of mathematical training a clear idea of the methods by which conclusions relating to it are drawn. The non-mathematical reader may possibly be able to gain some general idea, though vague, of the significance of the subject.

The fundamental hypothesis of the science assumes a system of bodies in motion, of which the sun and planets may be taken as examples, and of which each separate body is attracted toward all the others according to the law of Newton. The motion of each body is then expressed in the first place by Newton's three laws of motion (see MOTION, LAWS OF, and MECHANICS). The first step in the process shows in a striking way the perfection of the analytic method. The conception of force is, so to speak, eliminated from the conditions of the problem, which is reduced to one of pure kinematics. At the outset, the position of each body, considered as a material particle, is defined by reference to a system of co-ordinate axes, and not by any verbal description. Differential equations which express the changes of the co-ordinates are then constructed. The process of discovering the laws of motion of the particle then consists in the integration of these equations. Such equations can be formed for a system of any number of bodies, but the process of integration in a rigorous form is possible only to a limited extent or in special cases.

The problems to be treated are of two classes. In one, the bodies are regarded as material particles, no account being taken of their dimensions. The earth, for example, may be regarded as a particle attracted by another more massive particle, the sun. In the other class of problems, the relative motion of the different parts of the separate bodies is considered; for example, the rotation of the earth on its axis, and the consequences of the fact that those parts of a body which are nearer to another body are more strongly attracted by it. Beginning with the first branch of the subject, the fundamental ideas which it is our purpose to convey are embodied in the simple case of only two bodies, which we may call the sun and a planet. In this case the two bodies really revolve round their common centre of gravity; but a very slight modification of the equations of motion reduces them to the relative motion of the planet round the sun, regarding the moving centre of the latter as the origin of co-ordinates. The motion of this centre, which arises from the attraction of the planet on the sun, need not be considered.

In the actual problems of celestial mechanics three co-ordinates necessarily enter, leading to three differential equations and six equations of solution. But the general principles of the problem are completely exemplified with only two bodies, in which case the motion takes place in a fixed plane. By taking this plane, which is that of the orbit in which the planet performs its revolution, as the plane of xy, we have only two co-ordinates to consider. Let us use the following notation:

x, y, the co-ordinates of the planet relative to the sun as the origin.

M, m, the masses of the attracting bodies, sun and planet.

r, the distance apart of the two bodies, or the radius vector of m relative to M. This last quantity is analytically defined by the equation—

$$r^2 = x^2 + y^2$$

t, the time, reckoned from any epoch we choose.

The differential equations which completely determine the changes in the co-ordinates x and y, or the motion of m relative to M, are:—

$$\frac{d^2x}{dt^2} = -\frac{(M+m)x}{r^3}$$
$$\frac{d^2y}{dt^2} = -\frac{(M+m)y}{r^3} \qquad (1)$$

These formulae are worthy of special attention. They are the expression in the language of mathematics of Newton's first two laws of motion. Their statement in this language may be regarded as perfect, because it completely and unambiguously expresses the naked phenomena of the motion. The equations do this without expressing any conception, such as that of force, not associated with the actual phenomena. Moreover, as a third advantage, these expressions are entirely free from those difficulties and ambiguities which are met with in every attempt to express the laws of motion in ordinary language. They afford yet another great advantage in that the derivation of the results requires only the analytic operations of the infinitesimal calculus.

The power and spirit of the analytic method will be appreciated by showing how it expresses the relations of motion as they were conceived geometrically by Newton and Kepler. It is quite evident that Kepler's laws do not in themselves enable us to determine the actual motion of the planets. We must have, in addition, in the case of each special planet, certain specific facts, viz. the axes and eccentricity of the ellipse, and the position of the plane in which it lies. Besides these, we must have given the position of the planet in the orbit at some specified moment. Having these data, the position of the planet at any other time may be geometrically constructed by Kepler's laws. The third law enables us to compute the time taken by the radius vector to sweep over the entire area of the orbit, which is identical with the time of revolution. The problem of constructing successive radii vectores, the angles of which are measured off from the radius vector of the body at the original given position, is then a geometric one, known as Kepler's problem.

In the analytic process these specific data, called elements of the orbit, appear as arbitrary constants, introduced by the process of

integration. In a case like the present one, where there are two differential equations of the second order, there will be four such constants. The result of the integration is that the co-ordinates x and y and their derivatives as to the time, which express the position, direction of motion and speed of the planet at any moment, are found as functions of the four constants and of the time. Putting

$$a, b, c, d,$$

for the constants, the general form of the solution will be

$$\begin{aligned} x &= f_1(a, b, c, d, t) \\ y &= f_2(a, b, c, d, t) \end{aligned} \qquad (2)$$

From these may be derived by differentiation as to t the velocities

$$\begin{aligned} \frac{dx}{dt} &= f'_1(a, b, c, d, t) = x' \\ \frac{dy}{dt} &= f'_2(a, b, c, d, t) = y' \end{aligned} \qquad (3)$$

The symbols x' and y' are used for brevity to mean the velocities expressed by the differential coefficients. The arbitrary constants, a, b, c and d, are the elements of the orbit, or any quantities from which these elements can be obtained. We note that, in the actual process of integration, no geometric construction need enter.

Let us next consider the problem in another form. Conceive that instead of the orbit of the planet, there is given a position P (fig. 2), through which the planet passed at an assigned moment, with a given velocity, and in a given direction, represented by the arrowhead. Logically these data completely determine the orbit in which the planet shall move, because there is only one such orbit passing through P, a planet moving in which would have the given speed. It follows that the elements of the orbit admit of determination when the co-ordinates of the planet at an assigned moment and their derivatives as to time are given. Analytically the elements are determined from these data by solving the four equations just given, regarding a, b, c and d as unknown quantities, and x, y, x', y' and t as given quantities. The solution of these equations would lead to expressions of the form

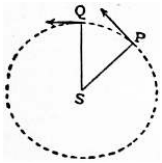


FIG. 2.

$$\begin{aligned} a &= \varphi_1(x, y, x', y', t) \\ b &= \varphi_2(x, y, x', y', t) \\ &\&c. \quad \&c. \end{aligned} \qquad (4)$$

one for each of the elements.

The general equations expressing the motion of a planet considered as a material particle round a centre of attraction lead to theorems the more interesting of which will now be enunciated.

(1) The motion of such a planet may take place not only in an ellipse but in any curve of the second order; an ellipse, hyperbola, or parabola, the latter being the bounding curve between the other two. A body moving in a parabola or hyperbola would recede indefinitely from its centre of motion and never return to it. The ellipse is therefore the only closed orbit.

(2) The motion takes place in accord with Kepler's laws, enunciated elsewhere.

(3) *Whewell's theorem*: if a point R be taken at a distance from the sun equal to the major axis of the orbit of a planet and, therefore, at double the mean distance of the planet, the speed of the latter at any point is equal to the speed which a body would acquire by falling from the point R to the actual position of the planet. The speed of the latter may, therefore, be expressed as a function of its radius vector at the moment and of the major axis of its orbit without introducing any other elements into the expression. Another corollary is that in the case of a body moving in a parabolic orbit the velocity at any moment is that which would be acquired by the body in falling from an infinite distance to the place it occupies at the moment.

(4) If a number of bodies are projected from any point in space with the same velocity, but in various directions, and subjected only to the attraction of the sun, they will all return to the point of projection at the same moment, although the orbits in which they move may be ever so different.

(5) At each distance from the sun there is a certain velocity which a body would have if it moved in a circular orbit at that distance. If projected with this velocity in any direction the point of projection will be at the end of the minor axis of the orbit, because this is the only point of an ellipse of which the distance from the focus is equal to the semi-major axis of the curve, and therefore the only point at which the distance of the body from the sun is equal to its mean distance.

(6) The relation between the periodic time of a planet and its mean distance, approximately expressed by Kepler's third law, follows very simply from the laws of centrifugal force. It is an elementary principle of mechanics that this force varies directly as the product of the distance of the moving body from the centre of motion into the square of its angular velocity. When bodies revolve at different distances around a centre, their velocities must be such that the centrifugal force of each shall be balanced by the attraction of the central mass, and therefore vary inversely as the square of the distance. If M is the central mass, n the angular velocity, and a the distance, the balance of the two forces is expressed by the equation

$$an^2 = M/a^2,$$

whence $a^3n^2 = M$, a constant.

The periodic time varying inversely as n, this equation expresses Kepler's third law. This reasoning tacitly supposes the orbit to be a circle of radius a, and the mass of the planet to be negligible. The rigorous relation is expressed by a slight modification of the law. Putting M and m for the respective masses of the sun and planet, a for the semi-major axis of the orbit, and n for the mean angular motion in unit of time, the relation then is

$$a^3n^2 = M + m.$$

What is noteworthy in this theorem is that this relation depends only on the sum of the masses. It follows, therefore, that were any portion of the mass of the sun taken from it, and added to the planet, the relation would be unchanged. Kepler's third law therefore expresses the fact that the mass of the sun is the same for all the planets, and deviates from the truth only to the extent that the masses of the latter differ from each other by quantities which are only a small fraction of the mass of the sun.

Problem of Three Bodies.—As soon as the general law of gravitation was fully apprehended, it became evident that, owing to the attraction of each planet upon all the others, the actual motion of the planets must deviate from their motion in an ellipse according to Kepler's laws. In the *Principia* Newton made several investigations to determine the effects of these actions; but the geometrical method which he employed could lead only to rude approximations. When the subject was taken up by the continental mathematicians, using the analytical method, the question naturally arose whether the motions of three bodies under their mutual attraction could not be determined with a degree of rigour approximating to that with which Newton had solved the problem of two bodies. Thus arose the celebrated "problem of three bodies." Investigation soon showed that certain integrals expressing relations between the motions not only of three but of any number of bodies could be found. These were:—

First, the law of the conservation of the centre of gravity. This expresses the general fact that whatever be the number of the bodies which act upon each other, their motions are so related that the centre of gravity of the entire system moves in a straight line with a constant velocity. This is expressed in three equations, one for each of the three rectangular co-ordinates.

Secondly, the law of conservation of areas. This is an extension of Kepler's second law. Taking as the radius vector of each body the line from the body to the common centre of gravity of all, the sum of the products formed by multiplying each area described, by the mass of the body, remains a constant. In the language of theoretical mechanics, the moment of momentum of the entire system is a constant quantity. This law is also expressed in three equations, one for each of the three planes on which the areas are projected.

Thirdly, the entire *vis viva* of the system or, as it is now called, the energy, which is obtained by multiplying the mass of each body into half the square of its velocity, is equal to the sum of the quotients formed by dividing the product of every pair of the masses, taken two and two, by their distance apart, with the addition of a constant depending on the original conditions of the system. In the language of algebra putting m_1, m_2, m_3, &c. for the masses of the bodies, $r_{1.2}$, $r_{1.3}$, $r_{2.3}$, &c. for their mutual distances apart; v_1, v_2, v_3, &c., for the velocities with which they are moving at any moment; these quantities will continually satisfy the equation

$$\tfrac{1}{2}(m_1v_1^2 + m_2v_2^2 + \ldots) = \frac{m_1m_2}{r_{1.2}} + \frac{m_1m_3}{r_{1.3}} + \frac{m_2m_3}{r_{2.3}} + \ldots + \text{a constant.}$$

The theorems of motion just cited are expressed by seven integrals, or equations expressing a law that certain functions of the variables and of the time remain constant. It is remarkable that although the seven integrals were found almost from the beginning of the investigation, no others have since been added; and indeed it has recently been shown that no others exist that can be expressed in an algebraic form. In the case of three bodies these do not suffice completely to define the motion. In this case, the problem can be attacked only by methods of approximation, devised so as to meet the special conditions of each case. The special conditions which obtain in the solar system are such as to make the necessary approximation theoretically possible however complex the process may be. These conditions are:—(1) The smallness of the masses of the planets in comparison with that of the sun, in consequence of which the orbit of each planet deviates but slightly from an ellipse during any one revolution; (2) the fact that the orbits of the planets are nearly circular, and the planes of their orbits but slightly inclined to each other. The result of these conditions is that all the quantities required admit of development in series proceeding according to the powers of the eccentricities and inclinations of the orbits, and the ratio of the masses of the several planets to the mass of the sun.

Perturbations of the Planets.—Kepler's laws do not completely express the motion of a planet around a central body, except when no force but the mutual attraction of the two bodies comes into play. When one or more other bodies form a part of the system, their action produces deviations from the elliptic motion, which are called *perturbations*. The problem of determining the perturbations of the heavenly bodies is perhaps the most complicated with which the mathematical astronomer has to grapple; and the forms under which it has to be studied are so numerous that they cannot be easily arranged under any one head. But there is one conception of perturbations of such generality and elegance that it forms the common base of all those methods of determining these deviations which have high scientific interest. This conception is embodied in the method of "variation of elements," originally due to J.L. Lagrange. The simplest method of presenting it starts with the second view of the elliptic motion already set forth.

We have shown that, when the position of a planet and the direction and speed of its motion at a certain instant are given, the elements of the orbit can be determined. We have supposed this to be done at a certain point P of the orbit, the direction and speed being expressed by the variables x, y, x′ and y′. Now, consider the values of these same variables expressing the position of the planet at a second point Q, and the speed with which it passes that point. With this position and speed the elements of the orbit can again be determined. Since the orbit is unchanged so long as no disturbing force acts, it follows that the elements determined by means of the two sets of values of the variables are in this case the same. In a word, although the position and speed of the planet and the direction of its motion are constantly changing, the values of the elements determined from these variables remain constant. This fact is fully expressed by the equations (4) where we have constants on one side of the equation equal to functions of the variables on the other. Functions of the variables possessing this property of remaining constant are termed *integrals*.

Now let the planet be subjected to any force additional to that of the sun's attraction,—say to the attraction of another planet. To fix the ideas let us suppose that the additional attraction is only an impulse received at the moment of passing the point P. The first effect will evidently be to change either the velocity or the direction in which the planet is moving at the moment, or both. If, with the changed velocity we again compute the elements they will be different from the former elements. But, if the impulse is not repeated, these new elements will again remain invariable. If repeated, the second impulse will again change the elements, and so on indefinitely. It follows that, if we go on computing the elements a, b, c, d from the actual values of x, y, x′ and y′, at each moment when the planet is subject to the attraction of another body, they will no longer be invariable, but will slowly vary from day to day and year to year. These ever varying elements represent an ever varying elliptic orbit,—not an orbit which the planet actually describes through its whole course, but an ideal one in which it is moving at each instant, and which continually adjusts itself to the actual motion of the planet at the instant. This is called the *osculating* orbit.

The essential principle of Lagrange's elegant method consists in determining the variations of this osculating ellipse, the co-ordinates and velocities of the planet being ignored in the determination. This may be done because, since the elements and co-ordinates completely determine each other, we may concentrate our attention on either, ignoring the other. The reason for taking the elements as the variables is that they vary very slowly, a property which facilitates their determination, since the variations may be treated as small quantities, of which the squares and products may be neglected in a first solution. In a second solution the squares and products may be taken account of, and so on as far as necessary.

If the problem is viewed from a synthetic point of view, the stages of its solution are as follows. We first conceive of the planets as moving in invariable elliptic orbits, and thus obtain approximate expressions for their positions at any moment. With these expressions we express their mutual action, or their pull upon each other at any and every moment. This pull determines the variations of the ideal elements. Knowing these variations it becomes possible to represent by integration the value of the elements as algebraic expressions containing the time, and the elements with which we started. But the variations thus determined will not be rigorously exact, because the pull from which they arise has been determined on the supposition that the planets are moving in unvarying orbits, whereas the actual pull depends on the actual position of the planets. Another approximation is, therefore, to be made, when necessary, by correcting the expression of the pull through taking account of the variations of the elements already determined, which will give a yet nearer approximation to the truth. In theory these successive approximations may be carried as far as we please, but in practice the labour of executing each approximation is so great that we are obliged to stop when the solution is so near the truth that the outstanding error is less than that of the best observations. Even this degree of precision may be impracticable in the more complex cases.

The results which are required to compare with observations are not merely the elements, but the co-ordinates. When the varying elements are known these are computed by the equations (2) because, from the nature of the algebraic relations, the slowly varying elements are continuously determined by the equations (4), which express the same relations between the elements and the variables as do the equations (2) and (3). This method is, therefore, in form at least, completely rigorous. There are some cases in which it may be applied unchanged. But commonly it proves to be extremely long and cumbrous, and modifications have to be resorted to. Of these modifications the most valuable is one conceived by P.A. Hansen. A certain mean elliptic orbit, as near as possible to the actual varying orbit of the planet, is taken. In this orbit a certain fictitious planet is supposed to move according to the law of elliptic motion. Comparing the longitudes of the actual and the fictitious planet the former will sometimes be ahead of the latter and sometimes behind it. But in every case, if at a certain time t, the actual planet has a certain longitude, it is certain that at a very short interval dt before or after t, the fictitious planet will have this same longitude. What Hansen's method does is to determine a correction dt such that, being applied to the actual time t, the longitude of the fictitious planet computed for the time t + dt, will give the longitude of the true planet at the time t. By a number of ingenious devices Hansen developed methods by which dt could be determined. The computations are, as a general rule, simpler, and the algebraic expressions less complex, than when the computations of the longitude itself are calculated. Although the longitude of the fictitious planet at the fictitious time is then equal to that of the true planet at the true time, their radii vectores will not be strictly equal. Hansen, therefore, shows how the radius vector is corrected so as to give that of the true planet.

In all that precedes we have considered only two variables as determining the position of the planet, the latter being supposed to move in a plane. Although this is true when there are any number of bodies moving in the same plane, the fact is that the planets move in slightly different planes. Hence the position of the plane of the orbit of each planet is continually changing in consequence of their mutual action. The problem of determining the changes is, however, simpler than others in perturbations. The method is again that of the variation of elements. The position and velocity being given in all three co-ordinates, a certain osculating plane is determined for each instant in which the planet is moving at that instant. This plane remains invariable so long as no third body acts; when it does act the position of the plane changes very slowly, continually rotating round the radius vector of the planet as an instantaneous axis of rotation.

Secular and Periodic Variations.—When, following the preceding method, the variations of the elements are expressed in terms of the time, they are found to be of two classes, *periodic* and *secular*. The first depend on the mean longitudes of the planets, and always tend back to their original values when the planets return to their original positions in their orbits. The others are, at least through long periods of time, continually progressive.

A luminous idea of the nature of these two classes of variation may be gained by conceiving of the motion of a ship, floating on an ocean affected by a long ground swell. In consequence of the swell, the ship is continually pitching in a somewhat irregular way, the oscillations up and down being sometimes great and sometimes small. An observer on board of her would notice no motion except this. But, suppose the tide to be rising. Then, by continued observation, extended over an hour or more, it will be found that, in the general average, the ship is gradually rising, so that two different kinds of motion are superimposed on each other. The effect of the rising tide is in the nature of a secular variation, while the pitching is periodic.

But the analogy does not end here. If the progressive rise of the ship be watched for six hours or more, it will be found gradually to cease and reverse its direction. That is to say, making abstraction of the pitching, the ship is slowly rising and falling in a total period of nearly twelve hours, while superimposed upon this slow motion is a more rapid motion due to the waves. It is thus with the motions of the planets going through their revolutions. Each orbit continually changes its form and position, sometimes in one direction and sometimes in another. But when these changes are averaged through years and centuries it is found that the average orbit has a secular variation

which, for a number of centuries, may appear as a very slow progressive change in one direction only. But when this change is more fully investigated, it is found to be really periodic, so that after thousands, tens of thousands, or hundreds of thousands of years, its direction will be reversed and so on continually, like the rising and falling tide. The orbits thus present themselves to us in the words of a distinguished writer as “Great clocks of eternity which beat ages as ours beat seconds.”

The periodic variations can be represented algebraically as the resultant of a series of harmonic motions in the following way: Let L be an angle which is increasing uniformly with the time, and let n be its rate of increase. We put L_0 for its value at the moment from which the time is reckoned. The general expression for the angle will then be

$$L = nt + L_0.$$

Such an angle continually goes through the round of 360° in a definite period. For example, if the daily motion is 5°, and we take the day as the unit of time, the round will be completed in 72 days, and the angle will continually go through the value which it had 72 days before. Let us now consider an equation of the form

$$U = a \sin (nt + L_0).$$

The value of U will continually oscillate between the extreme values +a and −a, going through a series of changes in the same period in which the angle $nt + L_0$ goes through a revolution. In this case the variation will be simply periodic.

The value of any element of the planet’s motion will generally be represented by the sum of an infinite series of such periodic quantities, having different periods. For example

$$U = a \sin (nt + L_0) + b \sin (mt + L_1) + c \sin (kt + L_2) \&c.$$

In this case the motion of U, while still periodic, is seemingly irregular, being much like that of a pitching ship, which has no one unvarying period.

In the problems of celestial mechanics the angles within the parentheses are represented by sums or differences of multiples of the mean longitudes of the planets as they move round their orbits. If l be the mean longitude of the planet whose motion we are considering, and l′ that of the attracting planet affecting it, the periodic inequalities of the elements as well as of the co-ordinates of the attracted planet, may be represented by an infinite series of terms like the following:—

$$a \sin (l' - l) + b \sin (2l' - l) + c \sin (l' - 2l) + \&c.$$

Here the coefficients of l and l′ may separately take all integral values, though as a general rule the coefficients a, b, c, &c. diminish rapidly when these coefficients become large, so that only small values have to be considered.

The most interesting kind of periodic inequalities are those known as “terms of long period.” A general idea both of their nature and of their cause will be gained by taking as a special case one celebrated in the history of the subject—the great inequality between Jupiter and Saturn. We begin by showing what the actual fact is in the case of these two planets. Let fig. 3 represent the two orbits, the sun being at C. We know that the period of Jupiter is nearly twelve years, and that of Saturn a little less than thirty years. It will be seen that these numbers are nearly in the ratio of 2 to 5. It follows that the motions of the mean longitudes are nearly in the same proportion reversed. The annual motion of Jupiter is nearly 30°, that of Saturn a little more than 12°. Let us now consider the effect of this relation upon the configurations and relations of the two planets. Let the line CJ represent the common direction of the two planets from the sun when they are in conjunction, and let us follow the motions until they again come into conjunction. This will occur along a line CR_1, making an angle of nearly 240° with CJ. At this point Saturn will have moved 240° and Jupiter an entire revolution + 240°, making 600°. These two motions, it will be seen, are in the proportion 5 : 2. The next conjunction will take place along CS_1, and the third after the initial one will again take place near the original position JQ, Jupiter having made five revolutions and Saturn two.

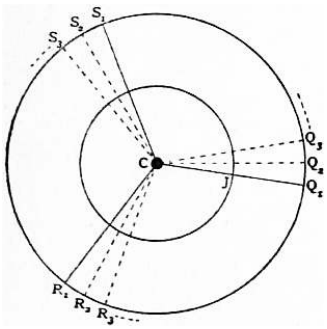


Fig. 3.

The result of these repetitions is that, during a number of revolutions, the special mutual actions of the two planets at these three points of their orbits repeat themselves, while the actions corresponding to the three intermediate arcs are wanting. Thus it happens that if the mutual actions are balanced through a period of a few revolutions only there is a small residuum of forces corresponding to the three regions in question, which repeats itself in the same way, and which, if it continued indefinitely, would entirely change the forms of the two orbits. But the actual mean motions deviate slightly from the ratio 2 : 5, and we have next to show how this deviation results in an ultimate balancing of the forces. The annual mean motions, with the corresponding combinations, are as follows:—

Jupiter:—n	= 30°.349043
Saturn:—n′	= 12°.221133
2n	= 60°.69809
5n′	= 61°.10567
5n′ − 2n	= 0°.40758

If we make a more accurate computation of the conjunctions from these data, we shall find that, in the general mean, the consecutive conjunctions take place when each planet has moved through an entire number of revolutions + 242.7°. It follows that the third conjunction instead of occurring exactly along the line CQ_1 occurs along CQ_2, making an angle of nearly 8° with CQ_1. The successive conjunctions following will be along CR_2, CS_2, CQ_3, &c., the law of progression being obvious.

The balancing of the series of forces will not be complete until the respective triplets of conjunctions have filled up the entire space between them. This will occur when the angle whose annual motion is 5n′ − 2n has gone through 360°. From the preceding value of 5n′ − 2n we see that this will require a little more than 883 years. The result of the continued action of the two planets upon each other is that during half of this period the motion of one planet is constantly retarded and of the other constantly accelerated, while during the other half the effects are reversed. There is thus in the case of each planet an oscillation of the mean longitude which increases it and then diminishes it to its original value at the end of the period of 883 years.

The longitudes, latitudes and radii vectores of a planet, being algebraically expressed as the sum of an infinite periodic series of the kind we have been describing, it follows that the problem of finding their co-ordinates at any moment is solved by computing these expressions. This is facilitated by the construction of tables by means of which the co-ordinates can be computed at any time. Such tables are used in the offices of the national Ephemerides to construct ephemerides of the several planets, showing their exact positions in the sky from day to day.

We pass now to the second branch of celestial mechanics viz. that in which the planets are no longer considered as particles, but as rotating bodies of which the dimensions are to be taken into account. Such a body, in free space, not acted on by any force except the attraction of its several parts, will go on rotating for ever in an invariable direction. But, in consequence of the centrifugal force generated by the rotation, it assumes a spheroidal form, the equatorial regions bulging out. Such a form we all know to be that of the earth and of the planets rotating on their axes. Let us study the effect of this deviation from the spherical form upon the attraction exercised by a distant body.

We begin with the special case of the earth as acted upon by the sun and moon. Let fig. 4 represent a section of the earth through its axis AB, ECQ being a diameter of the equator. Let the dotted lines show the direction of the distant attracting body. The point E, being more distant than C, will be attracted with less force, while Q will be attracted with a greater force than will the centre C. Were the force equal on every point of the earth it would have no influence on its rotation, but would simply draw its whole mass toward the attracting body. It is therefore only the *difference* of the forces on different parts of the earth that affects the rotation.

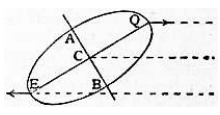


Fig. 4.

Let us, therefore, divide the attracting forces at each point into two parts, one the average force, which we may call F, and which for our purpose may be regarded as equal to the force acting at C; the others the residual forces which we must superimpose upon the average force F in order that the combination may be equal to the actual force. It is clear that at Q this residual force as represented by the arrow will be in the same direction as the actual force. But at E, since the actual force is less than F, the residual force must tend to

diminish F, and must, therefore, act toward the right, as shown by the arrow. These residual forces tend to make the whole earth turn round the centre C in a clockwise direction. If nothing modified this tendency the result would be to bring the points E and Q into the dotted lines of the attraction. In other words the equator would be drawn into coincidence with the ecliptic. Here, however, the same action comes into play, which keeps a rotating top from falling over. (See Gyroscope and Mechanics.) For the same reason as in the case of the gyroscope the actual motion of the earth's axis is at right angles to the line joining the earth and the attracting centre, and without going into the details of the mathematical processes involved, we may say that the ultimate mean effect will be to cause the pole P of the earth to move at right angles to the circle joining it to the pole of the ecliptic. Were the position of the latter invariable, the celestial pole would move round it in a circle. Actually the curve in which it moves is nearly a circle; but the distance varies slightly owing to the minute secular variation in the position of the ecliptic, caused by the action of the planets. This motion of the celestial pole results in a corresponding revolution of the equinox around the celestial sphere. The rate of motion is slightly variable from century to century owing to the secular motion of the plane of the ecliptic. Its period, with the present rate of motion, would be about 26,000 years, but the actual period is slightly indeterminate from the cause just mentioned.

The residual force just described is not limited to the case of an ellipsoidal body. It will be seen that the reasoning applies to the case of any one body or system of bodies, the dimensions of which are not regarded as infinitely small compared with the distance of the attracting body. In all such cases the residual forces virtually tend to draw those portions of the body nearest the attracting centre toward the latter, and those opposite the attracting centre away from it. Thus we have a tide-producing force tending to deform the body, the action of which is of the same nature as the force producing precession. It is of interest to note that, very approximately, this deforming force varies inversely as the cube of the distance of the attracting body.

The action of the sun upon the satellites of the several planets and the effects of this action are of the same general nature. For the same reason that the residual forces virtually act in opposite directions upon the nearer and more distant portions of a planet they will virtually act in the case of a satellite. When the latter is between its primary and the sun, the attraction of the latter tends to draw the satellite away from the primary. When the satellite is in the opposite direction from the sun, the same action tends to draw the primary away from the satellite. In both cases, relative to the primary, the action is the same. When the satellite is in quadrature the convergence of the lines of attraction toward the centre of the sun tends to bring the two bodies together. When the orbit of the satellite is inclined to that of the primary planet round the sun, the action brings about a change in the plane of the orbit represented by a rotation round an axis perpendicular to the plane of the orbit of the primary. If we conceive a pole to each of these orbits, determined by the points in which lines perpendicular to their planes intersect the celestial sphere, the pole of the satellite orbit will revolve around the pole of the planetary orbit precisely as the pole of the earth does around the pole of the ecliptic, the inclination of the two orbits remaining unchanged.

If a planet rotates on its axis so rapidly as to have a considerable ellipticity, and if it has satellites revolving very near the plane of the equator, the combined actions of the sun and of the equatorial protuberances may be such that the whole system will rotate almost as if the planes of revolution of the satellites were solidly fixed to the plane of the equator. This is the case with the seven inner satellites of Saturn. The orbits of these bodies have a large inclination, nearly 27°, to the plane of the planet's orbit. The action of the sun alone would completely throw them out of these planes as each satellite orbit would rotate independently; but the effect of the mutual action is to keep all of the planes in close coincidence with the plane of the planet's equator.

Literature.—The modern methods of celestial mechanics may be considered to begin with Joseph Louis Lagrange, whose theory of the variation of elements is developed in his *Mécanique analytique*. The practical methods of computing perturbations of the planets and satellites were first exhaustively developed by Pierre Simon Laplace in his *Mécanique céleste*. The only attempt since the publication of this great work to develop the various theories involved on a uniform plan and mould them into a consistent whole is that of de Pontécoulant in *Théorie analytique du système du monde* (1829-46, Paris). An approximation to such an attempt is that of F.F. Tisserand in his *Traité de mécanique céleste* (4 vols., Paris). This work contains a clear and excellent résumé of the methods which have been devised by the leading investigators from the time of Lagrange until the present, and thus forms the most encyclopaedic treatise to which the student can refer.

Works less comprehensive than this are necessarily confined to the elements of the subject, to the development of fundamental principles and general methods, or to details of special branches. An elementary treatise on the subject is F.R. Moulton's *Introduction to Celestial Mechanics* (London, 1902). Other works with the same general object are H.A. Resal, *Mécanique céleste*; and O.F. Dziobek, *Theorie der Planetenbewegungen*. The most complete and systematic development of the general principles of the subject, from the point of view of the modern mathematician, is found in J.H. Poincaré, *Les Méthodes nouvelles de la mécanique céleste* (3 vols., Paris, 1899, 1892, 1893). Of another work of Poincaré, *Leçons de mécanique céleste*, the first volume appeared in 1905.

Practical Astronomy.

Practical Astronomy, taken in its widest sense, treats of the instruments by which our knowledge of the heavenly bodies is acquired, the principles underlying their use, and the methods by which these principles are practically applied. Our knowledge of these bodies is of necessity derived through the medium of the light which they emit; and it is the development and applications of the laws of light which have made possible the additions to our stock of such knowledge since the middle of the 19th century.

At the base of every system of astronomical observation is the law that, in the voids of space, a ray of light moves in a right line. The fundamental problem of practical astronomy is that of determining by measurement the co-ordinates of the heavenly bodies as already defined. Of the three co-ordinates, the radius vector does not admit of direct measurement, and must be inferred by a combination of indirect measurements and physical theories. The other two co-ordinates, which define the direction of a body, admit of direct measurement on principles applied in the construction and use of astronomical instruments.

In the first system of co-ordinates already described the fundamental axis is the vertical line or direction of gravity at the point of observation. This is not the direction of gravity proper, or of the earth's attraction, but the resultant of this attraction combined with the centrifugal force due to the earth's rotation on its axis. The most obvious method of realizing this direction is by the plumb-line. In our time, however, this appliance is replaced by either of two others, which admit of much more precise application. These are the basin of mercury and the spirit-level. The surface of a liquid at rest is necessarily perpendicular to the direction of gravity, and therefore horizontal. Considered as a curved surface, concentric with the earth, a tangent plane to such a surface is the plane of the horizon. The problem of measuring from an axis perpendicular to this plane is solved on the principle that the incident and reflected rays of light make equal angles with the perpendicular to a reflecting surface. It follows that if PO (fig. 5) is the direction of a ray, either from a heavenly body or from a terrestrial point, impinging at O upon the surface of quicksilver, and reflected in the direction OR, the vertical line is the bisector OZ, of the angle POR. If the point P is so adjusted over the quicksilver that the ray is reflected back on its own path, P and R lying on the same line above O, then we know that the line PO is truly vertical. The zenith-distance of an object is the angle which the ray of light from it makes with the vertical direction thus defined.

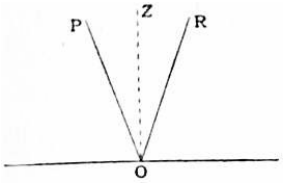


Fig. 5.

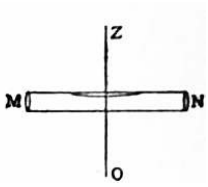


Fig. 6.

To show the principle involved in the spirit-level let MN (fig. 6) be the tube of such a level, fixed to an axis OZ on which it may revolve. If this axis is so adjusted that in the course of a revolution around it the bubble of the level undergoes no change of position, we know that the axis is truly vertical. Any slight deviation from verticality is shown by the motion of the bubble during the revolution, which can be measured and allowed for. The level may not be actually attached to an axis, a revolution of 180° being effected round an imaginary vertical axis by turning the level end for end. The motion of the bubble then measures double the inclination of this imaginary axis, or the deviation of a cylinder on which the level may rest from horizontality.

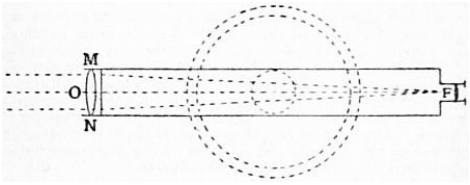


Fig. 7.

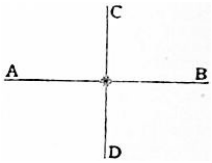


Fig. 8.

The problem of determining the zenith distance of a celestial object now reduces itself to that of measuring the angle between the direction of the object and the direction of the vertical line realized in one of these ways. This measurement is effected by a combination of two instruments, the telescope and the graduated circle. Let OF (fig. 7) be a section of the telescope, MN being its object glass. Let the parallel dotted lines represent rays of light emanating from the object to be observed, which, for our purpose, we regard as infinitely distant, a star for example. These rays come to a focus at a point F lying in the focal plane of the telescope. In this plane are a pair of cross threads or spider lines which, as the observer looks into the telescope, are seen as AB and CD (fig. 8). If the telescope is so pointed that the image of the star is seen in coincidence with the cross threads, as represented in fig. 8, then we know that the star is exactly in the line of sight of the telescope, defined as the line joining the centre of the object glass, and the point of intersection of the cross threads. If the telescope is moved around so that the images of two distant points are successively brought into coincidence with the cross threads, we know that the angle between the directions of these points is equal to that through which the telescope has been turned. This angle is measured by means of a graduated circle, rigidly attached to the tube of the telescope in a plane parallel to the line of sight. When the telescope is turned in this plane, the angular motion of the line of sight is equal to that through which the circle has turned.

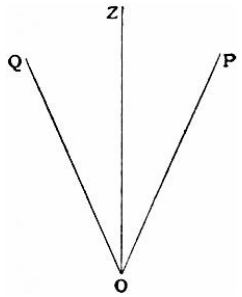


Fig. 9.

Stripped of all unnecessary adjuncts, and reduced to a geometric form, the ideal method by which the zenith distance of a heavenly body is determined by the combination which we have described is as follows:—Let OP (fig. 9) be the direction of a celestial body at which a telescope, supplied with a graduating circle, is pointed. Let OZ be an axis, as nearly vertical as it can easily be set, round which the entire instrument may revolve through 180°. After the image of the body is brought into coincidence with the cross threads, the instrument is turned through 180° on the axis, which results in the line of sight of the telescope pointing in a certain direction OQ, determined by the condition QOZ = ZOP. The telescope is then a second time pointed at the object by being moved through the angle QOP. Either of the angles QOZ and ZOP is then one half that through which the telescope has been turned, which may be measured by a graduated circle, and which is the zenith distance of the object measured from the direction of the axis OZ. This axis may not be exactly vertical. Its deviation from the vertical line is determined by the motion of the bubble of a spirit-level rigidly attached either to the axis, or to the telescope. Applying this deviation to the measured arc, the true zenith distance of the body is found.

When the basin of quicksilver is used, the telescope, either before or after being directed toward P, is pointed directly downwards, so that the observer mounting above it looks through it into the reflecting surface. He then adjusts the instrument so that the cross threads coincide with their images reflected from the surface of the quicksilver. The angular motion of the telescope in passing from this position to that when the celestial object is in the line of sight is the distance (ND) of the body from the nadir. Subtracting 90° from (ND) gives the altitude; and subtracting (ND) from 180° gives the zenith distance.

In the measurement of equatorial co-ordinates, the polar distance is determined in an analogous way. We determine the apparent position of an object near the pole on the celestial sphere at any moment, and again at another moment, twelve hours later, when, by the diurnal motion, it has made half a revolution. The angle through the celestial pole, between these two positions, is double the polar distance. The pole is the point midway between them. This being ascertained by one or more stars near it, may be used to determine by direct measurements the polar distances of other bodies.

The preceding methods apply mainly to the latitudinal co-ordinate. To measure the difference between the longitudinal co-ordinates of two objects by means of a graduated circle the instruments must turn on an axis parallel to the principal axis of the system of co-ordinates, and the plane of the graduated circle must be at right angles to that axis, and, therefore, parallel to the principal co-ordinate plane. The telescope, in order that it may be pointed in any direction, must admit of two motions, one round the principal axis, and the other round an axis at right angles to it. By these two motions the instrument may be pointed first at one of the objects and then at the other. The motion of the graduated circle in passing from one pointing to the other is the measure of the difference between the longitudinal co-ordinates of the two objects.

In the equatorial system this co-ordinate (the right ascension) is measured in a different way, by making the rotating earth perform the function of a graduated circle. The unceasing diurnal motion of the image of any heavenly body relative to the cross threads of a telescope makes a direct accurate measure of any co-ordinate except the declination almost impossible. Before the position of a star can be noted, it has passed away from the cross threads. This troublesome result is utilized and made a means of measurement. Right ascensions are now determined, not by measuring the angle between one star and another, but, by noting the time between the transits of successive stars over the meridian. The difference between these times, when reduced to an angle, is the difference of the right ascensions of the stars. The principle is the same as that by which the distance between two stations may be determined by the time required for a train moving at a uniform known speed to pass from one station to the other. The uniform speed of the diurnal motion is 15° per hour. We have already mentioned that in astronomical practice right ascensions are expressed in time, so that no multiplication by 15 is necessary.

Measures made on the various systems which we have described give the apparent direction of a celestial object as seen by the observer. But this is not the true direction, because the ray of light from the object undergoes refraction in passing through the atmosphere. It is therefore necessary to correct the observation for this effect. This is one of the most troublesome problems in astronomy because, owing to the ever varying density of the atmosphere, arising from differences of temperature, and owing to the impossibility of determining the temperature with entire precision at any other point than that occupied by the observer, the amount of refraction must always be more or less uncertain. The complexity of the problem will be seen by reflecting that the temperature of the air inside the telescope is not without its effect. This temperature may be and commonly is somewhat different from that of the observing room, which, again, is commonly higher than the temperature of the air outside. The uncertainty thus arising in the amount of the refraction is least near the zenith, but increases more and more as the horizon is approached.

The result of astronomical observations which is ordinarily wanted is not the direction of an object from the observer, but from the centre of the earth. Thus a reduction for parallax is required. Having effected this reduction, and computed the correction to be applied to the observation in order to eliminate all known errors to which the instrument is liable, the work of the practical astronomer is completed.

The instruments used in astronomical research are described under their several names. The following are those most used in astrometry:—

The equatorial telescope (*q.v.*) is an instrument which can be directed to any point in the sky, and which derives its appellation from its being mounted on an axis parallel to that of the earth. By revolving on this axis it follows a star in its diurnal motion, so that the star is kept in the field of view notwithstanding that motion.

Next in extent of use are the transit instrument and the meridian circle, which are commonly united in a single instrument, the transit circle (*q.v.*), known also as the meridian circle. This instrument moves only in the plane of the meridian on a horizontal east and west axis, and is used to determine the right ascensions and declinations of stars. These two instruments or combinations are a necessary part of the outfit of every important observatory. An adjunct of prime importance, which is necessary to their use, is an accurate clock, beating seconds.

Use of Photography.—Before the development of photography, there was no possible way of making observations upon the heavenly bodies except by the eye. Since the middle of the 19th century the system of photographing the heavenly bodies has been introduced, step by step, so that it bids fair to supersede eye observations in many of the determinations of astronomy. (See Photography: *Celestial*.)

The field of practical astronomy includes an extension which may be regarded as making astronomical science in a certain sense universal. The science is concerned with the heavenly bodies. The earth on which we live is, to all intents and purposes, one of these

bodies, and, so far as its relations to the heavens are concerned, must be included in astronomy. The processes of measuring great portions of the earth, and of determining geographical positions, require both astronomical observations proper, and determinations made with instruments similar to those of astronomy. Hence geodesy may be regarded as a branch of practical astronomy.

(S. N.)

History of Astronomy.

Origin of the science.

A practical acquaintance with the elements of astronomy is indispensable to the conduct of human life. Hence it is most widely diffused among uncivilized peoples, whose existence depends upon immediate and unvarying submission to the dictates of external nature. Having no clocks, they regard instead the face of the sky; the stars serve them for almanacs; they hunt and fish, they sow and reap in correspondence with the recurrent order of celestial appearances. But these, to the untutored imagination, present a mystical, as well as a mechanical aspect; and barbaric familiarity with the heavens developed at an early age, through the promptings of superstition, into a fixed system of observation. In China, Egypt and Babylonia, strength and continuity were lent to this native tendency by the influence of a centralized authority; considerable proficiency was attained in the arts of observation; and from millennial stores of accumulated data, empirical rules were deduced by which the scope of prediction was widened and its accuracy enhanced. But no genuine science of astronomy was founded until the Greeks sublimed experience into theory.

Chinese astronomy.

Already, in the third millennium B.C., equinoxes and solstices were determined in China by means of culminating stars. This is known from the orders promulgated by the emperor Yao about 2300 B.C., as recorded in the *Shu Chung*, a collection of documents antique in the time of Confucius (550-478 B.C.). And Yao was merely the renovator of a system long previously established. The *Shu Chung* further relates the tragic fate of the official astronomers, Hsi and Ho, put to death for neglecting to perform the rites customary during an eclipse of the sun, identified by Professor S.E. Russell[1] with a partial obscuration visible in northern China 2136 B.C. The date cannot be far wrong, and it is by far the earliest assignable to an event of the kind. There is, however, no certainty that the Chinese were then capable of predicting eclipses. They were, on the other hand, probably 809
acquainted, a couple of millenniums before Meton gave it his name, with the nineteen-year cycle, by which solar and lunar years were harmonized;[2] they immemorially made observations in the meridian; regulated time by water-clocks, and used measuring instruments of the nature of armillary spheres and quadrants. In or near 1100 B.C., Chou Kung, an able mathematician, determined with surprising accuracy the obliquity of the ecliptic; but his attempts to estimate the sun's distance failed hopelessly as being grounded on belief in the flatness of the earth. From of old, in China, circles were divided into 365¼ parts, so that the sun described daily one Chinese degree; and the equator began to be employed as a line of reference, concurrently with the ecliptic, probably in the second century B.C. Both circles, too, were marked by star-groups more or less clearly designated and defined. Cometary records of a vague kind go back in China to 2296 B.C.; they are intelligible and trustworthy from 611 B.C. onward. Two instruments constructed at the time of Kublai Khan's accession in 1280 were still extant at Peking in 1881. They were provided with large graduated circles adapted for measurements of declination and right ascension, and prove the Chinese to have anticipated by at least three centuries some of Tycho Brahe's most important inventions.[3] The native astronomy was finally superseded in the 17th century by the scientific teachings of Jesuit missionaries from Europe.

Egyptian astronomy.

Astrolatry was, in Egypt, the prelude to astronomy. The stars were observed that they might be duly worshipped. The importance of their heliacal risings, or first visible appearances at dawn, for the purposes both of practical life and of ritual observance, caused them to be systematically noted; the length of the year was accurately fixed in connexion with the annually recurring Nile-flood; while the curiously precise orientation of the Pyramids affords a lasting demonstration of the high degree of technical skill in watching the heavens attained in the third millennium B.C. The constellational system in vogue among the Egyptians appears to have been essentially of native origin; but they contributed little or nothing to the genuine progress of astronomy.

Babylonian astronomy.

With the Babylonians the case was different, although their science lacked the vital principle of growth imparted to it by their successors. From them the Greeks derived their first notions of astronomy. They copied the Babylonian asterisms, appropriated Babylonian knowledge of the planets and their courses, and learned to predict eclipses by means of the "Saros." This is a cycle of 18 years 11 days, or 223 lunations, discovered at an unknown epoch in Chaldaea, at the end of which the moon very nearly returns to her original position with regard as well to the sun as to her own nodes and perigee. There is no getting back to the beginning of astronomy by the shores of the Euphrates. Records dating from the reign of Sargon of Akkad (3800 B.C.) imply that even then the varying aspects of the sky had been long under expert observation. Thus early, there is reason to suppose, the star-groups with which we are now familiar began to be formed. They took shape most likely, not through one stroke of invention, but incidentally, as legends developed and astrological persuasions became defined.[4] The zodiacal series in particular seem to have been reformed and reconstructed at wide intervals of time (see Zodiac). Virgo, for example, is referred by P. Jensen, on the ground of its harvesting associations, to the fourth millennium B.C., while Aries (according to F.K. Ginzel) was interpolated at a comparatively recent time. In the main, however, the constellations transmitted to the West from Babylonia by Aratus and Eudoxus must have been arranged very much in their present order about 2800 B.C. E.W. Maunder's argument to this effect is unanswerable.[5] For the space of the southern sky left blank of stellar emblazonments was necessarily centred on the pole; and since the pole shifts among the stars through the effects of precession by a known annual amount, the ascertainment of any former place for it virtually fixes the epoch. It may then be taken as certain that the heavens described by Aratus in 270 B.C. represented approximately observations made some 2500 years earlier in or near north latitude 40°.

In the course of ages, Babylonian astronomy, purified from the astrological taint, adapted itself to meet the most refined needs of civil life. The decipherment and interpretation by the learned Jesuits, Fathers Epping and Strassmeier, of a number of clay tablets preserved in the British Museum, have supplied detailed knowledge of the methods practised in Mesopotamia in the 2nd century B.C.[6] They show no trace of Greek influence, and were doubtless the improved outcome of an unbroken tradition. How protracted it had been, can be in a measure estimated from the length of the revolutionary cycles found for the planets. The Babylonian computers were not only aware that Venus returns in almost exactly eight years to a given starting-point in the sky, but they had established similar periodic relations in 46, 59, 70 and 83 years severally for Mercury, Saturn, Mars and Jupiter. They were accordingly able to fix in advance the approximate positions of these objects with reference to ecliptical stars which served as fiducial points for their determination. In the Ephemerides published year by year, the times of new moon were given, together with the calculated intervals to the first visibility of the crescent, from which the beginning of each month was reckoned; the dates and circumstances of solar and lunar eclipses were predicted; and due information was supplied as to the forthcoming heliacal risings and settings, conjunctions and oppositions of the planets. The Babylonians knew of the inequality in the daily motion of the sun, but misplaced by 10° the perigee of his orbit. Their sidereal year was $4\frac{1}{2}^{m}$ too long,[7] and they kept the ecliptic stationary among the stars, making no allowance for the shifting of the equinoxes. The striking discovery, on the other hand, has been made by the Rev. F.X. Kugler[8] that the various periods underlying their lunar predictions were identical with those heretofore believed to have been independently arrived at by Hipparchus, who accordingly must be held to have borrowed from Chaldaea the lengths of the synodic, sidereal, anomalistic and draconitic months.

Greek astronomy. Thales.

Pythagoras.

Heraclides.

A steady flow of knowledge from East to West began in the 7th century B.C. A Babylonian sage named Berossus founded a school about 640 B.C. in the island of Cos, and perhaps counted Thales of Miletus (*c.* 639-548) among his pupils. The famous "eclipse of Thales" in 585 B.C. has not, it is true, been authenticated by modern research;[9] yet the story told by Herodotus appears to intimate that a knowledge of the Saros, and of the forecasting facilities connected with it, was possessed by the Ionian sage. Pythagoras of Samos (fl. 540-510 B.C.) learned on his travels in Egypt and the East to identify the morning and evening stars, to recognize the obliquity of the ecliptic, and to regard the earth as a sphere freely poised in space. The tenet of its axial movement was held by many of his followers—in an obscure form by Philolaus of Crotona after the middle of the 5th century B.C., and more explicitly by Ecphantus and Hicetas of Syracuse (4th century B.C.), and by Heraclides of Pontus. Heraclides, who became a disciple of Plato in 360 B.C., taught in addition that the sun, while circulating round the earth, was the centre of revolution to Venus and Mercury.[10] A genuine heliocentric system, developed by Aristarchus of Samos (fl. 280-264 B.C.), was described by Archimedes in his *Arenarius*, only to be set aside 810
with disapproval. The long-lived conception of a series of crystal spheres, acting as the vehicles of the heavenly bodies, and attuned to divine harmonies, seems to have originated with Pythagoras himself.

Eudoxus.

The first mathematical theory of celestial appearances was devised by Eudoxus of Cnidus (408-355 B.C.).[11] The problem he attempted to solve was so to combine uniform circular movements as to produce the resultant effects actually observed. The sun and moon and the five planets were, with this end in view, accommodated each with a set of variously revolving spheres, to the total number of 27. The Eudoxian or "homocentric" system, after it had been further elaborated by Callippus and

Aristotle, was modified by Apollonius of Perga (fl. 250-220 B.C.) into the hypothesis of deferents and epicycles, which held the field for 1800 years as the characteristic embodiment of Greek ideas in astronomy. Eudoxus further wrote two works descriptive of the heavens, the *Enoptron* and *Phaenomena*, which, substantially preserved in the *Phaenomena* of Aratus (fl. 270 B.C.), provided all the leading features of modern stellar nomenclature.

School of Alexandria.

Greek astronomy culminated in the school of Alexandria. It was, soon after its foundation, illustrated by the labours of Aristyllus and Timocharis (*c.* 320-260 B.C.), who constructed the first catalogue giving star-positions as measured from a reference-point in the sky. This fundamental advance rendered inevitable the detection of precessional effects.

Aristarchus.

Aristarchus of Samos observed at Alexandria 280-264 B.C. His treatise on the magnitudes and distances of the sun and moon, edited by John Wallis in 1688, describes a theoretically valid method for determining the relative distances of the sun and moon by measuring the angle between their centres when half the lunar disk is illuminated; but the time of dichotomy being widely indeterminate, no useful result was thus obtainable. Aristarchus in fact concluded the sun to be not more than twenty times, while it is really four hundred times farther off than our satellite. His general conception of the universe was comprehensive beyond that of any of his predecessors.

Eratosthenes.

Eratosthenes (276-196 B.C.), a native of Cyrene, was summoned from Athens to Alexandria by Ptolemy Euergetes to take charge of the royal library. He invented, or improved armillary spheres, the chief implements of ancient astrometry, determined the obliquity of the ecliptic at 23° 51′ (a value 5′ too great), and introduced an effective mode of arc-measurement. Knowing Alexandria and Syene to be situated 5000 stadia apart on the same meridian, he found the sun to be 7° 12′ south of the zenith at the northern extremity of this arc when it was vertically overhead at the southern extremity, and he hence inferred a value of 252,000 stadia for the entire circumference of the globe. This is a very close approximation to the truth, if the length of the unit employed has been correctly assigned.[12]

Hipparchus.

Among the astronomers of antiquity, two great men stand out with unchallenged pre-eminence. Hipparchus and Ptolemy entertained the same large organic designs; they worked on similar methods; and, as the outcome, their performances fitted so accurately together that between them they re-made celestial science. Hipparchus fixed the chief data of astronomy—the lengths of the tropical and sidereal years, of the various months, and of the synodic periods of the five planets; determined the obliquity of the ecliptic and of the moon's path, the place of the sun's apogee, the eccentricity of his orbit, and the moon's horizontal parallax; all with approximate accuracy. His loans from Chaldaean experts appear, indeed, to have been numerous; but were doubtless independently verified. His supreme merit, however, consisted in the establishment of astronomy on a sound geometrical basis. His acquaintance with trigonometry, a branch of science initiated by him, together with his invention of the planisphere, enabled him to solve a number of elementary problems; and he was thus led to bestow especial attention upon the position of the equinox, as being the common point of origin for measures both in right ascension and longitude. Its steady retrogression among the stars became manifest to him in 130 B.C., on comparing his own observations with those made by Timocharis a century and a half earlier; and he estimated at not less than 36″ (the true value being 50″) the annual amount of "precession."

The choice made by Hipparchus of the geocentric theory of the universe decided the future of Greek astronomy. He further elaborated it by the introduction of "eccentrics," which accounted for the changes in orbital velocity of the sun and moon by a displacement of the earth, to a corresponding extent, from the centre of the circles they were assumed to describe. This gave the elliptic inequality known as the "equation of the centre," and no other was at that time obvious. He attempted no detailed discussion of planetary theory; but his catalogue of 1080 stars, divided into six classes of brightness, or "magnitudes," is one of the finest monuments of antique astronomy. It is substantially embodied in Ptolemy's *Almagest* (see PTOLEMY).

Ptolemy.

An interval of 250 years elapsed before the constructive labours of Hipparchus obtained completion at Alexandria. His observations were largely, and somewhat arbitrarily, employed by Ptolemy. Professor Newcomb, who has compiled an instructive table of the equinoxes severally observed by Hipparchus and Ptolemy, with their errors deduced from Leverrier's solar tables, finds palpable evidence that the discrepancies between the two series were artificially reconciled on the basis of a year 6^m too long, adopted by Ptolemy on trust from his predecessor. He nevertheless holds the process to have been one that implied no fraudulent intention.

The Ptolemaic system was, in a geometrical sense, defensible; it harmonized fairly well with appearances, and physical reasonings had not then been extended to the heavens. To the ignorant it was recommended by its conformity to crude common sense; to the learned, by the wealth of ingenuity expended in bringing it to perfection. The *Almagest* was the consummation of Greek astronomy. Ptolemy had no successor; he found only commentators, among the more noteworthy of whom were Theon of Alexandria (fl. A.D. 400) and his daughter Hypatia (370-415). With the capture of Alexandria by Omar in 641, the last glimmer of its scientific light became extinct, to be rekindled, a century and a half later, on the banks of the Tigris.

Arab astronomers.

The first Arabic translation of the *Almagest* was made by order of Harun al-Rashid about the year 800; others followed, and the Caliph al-Mamun built in 829 a grand observatory at Bagdad. Here Albumazar (805-885) watched the skies and cast horoscopes; here Tobit ben Korra (836-901) developed his long unquestioned, yet misleading theory of the "trepidation" of the equinoxes; Abd-ar-rahman al-Sūf (903-986) revised at first hand the catalogue of Ptolemy;[13] and Abulwefa (939-998), like al-Sūfi, a native of Persia, made continuous planetary observations, but did not (as alleged by L. Sédillot) anticipate Tycho Brahe's discovery of the moon's variation. Ibn Junis (*c.* 950-1008), although the scene of his activity was in Egypt, falls into line with the astronomers of Bagdad. He compiled the Hakimite Tables of the planets, and observed at Cairo, in 977 and 978, two solar eclipses which, as being the first recorded with scientific accuracy,[14] were made available in fixing the amount of lunar acceleration. Nasir ud-din (1201-1274) drew up the Ilkhanic Tables, and determined the constant of precession at 51″. He directed an observatory established by Hulagu Khan (d. 1265) at Maraga in Persia, and equipped with a mural quadrant of 12 ft. radius, besides altitude and azimuth instruments. Ulugh Beg (1394-1449), a grandson of Tamerlane, was the illustrious personification of Tatar astronomy. He founded about 1420 a splendid observatory at Samarkand, in which he re-determined nearly all Ptolemy's stars, while the Tables published by him held the primacy for two centuries.[15]

Moorish Astronomy.

Arab astronomy, transported by the Moors to Spain, flourished temporarily at Cordova and Toledo. From the latter city the Toletan Tables, drawn up by Arzachel in 1080, took their name; and there also the Alfonsine Tables, published in 1252, were prepared under the authority of Alphonso X. of Castile. Their appearance signalized the dawn of European science, and was nearly coincident with that of the *Sphaera Mundi*, a text-book of spherical astronomy, written by a Yorkshireman, John Holywood, known as Sacro Bosco (d. 1256). It had an immense vogue, perpetuated by the printing-press in fifty-nine editions.

European Astronomy.

In Germany, during the 15th century, a brilliant attempt was made to patch up the flaws in Ptolemaic doctrine. George Purbach (1423-1461) introduced into Europe the method of determining time by altitudes employed by Ibn Junis. He lectured with applause at Vienna from 1450; was joined there in 1452 by Regiomontanus (*q.v.*); and was on the point of starting for Rome to inspect a manuscript of the *Almagest* when he died suddenly at the age of thirty-eight.

Purbach. Walther.

His teachings bore fruit in the work of Regiomontanus, and of Bernhard Walther of Nuremberg (1430-1504), who fitted up an observatory with clocks driven by weights, and developed many improvements in practical astronomy.

Copernicus.

Meantime, a radical reform was being prepared in Italy. Under the searchlights of the new learning, the dictatorship of Ptolemy appeared no more inevitable than that of Aristotle; advanced thinkers like Domenico Maria Novara (1454-1504) promulgated *sub rosa* what were called Pythagorean opinions; and they were eagerly and fully appropriated by Nicolaus Copernicus during his student-years (1496-1505) at Bologna and Padua. He laid the groundwork of his heliocentric theory between 1506 and 1512, and brought it to completion in *De Revolutionibus Orbium Coelestium* (1543). The colossal task of remaking astronomy on an inverted design was, in this treatise, virtually accomplished. Its reasonings were solidly founded on the principle of the relativity of motion. A continuous shifting of the standpoint was in large measure substituted for the displacements of the objects viewed, which thus acquired a regularity and consistency heretofore lacking to them. In the new system, the sphere of the fixed stars no longer revolved diurnally, the earth rotating instead on an axis directed towards the celestial pole. The sun too remained stationary, while the planets, including our own globe, circulated round him. By this means, the planetary "retrogradations" were explained as simple perspective effects due to the combination of the earth's revolutions with those of her sister orbs. The retention, however, by Copernicus of the antique postulate of uniform circular motion impaired the perfection of his plan, since it involved a partial survival of the epicyclical machinery. Nor was it feasible, on this showing, to place the sun at the true centre of any of the planetary orbits; so that his ruling position in the midst of them was illusory. The reformed scheme was then by no means perfect. Its simplicity was only comparative; many outstanding anomalies compromised its harmonious working. Moreover, the absence of sensible parallaxes in the stellar heavens seemed inconsistent with its validity; and a mobile earth outraged deep-rooted prepossessions. Under these disadvantageous circumstances, it is scarcely surprising that the heliocentric theory, while admired as a daring speculation, won its way slowly to acceptance as a truth.

The *Tabulae Prutenicae*, calculated on Copernican principles by Erasmus Reinhold (1511-1553), appeared in 1551. Although they represented celestial movements far better than the Alfonsine Tables, large discrepancies were still apparent, and the desirability of testing the novel hypothesis upon which they were based by more refined observations prompted a reform of methods, undertaken almost simultaneously by the landgrave William IV. of Hesse-Cassel (1532-1592), and by Tycho Brahe. The landgrave built at Cassel in 1561 the first observatory with a revolving dome, and worked for some years at a star-catalogue finally left incomplete. Christoph Rothmann and Joost Bürgi (1552-1632) became his assistants in 1577 and 1579 respectively; and through the skill of Bürgi, time-determinations were made available for measuring right ascensions. At Cassel, too, the altitude and azimuth instrument is believed to have made its first appearance in Europe.[16]

Observatory of Cassel.

Tycho's labours were both more strenuous and more effective. He perfected the art of pre-telescopic observation. His instruments were on a scale and of a type unknown since the days of Nasir ud-din. At Augsburg, in 1569, he ordered the construction of a 19-ft. quadrant, and of a celestial globe 5 ft. in diameter; he substituted equatorial for zodiacal armillae, thus definitively establishing the system of measurements in right ascension and declination; and improved the graduation of circular arcs by adopting the method of "transversals." By these means, employed with consummate skill, he attained an unprecedented degree of accuracy, and as an incidental though valuable result, demonstrated the unreality of the supposed trepidation of the equinoxes.

Tycho Brahe.

No more congruous arrangement could have been devised than the inheritance by Johann Kepler of the wealth of materials amassed by Tycho Brahe. The younger man's genius supplied what was wanting to his predecessor. Tycho's endowments were of the practical order; yet he had never designed his observations to be an end in themselves. He thought of them as means towards the end of ascertaining the true form of the universe. His range of ideas was, however, restricted; and the attempt embodied in his ground-plan of the solar system to revive the ephemeral theory of Heraclides failed to influence the development of thought. Kepler, on the contrary, was endowed with unlimited powers of speculation, but had no mechanical faculty. He found in Tycho's ample legacy of first-class data precisely what enabled him to try, by the touchstone of fact, the successive hypotheses that he imagined; and his untiring patience in comparing and calculating the observations at his disposal was rewarded by a series of unique discoveries. He long adhered to the traditional belief that all celestial revolutions must be performed equably in circles; but a laborious computation of seven recorded oppositions of Mars at last persuaded him that the planet travelled in an ellipse, one focus of which was occupied by the sun. Pursuing the inquiry, he found that its velocity was uniform with respect to no single point within the orbit, but that the areas described, in equal times, by a line drawn from the sun to the planet were strictly equal. These two principles he extended, by direct proof, to the motion of the earth; and, by analogy, to that of the other planets. They were published in 1609 in *De Motibus Stellae Martis*. The announcement of the third of "Kepler's Laws" was made ten years later, in *De Harmonice Mundi*. It states that the squares of the periods of circulation round the sun of the several planets are in the same ratio as the cubes of their mean distances. This numerical proportion, as being a necessary consequence of the law of gravitation, must prevail in every system under its sway. It does in fact prevail among the satellite-families of our acquaintance, and presumably in stellar combinations as well. Kepler's ineradicable belief in the existence of some such congruity was derived from the Pythagorean idea of an underlying harmony in nature; but his arduous efforts for its realization took a devious and fantastic course which seemed to give little promise of their surprising ultimate success. The outcome of his discoveries was, not only to perfect the geometrical plan of the solar system, but to enhance very materially the predicting power of astronomy. The Rudolphine Tables (Ulm, 1627), computed by him from elliptic elements, retained authority for a century, and have in principle never been superseded. He was deterred from research into the orbital relations of comets, by his conviction of their perishable nature. He supposed their tails to result from the action of solar rays, which, in traversing their mass, bore off with them some of their subtler particles to form trains directed away from the sun. And through the process of waste thus set on foot, they finally dissolved into the aether, and expired "like spinning insects." (*De Cometis; Opera*, ed. Frisch, t. vii. p. 110.) This remarkable anticipation of the modern theory of light-pressure was suggested to him by his observations of the great comets of 1618.

Kepler.

The formal astronomy of the ancients left Kepler unsatisfied. He aimed at finding out the cause as well as the mode of the planetary revolutions; and his demonstration that the planes in which they are described all pass through the sun was an important preliminary to a physical explanation of them. But his efforts to supply such an explanation were rendered futile by his imperfect apprehension of what motion is in itself. He had, it is true, a distinct conception of a force analogous to that of gravity, by which cognate bodies tended towards union. Misled, however, into identifying it with magnetism, he imagined circulation in the solar system to be maintained through the material compulsion of fibrous emanations from the sun, carried round by his axial rotation. Ignorance regarding the inertia of matter drove him to this expedient. The persistence of movement seemed to him to imply the persistence of a moving power. He did not recognize that motion and rest are equally natural, in the sense of requiring force for their alteration. Yet his rationale of the tides in *De Motibus Stellae* is not only memorable as an astonishing forecast of the principle of reciprocal attraction in the proportion of mass, but for its bold extension to the earth of the lunar sphere of influence.

Galileo Galilei, Kepler's most eminent contemporary, took a foremost part in dissipating the obscurity that still hung over the very foundations of mechanical science. He had, indeed, precursors and co-operators. Michel Varo of Geneva wrote correctly in 1584 on the composition of forces; Simon Stevin of Bruges (1548-1620) independently demonstrated the principle; and G.B. Benedetti expounded in his *Speculationum Liber* (Turin, 1585) perfectly clear ideas as to the nature of accelerated motion, some years in advance of Galileo's dramatic experiments at Pisa. Yet they were never assimilated by Kepler; while, on the other hand, the laws of planetary circulation he had enounced were strangely ignored by Galileo. The two lines of inquiry remained for some time apart. Had they at once been made to coalesce, the true nature of the force controlling celestial movements should have been quickly recognized. As it was, the importance of Kepler's generalizations was not fully appreciated until Sir Isaac Newton made them the corner-stone of his new cosmic edifice.

Galileo's contributions to astronomy were of a different quality from Kepler's. They were easily intelligible to the general public: in a sense, they were obvious, since they could be verified by every possessor of one of the Dutch perspective-instruments, just then in course of wide and rapid distribution. And similar results to his were in fact independently obtained in various parts of Europe by Christopher Scheiner at Ingolstadt, by Johann Fabricius at Osteel in Friesland, and by Thomas Harriot at Syon House, Isleworth. Galileo was nevertheless by far the ablest and most versatile of these early telescopic observers. His gifts of exposition were on a par with his gifts of discernment. What he saw, he rendered conspicuous to the world. His sagacity was indeed sometimes at fault. He maintained with full conviction to the end of his life a grossly erroneous hypothesis of the tides, early adopted from Andrea Caesalpino; the "triplicate" appearance of Saturn always remained an enigma to him; and in regarding comets as atmospheric emanations he lagged far behind Tycho Brahe. Yet he unquestionably ranks as the true founder of descriptive astronomy; while his splendid presentment of the laws of projectiles in his dialogue of the "New Sciences" (Leiden, 1638) lent potent aid to the solid establishment of celestial mechanics.

Galileo.

The accumulation of facts does not in itself constitute science. Empirical knowledge scarcely deserves the name. *Vere scire est per causas scire.* Francis Bacon's prescient dream, however, of a living astronomy by which the physical laws governing terrestrial relations should be extended the highest heavens, had long to wait for realization. Kepler divined its possibility; but his thoughts, derailed (so to speak) by the false analogy of magnetism, brought him no farther than to the rough draft of the scheme of vortices expounded in detail by René Descartes in his *Principia Philosophiae* (1644). And this was a Descartes *cul-de-sac*. The only practicable road struck aside from it. The true foundations of a mechanical theory of the heavens were laid by Kepler's discoveries, and by Galileo's dynamical demonstrations; its construction was facilitated by the development of mathematical methods. The invention of logarithms, the rise of analytical geometry, and the evolution of B. Cavalieri's "indivisibles" into the infinitesimal calculus, all accomplished during the 17th century, immeasurably widened the scope of exact astronomy. Gradually, too, the nature of the problem awaiting solution came to be apprehended. Jeremiah Horrocks had some intuition, previously to 1639, that the motion of the moon was controlled by the earth's gravity, and disturbed by the action of the sun. Ismael Bouillaud (1605-1694) stated in 1645 the fact of planetary circulation under the sway of a sun-force decreasing as the inverse square of the distance; and the inevitableness of this same "duplicate ratio" was separately perceived by Robert Hooke, Edmund Halley and Sir Christopher Wren before Newton's discovery had yet been made public. He was the only man of his generation who both recognized the law, and had power to demonstrate its validity. And this was only a beginning. His complete achievement had a twofold aspect. It consisted, first, in the identification, by strict numerical comparisons, of terrestrial gravity with the mutual attraction of the heavenly bodies; secondly, in the following out of its mechanical consequences throughout the solar system. Gravitation was thus shown to be the sole influence governing the movements of planets and satellites; the figure of the rotating earth was successfully explained by its action on the minuter particles of matter; tides and the procession of the equinoxes proved amenable to reasonings based on the same principle; and it satisfactorily accounted as well for some of the chief lunar and planetary inequalities. Newton's investigations, however, were very far from being exhaustive. Colossal though his powers were, they had limits; and his work could not but remain unterminated, since it was by its nature interminable. Nor was it possible to provide it with what could properly be called a sequel. The synthetic method employed by him was too unwieldy for common use. Yet no other was just then at hand. Mathematical analysis needed half a century of cultivation before it was fully available

Gravitational Astronomy.

Bacon. Descartes.

Newton.

for the arduous tasks reserved for it. They were accordingly taken up anew by a band of continental inquirers, primarily by three men of untiring energy and vivid genius, Leonhard Euler, Alexis Clairault, and Jean le Rond d'Alembert. The first of the outstanding gravitational problems with which they grappled was the unaccountably rapid advance of the lunar perigee. But the apparent anomaly disappeared under Euler's powerful treatment in 1749, and his result was shortly afterwards still further assured by Clairault. The subject of planetary perturbations was next attacked. Euler devised in 1753 a new method, that of the "variation of parameters," for their investigation, and applied it to unravel some of the earth's irregularities in a memoir crowned by the French Academy in 1756; while in 1757, Clairault estimated the masses of the moon and Venus by their respective disturbing effects upon terrestrial movements. But the most striking incident in the history of the verification of Newton's law was the return of Halley's comet to perihelion, on the 12th of March 1759, in approximate accordance with Clairault's calculation of the delays due to the action of Jupiter and Saturn. Visual proof was thus, it might be said, afforded of the harmonious working of a single principle to the uttermost boundaries of the sun's dominion.

Euler, Clairault, D'Alembert.

These successes paved the way for the higher triumphs of Joseph Louis Lagrange and of Pierre Simon Laplace. The subject of the lunar librations was treated by Lagrange with great originality in an essay crowned by the Paris Academy of Sciences in 1764; and he filled up the lacunae in his theory of them in a memoir communicated to the Berlin Academy in 1780. He again won the prize of the Paris Academy in 1766 with an analytical discussion of the movements of Jupiter's satellites (*Miscellanea*, Turin Acad. t. iv.); and in the same year expanded Euler's adumbrated method of the variation of parameters into a highly effective engine of perturbational research. It was especially adapted to the tracing out of "secular inequalities," or those depending upon changes in the orbital elements of the bodies affected by them, and hence progressing indefinitely with time; and by its means, accordingly, the mechanical stability of the solar system was splendidly demonstrated through the successive efforts of Lagrange and Laplace. The proper share of each in bringing about this memorable result is not easy to apportion, since they freely imparted and profited by one another's advances and improvements; it need only be said that the fundamental proposition of the invariability of the planetary major axes laid down with restrictions by Laplace in 1773, was finally established by Lagrange in 1776; while Laplace in 1784 proved the subsistence of such a relation between the eccentricities of the planetary orbits on the one hand, and their inclinations on the other, that an increase of either element could, in any single case, proceed only to a very small extent. The system was thus shown, apart from unknown agencies of subversion, to be constructed for indefinite permanence. The prize of the Berlin Academy was, in 1780, adjudged to Lagrange for a treatise on the perturbations of comets, and he contributed to the Berlin Memoirs, 1781-1784, a set of five elaborate papers, embodying and unifying his perfected methods and their results.

Lagrange.

The crowning trophies of gravitational astronomy in the 18th century were Laplace's explanations of the "great inequality" of Jupiter and Saturn in 1784, and of the "secular acceleration" of the moon in 1787. Both irregularities had been noted, a century earlier, by Edmund Halley; both had, since that time, vainly exercised the ingenuity of the ablest mathematicians; both now almost simultaneously yielded their secret to the same fortunate inquirer. Johann Heinrich Lambert pointed out in 1773 that the motion of Saturn, from being retarded, had become accelerated. A periodic character was thus indicated for the disturbance; and Laplace assigned its true cause in the near approach to commensurability in the periods of the two planets, the cycle of disturbance completing itself in about 900 (more accurately 929½) years. The lunar acceleration, too, obtains ultimate compensation, though only after a vastly protracted term of years. The discovery, just one hundred years after the publication of Newton's *Principia*, of its dependence upon the slowly varying eccentricity of the earth's orbit signalized the removal of the last conspicuous obstacle to admitting the unqualified validity of the law of gravitation. Laplace's calculations, it is true, were inexact. An error, corrected by J.C. Adams in 1853, nearly doubled the value of the acceleration deducible from them; and served to conceal a discrepancy with observation which has since given occasion to much profound research (see Moon).

Laplace.

The *Mécanique céleste*, in which Laplace welded into a whole the items of knowledge accumulated by the labours of a century, has been termed the "Almagest of the 18th century" (Fourier). But imposing and complete though the monument appeared, it did not long hold possession of the field. Further developments ensued. The "method of least squares," by which the most probable result can be educed from a body of observational data, was published by Adrien Marie Legendre in 1806, by Carl Friedrich Gauss in his *Theoria Motus* (1809), which described also a mode of calculating the orbit of a planet from three complete observations, afterwards turned to important account for the recapture of Ceres, the first discovered asteroid (see Planets, Minor). Researches into rotational movement were facilitated by S.D. Poisson's application to them in 1809 of Lagrange's theory of the variation of constants; Philippe de Pontécoulant successfully used in 1829, for the prediction of the impending return of Halley's comet, a system of "mechanical quadratures" published by Lagrange in the Berlin Memoirs for 1778; and in his *Théorie analytique du système du monde* (1846) he modified and refined general theories of the lunar and planetary revolutions. P.A. Hansen in 1829 (*Astr. Nach.* Nos. 166-168, 179) left the beaten track by choosing time as the sole variable, the orbital elements remaining constant. A.L. Cauchy published in 1842-1845 a method similarly conceived, though otherwise developed; and the scope of analysis in determining the movements of the heavenly bodies has since been perseveringly widened by the labours of Urbain J.J. Leverrier, J.C. Adams, S. Newcomb, G.W. Hill, E.W. Brown, H. Gyldén, Charles Delaunay, F. Tisserand, H. Poincaré and others too numerous to mention. Nor were these abstract investigations unaccompanied by concrete results. Sir George Airy detected in 1831 an inequality, periodic in 240 years, between Venus and the earth. Leverrier undertook in 1839, and concluded in 1876, the formidable task of revising all the planetary theories and constructing from them improved tables. Not less comprehensive has been the work carried out by Professor Newcomb of raising to a higher grade of perfection, and reducing to a uniform standard, all the theories and constants of the solar system. His inquiries afford the assurance of a nearly exact conformity among its members to strict gravitational law, only the moon and Mercury showing some slight, but so far unexplained, anomalies of movement. The discovery of Neptune in 1846 by Adams and Leverrier marked the first solution of the "inverse problem" of perturbations. That is to say, ascertained or ascertainable effects were made the starting-point instead of the goal of research.

Observational astronomy, meanwhile, was advancing to some extent independently. The descriptive branch found its principle of development in the growing powers of the telescope, and had little to do with mathematical theory; which, on the contrary, was closely allied, by relations of mutual helpfulness, with practical astronomy, or "astrometry." Meanwhile, the elementary requirement of making visual acquaintance with the stellar heavens was met, as regards the unknown southern skies, when Johann Bayer published at Nuremberg in 1603 a celestial atlas depicting twelve new constellations formed from the rude observations of navigators across the line. In the same work, the current mode of star-nomenclature by the letters of the Greek alphabet made its appearance. On the 7th of November 1631 Pierre Gassendi watched at Paris the passage of Mercury across the sun. This was the first planetary transit observed. The next was that of Venus on the 24th of November (O.S.) 1639, of which Jeremiah Horrocks and William Crabtree were the sole spectators. The improvement of telescopes was prosecuted by Christiaan Huygens from 1655, and promptly led to his discoveries of the sixth Saturnian moon, of the true shape of the Saturnian appendages, and of the multiple character of the "trapezium" of stars in the Orion nebula. William Gascoigne's invention of the filar micrometer and of the adaptation of telescopes to graduated instruments remained submerged for a quarter of a century in consequence of his untimely death at Marston Moor (1644). The latter combination had also been ineffectually proposed in 1634 by Jean Baptiste Morin (1583-1656); and both devices were recontrived at Paris about 1667, the micrometer by Adrien Auzout (d. 1691), telescopic sights (so-called) by Jean Picard (1620-1682), who simultaneously introduced the astronomical use of pendulum-clocks, constructed by Huygens eleven years previously. These improvements were ignored or rejected by Johann Hevelius of Danzig, the author of the last important star-catalogue based solely upon naked-eye determinations. He, nevertheless, used telescopes to good purpose in his studies of lunar topography, and his designations for the chief mountain-chains and "seas" of the moon have never been superseded. He, moreover, threw out the suggestion (in his *Cometographia*, 1668) that comets move round the sun in orbits of a parabolic form.

Descriptive and practical astronomy.

Bayer. Gassendi.

Horrocks. Huygens.

Gascoigne. Hevelius.

The establishment, in 1671 and 1676 respectively, of the French and English national observatories at once typified and stimulated progress. The Paris institution, it is true, lacked unity of direction. No authoritative chief was assigned to it until 1771. G.D. Cassini, his son and his grandson were only *primi inter pares*. Claude Perrault's stately edifice was equally accessible to all the more eminent members of the Academy of Sciences; and researches were, more or less independently, carried on there by (among others) Philippe de la Hire (1640-1718), G.F. Maraldi (1665-1729), and his nephew, J.D. Maraldi, Jean Picard, Huygens, Olaus Römer and Nicolas de Lacaille. Some of the best instruments then extant were mounted at the Paris observatory. G.D. Cassini brought from Rome a 17-ft. telescope by G. Campani, with which he discovered in 1671 Iapetus, the ninth in distance of Saturn's family of satellites; Rhea was detected in 1672 with a glass by the same maker of 34-ft. focus; the duplicity of the ring showed in 1675; and, in 1684, two additional satellites were disclosed by a Campani telescope of 100 ft. Cassini, moreover, set up an altazimuth in 1678, and employed from about 1682 a "parallactic machine," provided with clockwork to enable it to follow the diurnal motion. Both inventions have been ascribed to Olaus Römer, who used but did not claim them, and must have become familiar with their principles during the nine years (1672-1681) spent by him at the

The Paris observatory.

G.D. Cassini

Römer. Paris observatory. Römer, on the other hand, deserves full credit for originating the transit-circle and the prime vertical instrument; and he earned undying fame by his discovery of the finite velocity of light, made at Paris in 1675 by comparing his observations of the eclipses of Jupiter's satellites at the conjunctions and oppositions of the planet.

Flamsteed. The organization of the Greenwich observatory differed widely from that adopted at Paris. There a fundamental scheme of practical amelioration was initiated by John Flamsteed, the first astronomer royal, and has never since been lost sight of. Its purpose is the attainment of so complete a power of prediction that the places of the sun, moon and planets may be assigned without noticeable error for an indefinite future time. Sidereal inquiries, as such, made no part of the original programme in which the stars figured merely as points of reference. But these points are not stationary. They have an apparent precessional movement, the exact amount of which can be arrived at only by prolonged and toilsome enquiries. They have besides "proper motions," detected in 1718 by E. Halley in a few cases, and since found to prevail universally. Further, James Bradley discovered in 1728 the annual shifting of the stars due to the aberration of light (see Aberration), and in 1748, the complicating effects upon precession of the "nutation" of the earth's axis. Hence, the preparation of a catalogue recording the "mean" positions of a number of stars for a given epoch involves considerable preliminary labour; nor do those positions long continue to satisfy observation. They need, after a time, to be corrected, not only systematically for precession, but also empirically for proper motion. Before the stars can safely be employed as route-marks in the sky, their movements must accordingly be tabulated, and research into the method of such movements inevitably follows. We perceive then that the fundamental problems of sidereal science are closely linked up with the elementary and indispensable procedures of celestial measurement.

The history of the Greenwich observatory is one of strenuous efforts for refinement, stimulated by the growing stringency of theoretical necessities. Improved practice, again, reacted upon theory by bringing to notice residual errors, demanding the correction of formulae, or intimating neglected disturbances. Each increase of mechanical skill claims a corresponding gain in the subtlety of analysis; and vice versa. And this kind of interaction has gone on ever since Flamsteed reluctantly furnished the "places of the moon," which enabled Newton to lay the foundations of lunar theory.

Halley. Bradley. Edmund Halley, the second astronomer royal, devoted most of his official attention to the moon. But his plan of attack was not happily chosen; he carried it out with deficient instrumental means; and his administration (1720-1742) remained comparatively barren. That of his successor, though shorter, was vastly more productive. James Bradley chose the most appropriate tasks, and executed them supremely well, with the indispensable aid of John Bird (1700-1776), who constructed for him an 8-ft. quadrant of unsurpassed quality. Bradley's store of observations has accordingly proved invaluable. Those of 3222 stars, reduced by F.W. Bessel in 1818, and again with masterly insight by Dr A. Auwers in 1882, form the true basis of exact astronomy, and of our knowledge of proper motions. Those relating to the moon and planets, corrected by Sir George Airy, 1840-1846, form part of the standard materials for discussing theories of movement in the solar system. The fourth astronomer royal, Nathaniel Bliss, provided in two years a sequel of some value to Bradley's performance. Nevil Maskelyne, who succeeded him in 1764, set on foot, in 1767, the publication of the *Nautical Almanac*, and about the same time had an achromatic telescope fitted to the Greenwich mural quadrant. The invention, perfected by John Dollond in 1757, was long debarred from becoming effective by difficulties in the manufacture of glass, aggravated in England by a heavy excise duty levied until 1845. More immediately efficacious was the innovation made by John Pond (astronomer royal, 1811-1836) of substituting entire circles for quadrants. He further introduced, in 1821, the method of duplicate observations by direct vision and by reflection, and by these means obtained results of very high precision. During Sir George Airy's long term of office (1836-1881) exact astronomy and the traditional purposes of the royal observatory were promoted with increased vigour, while the scope of research was at the same time memorably widened. Magnetic, meteorological, and spectroscopic departments were added to the establishment; electricity was employed, through the medium of the chronograph, for the registration of transits; and photography was resorted to for the daily automatic record of the sun's condition.

Bliss. Maskelyne. Pond. Airy.

Wargentin. Lacaille. Meanwhile, advances were being made in various parts of the continent of Europe. Peter Wargentin (1717-1783), secretary to the Swedish Academy of Sciences, made a special study of the Jovian system. James Bradley had described to the Royal Society on the 2nd of July 1719 the curious cyclical relations of the three inner satellites; and their period of 437 days was independently discovered by Wargentin, who based upon it in 1746 a set of tables, superseded only by those of J.B.J. Delambre in 1792. Among the fruits of the strenuous career of Nicolas Louis de Lacaille were tables of the sun, in which terms depending upon planetary perturbations were, for the first time, introduced (1758); an extended acquaintance with the southern heavens; and a determination of the moon's parallax from observations made at opposite extremities of an arc of the meridian 85° in length. Tobias Mayer of Göttingen (1723-1762) originated the mode of adjusting transit-instruments still in vogue; drew up a catalogue of nearly a thousand zodiacal stars (published posthumously in 1775); and deduced the proper motions of eighty stars from a comparison of their places as given by Olaus Romer in 1706 with those obtained by himself in 1756. He executed besides a chart and forty drawings of the moon (published at Göttingen in 1881), and calculated lunar tables from a skilful development of Euler's theory, for which a reward of £3000 was in 1765 paid to his widow by the British government. They were published by the Board of Longitude, together with his solar tables, in 1770. The material interests of navigation were in these works primarily regarded; but the imaginative side of knowledge had also potent representatives during the latter half of the 18th century. In France, especially, the versatile activity of J.J. Lalande popularized the acquisitions of astronomy, and enforced its demands; and he had a German counterpart in J.E. Bode.

Tobias Mayer.

Lalande.

Distance of the sun. Between the time of Aristarchus and the opposition of Mars in 1672, no serious attempt was made to solve the problem of the sun's distance. In that year, however, Jean Richer at Cayenne and G.D. Cassini at Paris made combined observations of the planet, which yielded a parallax for the sun of 9.5″, corresponding to a mean radius for the terrestrial orbit of 87,000,000 m. This result, though widely inaccurate, came much nearer to the truth than any previously obtained; and it instructively illustrated the feasibility of concerted astronomical operations at distant parts of the earth. The way was thus prepared for availing to the full of the opportunities for a celestial survey offered by the transits of Venus in 1761 and 1769. They had been signalized by E. Halley in 1716; they were later insisted upon by Lalande; an enthusiasm for co-operation was evoked, and the globe, from Siberia to Otaheite, was studded with observing parties. The outcome, nevertheless, disappointed expectation. The instants of contact between the limbs of the sun and planet defied precise determination. Optical complications fatally impeded sharpness of vision, and the phenomena took place in a debateable borderland of uncertainty. J.F. Encke, it is true, derived from them in 1822-1824 what seemed an authentic parallax of 8.57″, implying a distance of 95,370,000 m.; but the confidence it inspired was finally overthrown in 1854 by P.A. Hansen's announcement of its incompatibility with lunar theory. An appeal then lay to the 19th century pair of transits in 1874 and 1882; but no peremptory decision ensued; observations were marred by the same optical evils as before. Their upshot, however, had lost its essential importance; for a fresh series of investigations based on a variety of principles had already been started. Leverrier, in 1858, calculated a value of 8.95″ for the solar parallax (equivalent to a distance of 91,000,000 m.) from the "parallactic inequality" of the moon; Professor Newcomb, using other forms of the gravitational method, derived in 1895 a parallax of 8.76″. Again, since the constant of aberration defines the ratio between the velocity of light and the earth's orbital speed, the span of the terrestrial circuit, in other words, the distance of the sun, is immediately deducible from known values of the first two quantities. The rate of light-transmission was accordingly made the subject of an elaborate set of experiments by Professor Newcomb in 1880-1882; and the result, taken in connexion with the aberration-constant as determined at Pulkowa, yielded a solar parallax of 8.79″, or a distance (in round numbers) of 93,000,000 m. But the direct or geometrical mode of attack has still the preference over any of the indirect plans. Sir David Gill derived a highly satisfactory value of 8.78″ for the long-sought constant from the opposition of Mars in 1877, and from combined heliometer observations at five observatories in 1888-1889 of the minor planets Iris, Victoria and Sappho, the apparently definitive value of 8.80″ (equivalent distance, 92,874,000 m.). But an unlooked-for fresh opportunity was afforded by the discovery in 1898 of the singularly circumstanced minor planet Eros, which occasionally approaches the earth more nearly than any other heavenly body except the moon. The opposition of November 1900, though only moderately favourable, could not be neglected; an international photographic campaign was organized at Paris with the aid of 58 observatories; and the voluminous collected data imply, so far as they have been discussed, a parallax for the sun a little greater than 8.8″. (See also Parallax.)

Reflecting telescopes. William Herschel. The first specimen of a reflecting telescope was constructed by Isaac Newton in 1668. It was of what is still called "Newtonian" design, and had a speculum 2 in. in diameter. Through the skill of John Hadley (1682-1743) and James Short of Edinburgh (1710-1768) the instrument unfolded, in the ensuing century, some of its capabilities, which the labours of William Herschel enormously enhanced. Between 1774 and 1789 he built scores of specula of continually augmented size, up to a diameter of 4 ft., the optical excellence of which approved itself by a crowd of discoveries. Uranus (*q.v.*) was recognized by its disk on the 13th of March 1781; two of its satellites, Oberon and Titania, disclosed themselves on the 11th of January 1787; while with the giant 48-in. mirror, used on the "front-view" plan, Mimas and Enceladus, the innermost Saturnian moons, were brought to view on the 28th of August and the 17th of September 1789. These were incidental trophies;

Herschel's main object was the exploration of the sidereal heavens. The task, though novel and formidable, was executed with almost incredible success. Charles Messier (1730-1817) had catalogued in 1781 103 nebulae; Herschel discovered 2500, laid down the lines of their classification, divined the laws of their distribution, and assigned their place in a scheme of development. The proof supplied by him in 1802 that coupled stars mutually circulate threw open a boundless field of research; and he originated experimental inquiries into the construction of the heavens by systematically collecting and sifting stellar statistics. He, moreover, definitively established, in 1783, the fact and general direction of the sun's movement in space, and thus introduced an element of order into the maze of stellar proper motions. Sir John Herschel continued in the northern, and extended to the southern hemisphere, his father's work. The third earl of Rosse mounted, at Parsonstown in 1845, a speculum 6 ft. in diameter, which afforded the first indications of the spiral structure shown in recent photographs to be the most prevalent characteristic of nebulae. Down to near the close of the 19th century, both the use and the improvement of reflectors were left mainly in British hands; but the gift of the "Crossley" instrument in 1895, to the Lick observatory, and its splendid subsequent performances in nebular photography, brought similar tools of research into extensive use among American astronomers; and they are now, for many of the various purposes of astrophysics, strongly preferred to refractors.

Sir John Herschel.

Lord Rosse.

Acquaintance with the asteroidal family began as the 19th century opened. On the 1st of January 1801 Giuseppe Piazzi (1746-1826) discovered Ceres, at Palermo, while engaged in collecting materials for his star-catalogues. A prolonged succession of similar events followed. But in the mode of detecting these swarming bodies, a typical change was made on the 22nd of December 1891, when Dr Max Wolf of Heidelberg photographically captured No. 323. Repetitions of the feat are now counted by the score.

Giuseppe Piazzi.

Max Wolf.

Practical astronomy was only secondarily concerned with the addition of Neptune, on the 23rd of September 1846, to the company of known planets; but William Lassell's discovery of its satellite, on the 10th of October following, was a consequence of the perfect figure and high polish of his 2-ft. speculum. With the same instrument, he further detected, on the 19th of September 1848, Hyperion, the seventh of Saturn's attendants, and, on the 24th of October 1851, Ariel and Umbriel, the interior moons of Uranus. Simultaneously with Lassell, on the opposite shore of the Atlantic, W.C. Bond identified Hyperion; and he perceived, on the 15th of November 1850, Saturn's dusky ring, independently observed, a fortnight later, by W.R. Dawes, at Wateringbury in Kent. With the Washington 26-in. refractor, on the 11th of August 1877, Professor Asaph Hall descried the moons of Mars, Deimos and Phobos; and a minute light-speck, noticed by Professor E.E. Barnard in the close neighbourhood of Jupiter on the 9th of September 1892, proved representative of a small inner satellite, invisible with less perfect and powerful instruments than the Lick 36-in. achromatic. The Jovian system has been reinforced by three remote and extremely faint members, two photographed by Professor C.D. Perrine with the Crossley reflector in 1904-1905, and the third at Greenwich in 1908; and a pair of Saturnian moons, designated Phoebe and Themis, were tracked out by Professor W.H. Pickering, in 1898 and 1905 respectively, amid the thicket of stars imprinted on negatives taken at Arequipa with the Bruce 24-in. doublet lens. This raises to 26 the number of discovered satellites in the solar system.

Lassell.

Bond.

Hall.

Barnard.

Perrine.

W.H. Pickering.

Cometary science has ramified in unexpected ways during the last hundred years. The establishment of a class of "short-period" comets by the computations of J.F. Encke in 1819, and of Wilhelm von Biela in 1826, led to the theory of their "capture" by the great planets, for which a solid mathematical basis was provided by H. Newton, F. Tisserand and O. Callandreau. An argument for the aboriginal connexion of comets with the solar system, founded by R.C. Carrington in 1860 upon their participation in its translatory movement, was more fully developed by L. Fabry in 1893; and the close orbital relationships of cometary groups, accentuated by the pursuit of each other along nearly the same track by the comets of 1843, 1880 and 1882, singularly illustrated the probable vicissitudes of their careers. The most remarkable event, however, in the recent history of cometary astronomy was its assimilation to that of meteors, which took unquestionable cosmical rank as a consequence of the Leonid tempest of November 1833. The affinity of the two classes of objects became known in 1866 through G.V. Schiaparelli's announcement that the orbit of the bright comet of 1862 agreed strictly with the elliptic ring formed by the circulating Perseid meteors; and three other cases of close coincidence were soon afterwards brought to light. Tebbutt's comet in 1881 was the first to be satisfactorily photographed. The study of such objects is now carried on mainly through the agency of the sensitive plate. The photographic registration of meteor-trails, too, has been lately attempted with partial success. The full realization of the method will doubtless provide adequate data for the detailed investigation of meteoric paths.

Comets.

Meteors.

The progress of science during the 19th century had no more distinctive feature than the rapid growth of sidereal astronomy (see Star). Its scope, wide as the universe, can be compassed no otherwise than by statistical means, and the collection of materials for this purpose involves most arduous preliminary labour. The multitudinous enrolment of stars was the first requisite. Only one "catalogue of precision"—Nevil Maskelyne's of 36 fundamental stars—was available in 1800. J.J. Lalande, however, published in 1801, in his *Histoire céleste*, the approximate places of 47,390 from a re-observation of which the great Paris catalogue (1887-1892) has been compiled. A valuable catalogue of about 7600 stars was issued by Giuseppe Piazzi in 1814; Stephen Groombridge determined 4239 at Blackheath in 1806-1816; while through the joint and successive work of F.W. Bessel and W.A. Argelander, exact acquaintance was made with 90,000, a more general acquaintance with the 324,000 stars recorded in the *Bonn Durchmusterung* (1859-1862). The southern hemisphere was subsequently reviewed on a similar duplicate plan by E. Schönfeld (1828-1891) at Bonn, by B.A. Gould and J.M. Thome at Córdoba. Moreover, the imposing catalogue set on foot in 1865 at thirteen observatories by the German astronomical society has recently been completed; and adjuncts to it have, from time to time, been provided in the publications of the royal observatories at Greenwich and the Cape of Good Hope, and of national, imperial and private establishments in the United States and on the continent of Europe. But in the execution of these protracted undertakings, the human eye has been, to a large and increasing extent, superseded by the camera. Photographic star-charting was begun by Sir David Gill in 1885, and the third and concluding volume of the *Cape Photographic Durchmusterung* appeared in 1900. It gives the co-ordinates of above 450,000 stars, measured by Professor J.C. Kapteyn at Groningen on plates taken by C. Ray Woods at the Cape observatory. And this comprehensive work was merely preparatory to the International Catalogue and Chart, the production of which was initiated by the resolutions of the Paris Photographic Congress of 1887. Eighteen observatories scattered north and south of the equator divided the sky among them; and the outcome of their combined operations aimed at the production of a catalogue of at least 2,000,000 strictly determined stars, together with a colossal map in 22,000 sheets, showing stars to the fourteenth magnitude, in numbers difficult to estimate. (See Photography, Celestial.)

Sidereal astronomy.

Star catalogues.

The arrangement of the stars in space can be usefully discussed only in connexion with their apparent light-power, or "magnitude." Photometric catalogues, accordingly, form an indispensable part of stellar statistics; and their construction has been zealously prosecuted. The *Harvard Photometry* of 4260 lucid stars was issued by Professor E.C. Pickering in 1884, the *Uranometria Nova Oxoniensis*, giving the relative lustre of 2784 stars, by C. Pritchard in 1885. The instrument used at Harvard was a "meridian photometer," constructed on the principle of polarization; while the "method of extinctions," by means of a wedge of neutral-tinted glass, served for the Oxford determinations. At Potsdam, some 17,000 stars have been measured by C.H.G. Müller and P.F.F. Kempf with a polarizing photometer; but by far the most comprehensive work of the kind is the Harvard *Photometric Durchmusterung* (1901-1903), embracing all stars to 7.5 magnitude, and extended to the southern pole by measurements executed at Arequipa. The embarrassing subject of photographic photometry has also been attacked by Professor Pickering. The need is urgent of fixing a scale, and defining standards of actinic brightness; but it has not yet been successfully met.

Photometric catalogues.

The investigation of double stars was carried on from 1819 to 1850 with singular persistence and ability at Dorpat and Pulkowa by F.G.W. Struve, and by his son and successor, O.W. Struve. The high excellence of the data collected by them was a combined result of their skill, and of the vast improvement in refracting telescopes due to the genius of Joseph Fraunhofer (1787-1826). Among the inheritors of his renown were Alvan Clark and Alvan G. Clark of Cambridgeport, Massachusetts; and the superb definition of their great achromatics rendered practicable the division of what might have been deemed impossibly close star-pairs. These facilities were remarkably illustrated by Professor S.W. Burnham's record of discovery, which roused fresh enthusiasm for this line of inquiry by compelling recognition of the extraordinary profusion throughout the heavens of compound objects. Discoveries with the spectroscope have ratified and extended this conclusion.

Double stars.

Only spurious star-parallaxes had claimed the attention of astronomers until F.W. Bessel announced, in December 1838, the perspective yearly shifting of 61 Cygni in an ellipse with a mean radius of about one-third of a second. Thomas Henderson (1798-1844) had indeed measured the larger displacements of α Centauri at the Cape in 1832-1833, but delayed until 1839 to publish his result. Out of several hundred stars since then examined, seventy or eighty have yielded fairly accurate, though very small parallaxes. But this amount of knowledge, however valuable in itself, is utterly inadequate to the needs of sidereal research; and various attempts have accordingly been made, chiefly by Professors J.C. Kapteyn and

Stellar parallax.

Simon Newcomb, to estimate, through the analysis of their proper motions, the "mean parallax" of stars assorted by magnitude. And the data thus arrived at are reassuringly self-consistent. A wide photographic survey, by which parallaxes might be secured wholesale, has further been recommended by Kapteyn; but is unlikely to be undertaken in the immediate future.

Proper motions.

The exhaustive ascertainment of stellar parallaxes, combined with the visible facts of stellar distribution, would enable us to build a perfect plan of the universe in three dimensions. Its perfection would, nevertheless, be undermined by the mobility of all its constituent parts. Their configuration at a given instant supplies no information as to their configuration hereafter unless the mode and laws of their movements have been determined. Hence, one of the leading inducements to the 817 construction of exact and comprehensive catalogues has been to elicit, by comparisons of those for widely separated epochs, the proper motions of the stars enumerated in them. Little was known on the subject at the beginning of the 19th century. William Herschel founded his determination in 1783 of the sun's route in space upon the movements of thirteen stars; and he took into account those of only six in his second solution of the problem in 1805. But in 1837 Argelander employed 390 proper motions as materials for the treatment of the same subject; and L. Struve had at his disposal, in 1887, no less than 2800. From the re-observation of Lalande's stars, after the lapse of not far from a century, J. Bossert was enabled to deduce 2675 proper motions, published at Paris in four successive memoirs, 1887-1902; and the sum-total of those ascertained probably now exceeds 6000. Yet this number, although it represents a portentous expenditure of labour, is insignificant compared with the multitude of the stellar throng; nor had any general tendency been discerned to regulate what seemed casual flittings until Professor Kapteyn, in 1904, adverted to the prevalence among all the brighter stars of opposite stream-flows towards two "vertices" situated in the Milky Way (see Star). The assured general fact as regards the direction of stellar movements was that they included a common parallactic element due to the sun's translation. And it is by the consideration of this partial accordance in motion that the advance through space of the solar system has been ascertained.

The apex of the sun's way was fixed by Professor Newcomb in 1898 at a point about 4° S. of the brilliant star Vega; but was shifted nearly 7° to the S.W. by J.C. Kapteyn's inquiry in 1901; so that the range of uncertainty as to its position continues unsatisfactorily wide. The speed with which our system progresses is, on the other hand, fairly well known. It cannot differ much from 12½ m. a second, the rate assigned to it by Professor W.W. Campbell in 1902. He employed in his discussion the radial velocities of 280 stars, spectroscopically determined; and the upshot signally exemplified the community of interests between the rising science of astrophysics and the ancient science of astrometry. Their characteristic purposes are, nevertheless, entirely different. The positions of the heavenly bodies in space, and the changes of those positions with time, constitute the primary subject of investigation by the elder school; while the new astronomy concerns itself chiefly with the individual peculiarities of suns and planets, with their chemistry, physical habitudes and modes of luminosity. Its distinctive method is spectrum analysis, the invention and development of which in the 19th century have fundamentally altered the purpose and prospects of celestial inquiries.

Astrophysics.

Spectrum analysis.

A beam of sunlight admitted into a darkened room through a narrow aperture, and there dispersed into a vario-tinted band by the interposition of a prism, is not absolutely continuous. Dr W.H. Wollaston made the experiment in 1802, and perceived the spaces of colour to be interrupted by seven obscure gaps, which took the shape of lines owing to his use of rectangular slit. He thus caught a preliminary glimpse of the "Fraunhofer lines," so called because Joseph Fraunhofer brought them into prominent notice by the diligence and insight of his labours upon them in 1814-1815. He mapped 324, chose out nine, which he designated by the letters of the alphabet, to be standards of measurement for the rest, and ascertained the coincidence in position between the double yellow ray derived from the flame of burning sodium and the pair of dark lines named by him "D" in the solar spectrum. There ensued forty-five years of groping for a law which should clear up the enigma of the solar reversals. Partial anticipations abounded. The vital heart of the matter was barely missed by W.A. Miller in 1845, by L. Foucault in 1849, by A.J. Ångström in 1853, by Balfour Stewart in 1858; while Sir George Stokes held the solution of the problem in the hollow of his hand from 1852 onward. But it was the synthetic genius of Gustav Kirchhoff which first gave unity to the scattered phenomena, and finally reconciled what was elicited in the laboratory with what was observed in the sun. On the 15th of December 1859 he communicated to the Berlin Academy of Sciences the principle which bears his name. Its purport is that glowing vapours similarly circumstanced absorb the identical radiations which they emit. That is to say, they stop out just those sections of white light transmitted through them which form their own special luminous badges. Moreover, if the white light come from a source at a higher temperature than theirs, the sections, or lines, absorbed by them show dark against a continuous background. And this is precisely the case with the sun. Kirchhoff's principle, accordingly, not only afforded a simple explanation of the Fraunhofer lines, but availed to found a far-reaching science of celestial chemistry. Thousands of the dark lines in the solar spectrum agree absolutely in wave-length with the bright rays artificially obtained from known substances, and appertaining to them individually. These substances must then exist near the sun. They are in fact suspended in a state of vapour between our eyes and the photosphere, the dazzling prismatic radiance of which they, to a minute extent, intercept, thus writing their signatures on the coloured scroll of dispersed sunshine. By persistent research, powerfully aided by the photographic camera and by the concave gratings invented by H.A. Rowland (1848-1901) in 1882, about forty terrestrial elements have been identified in the sun. Among them, iron, sodium, magnesium, calcium and hydrogen are conspicuous; but it would be rash to assert that any of the seventy forms of matter provisionally enumerated in text-books are wholly absent from his composition.

Wollaston. Fraunhofer.

Kirchhoff.

Chemistry of the sun.

Solar physics has profited enormously by the abolition of glare during total eclipses. That of the 8th of July 1842 was the first to be efficiently observed; and the luminous appendages to the sun disclosed by it were such as to excite startled attention. Their investigation has since been diligently prosecuted. The corona was photographed at Königsberg during the totality of the 28th of July 1851; similar records of the red prominences, successively obtained by Father Angelo Secchi and Warren de la Rue, as the shadow-track crossed Spain on the 18th of July 1860, finally demonstrated their solar status. The Indian eclipse of the 18th of August 1868 supplied knowledge of their spectrum, found to include the yellow ray of an exotic gas named by Sir Norman Lockyer "helium." It further suggested, to Lockyer and P. Janssen separately, the spectroscopic method of observing these objects in daylight. Under cover of an eclipse visible in North America on the 7th of August 1869, the bright green line of the corona was discerned; and Professor C.A. Young caught the "flash spectrum" of the reversing layer, at the moment of second contact, at Xerez de la Frontera in Spain, on the 22nd of December 1870. This significant but evanescent phenomenon, which represents the direct emissions of a low-lying solar envelope, was photographed by William Shackleton on the occasion of an eclipse in Novaya Zemlya on the 9th of August 1896; and it has since been abundantly registered by exposures made during the obscurations of 1898, 1900, 1901 and 1905. A singular and unlooked-for result of eclipse-work has been to include the corona within the scope of solar periodicity. Heinrich Schwabe established, in 1851, the cyclical variation, in eleven years, of spot-frequency; terrestrial magnetic disturbances manifestly obeyed the same law; and the peculiar winged aspect of the corona disclosed by the eclipse of the 29th of July 1878, at an epoch of minimum sun-spots, intimated to A.C. Ranyard a theory of coronal types, changing concurrently with the fluctuations of spot-activity. This was amply verified at subsequent eclipses.

Solar eclipses.

The photography of prominences was, after some preliminary trials by C.A. Young and others, fully realized in 1891 by Professor George E. Hale at Chicago, and independently by Henri Deslandres at Paris. The pictures were taken, in both cases, with only one quality of light; the violet ray of calcium, the remaining superfluous beams being eliminated by the agency of a double slit. The last-named expedient had been described by Janssen in 1867. Hale devised on the same principle the 818 "spectroheliograph," an instrument by which the sun's disk can be photographed in calcium-light by imparting a rapid movement to its image relatively to the sensitive plate; and the method has proved in many ways fruitful.

Prominence photography.

The likeness of the sun to the stars has been shown by the spectroscope to be profound and inherent. Yet the general agreement of solar and stellar chemistry does not exclude important diversities of detail. Fraunhofer was the pioneer in this branch. He observed, in 1823, dark lines in stellar spectra which Kirchhoff's discovery supplied the means of interpreting. The task, attempted by G.B. Donati in 1860, was effectively taken in hand, two years later, by Angelo Secchi, William Huggins and Lewis M. Rutherfurd. There ensued a general classification of the stars by Secchi into four leading types, distinguished by diversities of spectral pattern; and the recognition by Huggins of a considerable number of terrestrial elements as present in stellar atmospheres. Nebular chemistry was initiated by the same investigator when, on the 29th of August 1864, he observed the bright-line spectrum of a planetary nebula in Draco. About seventy analogous objects, including that in the Sword of Orion, were found by him to give light of the same quality; and thus after seventy-three years, verification was brought to William Herschel's hypothesis of a "shining fluid" diffused through space, the possible raw material of stars. In 1874, Dr H.C. Vogel published a modification of Secchi's scheme of stellar diversities, and gave it organic meaning by connecting spectral differences with advance in "age." And in 1895, he set apart, as in the earliest stage of growth, a new class of "helium stars," supposed to develop successively into Sirian, solar, Antarian, or alternatively into carbon stars.

Stellar spectroscopy.

On the 5th of August 1864, G.B. Donati analysed the light of a small comet into three bright bands. Sir William Huggins repeated the

Spectra of comets.

experiment on Winnecke's comet in 1868, obtained the same bands, and traced them to their origin from glowing carbon-vapour. A photograph of the spectrum of Tebbutt's comet, taken by him on the 24th of June 1881, showed radiations of shorter wave-lengths but identical source, and in addition, a percentage of reflected solar light marked as such by the presence of some well-known Fraunhofer lines. Further experience has generalized these earlier results. The rule that comets yield carbon-spectra has scarcely any exceptions. The usual bands were, however, temporarily effaced in the two brilliant apparitions of 1882 by vivid rays of sodium and iron, emitted during the excitement of perihelion-passage.

Progress in spectrography.

The adoption, by Sir William Huggins in 1876, of gelatine or dry plates in celestial photography was a change of decisive import. For it made long exposures possible; and only with long exposures could autographic impressions be secured of such faint objects as nebulae, telescopic comets, and the immense majority of stars, or of the dim ranges of stellar and nebular spectra. The first conspicuous triumph of the new "spectrographic" art thus established was the record by Huggins in 1879 of the dispersed light of several "white" or Sirian stars, in which the chief traits of absorption were the rhythmical series of hydrogen-lines, then memorably discovered. Again by Sir William Huggins, the spectrum of the Orion nebula was photographed on the 7th of March 1882; and the method has gradually become nearly exclusive in the study of nebular emanations. The "Draper Catalogue" of 10,351 stellar spectra was published by Professor E.C. Pickering in 1890. The materials for it were rapidly accumulated by the use of an objective prism, that is, of a prism placed in front of, instead of behind the object-lens, by which means the spectra of all the stars in the field, to the number often of many score, imprinted themselves simultaneously on the sensitive plate. The progress of this survey was marked by a number of important discoveries of "new" and variable stars and of spectroscopic binaries, mainly through the acumen of Mrs Williamina Paton Fleming of Harvard College in scrutinizing the negatives forming the data for the great catalogue.

Doppler's principle.

The principle that the refrangibility of light is altered by end-on motion was enunciated by Christian Doppler of Prague in 1842. The pitch of a steam-whistle quite obviously rises and falls as the engine to which it is attached approaches and recedes from a stationary auditor; and light-pulses are modified like sound-waves by velocity in the line of sight. They are crowded together and therefore rendered shorter and more frequent by the advance of their source, but drawn apart and lengthened by its recession. These effects vary with the rate of motion, which they consequently serve to measure; and they are produced indifferently by movements of the spectator or of the light-source. But Doppler's idea that they might be detected by colour-change was entirely illusory. It would apply only if the spectrum had no infra-red and ultraviolet extensions. These, however, since they share the general lengthening or shortening of wave-length through motion, are thereby shifted, to a certain definite extent, into visibility, and so produce accurate chromatic compensation. Integrated light, accordingly, tells nothing about velocity; but analysed light does, when it includes bright or dark rays the normal positions of which are known. The distinction was pointed out by Hippolyte Fizeau in 1848. By comparison with their analogues in the laboratory it can be determined whether, in which direction, and how much, lines of recognized origin are displaced in the spectra of the heavenly bodies. This subtle mode of research was made available by Sir William Huggins in 1868. He employed it, with an outcome of striking promise, to measure the radial speed of some of the brighter stars. In the following year, Sir Norman Lockyer was enabled to prove, by its means, the extraordinary vehemence of chromospheric disturbances, the bright prominence-rays in his spectroscope betraying, through their opposite shiftings, movements and counter-movements up to 120 m. a second; while its validity and refinement were, in 1871, vouched for by H.C. Vogel's observations on the 9th of June 1871, of differences due to the sun's rotation in the refrangibility of Fraunhofer lines derived respectively from the east and west limbs. Stellar line-of-sight work, however, made no satisfactory progress until, in 1888, Vogel changed the *venue* from the eye to the camera. A high degree of precision in measurement thus became attainable, and has since been fully attained. Not only the grosser facts concerning radial velocity, but variations in it so small as a mile, or less, per second, have been recorded and interpreted in terms of deep meaning. For the investigation of the general scheme of sidereal structure, the multiplication of results of the kind is indispensable. But as yet, the recessional or approaching movements of only a few hundred stars have been registered; and this store of information is scanty indeed compared with the needs of research. How the stars really move in space, and how the sun travels among them, can be ascertained only with the aid of materials collected by the spectrograph, which has now fortunately been brought to comply with the arduous conditions of exactitude requisite for collaboration with the transit instrument and its allies, the clock and chronograph. And here, to their great mutual advantage, the old and the new astronomies meet and join forces.

AUTHORITIES.—R. Grant, *History of Physical Astronomy* (1852); Sir G. Cornewall Lewis, *An Historical Survey of the Astronomy of the Ancients* (1862); J.B.J. Delambre, *Hist. de l'astr. ancienne*; *Hist. de l'astr. au moyen âge*; *Hist. de l'astr. moderne*; *Hist, de l'astr. au XVIII^e siècle*; J.S. Bailly, *Histoire de l'astronomie* (5 vols., 1775-1787); J.F. Weidler, *Historia Astronomiae* (1741); J.H. Mädler, *Geschichte der Himmelskunde* (1873); R. Wolf, *Geschichte der Astronomie* (1876); *Handbuch der Astronomie* (1890-1892); W. Whewell, *Hist. of the Inductive Sciences*; A.M. Clerke, *Hist. of Astronomy during the 19th Century* (4th ed., 1903); A. Berry, *Hist. of Astronomy* (1898); J.K. Schaubach, *Geschichte der griechischen Astronomie bis auf Eratosthenes* (1802); Th. H. Martin, "Mémoire sur l'histoire des hypotheses astronomiques," *Mémoires de l'Institut*, t. xxx. (Paris, 1881); P. Tannery, *Recherches sur l'histoire de l'astronomie ancienne* (1893); O. Gruppe, *Die kosmischen Systeme der Griechen* (1851); G.V. Schiaparelli, *I Precursori del Copernico* (1873); *Le Sfere Omocentriche di Eudosso* (1875); P. Jensen, *Kosmologie der Babylonier* (1890); F.X. Kugler, *Die babylonische Mondrechnung* (1900); J. Epping and J.N. Strassmeier, *Astronomisches aus Babylon* (1889); F.K. Ginzel, *Die astronomischen Kenntnisse der Babylonier* (1901); C.L. Ideler, *Historische Untersuchungen über die astronomischen Beobachtungen der Alten* (1806); *Handbuch der math. Chronologie* (2 vols., 1825-1826); *Untersuchungen über den Ursprung der Sternnamen* (1809); G. Costard, *History of Astronomy* (1767); J. Narrien, *An Historical Account of the Origin and Progress of Astronomy* (1833); J.L.E. Dreyer, *Hist. of the Planetary Systems* (1906); G.W. Hill, "Progress of Celestial Mechanics," *The Observatory*, vol. xix. (1896).

(A. M. C.)

1 *The Observatory*, Nos. 231-234, 1895.

2 *Observations of Comets*, translated from the Chinese *Annals* by John Williams, F.S.A. (1871).

3 J.L.E. Dreyer, *Proc. Roy. Irish Acad.* vol. iii. No. 7 (December 1881).

4 F.K. Ginzel, "Die astronomischen Kenntnisse der Babylonier," C.F. Lehmann, *Beiträge zur alten Geschichte*, Heft i. p. 6 (1901).

5 *Knowledge and Scientific News*, vol. i. pp. 2, 228.

6 *Astronomisches aus Babylon* (Freiburg im Breisgau, 1889).

7 Ginzel, loc. cit. Heft ii. p. 204.

8 *Die babylonische Mondrechnung*, p. 50 (1900).

9 S. Newcomb, *Astr. Nach.* No. 3682; P.H. Cowell, *Month. Notices Roy. Astr. Soc.* lxv. 867.

10 G.V. Schiaparelli, *I Precursori del Copernico*, pp. 23-28, Pubbl. del R. Osservatorio di Brera, No. iii. (1873).

11 G.V. Schiaparelli, *I Precursori del Copernico*, pp. 23-28, Pubbl. del R. Osservatorio di Brera, No. ix.

12 Marie. *Hist. des sciences*, t. i. p. 79; P. Tannery, *Hist. de l'astronomie ancienne*, ch. v. p. 115.

13 Published by H.C. Schjellerup in a French translation (St Petersburg, 1874).

14 Newcomb, *Researches on the Motion of the Moon*, Washington Observations for 1875, Appendix ii. p. 20.

15 F. Baily, *Memoirs Roy. Astr. Society*, vol. xiii. p. 19.

16 J.L.E. Dreyer, *Life of Tycho Brahe*, p. 321.

ASTROPALIA (classical *Astypalaea*), an island, with good harbours, in the south part of the Aegean, situated in 36.5° N. and immediately west of 26.5° E. It was colonized by Megara, and its constitution and buildings are known from numerous inscriptions. The Roman emperors recognized it as a free state, and in the middle ages it was called *Stampalia*, and belonged to the noble Venetian family of Quirini. It was taken by the Turks in the 16th century, and is now noted for its sponges. The customs and dress of the people, who speak a patois of romaic origin, are interesting.

ASTROPHYSICS, the branch of astronomical science which treats of the physical constitution of the heavenly bodies. So long as these bodies could be known to men only as points or disks of light in the sky, no such science was possible. Even later, when the telescope was the only instrument of research, knowledge on this subject was confined to the appearances presented by the planets, supplemented by more or less probable inferences as to the nature of their surfaces. When, in the third quarter of the 19th century, spectrum analysis was applied to the light coming to us from the heavenly bodies, a new era in astronomical science was opened up of such importance that the body of knowledge revealed by this method has sometimes been termed the "new astronomy." The development of the method has been greatly assisted by photography, while the application of photometric measurements has been a powerful auxiliary in the work. It has thus come about that astrophysics owes its recent development, and its recognition as a distinct branch of astronomical science, to the combination of the processes involved in the three arts of spectroscopy, photography and photometry. The most general conclusions reached by this combination may be summed up as follows:—

1. The heavenly bodies are composed of like matter with that which we find to make up our globe. The sun and stars are found to contain the more important elements with which chemistry has made us acquainted. Iron, calcium and hydrogen may be especially mentioned as three familiar chemical elements which enter largely into the constitution of all the matter of the heavens. It would be going too far to say that all the elements known to us exist in the sun or the stars; nor is the question whether the rarer ones can or cannot be found there of prime importance. The general fact of identity in the main constituents is the one of most fundamental importance. It would be going too far in the other direction to claim that all the elements which compose the heavenly bodies are found on the earth. There are many lines in the spectra of the stars, as well as of the nebulae, which are not certainly identified with those belonging to any elements known to our chemistry. The recent discoveries growing out of the investigation of newly discovered forms of radiation lead to the conclusion that the question of the forms of matter in the stars has far wider range than the simple question whether any given element is or is not found outside our earth. The question is rather that of the infinity of forms that matter may assume, including that most attenuated form found in the nebulae, which seem to be composed of matter more refined than even the atoms supposed to make up the matter around us.

2. The second conclusion is that, as a general rule, the incandescent heavenly bodies are not masses of solid or liquid matter as formerly assumed, but mainly masses either of gas, or of substances gaseous in their nature, so compressed by the gravitation of their superincumbent parts toward a common centre that their properties combine those of the three forms of matter known to us. We have strong reason to believe that even the sun, though much denser than the general average of the stars, may possibly be characterized as gaseous rather than solid. Probabilities also seem to favour the view that this may, to a certain extent, be true of the four great planets of our system. The case of bodies like our earth and Mars, which are solid either superficially or throughout, is probably confined to the smaller bodies of the universe.

3. A third characteristic which seems to belong to the great bodies of the universe is the very high temperature of their interior. With a modification to be mentioned presently, we may regard them as intensely hot bodies, probably at a temperature higher than any we can produce by artificial means, of which the superficial portions have cooled off by radiation into space. A modification in this proposition which may hereafter be accepted involves an extension of our ideas of temperature, and leads us to regard the interior heat of the heavenly bodies as due to a form of molecular activity similar to that of which radium affords so remarkable an instance. This modification certainly avoids many difficulties connected with the question of the interior heat of the earth, sun, Jupiter and probably all the larger heavenly bodies.

A limit is placed on our knowledge of astrophysics which, up to the present time, we have found no means of overstepping. This is imposed upon us by the fact that it is only when matter is in a gaseous form that the spectroscope can give us certain knowledge as to its physical condition. So long as bodies are in the solid state the light which they emit, though different in different substances, has no characteristic so precisely marked that detailed conclusions can be drawn as to the nature of the substance emitting it. Even in a liquid form, the spectrum of any kind of matter is less characteristic than that of gas. Moreover, a gaseous body of uniform temperature, and so dense as to be non-transparent, does not radiate the characteristic spectrum of the gas of which it is composed. Precise conclusions are possible only when a gaseous body is transparent through and through, so that the gas emits its characteristic rays—or when the rays from an incandescent body of any kind pass through a gaseous envelope at a temperature lower than that of the body itself. In this case the revelations of the spectroscope relate only to the constitution of the gaseous envelope, and not to the body below the envelope, from which the light emanates. The outcome of this drawback is that our knowledge of the chemical constitution of the stars and planets is still confined to their atmospheres, and that conclusions as to the constitution of the interior masses which form them must be drawn by other methods than the spectroscopic one.

When the spectroscope was first applied in astronomy, it was hoped that the light reflected from living matter might be found to possess some property different from that found in light reflected from non-living matter, and that we might thus detect the presence of life on the surface of a planet by a study of its spectrum; but no hope of this kind has so far been realized.

We have, in this brief view of the subject, referred mainly to the results of spectrum analysis. Growing out of, but beyond this method is the beginning of a great branch of research which may ultimately explain many heretofore enigmatical phenomena of nature. The discovery of radio-activity may, by explaining the interior heat of the great bodies of the universe, solve a difficulty which since the middle of the 19th century has been discussed by physicists and geologists—that of reconciling the long duration which geologists claim for the crust of the earth with the period during which physicists have deemed it possible that the sun should have radiated heat. Evidence is also accumulating to show that the sun and stars are radio-active bodies, and that emanations proceeding from the sun, and reaching the earth, have important relations to the phenomena of Terrestrial Magnetism and the Aurora.

The subject of Astrophysics does not admit of so definite a subdivision as that of Astrometry. The conclusions which researches relating to it have so far reached are treated in the articles Star; Sun; Comet; Nebula; Aurora Polaris, &c.

(S. N.)

ASTRUC, JEAN (1684-1766), French physician and Biblical critic, was born on the 19th of March 1684 at Sauve, in Languedoc. He graduated in medicine at Montpellier in 1703, and in 1710 he was appointed to the chair of anatomy at Toulouse, which he retained till 1717, when he became professor of medicine at Montpellier. Subsequently he was appointed successively superintendent of the mineral waters of Languedoc (1721), first physician to the king of Poland (1729), and regius professor of medicine at Paris (1731). He died on the 5th of May 1766 at Paris. Of his numerous works, that on which his fame principally rests is the treatise entitled *De Morbis Venereis libri sex*, 1736. In addition to other medical works he published anonymously *Conjectures sur les mémoires originaux dont il parait que Moyse s'est servi pour composer le livre de la Genèse*, (1753), in which he pointed out that two main sources can be traced in the book of Genesis; and two dissertations on the immateriality and immortality of the soul, 1755.

See Hauck, *Realencyk. f. prot. Theol.*, 1897, vol. ii. pp. 162-170.

ASTURA, formerly an island, now a peninsula, on the coast of Latium, Italy, 7 m. S.E. of Antium, at the S.E. extremity of the Bay of Antium. The name also belongs to the river which flowed into the sea immediately to the S.E., at the mouth of which there was, according to Strabo, an anchorage. The medieval castle of the Frangipani, in which Conradin of Swabia vainly sought refuge after the battle of Tagliacozza in 1268, is built upon the foundations of a very large villa, of *opus reticulatum* with later additions in brickwork, and with a small harbour attached to it on the south-east. Remains of buildings also exist behind the sand dunes, which possibly mark the line of the channel which separated the island from the mainland, and these may have belonged to the post-station on the Via Severiana. As far as can be seen at present, there are remains of only one villa on the island itself;[1] but along the coast a mile to the north-west a line of villas begins, which continues as far as Antium. To the south-east, on the other hand, remains are almost entirely absent, and this portion of the coast seems to have been as sparsely populated in Roman times as it is now. The island seems to have existed as such in the time of Pope Honorius III. Astura was the site of a favourite villa of Cicero, whither he retired on the death of his daughter Tullia in 453 B.C. It appears

to have been unhealthy even in Roman times; according to Suetonius, both Augustus and Tiberius contracted here the illnesses which proved fatal to them.

See T. Ashby, in *Mélanges de l'École Française de Rome* (1905), p. 207.

(T. As.)

1 Servius, in speaking of it as *oppidum*, must be referring to the post-station.

ASTURIAS, an ancient province and principality of northern Spain, bounded on the N. by the Bay of Biscay, E. by Old Castile, S. by Leon and W. by Galicia. Pop. (1900) 627,069; area, 4205 sq. m. By the division of Spain in 1833, the province took the name of Oviedo, though not to the exclusion, in ordinary usage, of the older designation. A full description of its modern condition is therefore given under the heading Oviedo; the present article being confined to an account of its physical features, its history, and the resultant character of its inhabitants. Asturias consists of a portion of the northern slope of the Cantabrian Mountains, and is covered in all directions with offshoots from the main chain, by which it is almost completely shut in on the south. The higher summits, which often reach a height of 7000-8000 ft., are usually covered with snow until July or August, and the whole region is one of the wildest and most picturesque parts of Spain. Until the first railway was opened, in the middle of the 19th century, few of the passes across the mountains were practicable for carriages, and most of them are difficult even for horses. A narrow strip of level moorland, covered with furze and rich in deposits of peat, coal and amber, stretches inland, from the edge of the sheer cliffs which line the coast, to the foot of the mountains. The province is watered by numerous streams and rivers, which have hollowed out deep valleys; but owing to the narrowness of the level tract, their courses are short, rapid and subject to floods. The most important is the Nalon or Pravia, which receives the waters of the Caudal, the Trubia and the Narcea, and has a course of 62 m.; after it rank the Navia and the Sella. The estuaries of these rivers are rarely navigable, and along the entire littoral, a distance of 130 m., the only important harbours are at Gijón and Avilés.

A country so rugged, and so isolated by land and sea, naturally served as the last refuge of the older races of Spain when hard pressed by successive invaders. Before the Roman conquest, the Iberian tribe of Astures had been able to maintain itself independent of the Carthaginians, and to extend its territory as far south as the Douro. It was famous for its wealth in horses and gold. About 25 B.C., the Romans subjugated the district south of the Cantabrians, to which they gave the name of Augustana. Their capital was Asturica Augusta, the modern Astorga, in Leon. The warlike mountaineers of the northern districts, known as Transmontana, never altogether abandoned their hostility to the Romans, whose rule was ended by the Visigothic conquest, late in the 5th century. In 713, two years after the defeat and death of Roderick, the last Visigothic king, all Spain, except Galicia and Asturias, fell into the hands of the Moors. One of the surviving Christian leaders, Pelayo the Goth, took refuge with three hundred followers in the celebrated cave of Covadonga, or Cobadonga, near Cangas de Onís, and from this hiding-place undertook the Christian reconquest of Spain. The Asturians chose him as their king in 718, and although Galicia was lost in 734, the Moors proved unable to penetrate into the remoter fastnesses held by the levies of Pelayo. After his death in 737, the Asturians continued to offer the same heroic resistance, and ultimately enabled the people of Galicia, Leon and Castile to recover their liberty. The title of prince of Asturias, conferred on the heir-apparent to the crown of Spain, dates from 1388, when it was first bestowed on a Castilian prince. The title of count of Covadonga is assumed by the kings of Spain. In modern times Asturias formed a captaincy-general, divided into Asturias d'Oviedo, which corresponds with the limits of the ancient principality, and Asturias de Santillana, which now constitutes the western half of Santander.

Owing to their almost entire immunity from any alien domination except that of the Romans and Goths, the Asturians may perhaps be regarded as the purest representatives of the Iberian race; while their dialect (*linguaje bable*) is sometimes held to be closely akin to the parent speech from which modern Castilian is derived. It is free from Moorish idioms, and, like Galician and Portuguese it often retains the original Latin *f* which Castilian changes into *h*. In physique, the Asturians are like the Galicians, a people of hardy mountaineers and fishermen, finely built, but rarely handsome, and with none of the grace of the Castilian or Andalusian. Unlike the Galicians, however, they are remarkable for their keen spirit of independence, which has been fostered by centuries of isolation. Despite the harsh land-laws and grinding taxation which prevent them, with all their industry and thrift, from securing the freehold of the patch of ground cultivated by each peasant family, the Asturians regard themselves as the aristocracy of Spain. This pride in their land, race and history they preserve even when, as often happens, they emigrate to other parts of the country or to South America, and earn their living as servants, water-carriers, or, in the case of the women, as nurses. They make admirable soldiers and sailors, but lack the enterprise and commercial aptitude of the Basques and Catalans; while they are differentiated from the inhabitants of central and southern Spain by their superior industry, and perhaps their lower standard of culture. It is, on the whole, true that by the exclusion of the Moors they lost their opportunity of playing any conspicuous part in the literary and artistic development of Spain. One class of the Asturians deserving special mention is that of the nomad cattle-drovers known as Baqueros or Vaqueros, who tend their herds on the mountains of Leitariegos in summer, and along the coast in winter; forming a separate caste, with distinctive customs, and rarely or never intermarrying with their neighbours.

For the modern condition of the principality (including climate, fauna and flora), see S. Canals, *Asturias: informancion sobre su presente estado* (Madrid, 1900); and G. Casal, *Memorias de historia natural y médica, de Asturias* (Oviedo, 1900). For the history and antiquities, there is much that is valuable in *Asturias monumental, epigráfica y diplomática*, &c., by C.M. Vigil (Madrid, 1887)—folio, with maps and illustrations. See also F. de Aramburu y Zuloaga, *Monografia de Asturias* (Oviedo, 1899). 821

ASTYAGES, the last king of the Median empire. In the inscriptions of Nabonidus the name is written Ishtuvegu (cylinder from Abu Habba V R 64, col. 1, 32; Annals, published by Pinches, *Tr. Soc. Bibl. Arch.* vii. col. 2, 2). According to Herodotus, he was the son of Cyaxares and reigned thirty-five years (584-550 B.C.); his wife was Aryenis, the daughter of Alyattes of Lydia (Herod, i. 74). About his reign we know little, as the narrative of Herodotus, which makes Cyrus the grandson of Astyages by his daughter Mandane, is merely a legend; the figure of Harpagus, who as general of the Median army betrays the king to Cyrus, alone seems to contain an historical element, as Harpagus and his family afterwards obtained a high position in the Persian empire. From the inscriptions of Nabonidus we learn that Cyrus, king of Anshan (Susiana), began war against him in 553 B.C.; in 550, when Astyages marched against Cyrus, his troops rebelled, and he was taken prisoner. Then Cyrus occupied and plundered Ecbatana. The captive king was treated fairly by Cyrus (Herod, i. 130), and according to Ctesias (*Pers.* 5, cf. Justin i. 6) made satrap of Hyrcania, where he was afterwards slain by Oebares against the will of Cyrus, who gave him a splendid funeral. Alexander Polyhistor and Abydenus in their excerpts from Berossus, which Eusebius (*Chron.* i. pp. 29 and 37) and Syncellus (p. 396) have preserved, give the name Astyages to the Median king who reigned in the time of the fall of Nineveh (606 B.C.), and became father-in-law of Nebuchadrezzar. This is evidently a mistake; the name ought to be Cyaxares (in the fragments of the Jewish history of Alexander Polyhistor, in Euseb. *Praep. Ev.* ix. 39, the name is converted into Astibaras, who, according to the unhistorical list of Ctesias, was the father of Astyages), and there is no reason to invent an earlier king Astyages I., as some modern authors have done. The Armenian historians render the name Astyages by Ashdahak, *i.e.* Azhi Dahaka (Zohak), the mythical king of the Iranian epics, who has nothing whatever to do with the historical king of the Medes.

(Ed. M.)

ASTYLAR (from Gr. ἀ-, privative, and στῦλος, a column), an architectural term given to a class of design in which neither columns nor pilasters are used for decorative purposes; thus the Ricardi and Strozzi palaces in Florence are astylar in their design, in contradistinction to Palladio's palaces at Vicenza, which are columnar.

ASUNCIÓN (Nuestra Senora de la Asunción), a city and port of Paraguay, and capital of the republic, on the left bank of the Paraguay river in 25° 16′ 04″ S., 57° 42′ 40″ W., and 970 m. above Buenos Aires. Pop. (est. in 1900) 52,000. The port is connected with Buenos Aires and Montevideo by regular lines of river steamers, which are its only means of trade communication with the outer world, and with the inland town of Villa Rica (95 m.) by a railway worked by an English company. The city faces upon a curve in the river bank forming what is called the Bay of Asunción, and is built on a low sandy plain, rising to pretty hillsides overlooking the bay and the low, wooded country of the Chaco on the opposite shore. The general elevation is only 253 ft. above sea-level. Asunción is laid out on a regular plan, the credit for which is largely due to Dictator Francia; the principal streets are paved and lighted by gas and electricity; and telephone and street-car services are maintained. The climate is hot but healthful, the mean annual temperature being about 72° F. The city is the seat of a bishopric dating from 1547, and contains a large number of religious edifices. It has a national college and public library, but no great progress in education has been made. The most prominent edifice in the city is the palace begun by the younger Lopez, which is now occupied by a bank. There are some business edifices and residences of considerable architectural merit, but the greater part are small and inconspicuous, a majority of the residences being thatched, mud-walled cabins. Considerable progress was made during the last two decades of the 19th century, however, notwithstanding misgovernment and the extreme poverty of the people. Asunción was founded by Ayolas in 1335, and is the oldest permanent Spanish settlement on the La Plata. It was for a long time the seat of Spanish rule in this region, and later the scene of a bitter struggle between the church authorities and Jesuits. Soon after the declaration of independence in 1811, the city fell under the despotic rule of Dr Francia, and then under that of the elder and younger Lopez, through which its development was greatly impeded. It was captured and plundered by the Brazilians in 1869, and has been the theatre of several revolutionary outbreaks since then, one of which (1905) resulted in a blockade of several months' duration.

(A. J. L.)

ASVINS, in Hindu mythology, twin deities of light. After Indra, Agni and Soma, they are the most prominent divinities in the Rig-Veda, and have more than fifty entire hymns addressed to them. Their exact attributes are obscure. They appear to be the spirits of dawn, the earliest bringers of light in the morning sky; they hasten on in the clouds before Dawn and prepare the way for her. In some hymns they are called sons of the sun; in others, children of the sky; in others, offspring of the ocean. They are youngest of the gods, bright lords of lustre, honey-hued. They are inseparable. The sole purpose of one hymn is to compare them with different twin objects, such as eyes, hands, feet and wings. They have a common wife, Surya. They are physicians, protectors of the weak and old, especially of elderly unmarried women. They are the friends of lovers, and bless marriages and make them fruitful.

See A.A. Macdonell, *Vedic Mythology* (Strassburg, 1897).

ASYLUM (from Gr. ἀ-, privative, and σύλη, right of seizure), a place of refuge. In ancient Greece, an asylum was an "inviolable" refuge for persons fleeing from pursuit and in search of protection. In a general sense, all Greek temples and altars were inviolable, that is, it was a religious crime to remove by force any person or thing once under the protection of a deity. But it was only in the case of a small number of temples that this protecting right of a deity was recognized with common consent. Such were the sanctuaries of Zeus Lycaeus in Arcadia, of Poseidon in the island of Calauria, and of Apollo at Delos, they were, however, numerous in Asia Minor. They guaranteed absolute security to the suppliant within their limits. The right of sanctuary, originally possessed by all temples, appears to have become limited to a few in consequence of abuses of it. Asylums in this sense were peculiar to the Greeks. The asylum of Romulus (Livy i. 8), which was probably the altar of Veiovis, cannot be considered as such. Under Roman dominion, the rights of existing Greek sanctuaries were at first confirmed, but their number was considerably reduced by Tiberius. Under the Empire, the statues of the emperors and the eagles of the legions were made refuges against acts of violence. Generally speaking, the classes of persons who claimed the rights of asylum were slaves who had been maltreated by their masters, soldiers defeated and pursued by the enemy, and criminals who feared a trial or who had escaped before sentence was passed. (See treatises *De Asylis Graecis*, by Förster, 1847; Jaenisch, 1868; Barth, 1888.)

With the establishment of Christianity, the custom of asylum or sanctuary (*q.v.*) became attached to the church or churchyard. In modern times the word asylum has come to mean an institution providing shelter or refuge for any class of afflicted or destitute persons, such as the blind, deaf and dumb, &c., but more particularly the insane. (See Insanity.)

ASYLUM, RIGHT OF (Fr. *droit d'asile*; Ger. *Asylrecht*), in international law, the right which a state possesses, by virtue of the principle that every independent state is sole master within its boundaries, of allowing fugitives from another country to enter or sojourn upon its territory. Extradition (*q.v.*) treaties are undertakings between states curtailing the exercise of the right of asylum in respect of refugees from justice, but the conditions therein laid down invariably show that nations regard the maintenance of this right of asylum as intimately connected with their right of independent action, however weak as states they may be, on their own soil. The neutral right to grant asylum to belligerent forces is now governed by articles 57, 58 and 59 of the regulations annexed to the Hague Convention of the 29th of July 1899, relating to the Laws and Customs of War on Land. (See War.)

(T. Ba.)

ATACAMA, a province of northern Chile, bounded N. and S. respectively by the provinces of Antofagasta and Coquimbo, and extending from the Pacific coast E. to the Argentine boundary line. It has an area of 30,729 sq. m., lying in great part within the Atacama desert region (see below), and a population (1902) of 71,446. The silver and copper mines of the province are numerous, some of them ranking among the most productive known, but the majority are worked with limited capital and on a small scale. The silver ore was first discovered in 1832 by a shepherd at a place which bears his name, Juan Godoi. The nitrate and borax deposits are extensive and productive, and common salt is a natural product of large areas in the elevated desert regions of the Andes. The exports include copper and silver and their ores, nitrate of soda, borax, guano and other minerals in small quantities. The capital, Copiapó (est. pop. 8991 in 1902), is situated on a small river of the same name 37 m. from the coast and 51 m. south-east by rail from Caldera, the principal port of this great mining district. Before 1842, when guano began to attract notice as an exportable product, Atacama was considered as Bolivian territory, and Coquimbo the extreme northern province of Chile. In that year Chile decided to explore the desert coast, and in 1843 that part of the desert extending north to the 26th parallel was organized into the province of Atacama.

ATACAMA, DESERT OF, an arid, barren and saline region of western South America, covering the greater part of the Chilean provinces of Atacama and Antofagasta, the Argentine territory of Los Andes, and the south-western corner of the Bolivian department of Potosí. The higher elevations are known as the Puna de Atacama, which is practically a continuation southward of the great *puna* region of Peru and Bolivia. It is a broken, mountainous region, volcanic in places, saline in others, and ranges from 7000 to 13,500 ft. in general elevation. Its culminating ridges are marked by an irregular line of peaks and extinct volcanoes extending north by east from about 28° S. into southern Bolivia. On the eastern side, occasional rainfalls occur and streams from the snow-clads peaks produce some slight displays of fertility, but the general aspect of the plateaus, which are dry and cold in winter and in summer are swept by rainstorms and covered by occasional tufts of coarse grass, is barren and forbidding. They are also broken by great saline lagoons and dry salt basins. This region forms the Argentine territory of Los Andes and is habitable in places. On the western slope the land descends gradually to the Pacific, being broken into great basins, or terraces, by mountainous ridges in its higher elevations, widening out into gently-sloping sandy plains below, famous for their nitrate deposits, and terminating on the coast with sharply-sloping bluffs, having an elevation of 800 to 1500 ft., and looking from the sea like a range of flat-topped hills. This desolate region, which is rainless and absolutely barren, and was considered worthless for three and a half centuries, is now a treasure-house of mineral wealth, abounding in copper, silver, lead, nickel, cobalt, iron, nitrates and borax. It is occupied by many mining settlements, and includes some of the most productive copper and silver mines of the world.

See L. Darapsky, "Zur Geographic der Puna de Atacama," *Zeits. Ges. Erdk. zu Berlin*, 1899; G.E. Church, "South America: an Outline of its Physical Geography," *Geographical Journal*, 1901; John Ball, *Notes of a Naturalist in South America* (London, 1887); F. O'Driscoll, "A Journey to the North of the Argentine Republic," *Geographical Journal*, 1904.

(A. J. L.)

ATACAMITE, a mineral found originally in the desert of Atacama, and named by D. de Gallizen in 1801. It is a cupric oxychloride, having the formula $CuCl_2 \cdot 3Cu(OH)_2$, and crystallizing in the orthorhombic system. Its hardness is about 3 and its specific gravity 3.7, while its colour presents various shades of green, usually dark. Atacamite is a comparatively rare mineral, formed in some cases by the action of sea-water on various copper-ores, and occurring also as a volcanic product on Vesuvian lavas. Some of the finest crystals have been yielded by the copper-mines of South Australia, especially at Wallaroo. It occurs also, with malachite, at Bembe, near Ambriz, in West Africa. From one of its localities in Chile, Los Remolinos, it was termed Remolinite by Brooke and Miller. Atacamite, in a pulverulent state, was formerly used as a pounce under the name of "Peruvian green sand," and was known in Chile as arsenillo.

(F. W. R.*)

ATAHUALLPA (*atahu*, Lat. *virtus*, and *allpa*, sweet), "the last of the Incas" (or Yncas) of Peru, was the son of the ruler Huayna Capac, by Pacha, the daughter of the conquered sovereign of Quito. His brother Huascar succeeded Huayna Capac in 1527; for, as Atahuallpa was not descended on both sides from the line of Incas, Peruvian law considered him illegitimate. He obtained, however, the kingdom of Quito. A jealous feeling soon sprang up between him and Huascar, who insisted that Quito should be held as a dependent province of his empire. A civil war broke out between the brothers, and, about the time when the Spanish conqueror Pizarro was beginning to move inland from the town of San Miguel, Huascar had been defeated and thrown into prison, and Atahuallpa had become Inca. Pizarro set out in September 1532, and made for Caxamarca, where the Inca was. Messengers passed frequently between them, and the Spaniards on their march were hospitably received by the inhabitants. On the 15th of November, Pizarro entered Caxamarca, and sent his brother and Ferdinando de Soto to request an interview with the Inca. On the evening of the next day, Atahuallpa entered the great square of Caxamarca, accompanied by some five or six thousand men, who were either unarmed or armed only with short clubs and slings concealed under their dresses. Pizarro's artillery and soldiers were planted in readiness in the streets opening off the square. The interview was carried on by the priest Vicente de Valverde, who addressed the Inca through an interpreter. He stated briefly and dogmatically the principal points of the Christian faith and the Roman Catholic policy, and concluded by calling upon Atahuallpa to become a Christian, obey the commands of the pope, give up the administration of his kingdom, and pay tribute to Charles V., to whom had been granted the conquest of these lands. To this extraordinary harangue, which from its own nature and the faults of the interpreter must have been completely unintelligible, the Inca at first returned a very temperate answer. He pointed out what seemed to him certain difficulties in the Christian religion, and declined to accept as monarch of his dominions this Charles, of whom he knew nothing. He then took a bible from the priest's hands, and, after looking at it, threw it violently from him, and began a more impassioned speech, in which he exposed the designs of the Spaniards, and upbraided them with the cruelties they had perpetrated. The priest retired, and Pizarro at once gave the signal for attack. The Spaniards rushed out suddenly, and the Peruvians, astonished and defenceless, were cut down in hundreds. Pizarro himself seized the Inca, and in endeavouring to preserve him alive, received, accidentally, on his hand the only wound inflicted that day on a Spaniard. Atahuallpa, thus treacherously captured, offered an enormous sum of money as a ransom, and fulfilled his engagement; but Pizarro still detained him, until the Spaniards should have arrived in sufficient numbers to secure the country. While in captivity, Atahuallpa gave secret orders for the assassination of his brother Huascar, and also endeavoured to raise an army to expel the invaders. His plans were betrayed, and Pizarro at once brought him to trial. He was condemned to death, and, as being an idolater, to death by fire. Atahuallpa, however, professed himself a Christian, received baptism, and his sentence was then altered into death by strangulation (August 29, 1533). His body was afterwards burned, and the ashes conveyed to Quito. (See also Peru: *History*.)

ATALANTA, in Greek legend, the name of two Greek heroines, (1) The Arcadian Atalanta was the daughter of Iasius or Iasion and Clymene. At her birth, she had been exposed on a hill, her father having expected a son. At first she was suckled by a she-bear, and then saved by huntsmen, among whom she grew up to be skilled with the bow, swift, and fond of the chase, like the virgin goddess Artemis. At the Calydonian boar-hunt her arrows were the first to hit the monster, for which its head and hide were given her by Meleager. At the funeral games of Pelias, she wrestled with Peleus, and won. For a long time she remained true to Artemis and rejected all suitors, but Meilanion at last gained her love by his persistent devotion. She was the mother of Parthenopaeus, one of the Seven against Thebes (Apollodorus iii. 9; Hyginus, *Fab.* 99). (2) The Boeotian Atalanta was the daughter of Schoeneus. She was famed for her running, and would only consent to marry a suitor who could outstrip her in a race, the consequence of failure being death. Hippomenes, before starting, had obtained from Aphrodite three golden apples, which he dropped at intervals, and Atalanta, stopping to pick them up, fell behind. Both were happy at the result; but forgetting to thank the goddess for the apples, they were led by her to a religious crime, and were transformed into lions by the goddess Cybele (Ovid, *Metam.* x. 560; Hyginus, *Fab.* 185). The characteristics of these two heroines (frequently confounded) point to their being secondary forms of the Arcadian Artemis.

ATARGATIS, a Syrian deity, known to the Greeks by a shortened form of the name, Derketo (Strabo xvi. c. 785; Pliny, *Nat. Hist.* v. 23. 81), and as Dea Syria, or in one word Deasura (Lucian, *de Dea Syria*). She is generally described as the "fish-goddess." The name is a compound of two divine names; the first part is a form of the Himyaritic *'Athlar*, the equivalent of the Old Testament *Ashtoreth*, the Phoenician *Astarte* (*q.v.*), with the feminine ending omitted (Assyr. *Ishtar*); the second is a Palmyrene name *'Athe* (*i.e. tempus opportunum*), which occurs as part of many compounds. As a consequence of the first half of the name, Atargatis has frequently, though wrongly, been identified with Astarte. The two deities were, no doubt, of common origin, but their cults are historically distinct. In 2

Macc. xii. 26 we find reference to an Atargateion or Atergateion (temple of Atargatis) at Carnion in Gilead (cf. 1 Macc. v. 43), but the home of the goddess was unquestionably not Palestine, but Syria proper, especially at Hierapolis (*q.v.*), where she had a great temple. From Syria her worship extended to Greece, Italy and the furthest west. Lucian and Apuleius give descriptions of the beggar-priests who went round the great cities with an image of the goddess on an ass and collected money. The wide extension of the cult is attributable largely to Syrian merchants; thus we find traces of it in the great seaport towns; at Delos especially numerous inscriptions have been found bearing witness to its importance. Again we find the cult in Sicily, introduced, no doubt, by slaves and mercenary troops, who carried it even to the farthest northern limits of the Roman empire. In many cases, however, Atargatis and Astarte are fused to such an extent as to be indistinguishable. This fusion is exemplified by the Carnion temple, which is probably identical with the famous temple of Astarte at Ashtaroth-Karnaim.

Atargatis appears generally as the wife of Hadad (Baal). They are the protecting deities of the community. Atargatis, in the capacity of πολιοῦχος, wears a mural crown, is the ancestor of the royal house, the founder of social and religious life, the goddess of generation and fertility (hence the prevalence of phallic emblems), and the inventor of useful appliances. Not unnaturally she is identified with the Greek Aphrodite. By the conjunction of these many functions, she becomes ultimately a great Nature-Goddess, analogous to Cybele and Rhea (see Great Mother of the Gods); in one aspect she typifies the function of water in producing life; in another, the universal mother-earth (Macrobius, *Saturn*, i. 23); in a third (influenced, no doubt, by Chaldaean astrology), the power of destiny. The legends are numerous and of an astrological character, intended to account for the Syrian dove-worship and abstinence from fish (see the story in Athenaeus viii. 37, where Atargatis is derived from ἄτερ Γάτιδος "without Gatis,"—a queen who is said to have forbidden the eating of fish). Thus Diodorus Siculus, using Ctesias, tells how she fell in love with a youth who was worshipping at the shrine of Aphrodite, and by him became the mother of Semiramis, the Assyrian queen, and how in shame she flung herself into a pool at Ascalon or Hierapolis and was changed into a fish (W. Robertson Smith in *Eng. Hist. Rev.* ii., 1887). In another story she was hatched from an egg found by some fish in the Euphrates and by them thrust on the bank where it was hatched by a dove; out of gratitude she persuaded Jupiter to transfer the fish to the Zodiac (cf. Ovid, *Fast.* ii. 459-474, *Metam.* v. 331).

See articles *s.v.* in Herzog-Hauck, *Realencyk.* (1897), by W. Baudissin; and Pauly-Wissowa, *Realencyc.*; Fr. Baethgen, *Beiträge zur Semit. Religiongesch.* (1888); R. Pietschmann, *Gesch. der Phönizier* (1889).

ATAULPHUS (the Latinized form of the Gothic Ataulf, "Father-wolf," from *atta*, father, and *vulfs*, wolf; mod. Germ. Adolf, Latinized as Adolphus, the form used by Gibbon for the subject of this article), king of the Goths (d. 415). On the death of Alaric (*q.v.*) his followers acclaimed his brother-in-law Ataulphus as king. In 412 he quitted Italy and led his army across the Alps into Gaul. Here he fought against some of the usurpers who threatened the throne of Honorius; he made some sort of compact with that emperor and, in 414, he married his sister Placidia, who had been since the siege of Rome a captive in the camp of the Goths. The ex-emperor Attalus danced at the marriage festival, which was celebrated with great pomp at Narbonne. In 415 Ataulphus crossed the Pyrenees into Spain and died at Barcelona, being assassinated by a groom. The most important fact in his history is his confession, recorded by Orosius, that he saw the inability of his countrymen to rear a civilized or abiding kingdom, and that consequently his aim should be to build on Roman foundations and blend the two nations into one.

ATAVISM (from Lat. *atavus*, a great-great-great-grandfather or ancestor), the term given in biology to the reproduction in a living person or animal of the characteristics of an ancestor more remote than its parents (see Heredity). Loosely used, it connotes a reversion to an earlier type. Individuals reproduce unexpectedly the traits of earlier ancestors, and ethnologists and criminologists frequently explain by "atavism" the occurrence of degenerate species of man; but the whole subject is complicated by other possible explanations of such phenomena, included in the scientific study of normal "variation."

ATBARA (*Bahr-el-Aswad*, or Black River), the most northern affluent of the river Nile, N.E. Africa. It rises in Abyssinia to the N.W. of Lake Tsana, unites its waters with a number of other rivers which also rise in the Abyssinian highlands, and flows north-west 800 m. till its junction at Ed Damer with the Nile (*q.v.*). The battle of the Atbara, fought near Nakheila, a place on the north bank of the river about 30 m. above Ed Damer, on the 8th of April 1898, between the khalifa's forces under Mahmud and Sir Herbert (afterwards Lord) Kitchener's Anglo-Egyptian army, resulted in the complete defeat of the Mahdists and the capture of their leader, and paved the way for the decisive battle of Omdurman on the 2nd of September following (see Egypt: *Military Operations*).

ATCHISON, a city and the county-seat of Atchison county, Kansas, U.S.A., on the west bank of the Missouri river, which is navigable at this point but is utilized comparatively little for commerce. Pop. (1890) 13,963; (1900) 15,722, of whom 2508 were of negro descent and 1308 were foreign-born; (1910) 16,429. Atchison is served by the Atchison, Topeka & Santa Fé, the Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific, and the Missouri Pacific railways. The city is the seat of Midland College (Lutheran, 1887), St Benedict's College (Roman Catholic, 1858) for boys, Mt. Scholastics Academy (Roman Catholic) for girls, and Western Theological Seminary (Evangelical-Lutheran, 1893); a state soldiers' orphans' home is also located here. Atchison's situation and transportation facilities make it an important supply-centre, its trade in grains and live-stock being particularly large; it has large railway machine shops, and its principal manufactures are flour, furniture, lumber, hardware and drugs. The value of the city's factory products increased from $2,093,469 in 1900 to $4,052,274 in 1905, or 93.6%. Atchison was founded in 1854 by pro-slavery partisans, and was named in honour of their leader, David Rice Atchison, a United States senator. The city was quickly surpassed by Leavenworth in commercial importance, and during the Kansas struggle was never of great political importance. Its first city charter was granted in 1858. The Atchison *Globe* (established 1878) is one of the best-known of western papers.

ATE, in Greek mythology, the personification of criminal folly, the daughter of Zeus and Eris (Strife). She misled even Zeus to take a hasty oath, whereby Heracles became subject to Eurystheus. Zeus thereupon cast her by the hair out of Olympus, whither she did not return, but remained on earth, working evil and mischief (*Iliad*, xix. 91). She is followed by the Litae (Prayers), the old and crippled daughters of Zeus, who are able to repair the evil done by her (*Iliad*, ix. 502). In later times Ate is regarded as the avenger of sin (Sophocles, *Antigone*, 614, 625).

See J. Girard, *Le Sentiment religieux en Grèce* (1869); J.F. Scherer, *De Graecorum Ates Notione atque Indole* (1858); E. Berch, *Bedeutung der Ate bei Aeschylos* (1876); C. Lehrs, *Populare Aufsatze aus dem Alterthum* (1875); L. Schmidt, *Die Ethik der alten Griechen* (1882).

ATELLA, an ancient Oscan town of Campania, 9 m. N. of Naples and 9 m. S. of Capua, on the road between the two. It was a member of the Campanian confederation, and shared the fortunes of Capua, but remained faithful to Hannibal for a longer time; the great part of the inhabitants, when they could no longer resist the Romans, were transferred by him to Thurii, and the town was reoccupied in 211 by the Romans, who settled the exiled inhabitants of Nuceria there. The fate of Atella at the end of the war, when the latter were able to return to their own city, is unknown. Cicero was in friendly relations with it, and exerted influence that it might retain its property in Gaul, so that it is obvious that it had then recovered municipal rights. The town is mainly famous as the cradle of early Roman comedy, the *Fabulae Atellanae* (see below). Some remains of the town still exist, including a tower of the city wall in brick.

See J. Beloch, *Campanien* (2nd ed., Breslau, 1890), p. 379.

ATELLANAE FABULAE ("Atellan fables"), the name of a sort of popular comedy amongst the ancient Romans. The name is derived from Atella, an Oscan town in Campania; for this reason, and from their being also called *Osci Ludi*, it has been supposed that they were of Oscan origin and introduced at Rome after Campania had been deprived of its independence. It seems highly improbable that they were performed in the Oscan language. Mommsen, however, rejects their Oscan origin altogether; he regards them as purely Latin, the scene merely being laid at Atella to avoid causing offence by placing it at Rome or one of the Latin cities. These plays, or rather sketches, contained humorous descriptions of country as contrasted with town life, and found their subjects amongst the lower classes of the people. The subjects alone were decided upon before the performance began; the dialogue was improvised as it proceeded. The Atellanae contained certain stock characters, like the Italian harlequinades: Maccus (the fool), Bucco (fat-chaps), Pappus (daddy), Dossennus (sharper); monsters and bogeys like Manducus, Pytho, Lamia also made their appearance. The performers were the sons of Roman citizens, who did not lose their rights as citizens, and were allowed to serve in the army: professional actors were excluded. The simple prose dialogues were probably varied by songs in the rude Saturnian metre: the language was that of the common people, accompanied by lively gesticulation and movements. They were characterized by coarseness and obscenity. In the time of Sulla a literary form was given to the Atellanae by Pomponius of Bononia and Novius, who made them regular written comedies. Living persons seem to have been attacked, and even the doings of the gods and heroes of mythology burlesqued. From this time the Atellanae were used as after-pieces and performed by professional actors. In 46 B.C. they were ousted by the mimes, but regained popularity during the reign of Tiberius (chiefly owing to a certain Mummius), until they were definitely superseded by and merged in the mimes. They held their ground in the small towns and villages of Italy during the last days of the empire; they probably lingered on into the middle ages, and were the origin of the Italian *Commedie dell' arte.*

The scanty fragments of Pomponius and Novius are collected in Ribbeck's *Comicorum Romanorum Reliquiae*; see also Munk, *De Fabulis Atellanis* (1840); and art. Latin Literature.

ATESTE (mod. *Este, q.v.*), an ancient town of Venetia, at the southern foot of the Euganean hills, 43 ft. above sea-level; 22 m. S.W. of Patavium (Padua). The site was occupied in very early times, as the discoveries since 1882 show. Large cemeteries have been excavated, which show three different periods from the 8th century B.C. down to the Roman domination. In the first period (Italic) cremation burials closely approximating to the Villanova type are found; in the second[1] (Venetian) the tombs are constructed of blocks of stone, and *situlae* (bronze buckets), sometimes decorated with elaborate designs, are frequently used to contain the cinerary urns; in the third (Gallic), which begins during the 4th century B.C., though cremation continues, the tombs are much poorer, the ossuaries being of badly baked rough clay, and show traces of Gallic influence, and characteristics of the La-Tène civilization. The many important objects found in these excavations are preserved in the local museum. See G. Ghirardini in *Notizie degli Scavi; Monumenti dei Lincei*, ii. (1893) 161 seq., vii. (1897) 5 seq., x. (1901) 5 seq.; *Atti del Congresso Internazionale di Scienze Storiche* (Rome, 1904), v. 279 seq. Inscriptions show that the national language asserted its existence even after Ateste came into the hands of the Romans. When this occurred is not known; boundary stones of 135 B.C. exist, which divide the territory of Ateste from that of Patavium and of Vicetia, showing that the former extended from the middle of the Euganean hills to the Atesis (mod. *Adige*, from which Ateste no doubt took its name, and on which it once stood). After the battle of Actium, Augustus settled veterans from various of his legions in this territory, Ateste being thenceforth spoken of as a colony. It appears to have furnished many recruits, especially for the *cohortes urbanae*. It appears but little in history, though its importance is vouched for by numerous inscriptions, the majority of which belong to the early Empire.

(T. As.)

1 This is by some authorities divided into two.

ATH, or Aath, an ancient town of the province of Hainaut, Belgium, situated on the left bank of the Dender. Pop. (1890) 9868; (1904) 11,201. Formerly it was fortified, but after the change in the defensive system of Belgium in 1858 the fortress was dismantled and its ramparts superseded by boulevards. Owing to a fire caused by lightning its fine church of St Julien, dating from the 14th century, which had escaped serious injury during many wars, was destroyed in 1817 (since rebuilt). This left the Tour Burbant as its sole relic of the middle ages. This tower formed part of the *donjon* of the fortress erected by Baldwin IV., count of Hainaut, about the year 1150. Near Ath is the fine castle of Beloeil, the ancient seat of the princely family of Ligne. Ath is famous for its gild of archers, whose butts are erected on the plain of the Esplanade in the centre of the town. The town militia has the privilege of being armed with bows and crossbows. Ath is also well known in Hainaut for its annual fête called *le jour de ducasse—ducasse* being the Walloon word for kermesse (fête). On this occasion a procession escorting figures of two giants, Goliath, called locally Goyasse, and Samson, forms the chief feature of the celebration. The emperor Joseph II. stopped it for its "idolatrous" character, but this act was one of the causes of the Brabant revolution of 1789. The procession, revived in 1790, was again stopped by the French republicans five years later, but was revived under the Empire, and has flourished ever since.

ATHABASCA (*Athiapescow*), or Elk, a river and lake Of the province of Alberta, Canada. The river rises in the Rocky Mountains near the Yellowhead Pass in 52° 10′ N. and 117° 10′ W., and flows north-east as far as Athabasca Landing, and thence north into Lake Athabasca. It is 740 m. long and has a number of important tributaries, including the McLeod, Pembina, Lesser Slave, which drains the lake of that name, and Clearwater. Athabasca lake is 195 m. long, west to east, from 20 to 32 m. wide has an area of 3085 sq. m., and is 690 ft. above the sea. It discharges its waters northward by Slave river and the Mackenzie system to the Arctic Ocean. On its north shore the country is high and rocky; on the south, sandy and barren. Shallow draught steamers navigate the lake and river, and Lesser Slave lake and river, with one interruption—at Grand Rapids near the mouth of the Clearwater river.

ATHALARIC (516-534), king of the Ostrogoths, grandson of Theodoric, became king of the Ostrogoths in Italy on his grandfather's death (526). As he was only ten years old, the regency was assumed by his mother Amalasuntha (*q.v.*). The murmurs of the Gothic nobles procured for their young sovereign too early emancipation from the schoolroom. He drank heavily, and indulged in vicious excesses which ruined his constitution. He died on the 2nd of October 534.

ATHALIAH, in the Bible, the daughter of Ahab, and wife of Jehoram, king of Judah. After the death of Ahaziah, her son she usurped the throne and reigned for six years. She is said to have massacred all the members of the royal house of Judah (2 Kings xi. 1-3), but a similar atrocity is also ascribed to Jehu (2 Kings x. 12-14); with both notices contrast 2 Chron. xxi. 17. The sole survivor Joash was concealed in the temple by his aunt, Jehosheba, wife of the priest Jehoida (2 Chron. xxii. 11) These organized a revolution in favour of Joash, and caused Athaliah and her adherents to be put to death (2 Kings xi.; 2 Chron. xxii. 10-12, xxiii., xxiv. 7).

The story of Athaliah forms the subject of one of Racine's best tragedies. It has been musically treated by Handel and Mendelssohn.

ATHAMAS, in Greek mythology, king of the Minyae in Boeotian Orchomenus, son of Aeolus, king of Thessaly, or of Minyas. His first wife was Nephele, the cloud-goddess, by whom he had two children, Phrixus and Helle (see Argonauts). Athamas and his second wife Ino were said to have incurred the wrath of Hera, because Ino had brought up Dionysus, the son of her sister Semele, as a girl, to save his life. Athamas went mad, and slew one of his sons, Learchus; Ino, to escape the pursuit of her frenzied husband, threw herself into the sea with her other son Melicertes. Both were afterwards worshipped as marine divinities, Ino as Leucothea, Melicertes as Palaemon (*Odyssey* v. 333). Athamas, with the guilt of his son's murder upon him, was obliged to flee from Boeotia. He was ordered by the oracle to settle in a place where he should receive hospitality from wild beasts. This he found at Phthiotis in Thessaly, where he surprised some wolves eating sheep; on his approach they fled, leaving him the bones. Athamas, regarding this as the fulfilment of the oracle, settled there and married a third wife, Themisto. The spot was afterwards called the Athamanian plain (Apollodorus i. 9; Hyginus, *Fab.* 1-5; Ovid, *Metam.* iv. 416, *Fasti*, vi. 485; Valerius Flaccus i. 277).

According to a local legend, Athamas was king of Halos in Phthiotis from the first (Schol. on Apoll. Rhodius ii. 513). After his attempt on the life of Phrixus, which was supposed to have succeeded, the Phthiots were ordered to sacrifice him to Zeus Laphystius, in order to appease the anger of the gods. As he was on the point of being put to death, Cytissorus, a son of Phrixus, suddenly arrived from Aea with the news that Phrixus was still alive. Athamas's life was thus saved, but the wrath of the gods was unappeased, and pursued the family. It was ordained that the eldest born of the race should not enter the council-chamber; if he did so, he was liable to be seized and sacrificed if detected (Herodotus vii. 197). The legend of Athamas is probably founded on a very old custom amongst the Minyae—the sacrifice of the first-born of the race of Athamas to Zeus Laphystius. The story formed the subject of lost tragedies by Aeschylus, Sophocles, Euripides and other Greek and Latin dramatists.

ATHANAGILD (d. 547) became king of the Visigoths (in Spain) in 534, having invoked the aid of the emperor Justinian for his revolt against his predecessor Agila. Athanagild, when himself king, vainly tried to oust his late allies from the footing which they had gained in Spain, nor were the Greeks finally expelled from Spain till seventy years later. Athanagild himself is chiefly remembered for the tragic fortunes of his daughters Brunechildis and Gavleswintha, who married two Frankish brother kings, Sigebert and Chilperic. Athanagild died ("peacefully," as the annalist remarks) in 547.

ATHANARIC (d. 381), a ruler of the Visigoths from about 366 to 380. He bore the title not of king but of judge, a title which may be compared with that of ealdorman among the Anglo-Saxon invaders of Britain. Athanaric waged, from 367 to 369, an unsuccessful war with the emperor Valens, and the peace by which the war was ended was ratified by the Roman and Gothic rulers meeting on a barge in mid-stream of the Danube. Athanaric was a harsh and obstinate heathen, and his short reign was chiefly famous for his brutal persecution of his Christian fellow-countrymen. In 376 he was utterly defeated by the Huns, who a few years before had burst into Europe. The bulk of the Visigothic people sought refuge within the Empire in the region now known as Bulgaria, but Athanaric seems to have fled into Transylvania. Being attacked there by two Ostrogothic chiefs he also, in 381, sought the protection of the Roman emperor. Theodosius I. received him courteously, and he was profoundly impressed by the glories of Constantinople, but on the fifteenth day after his arrival he died, and was honoured by the emperor with a magnificent funeral.

ATHANASIUS (293-373), bishop of Alexandria and saint, one of the most illustrious defenders of the Christian faith, was born probably at Alexandria. Of his family and of his early education nothing can be said to be known. According to the legend, the boy is said to have once baptized some of his playmates and thereupon to have been taken into his house by Bishop Alexander, who recognized the validity of this proceeding. It is certain that Athanasius was young when he took orders, and that he must soon have entered into close relations with his bishop, whom, after the outbreak of the Arian controversy, he accompanied as archdeacon to the council of Nicaea. In the sessions and discussions of the council he could take no part; but in unofficial conferences he took sides vigorously, according to his own evidence, against the Arians, and was certainly not without influence. He had already, before the opening of the Council, defined his personal attitude towards the dogmatic problem in two essays, *Against the Gentiles* and *On the Incarnation*, without, however, any special relation to the Arian controversy.

The essay *On the Incarnation* is the *locus classicus* for the presentation of the teaching of the ancient church on the subject of salvation. In this the great idea that God himself had entered into humanity becomes dominant. The doom of death under which mankind had sighed since Adam's fall could only then be averted, when the immortal Word of God (Λόγος) assumed a mortal body, and, by yielding this to death for the sake of all, abrogated once for all the law of death, of which the power had been spent on the body of the Lord. Thus was rendered possible the leading back of mankind to God, of which the sure pledge lies in the grace of the resurrection of Christ. Athanasius would hear of no questioning of this religious mystery. In the catchword *Homousios*, which had been added to the creed at Nicaea, he too recognized the best formula for the expression of the mystery, although in his own writings he made but sparing use of it. He was in fact less concerned with the formula than with the content. Arians and Semi-Arians seemed to him to be pagans, who worship

the creature, instead of the God who created all things, since they teach two gods, one having no beginning, the other having a beginning in Time and therefore of the same nature as the heathen gods, since, like them, he is a creature. Athanasius has no terms for the definition of the Persons in the one "Divine" (τὸ θεῖον), which are in their substance one; and yet he is certain that this "Divine" is not mere abstraction, but something truly personal: "They are One," so he wrote later in his *Discourses against the Arians*. "not as though the unity were torn into two parts, which outside the unity would be nothing, nor as though the unity bore two names, so that one and the same is at one time Father and then his own Son, as the heretic Sabellius imagined. But they are two, for the Father is Father, and the Son is not the same, but, again, the Son is Son, and not the Father himself. But their Nature (φύσις) is one, for the Begotten is not dissimilar (ἀνόμοιος) to the Begetter, but his image, and everything that is the Father's is also the Son's." 826

Five months after the return from the council of Nicaea Bishop Alexander died; and on the 8th of February 326 Athanasius, at the age of thirty-three, became his successor. The first years of his episcopate were tranquil; then the storms in which the remainder of his life was passed began to gather round him. The council had by no means composed the divisions in the Church which the Arian controversy had provoked. Arius himself still lived, and his friend Eusebius of Nicomedia rapidly regained influence over the emperor Constantine. The result was a demand made by the emperor that Arius should be readmitted to communion. Athanasius stood firm, but many accusers soon rose up against one who was known to be under the frown of the imperial displeasure. He was charged with cruelty, even with sorcery and murder. It was reported that a bishop of the Meletian party (see Meletius) in the Thebaid, of the name of Arsenius, had been unlawfully put to death by him. He was easily able to clear himself of these charges; but the hatred of his enemies was not relaxed, and in the summer of 335 he was peremptorily ordered to appear at Tyre, where a council had been summoned to sit in judgment upon his conduct. There appeared plainly a predetermination to condemn him, and he fled from Tyre to Constantinople to appeal to the emperor himself. Refused at first a hearing, his perseverance was at length rewarded by the emperor's assent to his reasonable request that his accusers should be brought face to face with him in the imperial presence. Accordingly the leaders of the council, the most conspicuous of whom were Eusebius of Nicomedia and his namesake of Caesarea, were summoned to Constantinople. Here they did not attempt to repeat their old charges, but found a more effective weapon to their hands in a new charge of a political kind—that Athanasius had threatened to stop the Alexandrian corn-ships bound for Constantinople. It is very difficult to understand how far there was truth in the persistent accusations made against the prince-bishop of Alexandria. Probably there was in the very greatness of his character and the extent of his popular influence a certain species of dominance which lent a colour of truth to some of the things said against him. On the present occasion his accusers succeeded at once in arousing the imperial jealousy. Without obtaining a hearing, he was banished at the end of 335 to Trèves in Gaul. This was the first banishment of Athanasius, which lasted about one year and a half. It was brought to a close by the death of Constantine, and the accession as emperor of the West of Constantine II., who, in June 337, allowed Athanasius to return to Alexandria.

He reached his see on the 23rd of November 337, and, as he himself has told us, "the people ran in crowds to see his face; the churches were full of rejoicing; thanksgivings were everywhere offered up; the ministers and clergy thought the day the happiest in their lives." But this period of happiness was destined to be short-lived. His position as bishop of Alexandria placed him, not under his patron Constantine, but under Constantius, another son of the elder Constantine, who had succeeded to the throne of the East. He in his turn fell, as his father had done in later years, under the influence of Eusebius of Nicomedia, who in the latter half of 339 was transferred to the see of Constantinople, the new seat of the imperial court. A second expulsion of Athanasius was accordingly resolved upon. The old accusations against him were revived, and he was further charged with having set at naught the decision of a council. On the 18th of March 339 the exarch of Egypt suddenly confronted Athanasius with an imperial edict, by which he was deposed and a Cappadocian named Gregory was nominated bishop in his place. On the following day, after tumultuous scenes, Athanasius fled, and four days later Gregory was installed by the aid of the soldiery. On the first opportunity, Athanasius went to Rome, to "lay his case before the church." A synod assembled at Rome in the autumn of 340, and the great council—probably that which met at Sardica in 342 or 343, where the Orientals refused to meet the representatives of the Western church—declared him guiltless. This decision, however, had no immediate effect in favour of Athanasius. Constantius continued for some time implacable, and the bold action of the Western bishops only incited the Arian party in Alexandria to fresh severities. But the death of the intruder Gregory, on the 26th of June 345, opened up a way of reconciliation. Constantius decided to yield to the importunity of his brother Constans, who had succeeded Constantine II. in the West; and the result was the restoration of Athanasius for the second time, on the 21st of October 346. Again he returned to Alexandria amid the enthusiastic demonstrations of the populace, which is described by Gregory of Nazianzus, in his panegyric on Athanasius, as streaming forth like "another Nile" to meet him afar off as he approached the city.

The six years of his residence in the West had given Athanasius the opportunity of displaying a momentous activity. He made long journeys in Italy, in Gaul, and as far as Belgium. Everywhere he laboured for the Nicene faith, and the impression made by his personality was so great that to hold fast the orthodox faith and to defend Athanasius were for many people one and the same thing. This was shown when, after the death of the emperor Constans, Constantius became sole ruler of East and West. With the help of counsellors more subtle than discerning, the emperor, with the object of uniting the various parties in the Church at any cost, sought for the most colourless possible formula of belief, which he hoped to persuade all the bishops to accept. As his efforts remained for years fruitless, he used force. "My will is your guiding-line," he exclaimed in the summer of 355 to the bishops who had assembled at Milan in response to his orders. A series of his most defiant opponents had to go into banishment, Liberius of Rome, Hilarius of Poitiers and Hosius of Corduba, the last-named once the confidant of Constantine and the actual originator of the *Homousios*, and now nearly a hundred years old. At length came the turn of Athanasius, now almost the sole upholder of the banner of the Nicene creed in the East. Several attempts to expel him failed owing to the attitude of the populace. On the night of the 8th-9th of February 356, however, when the bishop was holding the Vigils, soldiers and police broke into the church of Theonas. Athanasius himself has described the scene for us: "I was seated upon my chair, the deacon was about to read the psalm, the people to answer, 'For his mercy endureth for ever.' The solemn act was interrupted; a panic arose." The bishop, who was at first unwilling to save himself, until he knew that his faithful followers were in safety, succeeded in escaping, leaving the town and finding a hiding-place in the country. The solitudes of Upper Egypt, where numerous monasteries and hermitages had been planted, seem at this time to have been his chief shelter. In this case, benefit was repayed by benefit, for Athanasius during his episcopate had been a zealous promoter of asceticism and monachism. With Anthony the hermit and Pachomius the founder of monasteries, he had maintained personal relations, and the former he had commemorated in his *Life of Anthony*. During his exile his time was occupied in writing on behalf of his cause, and to this period belong some of his most important works, above all the great *Orations or Discourses against the Arians*, which furnish the best exposition of his theological principles.

During his absence the see of Alexandria was left without a pastor. It is true that George of Cappadocia had taken his place; but he could only maintain himself for a short while (February 357-October 358). The great majority of the population remained faithful to the exile. At length, in November 361, the way was opened to him for his return to his see by the death of Constantius. Julian, who succeeded to the imperial throne, professed himself indifferent to the contentions of the Church, and gave permission to the bishops exiled in the late reign to return home. Among others, Athanasius availed himself of this permission, and in February 362 once more seated himself upon his throne, amid the rejoicings of the people. He had begun his episcopal labours with renewed ardour, and assembled his bishops in Alexandria to decide various important questions, when an imperial mandate again—for the fourth time—drove him from his place of power. The faithful gathered around him weeping. "Be of good heart," he said, "it is but a cloud: it will pass." His forecast proved true; for within a few months Julian had closed his brief career of pagan revival. As early as September 363, Athanasius was able to travel to Jovian, the new emperor, who had sent him a letter praising his Christian fidelity and encouraging him to resume his work. He returned to Alexandria on the 20th of February 364. With the emperor he continued to maintain friendly relations; but the period of repose was short. In the spring of 365, after the accession of Valens to the throne, troubles again arose. Athanasius was once more compelled to seek safety from his persecutors in concealment (October 365), which lasted, however, only for four months. In February 366 he resumed his episcopal labours, in which he henceforth remained undisturbed. On the 2nd of May 373, having consecrated one of his presbyters as his successor, he died quietly in his own house. 827

Athanasius was a man of action, but he also knew how to use his pen for the furtherance of his cause. He left a large number of writings, which cannot of course be compared with those of an Origen, a Basil, or a Gregory of Nyssa. Athanasius was no systematic theologian. All his treatises are occasional pieces, born of controversy and intended for controversial ends. The interest in abstract exposition of clearly formulated theological ideas is everywhere subordinate to the polemical purpose. But all these writings are instinct with a living personal faith, and serve for the defence of the cause; for it was not about words that he was contending. Even those who do not sympathize with the cause which Athanasius steadfastly defended cannot but admire his magnanimous and heroic character. If he was imperious in temper and inflexible in his conception of the Christian faith, he possessed a great heart and a great intellect, inspired with an enthusiastic devotion to Christ. As a theologian, his main distinction was his zealous advocacy of the essential divinity of Christ. Christianity in its Arian conception would have evaporated in a new polytheism. To have set a dam against this process with the whole force of a mighty personality constitutes the importance of Athanasius in the world's history. It is with good reason that the Church honours him as the "Great," and as the "Father of Orthodoxy."

The best edition of the works of Athanasius is the so-called Maurine edition of Bernard de Montfaucon in 3 vols. (Paris, 1698); this was enlarged in the 3rd edition by Giustiniani (4 vols., Padua, 1777), and is printed in this form in Migne's *Patrologia*, vols. xxv.-xxviii. An English translation of selections, with excellent introductions to the several writings, was published by Archibald Robertson in the *Library of the Nicene and Post-Nicene Fathers*, second series, vol. 4 (Oxford and New York, 1892). There is no biography satisfactory from the modern point of view. Studies preliminary to such a biography began to be published by E. Schwartz in his essays, "Zur Geschichte des Athanasius" (in the *Nachrichten der koniglichen Gesellschaft der Wissenschaften zu Göttingen*, 1904, &c.). The life of Athanasius, however, is so completely intertwined with the history of his time that it is permissible to refer, for a knowledge of him, to the general descriptions which will be found at the close of the article Arius. Of the older literature, Tillemont's *Mémoires pour servir à l'histoire ecclésiastique des six premiers siècles*, vols. vi. and viii., are still a mine of material for the historian. Of the newer literature the following deserve to be read:—Johann Adam Möhler, *Athanasius der Grosse und die Kirche seiner Zeit*, 2 vols. (2nd ed., Mainz, 1844); and Fr. Boehringer, "Arius und Athanasius," *Die Kirche Christi und ihre Zeugen*, vol. i. part 2 (2nd ed., Stuttgart, 1874).

(G. K.)

ATHAPASCAN, a widely distributed linguistic stock of North American Indians, the chief tribes included being the Chippewyan, Navajo, Apache, Jicarilla, Lipan, Hupa and Wailaki. The Athapascan family is geographically divided into Northern, Pacific and Southern. The Northern division (Tinneh or Déné) is about Alaska, and the Yukon and Mackenzie rivers,—the eponymous "Athabasca" tribe living round Lake Athabasca, in the province of Alberta in Canada. The Pacific division covers a strip of territory, some 400 m. in length, from Oregon southwards into California. The Southern division includes Arizona and New Mexico, parts of Utah, Colorado, Kansas and Texas, and the northern part of Mexico. The typical tribes are those of the Northern division.

See *Handbook of American Indians* (Washington, 1907).

ATHARVA VEDA, the fourth book of the Vedas, the ancient scriptures of the Brahman religion. Like the other Vedas it is divided into Samhita, Brahmanas and Upanishads, representing the spiritual element and its magical and nationalistic development. The mantras or sayings composing the Samhita of the Atharva Veda differ from those of the other Vedas by being in the form of spells rather than prayers or hymns, and seem to indicate a stage of religion lower than that of the Rig Veda.

ATHEISM (from Gr. ἀ-, privative, and θεός, God), literally a system of belief which denies the existence of God. The term as generally used, however, is highly ambiguous. Its meaning varies (*a*) according to the various definitions of deity, and especially (*b*) according as it is (i.) deliberately adopted by a thinker as a description of his own theological standpoint, or (ii.) applied by one set of thinkers to their opponents. As to (*a*), it is obvious that atheism from the standpoint of the Christian is a very different conception as compared with atheism as understood by a Deist, a Positivist, a follower of Euhemerus or Herbert Spencer, or a Buddhist. But the ambiguities arising from the points of view described in (*b*) are much more difficult both intellectually and in their practical social issues. Thus history shows how readily the term has been used in the most haphazard manner to describe even the most trivial divergence of opinion concerning points of dogma. In other words, "atheism" has been used generally by the orthodox adherents of one religion, or even of a single sect, for all beliefs which are different or even differently expressed. It is in fact in these cases, like "heterodoxy," a term of purely negative significance, and its intellectual value is of the slightest. The distinction between the terms "religion" and "magic" is, in a similar way, often due merely to rivalry between the adherents of two or more mutually exclusive religions brought together in the same community. When the psalmist declares that "the fool hath said in his heart, there is no God," he probably does not refer to theoretical denial, but to a practical disbelief in God's government of human affairs, shown in disobedience to moral laws. Socrates was charged with "not believing in the gods the city believes in." The cry of the heathen populace in the Roman empire against the Christians was "Away with the atheists! To the lions with the Christians!" The ground for the charge was probably the lack of idolatry in all Christian worship. Spinoza, for whom God alone existed, was persecuted as an atheist. A common designation of Knox was "the atheist," although it was to him "matter of satisfaction that our most holy religion is founded on faith, not on reason."

In its most scientific and serious usage the term is applied to that state of mind which does not find deity (*i.e.* either one or many gods) in or above the physical universe. Thus it has been applied to certain primitive savages, who have been thought (*e.g.* by Lord Avebury in his *Prehistoric Times*) to have no religious belief; it is, however, the better opinion that there are no peoples who are entirely destitute of some rudimentary religious belief. In the second place, and most usually, it is applied to a purely intellectual, metaphysical disbelief in the existence of any god, or of anything supernatural. In this connexion it is usual to distinguish three types of atheism:—the *dogmatic*, which denies the existence of God positively; the *sceptical*, which distrusts the capacity of the human mind to discover the existence of God; and the *critical*, which doubts the validity of the theistic argument, the proofs for the existence of God. That the first type of atheism exists, in spite of the denials of those who favour the second or the third, may be proved by the utterances of men like Feuerbach, Flourens or Bradlaugh. "There is no God," says Feuerbach, "it is clear as the sun and as evident as the day that there is no God, and still more that there can be none." With greater passion Flourens declares "Our enemy is God. Hatred of God is the beginning of wisdom. If 828
mankind would make true progress, it must be on the basis of atheism." Bradlaugh maintained against Holyoake that he would fight until men respected the name "atheist." The answer to dogmatic atheism, that it implies infinite knowledge, has been well stated in John Foster's *Essays*, and restated by Chalmers in his *Natural Theology*, and its force is recognized in Holyoake's careful qualification of the sense in which secularism accepts atheism, "always explaining the term atheist to mean 'not seeing God' visually or inferentially, never suffering it to be taken for anti-theism, that is, hating God, denying God—as *hating* implies personal knowledge as the ground of dislike, and *denying* implies infinite knowledge as the ground of disproof." But dogmatic atheism is rare compared with the sceptical type, which is identical with agnosticism (*q.v.*) in so far as it denies the capacity of the mind of man to form any conception of God, but is different from it in so far as the agnostic merely holds his judgment in suspense, though, in practice, agnosticism is apt to result in an attitude towards religion which is hardly distinguishable from a passive and unaggressive atheism. The third or critical type may be illustrated by *A Candid Examination of Theism* by "Physicus" (G.J. Romanes), in which the writer endeavours to establish the weakness of the proofs for the existence of God, and to substitute for theism Spencer's physical explanation of the universe, and yet admits how unsatisfying to himself the new position is. "When at times I think, as think at times I must, of the appalling contrast between the hallowed glory of that creed which once was mine, and the lonely mystery of existence as now I find it—at such times I shall ever feel it impossible to avoid the sharpest pang of which my nature is susceptible."

Atheism has to meet the protest of the heart as well as the argument of the mind of mankind. It must be judged not only by theoretical but by practical arguments, in its relations either to the individual or to a society. Voltaire himself, speaking as a practical man rather than as a metaphysician, declared that if there were no God it would be necessary to invent one; and if the analysis is only carried far enough it will be found that those who deny the existence of God (in a conventional sense) are all the time setting up something in the nature of deity by way of an ideal of their own, while fighting over the meaning of a word or its conventional misapplication.

ATHELM (d. 923), English churchman, is said to have been a monk of Glastonbury before his elevation in 909 to the see of Wells, of which he was the first occupant. In 914 he became archbishop of Canterbury.

ATHELNEY, a slight eminence of small extent in the low level tract about the junction of the rivers Tone and Parrett in Somersetshire, England. It was formerly isolated by marshes and accessible only by boat or artificial causeway, and under these conditions it gained its historical fame as the retreat of King Alfred in 878-879 when he was unable to withstand the incursions of the Danes. After regaining his throne he founded a monastery here in gratitude for the retreat afforded him by the island; no traces of it exist above ground, but remains have been excavated. There was also found here, in 1693, the celebrated Alfred jewel, bearing his name, and preserved in the Ashmolean Museum at Oxford. An inscribed pillar commemorating the king was set up in 1801. The name of Athelney signifies the Isle of Princes (A.S. *Æthelingaea*). Athelney is a railway station on a branch of the Great Western line.

ATHENA (the Attic form of the Homeric Athene, also called Athenaia, Pallas Athene, Pallas), one of the most important goddesses in Greek mythology. With Zeus and Apollo, she forms a triad which represents the embodiment of all divine power. No satisfactory derivation of the name Athena has been given[1]; Pallas, at first an epithet, but after Pindar used by itself, may possibly be connected with παλλακή ("maiden"). Athena has been variously described as the pure aether, the storm-cloud, the dawn, the twilight; but there is little evidence that she was regarded as representing any of the physical powers of nature, and it is better to endeavour to form an idea of her character and attributes from a consideration of her cult-epithets and ritual. According to the legend, her father Zeus swallowed his wife Metis ("counsel"), when pregnant with Athena, since he had been warned that his children by her might prove stronger than himself and dethrone him. Hephaestus (or Prometheus) subsequently split open his head with a hatchet, and Athena sprang forth fully armed, uttering a loud shout of victory (Hesiod, *Theogony*, 886; Pindar, *Olympia*, vii. 35). In Crete she was said to have issued from a cloud burst asunder by Zeus. According to Roscher, the manner of her birth represents the storm-cloud split by lightning; Farnell (*Cults of the Greek States*, i. p. 285) sees in it an indication that, as the daughter of Metis, Athena was already invested with a mental and moral character, and explains the swallowing of Metis (for which compare the story of Cronus and his children) by the desire to attribute an extraordinary birth to one in whom masculine traits predominated. In another account (as Τριτογένεια) she is the daughter of the river Triton, to which various localities were assigned, and wherever there was a river (or lake) of that name, the inhabitants claimed that she was born there. It is probable that the name originated in Boeotia (C.O. Müller, *Geschichten hellenischer Stamme*, i. pp. 351-357; but see Macan on Herodotus, iv. 180), whence it was conveyed by colonists to Cyrene and thence to Libya, where there was a river Triton. Here some local divinity, a daughter of Poseidon, connected with the water and also of a warlike character, was identified by the colonists with their own Athena. In any case, it is fairly certain that Tritogeneia means "water-born," although an old interpretation derived it from τριτώ, a supposed Boeotian word meaning "head," which further points to the name having originated in Boeotia. Roscher suggests that the localization of her birthplace in the extreme west points to the western sea, the home of cloud and storm.

In Homer Athena already appears as the goddess of counsel, of war, of female arts and industries, and the protectress of Greek cities, this last aspect of her character being the most important and pronounced. Hence she is called πολιάς, πολιοῦχος, in many Greek states, and is frequently associated with Ζεὺς πολιεύς. The most celebrated festival of the city-goddess was the Panathenaea at Athens and other places. Other titles of kindred meaning are ἀρχηγέτις ("founder") and παναχαΐς, the protectress of the Achaean league. At Athens she presided over the phratries or clans, and was known as ἀπατουρία and φρατρία, and sacrifice was offered to her at the festival Apaturia. The title μήτηρ, given her by the inhabitants of Elis, whose women, according to the legend, she had blessed with abundance of children, seems at variance with the generally-recognized conception of her as παρθένος; but μήτηρ may bear the same meaning as κουροτρόφος, the fosterer of the young, in harmony with her aspect as protectress of civic and family life. At Alalcomenae, near the Tritonian lake in Boeotia, she was ἀλαλκομενηΐς ("defender"). Her temple, which was pillaged by Sulla, contained an ivory image, which was said to have fallen from heaven. The inhabitants claimed that the goddess was born there and brought up by a local hero Alalcomeneus. Her images, called Palladia, which guarded the heights (cf. her epithets ἀκρία, κραναία), represented her with shield uplifted, brandishing her spear to keep off the foe. The cult of Athena Itonia, whose earliest seat appears to have, been amongst the Thessalians, who used her name as a battle-cry, made its way to Coronea in Boeotia, where her sanctuary was the seat of the Pamboeotian confederacy. The meaning of Itonia is obscure: Dümmler connects it with ἰτεῶνες, the "willow-beds" on the banks of the river Coralios (the river of the maiden, *i.e.* Athena); Jebb (on Bacchylides, *fr.* xi. 2) suggests a derivation from ἴέναι, the goddess of the "onset." At Thebes she was worshipped as Athena Onka or Onga, of equally uncertain derivation (possibly from ὄγκος, "a height"). Peculiar to Arcadia is the title Athena Alea, probably = "warder off of evil," although others explain it as = "warmth," and see in it an allusion to her physical nature as one of the powers of light. Farnell (*Cults*, p. 275) points out that at the same time she is certainly looked upon as in some way connected with the health-divinities, since in her temple she is grouped with Asclepius and Hygieia (see Hygieia).

She already appears as the goddess of counsel (πολύβουλος) in the *Iliad* and in Hesiod. The Attic bouleutae took the oath by Athena Boulaia; at Sparta she was ἀγοραία, presiding over the popular assemblies in the market-place; in Arcadia μηχανῖτις the discoverer of devices. The epithet προνοία ("forethought") is due, according to Farnell, to a confusion with προναία, referring to a statue of the goddess standing "before a shrine," and arose later (probably spreading from Delphi), some time after the Persian wars, in which she repelled a Persian attack on the temples "by divine forethought"; another legend attributes the name to her skill in assisting Leto at the birth of Apollo and Artemis. With this aspect of her character may be compared the Hesiodic legend, according to which she was the daughter of Metis. Her connexion with the trial of Orestes, the introduction of a milder form of punishment for justifiable homicide, and the institution of the court τὸ ἐπὶ Παλλαδίῳ, show the important part played by her in the development of legal ideas.

The protectress of cities was naturally also a goddess of war. As such she appears in Homer and Hesiod and in post-Homeric legend as the slayer of the Gorgon and taking part in the battle of the giants. On numerous monuments she is represented as ἀρεία, "the warlike," νικηφόρος, "bringer of victory," holding an image of Nike (*q.v.*) in her outstretched hand (for other similar epithets see Roscher's *Lexikon*). She was also the goddess of the arts of war in general; στοιχεία, she who draws up the ranks for battle, ζωστηρία, she who girds herself for the fray. Martial music (cp. Ἀθήνη σάλπιγξ, "trumpet") and the Pyrrhic dance, in which she herself is said to have taken part to commemorate the victory over the giants, and the building of war-ships were attributed to her. She instructed certain of her favourites in gymnastics and athletics, as a useful training for war. The epithets ἱππία, χαλινῖτις, δαμάσιππος, usually referred to her as goddess of war-horses, may perhaps be reminiscences of an older religion in which the horse was sacred to her. As a war-goddess, she is the embodiment of prudent and intelligent tactics, entirely different from Ares, the personification of brute force and rashness, who is fitly represented as suffering defeat at her hands. She is the patroness and protectress of those heroes who are distinguished for their prudence and caution, and in the Trojan War she sides with the more civilized Greeks.

The goddess of war develops into the goddess of peace and the pursuits connected with it. She is prominent as the promoter of agriculture in Attic legend. The Athenian hero Erechtheus (Erichthonius), originally an earth-god, is her foster-son, with whom she was honoured in the Erechtheum on the Acropolis. Her oldest priestesses, the dew-sisters—Aglauros, Herse, Pandrosos—signify the fertilization of the earth by the dew, and were probably at one time identified with Athena, as surnames of whom both Aglauros and Pandrosos are found. The story of the voluntary sacrifice of the Attic maiden Aglauros on behalf of her country in time of war (commemorated by the ephebi taking the oath of loyalty to their country in her temple), and of the leap of the three sisters over the Acropolis rock (see Erechtheus), probably points to an old human sacrifice. Athena also gave the Athenians the olive-tree, which was supposed to have sprung from the bare soil of the Acropolis, when smitten by her spear, close to the horse (or spring of water) produced by the trident of Poseidon, to which he appealed in support of his claim to the lordship of Athens. She is also connected with Poseidon in the legend of Erechtheus, not as being in any way akin to the former in nature or character, but as indicating the contest between an old and a new religion. This god, whose worship was introduced into Athens at a later date by the Ionian immigrants, was identified with Erechtheus-Erichthonius (for whose birth Athena was in a certain sense responsible), and thus was brought into connexion with the goddess, in order to effect a reconciliation of the two cults. Athena was said to have invented the plough, and to have taught men to tame horses and yoke oxen. Various arts were attributed to her—shipbuilding, the goldsmith's craft, fulling, shoemaking and other branches of industry. As early as Homer she takes especial interest in the occupations of women; she makes Hera's robe and her own peplus, and spinning and weaving are often called "the works of Athena." The custom of offering a beautifully woven peplus at the Panathenaic festival is connected with her character as Ergane the goddess of industry.[2] As patroness of the arts, she is associated with Hephaestus (one of her titles is Ἡφαιστία) and Prometheus, and in Boeotia she was regarded as the inventress of the flute. According to Pindar, she

imitated on the flute the dismal wail of the two surviving Gorgons after the death of Medusa. The legend that Athena, observing in the water the distortion of her features caused by playing that instrument, flung it away, probably indicates that the Boeotians whom the Athenians regarded with contempt, used the flute in their worship of the Boeotian Athena. The story of the slaying of Medusa by Athena, in which there is no certain evidence that she played a direct part, explained by Roscher as the scattering of the storm-cloud, probably arose from the fact that she is represented as wearing the Gorgon's head as a badge.

As in the case of Aphrodite and Apollo, Roscher in his *Lexikon* deduces all the characteristics of Athena from a single conception—that of the goddess of the storm or the thunder-cloud (for a discussion of such attempts see Farnell, *Cults*, i. pp. 3, 263). There seems little reason for regarding her as a nature-goddess at all, but rather as the presiding divinity of states and cities, of the arts and industries—in short, as the goddess of the whole intellectual side of human life.

Except at Athens, little is known of the ceremonies or festivals which attended her worship. There we have the following. (1) The ceremony of the *Three Sacred Ploughs*, by which the signal for seed-time was given, apparently dating from a period when agriculture was one of the chief occupations of her worshippers. (2) The *Procharisteria* at the end of winter, at which thanks were offered for the germination of the seed. (3) The *Scirophoria*, with a procession from the Acropolis to the village of Skiron, in the height of summer, the priests who were to entreat her to keep off the summer heat walking under the shade of parasols (σκίρον) held over them; others, however, connect the name with σκῖρος ("gypsum"), perhaps used for smearing the image of the goddess. (4) The *Oschophoria*, at the vintage season, with races among boys, and a procession, with songs in praise of Dionysus and Ariadne. (5) The *Chalkeia* (feast of smiths), at which the birth of Erechtheus and the invention of the plough were celebrated. (6) The *Plynteria* and *Callynteria*, at which her ancient image and peplus in the Erechtheum and the temple itself were cleaned, with a procession in which bunches of figs (frequently used in lustrations) were carried. (7) The *Arrhephoria* or *Errephoria* (perhaps = *Ersephoria*, "dew-bearing"), at which four girls, between seven and eleven years of age, selected from noble families, carried certain unknown sacred objects to and from the temple of Aphrodite "in the gardens" (see J.E. Harrison, *Classical Review*, April 1889). (8) The *Panathenaea*, at which the new robes for the image of he goddess were carried through the city, spread like a sail on a mast. The reliefs of the frieze of the cella of the Parthenon enable us to form an idea of the procession. Athletic games, open to all who traced their nationality to Athens, were part of this festival. Mention should also be made of the Argive ceremony, at which the *xoanon* (ancient wooden statue) of Athena was washed in the river Inachus, a symbol of her purification after the Gigantomachia. 830

The usual attributes of Athena were the helmet, the aegis, the round shield with the head of Medusa in the centre, the lance, an olive branch, the owl, the cock and the snake. Of these the aegis, usually explained as a storm-cloud, is probably intended as a battle-charm, like the Gorgon's head on the shield and the faces on the shields of Chinese soldiers; the owl probably represents the form under which she was worshipped in primitive times, and subsequently became her favourite bird (the epithet γλαυκῶπις, meaning "keen-eyed" in Homer, may have originally signified "owl-faced"); the snake, a common companion of the earth deities, probably refers to her connexion with Erechtheus-Erichthonius.

As to artistic representations of the goddess, we have first the rude figure which seems to be a copy of the Palladium; secondly, the still rude, but otherwise more interesting, figures of her, as *e.g.* when accompanying heroes, on the early painted vases; and thirdly, the type of her as produced by Pheidias, from which little variation appears to have been made. Of his numerous statues of her, the three most celebrated were set up on the Acropolis. (1) Athena *Parthenos*, in the Parthenon. It was in ivory and gold, and 30 ft. high. She was represented standing, in a long tunic; on her head was a helmet, ornamented with sphinxes and griffins; on her breast was the aegis, fringed with serpents and the Gorgon's head in centre. In her right hand was a Nike or winged victory, while her left held a spear, which rested on a shield on which were represented the battles of the Amazons with the giants. (2) A colossal statue said to have been formed from the spoils taken at Marathon, the so-called Athena *Promachos*. (3) Athena *Lemnia*, so called because it had been dedicated by the Athenian cleruchies in Lemnos. In this she was represented without arms, as a brilliant type of virgin beauty. The two last statues were of bronze. From the time of Pheidias calm earnestness, self-conscious might, and clearness of intellect were the main characteristics of the goddess. The eyes, slightly cast down, betoken an attitude of thoughtfulness; the forehead is clear and open; the mouth indicates firmness and resolution. The whole suggests a masculine rather than a feminine form.

From Greece the worship of Athena extended to Magna Graecia, where a number of temples were erected to her in various places. In Italy proper she was identified with Minerva (*q.v.*).

See articles in Pauly-Wissowa's *Realencyclopädie*; W.H. Roscher's *Lexikon der Mythologie*; Daremberg and Saglio's *Dictionnaire des antiquités* (s.v. "Minerva"); L. Preller, *Griechische Mythologie*; W.H. Roscher, "Die Grundbedeutung der Athene," in *Nektar und Ambrosia* (1883); F.A. Voigt, "Beiträge zur Mythologie des Ares und Athena," in *Leipziger Studien*, iv. (1881); L.R. Farnell, *The Cults of the Greek States*, i. (1896); J.E. Harrison, *Prolegomena to the Study of Greek Religion* (1903), for the festivals especially; O. Gruppe, *Griechische Mythologie*, ii. (1907). In the article Greek Art, fig. 21 represents Athena in the act of striking a prostrate giant; fig. 38 a statuette of Athena Parthenos, a replica of the work of Pheidias.

(J. H. F.)

1 O. Gruppe (*Griechische Mythologie*, ii. p. 1194) thinks that it probably means "without mother's milk," either in an active or in a passive sense "not giving suck," or "unsuckled," in her character as the virgin goddess, or as springing from the head of Zeus. In support of this view he refers to Hesychius θήνιον γάλα and a passage in Athenagoras (*Legatio pro Christianis*, 17), where it is stated that Athena was sometimes called Ἀθηλᾶ or Ἀθήλη. For Pallas, he prefers the old etymology from πάλλω (to "shake"), rather in the sense of "earth-shaker" than "lance-brandisher."

2 According to J.E. Harrison in Classical Review (June 1894), Athena Ergane is the goddess of the fruits of the field and the procreation of children.

ATHENAEUM, a name originally applied in ancient Greece (Ἀθήναιον) to buildings dedicated to Athena, and specially used as the designation of a temple in Athens, where poets and men of learning were accustomed to meet and read their productions. The academy for the promotion of learning which the emperor Hadrian built (about A.D. 135) at Rome, near the Forum, was also called the Athenaeum. Poets and orators still met and discussed there, but regular courses of instruction were given by a staff of professors in rhetoric, jurisprudence, grammar and philosophy. The institution, later called Schola Romana, continued in high repute till the 5th century. Similar academies were also founded in the provinces and at Constantinople by the emperor Theodosius II. In modern times the name has been applied to various academies, as those of Lyons and Marseilles, and the Dutch high schools; and it has become a very general designation for literary clubs. It is also familiar as the title of several literary periodicals, notably of the London literary weekly founded in 1828.

ATHENAEUS, of Naucratis in Egypt, Greek rhetorician and grammarian, flourished about the end of the 2nd and the beginning of the 3rd century A.D. Suidas only tells us that he lived "in the times of Marcus"; but the contempt with which he speaks of Commodus (died 192) shows that he survived that emperor. Athenaeus himself states that he was the author of a treatise on the *thratta*—a kind of fish mentioned by Archippus and other comic poets—and of a history of the Syrian kings, both of which works are lost. We still possess the *Deipnosophistae*, which may mean dinner-table philosophers or authorities on banquets, in fifteen books. The first two books, and parts of the third, eleventh and fifteenth, are only extant in epitome, but otherwise we seem to possess the work entire. It is an immense storehouse of miscellaneous information, chiefly on matters connected with the table, but also containing remarks on music, songs, dances, games, courtesans. It is full of quotations from writers whose works have not come down to us; nearly 800 writers and 2500 separate writings are referred to by Athenaeus; and he boasts of having read 800 plays of the Middle Comedy alone. The plan of the *Deipnosophistae* is exceedingly cumbrous, and is badly carried out. It professes to be an account given by the author to his friend Timocrates of a banquet held at the house of Laurentius (or Larentius), a scholar and wealthy patron of art. It is thus a dialogue within a dialogue, after the manner of Plato, but a conversation of sufficient length to occupy several days (though represented as taking place in one) could not be conveyed in a style similar to the short conversations of Socrates. Among the twenty-nine guests are Galen and Ulpian, but they are all probably fictitious personages, and the majority take no part in the conversation. If Ulpian is identical with the famous jurist, the *Deipnosophistae* must have been written after his death (228); but the jurist was murdered by the praetorian guards, whereas

Ulpian in Athenaeus dies a natural death. The conversation ranges from the dishes before the guests to literary matters of every description, including points of grammar and criticism; and they are expected to bring with them extracts from the poets, which are read aloud and discussed at table. The whole is but a clumsy apparatus for displaying the varied and extensive reading of the author. As a work of art it can take but a low rank, but as a repertory of fragments and morsels of information it is invaluable.

Editio princeps, Aldine, 1524; Casaubon, 1597-1600; Schweighäuser, 1801-1807; Dindorf, 1827; Meineke, 1859-1867; Kaibel, 1887-1890; English translation by Yonge in Bohn's *Classical Library*.

ATHENAGORAS, a Christian apologist of the 2nd century A.D., was, according to an emendator of the Paris Codex 451 of the 11th century, a native of Athens. The only sources of information regarding him are a short notice by Philip of Side, in Pamphylia (*c.* A.D. 420), and the inscription on his principal work. Philip—or rather the compiler who made excerpts from him—says that he was at the head of an Alexandrian school (the catechetical), that he lived in the time of Hadrian and Antoninus, to whom he addressed his *Apology*, and that Clement of Alexandria was his pupil; but these statements are more than doubtful. The inscription on the work describes it as the "Embassy of Athenagoras, the Athenian, a philosopher and a Christian concerning the Christians, to the Emperors Marcus Aurelius Antoninus and Lucius Aurelius Commodus, &c." This statement has given rise to considerable discussion, but from it and internal evidence the date of the *Apology* (Πρεσβεία περὶ Χρίστιανῶν) may be fixed at about A.D. 177. Athenagoras is also the author of a discourse on the resurrection of the body, which is not authenticated otherwise than by the titles on the various manuscripts. In the *Apology*, after contrasting the judicial treatment of Christians with that of other accused persons, he refutes the accusations brought against the Christians of atheism, eating human flesh and licentiousness, and in doing so takes occasion to make a vigorous and skilful attack on pagan polytheism and mythology. The discourse on the resurrection answers objections to the doctrine, and attempts to prove its truth from considerations of God's purpose in the creation of man, His justice and the nature of man himself. Athenagoras is a powerful and clear writer, who strives to comprehend his opponents' views and is acquainted with the classical writers. He used the *Apology* of Justin, but hardly the works of Aristides or Tatian. His theology is strongly tinged with Platonism, and this may account for his falling into desuetude. His discussion of the Trinity has some points of speculative interest, but it is not sufficiently worked out; he regards the Son as the Reason or Wisdom of the Father, and the Spirit as a divine effluence. On some other points, as the nature of matter, the immortality of the soul and the principle of sin, his views are interesting.

EDITIONS.—J.C. Th. Eg. de Otto, *Corpus Apol. Christ. Saec.* II. vol. vii. (Jena, 1857); E. Schwartz in *Texte und Untersuchungen*, iv. 2 (Leipzig, 1891).

TRANSLATIONS.—Humphreys (London, 1714); B.P. Pratten (*Ante-Nic. Fathers*, Edinburgh, 1867).

LITERATURE.—A. Harnack, *Gesch. der altchr. Litt.* pp. 526-558, and similar works by O. Bardenhewer and A. Ehrhard; Herzog-Hauck, *Realencyk.*; G. Krüger, *Early Chr. Lit.* p. 130 (where additional literature is cited). In 1559 and 1612 appeared in French a work on *True and Perfect Love*, purporting to be a translation from the Greek of Athenagoras; it is a palpable forgery.

ATHENODORUS, the name of two Stoic philosophers of the 1st century B.C., who have frequently been confounded.

1. ATHENODORUS CANANITES (*c.* 74 B.C.-A.D. 7), so called from his birthplace Canana near Tarsus (not Cana in Cilicia nor Canna in Lycaonia), was the son of one Sandon, whose name indicates Tarsian descent, not Jewish as many have held. He was a personal friend of Strabo, from whom we derive our knowledge of his life. He taught the young Octavian (afterwards Augustus) at Apollonia, and was a pupil of Posidonius at Rhodes. Subsequently he appears to have travelled in the East (Petra and Egypt) and to have made himself famous by lecturing in the great cities of the Mediterranean. Writing in 50 B.C., Cicero speaks of him with the highest respect (cf. *Ep. ad. Att.*, xvi. 11. 4, 14. 4), a fact which enables us to fix the date of his birth as not later than about 74. His influence over Augustus was strong and lasting. He followed him to Rome in 44, and is said to have criticized him with the utmost candour, bidding him repeat the letters of the alphabet before acting on an angry impulse. In later years he was allowed by Augustus to return to Tarsus in order to remodel the constitution of the city after the degenerate democracy which had misgoverned it under Boethus. He succeeded (*c.* 15-10 B.C.) in setting up a timocratic oligarchy in the imperial interest (see TARSUS). Sir W.M. Ramsay is inclined to attribute to the influence of Athenodorus the striking resemblances which can be established between Seneca and Paul, the latter of whom must certainly have been acquainted with his teachings. According to Eusebius and Strabo he was a learned scientist for his day, and some attribute to him a history of Tarsus. He helped Cicero in the composition of the *De Officiis*. His works are not certainly known, and none are extant. (See Sir W.M. Ramsay in the *Expositor*, September 1906, pp. 268 ff.)

2. ATHENODORUS CORDYLION, also of Tarsus, was keeper of the library at Pergamum, and was an old man in 47 B.C. In his enthusiasm for Stoicism he used to cut out from Stoic writings passages which seemed to him unsatisfactory. He also settled in Rome, where he died in the house of the younger Cato.

Among others of the name may be mentioned (3) ATHENODORUS OF TEOS, who played the cithara at the wedding of Alexander the Great and Statira at Susa (324 B.C.); (4) a Greek physician of the 1st century A.D., who wrote on epidemic diseases; and two sculptors, of whom (5) one executed the statues of Apollo and Zeus which the Spartans dedicated at Delphi after Aegospotami; and (6) the other was a son of Alexander of Rhodes, whom he helped in the Laocoon group.

ATHENRY, a market town of county Galway, Ireland, 14 m. inland (E.) from Galway on the Midland Great Western main line. Pop. (1901) 853. Its name is derived from *Ath-na-riogh*, the ford of kings; and it grew to importance after the Anglo-Norman invasion as the first town of the Burgs and Berminghams. The walls were erected in 1211 and the castle in 1238, and the remains of both are noteworthy. A Dominican monastery was founded with great magnificence by Myler de Bermingham in 1241, and was repaired by the Board of Works in 1893. Of the Franciscan monastery of 1464 little is left. The town returned two members to the Irish parliament from the time of Richard II. to the Union; but it never recovered from the wars of the Tudor period, culminating in a successful siege by Red Hugh O'Donnell in 1596.

ATHENS [Ἀθῆναι, *Athenae*, modern colloquial Greek Ἀθήνα], the capital of the kingdom of Greece, situated in 23° 44′ E. and 37° 58′ N., towards the southern end of the central and principal plain of Attica. The various theories with regard to the origin of the name are all somewhat unconvincing; it is conceivable that, with the other homonymous Greek towns, such as Athenae Diades in Euboea, Ἀθῆναι may be connected etymologically with ἄνθος, a flower (cf. *Firenze*, Florence); the patron goddess, Athena, was probably called after the place of her cult.

I. TOPOGRAPHY AND ANTIQUITIES

The Attic plain, τὸ πεδίον, slopes gently towards the coast of the Saronic Gulf on the south-west; on the east it is overlooked by Mount

Hymettus (3369 ft.); on the north-east by Pentelicus or Brilessus (3635 ft.) from which, in ancient and modern times, an immense quantity of the finest marble has been quarried; on the north-west by Parnes (4636 ft.), a continuation of the Boeotian Cithaeron, and on the west by Aegaleus (1532 ft.), which descends abruptly to the bay of Salamis. In the centre of the plain extends from north-east to south-west a series of low heights, now known as Turcovuni, culminating towards the south in the sharply pointed Lycabettus (1112 ft.), now called Hagios Georgios from the monastery which crowns its summit. Lycabettus, the most prominent feature in the Athenian landscape, directly overhung the ancient city, but was not included in its walls; its peculiar shape rendered it unsuitable for fortification. The Turcovuni ridge, probably the ancient Anchesmus, separates the valley of the Cephisus on the north-west from that of its confluent, the Ilissus, which skirted the ancient city on the south-west. The Cephisus, rising in Pentelicus, enters the sea at New Phalerum; in summer it dwindles to an insignificant stream, while the Ilissus, descending from Hymettus, is totally dry, probably owing to the destruction of the ancient forests on both mountains, and the consequent denudation of the soil. Separated from Lycabettus by a depression to the south-west, through which flows a brook, now a covered drain (probably to be identified with the Eridanus), stands the remarkable oblong rocky mass of the Acropolis (512 ft.), rising precipitously on all sides except the western; its summit was partially levelled in prehistoric times, and the flat area was subsequently enlarged by further cutting and by means of retaining walls. Close to the Acropolis on the west is the lower rocky eminence of the Areopagus, Ἄρειος πάγος (377 ft.), the seat of the famous council; the name (see also Areopagus) has been connected with Ares, whose temple stood on the northern side of the hill, but is more probably derived from the Ἀραί or Eumenides, whose sanctuary was formed by a cleft in its north-eastern declivity. Farther west of the Acropolis are three elevations; to the north-west the so-called "Hill of the Nymphs" (341 ft.), on which the modern Observatory stands; to the west the Pnyx, the meeting-place of the Athenian democracy (351 ft.), and to the south-west the loftier Museum Hill (482 ft.), still crowned with the remains of the monument of Philópappus. A cavity, a little to the west of the Observatory Hill, is generally supposed to be the ancient Barathron or place of execution. To the south-east of the Acropolis, beyond the narrow valley of the Ilissus, is the hill Ardettus (436 ft.). The distance from the Acropolis to the nearest point of the sea coast at Phalerum is a little over 3 m.

Influence of the geographical position.

The natural situation of Athens was such as to favour the growth of a powerful community. For the first requisites of a primitive settlement—food supply and defence—it afforded every advantage. The Attic plain, notwithstanding the lightness of the soil, furnished an adequate supply of cereals; olive and fig groves and vineyards were cultivated from the earliest times in the valley of the Cephisus, and pasturage for sheep and goats was abundant. The surrounding rampart of mountains was broken towards the north-east by an open tract stretching between Hymettus and Pentelicus towards Marathon, and was traversed by the passes of Decelea, Phylé and Daphné on the north and north-west, but the distance between these natural passages and the city was sufficient to obviate the danger of surprise by an invading land force. On the other hand Athens, like Corinth, Megara and Argos, was sufficiently far from the sea to enjoy security against the sudden descent of a hostile fleet. At the same time the relative proximity of three natural harbours, Peiraeus, Zea and Munychia, favoured the development of maritime commerce and of the sea power which formed the basis of Athenian hegemony. The climate is temperate, but liable to sudden changes; the mean temperature is 63°.1 F., the maximum (in July) 99°.01, the minimum (in January) 31°.55. The summer heat is moderated by the sea-breeze or by cool northerly winds from the mountains (especially in July and August). The clear, bracing air, according to ancient writers, fostered the intellectual and aesthetic character of the people and endowed them with mental and physical energy. For the architectural embellishment of the city the finest building material was procurable without difficulty and in abundance; Pentelicus forms a mass of white, transparent, blue-veined marble; another variety, somewhat similar in appearance, but generally of a bluer hue, was obtained from Hymettus. For ordinary purposes grey limestone was furnished by Lycabettus and the adjoining hills; limestone from the promontory of Acté (the so-called "poros" stone), and conglomerate, were also largely employed. For the ceramic art admirable material was at hand in the district north-west of the Acropolis. For sculpture and various architectural purposes white, fine-grained marble was brought from Paros and Naxos. The main drawback to the situation of the city lay in the insufficiency of its water-supply, which was supplemented by an aqueduct constructed in the time of the Peisistratids and by later water-courses dating from the Roman period. A great number of wells were also sunk and rain-water was stored in cisterns.

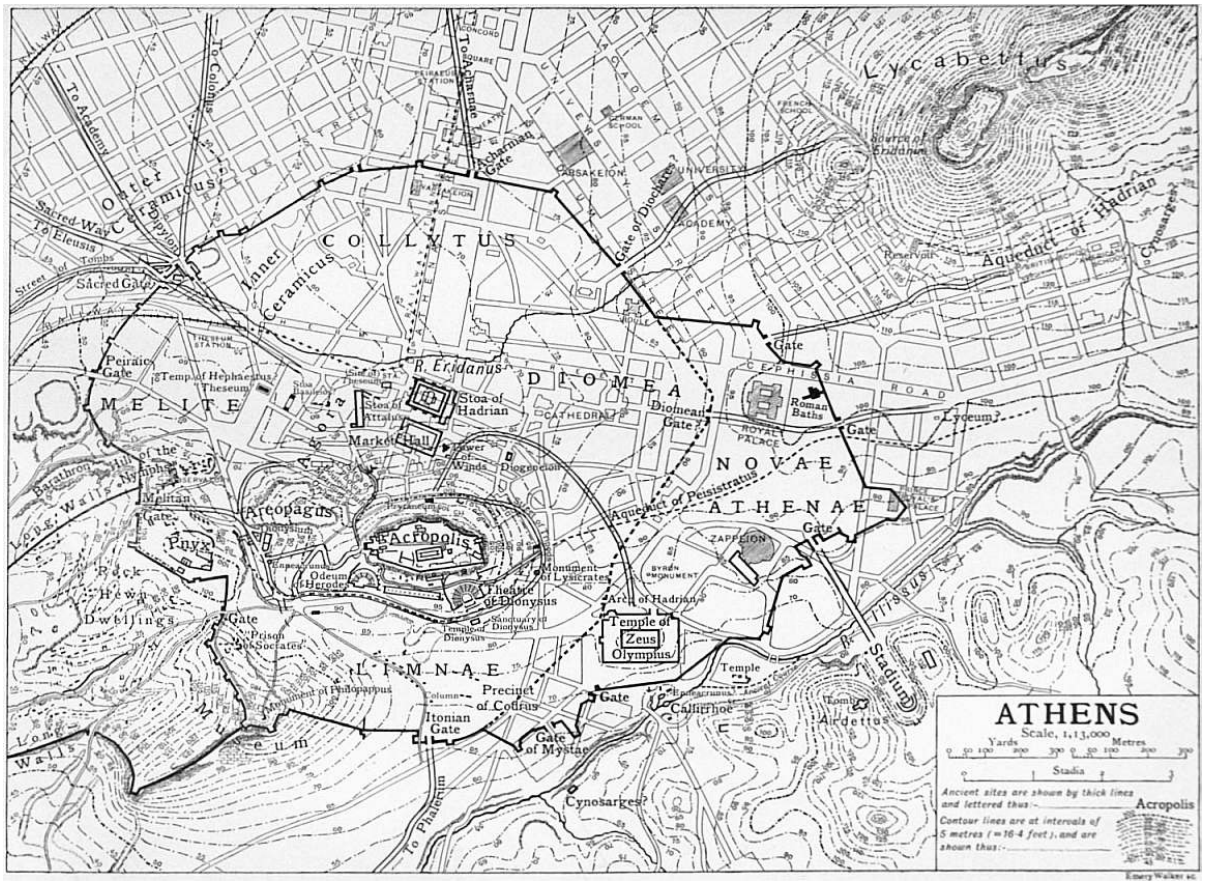
Sources for Athenian topography.

For the purposes of scientific topography observation of the natural features and outlines is followed by exact investigation of the architectural structures or remnants, a process demanding high technical competence, acute judgment and practical experience, as well as wide and accurate scholarship. The building material and the manner of its employment furnish evidence no less important than the character of the masonry, the design and the modes of ornamentation. The testimony afforded by inscriptions is often of decisive importance, especially that of commemorative or votive tablets or of boundary-stones found *in situ*; the value of this evidence is, on the other hand, sometimes neutralized owing to the former removal of building material already used and its incorporation in later structures. Thus sepulchral inscriptions have been found on the Acropolis, though no burials took place there in ancient times. In the next place comes the evidence derived from the whole range of ancient literature and specially from descriptions of the city or its different localities. The earliest known description of Athens was that of Diodorus, ὁ περιηγτής, who lived in the second half of the 4th century B.C. Among his successors were Polemon of Ilium (beginning of 2nd century B.C.), whose great κοσμική περιήγησις gave a minute account of the votive offerings on the Acropolis and the tombs on the Sacred Way; and Heliodorus (second half of the 2nd century) who wrote fifteen volumes on the monuments of Athens. Of these and other works of the earliest topographers only some fragments remain. In the period between A.D. 143 and 159 Pausanias visited Athens at a time when the monuments of the great age were still in their perfection and the principal embellishments of the Roman period had already been completed. The first thirty chapters of his invaluable *Description of Greece* (περιήγησις τῆς Ἑλλάδος) are devoted to Athens, its ports and environs. Pausanias makes no claim to exhaustiveness; he selected what was best worth noticing (τὰ ἀξιολογώτατα). His account, drawn up from notes taken in the main from personal observation, possesses an especial importance for topographical research, owing to his method of describing each object in the order in which he saw it during the course of his walks. His accuracy, which has been called in question by some scholars, has been remarkably vindicated by recent excavations at Athens and elsewhere. The list of ancient topographers closes with Pausanias. The literature of succeeding centuries furnishes only isolated references; the more important are found in the scholia on Aristophanes, the lexicons of Hesychius, Photius and others, and the *Etymologicum Magnum*. The notices of Athens during the earlier middle ages are scanty in the extreme. In 1395 Niccola da Martoni, a pilgrim from the Holy Land, visited Athens and wrote a description of a portion of the city. Of the work of Cyriac of Ancona, written about 1450, only some fragments remain, which are well supplemented by the contemporaneous description of the capable observer known as the "Anonymous of Milan." Two treatises in Greek by unknown writers belong to the same period. The Dutchman Joannes Meursius (1579-1639) wrote three disquisitions on Athenian topography. The conquest by Venice in 1687 led to the publication of several works in that city, including the descriptions of De la Rue and Fanelli and the maps of Coronelli and others. The systematic study of Athenian topography was begun in the 17th century by French residents at Athens, the consuls Giraud and Chataignier and the Capuchin monks. The visit of the French physician Jacques Spon and the Englishman, Sir George Wheler or Wheeler (1650-1723), fortunately took place before the catastrophe of the Parthenon in 1687; Spon's *Voyage d'Italie, de Dalmatie, de Grèce et du Levant*, which contained the first scientific description of the ruins of Athens, appeared in 1678; Wheler's *Journey into Greece*, in 1682. A period of British activity in research followed in the 18th century. The monumental work of James Stuart and Nicholas Revett, who spent three years at Athens (1751-1754), marked an epoch in the progress of Athenian topography and is still indispensable to its study, owing to the demolition of ancient buildings which began about the middle of the 18th century. To this period also belong the labours of Richard Pococke and Richard Dalton, Richard Chandler, E.D. Clarke and Edward Dodwell. The great work of W.M. Leake (*Topography of Athens and the Demi*, 2nd ed., 1841) brought the descriptive literature to an end and inaugurated the period of modern scientific research, in which German archaeologists have played a distinguished part.

Recent research.

Recent investigation has thrown a new and unexpected light on the art, the monuments and the topography of the ancient city. Numerous and costly excavations have been carried out by the Greek government and by native and foreign scientific societies, while accidental discoveries have been frequently made during the building of the modern town. The museums, enriched by a constant inflow of works of art and inscriptions, have been carefully and scientifically arranged, and afford opportunities for systematic study denied to scholars of the past generation. Improved means of communication have enabled many acute observers to apply the test of scrutiny on the spot to theories and conclusions mainly based on literary evidence; five foreign schools of archaeology, directed by eminent scholars, lend valuable aid to students of all nationalities, and lectures are frequently delivered in the museums and on the more interesting and important sites. The native archaeologists of the present day hold a recognized position in the scientific work; the patriotic sentiment of former times, which prompted their zeal but occasionally warped their judgment, has been merged in devotion to science for its own sake, and the supervision of excavations, as well as the control of the art-collections, is now in highly competent hands. Athens has thus become a centre of learning, a meeting-place for scholars and a basis for research in every part of the Greek world. The attention of many students has naturally been concentrated on the ancient city, the birthplace of European art and literature, and a great development of investigation and discussion in the special domain of Athenian archaeology has given birth to a voluminous literature. Many theories hitherto universally accepted have been called in question or proved to be unsound: the views of Leake, for instance, have been challenged on various points, though many of his conclusions have been justified and confirmed. The supreme importance of a study of Greek antiquities on the spot, long understood by scholars in Europe and in America, has gradually come to be recognized in England, where a close attention to ancient texts, not always adequately supplemented by a course of local study and observation, formerly fostered a peculiarly conservative attitude in regard to the problems of Greek archaeology. Since the foundation of the German Institute in 1874, Athenian topography has to a large extent become

a speciality of German scholars, among whom Wilhelm Dörpfeld occupies a pre-eminent position owing to his great architectural attainments and unrivalled local knowledge. Many of his bold and novel theories have provoked strenuous opposition, while others have met with general acceptance, except among scholars of the more conservative type.



(Click to enlarge.)

Prehistoric Athens.—Numerous traces of the "Mycenaean" epoch have recently been brought to light in Athens and its neighbourhood. Among the monuments of this age discovered in the surrounding districts are the rock-hewn tombs of Spata, accidentally revealed by a landslip in 1877, and domed sepulchre at Menidí, near the ancient Acharnae, excavated by Lolling in 1879. Other "Mycenaean" landmarks have been laid bare at Eleusis, Thoricus, Halae and Aphidna. These structures, however, are of comparatively minor importance in point of dimensions and decoration; they were apparently designed as places of sepulture for local chieftains, whose domains were afterwards incorporated in the Athenian realm by the συνοικισμός (synoecism) attributed to Theseus. The situation of the Acropolis, dominating the surrounding plain and possessing easy communication with the sea, favoured the formation of a relatively powerful state—inferior, however, to Tiryns and Mycenae; the myths of Cecrops, Erechtheus and Theseus bear witness to the might of the princes who ruled in the Athenian citadel, and here we may naturally expect to find traces of massive fortifications resembling in some degree those of the great Argolid cities. Such in fact have been brought to light by the modern excavations on the Acropolis (1885-1889). Remains of primitive polygonal walls which undoubtedly surrounded the entire area have been found at various points a little within the circuit of the existing parapet. The best-preserved portions are at the eastern extremity, at the northern side near the ancient "royal" exit, and at the south-western angle. The course of the walls can be traced with a few interruptions along the southern side. On the northern side are the foundations of a primitive tower and other remains, apparently of dwelling-houses, one of which may have been the πυκινὸς δόμος Ἐρεχθῆος mentioned by Homer (*Od.* vii. 81). Among the foundations were discovered fragments of "Mycenaean" pottery. The various approaches to the citadel on the northern side—the rock-cut flight of steps north-east of the Erechtheum (*q.v.*), the stairs leading to the well Clepsydra, and the intermediate passage supposed to have furnished access to the Persians—are all to be attributed to the primitive epoch. Two pieces of polygonal wall, one beneath the bastion of Nike Apteros, the other in a direct line between the Roman gateway and the door of the Propylaea, are all that remain of the primitive defences of the main entrance.

The early citadel.

These early fortifications of the Acropolis, ascribed to the primitive non-hellenic Pelasgi, must be distinguished from the Pelasgicum Or Pelargicum, which was in all probability an encircling wall, built round the base of the citadel and furnished with nine gates from which it derived the name of Enneapylon. Such a wall would be required to protect the clusters of dwellings around the Acropolis as well as the springs issuing from the rock, while the gates opening in various directions would give access to the surrounding pastures and gardens. This view, which is that of E. Curtius, alone harmonizes with the statement of Herodotus (vi. 137) that the wall was "around" (περί) the Acropolis, and that of Thucydides (ii. 17) that it was "beneath" (ὑπό) the fortress. Thus it would appear that the citadel had an outer and an inner line of defence in prehistoric times. The space enclosed by the outer wall was left unoccupied after the Persian wars in deference to an oracular response apparently dictated by military considerations, the maintenance of an open zone being desirable for the defence of the citadel. A portion of the outer wall has been recognized in a piece of primitive masonry discovered near the Odeum of Herodes Atticus; other traces will probably come to light when the northern and eastern slopes of the Acropolis have been completely explored. Leake, whom Frazer follows, assumed the Pelasgicum to be a fortified space at the western end of the Acropolis; this view necessitates the assumption that the nine gates were built one within the other, but early antiquity furnishes no instance of such a construction; Dörpfeld believes it to have extended from the grotto of Pan to the sacred precinct of Asclepius. The well-known passage of Lucian (*Piscator*, 47) cannot be regarded as decisive for any of the theories advanced, as any portion of the old *enceinte* dismantled by the Persians may have retained the name in later times. The Pelasgic wall enclosed the spring Clepsydra, beneath the north-western corner of the Acropolis, which furnished a water-supply to the defenders of the fortress. The spring, to which a staircase leads down, was once more included in a bastion during the War of Independence by the Greek chief Odysseus.

The Pelasgicum.

To the "Pelasgic" era may perhaps be referred (with Curtius and Milchhöfer) the immense double terrace on the north-eastern slope of the Pnyx (395 ft. by 212), the upper portion of which is cut out of the rock, while the lower is enclosed by a semicircular wall of massive masonry; the theory of these scholars, however, that the whole precinct was a sanctuary of the Pelasgian Zeus cannot be regarded as proved, nor is it easy to abandon the generally received view that this was the scene of the popular assemblies of later times, notwithstanding the apparent unsuitability of the ground and the insufficiency of room for a large multitude. These difficulties are met by the assumption that the semicircular masonry formed the base of a retaining-wall which rose to a considerable height, supporting a theatre-like structure capable of seating many thousand persons. The masonry may be attributed to the 5th century; the chiselling of the immense blocks is not "Cyclopean." Projecting from the upper platform at the centre of the chord of the semicircular area is a cube of rock, 11 ft. square and 5 ft. high, approached on either side by a flight of steps leading to the top; this block, which Curtius supposes to have been the primitive altar of Zeus Ὕψιστος, may be safely identified with the orators' bema, ὁ λίθος

The Pnyx.

ἐν τῇ Πυκνί (Aristoph. *Pax*, 680). Plutarch's statement that the Thirty Tyrants removed the bema so as to face the land instead of the sea is probably due to a misunderstanding. Other cubes of rock, apparently altars, exist in the neighbourhood. There can be little doubt that the Pnyx was the seat of an ancient cult; the meetings of the Ecclesia were of a religious character and were preceded by a sacrifice to Zeus Ἀγοραῖος; nor is it conceivable that, but for its sacred associations, a site would have been chosen so unsuitable for the purposes of a popular assembly as to need the addition of a costly artificial auditorium.

Rock-dwellings and tombs.

The Pnyx, the Hill of the Nymphs and the Museum Hill are covered with vestiges of early settlements which extend to a considerable distance towards the south-east in the direction of Phalerum. They consist of chambers of various sizes, some of which were evidently human habitations, together with cisterns, channels, seats, steps, terraces and quadrangular tombs, all cut in the rock. This neighbourhood was held by Curtius to have been the site of the primeval rock city, κρανάα πόλις (Aristoph. *Ach*. 75), anterior to the occupation of the Acropolis and afterwards abandoned for the later settlement. It seems inconceivable, however, that any other site should have been preferred by the primitive settlers to the Acropolis, which offered the greatest advantages for defence; the Pnyx, owing to its proximity to the centres of civic life, can never have been deserted, and that portion which lay within the city walls must have been fully occupied when Athens was crowded during the Peloponnesian War. Some of the rock chambers originally intended for tombs were afterwards converted, perhaps under pressure of necessity, into habitations, as in the case of the so-called "Prison of Socrates," which consists of three chambers horizontally excavated and a small round apartment of the "beehive" type. The remains on the Pnyx and its neighbourhood cannot all be assigned to one epoch, the prehistoric age. The dwellings do not correspond in size or details with the undoubtedly prehistoric abodes on the Acropolis. In view of the ancient law which forbade burial within the city, the tombs within the circuit of the city walls must either be earlier than the time of Themistocles or several centuries later; in the similar rock-tombs on the neighbouring slopes of the Acropolis and Areopagus both Mycenaean and Dipylon pottery have been found. But the numerous vertically excavated tombs outside the walls are of late date and belong for the most part to the Roman period.

The Areopagus.

The Areopagus is now a bare rock possessing few architectural traces. The legend of its occupation by the Amazons (Aeschylus, *Eum*. 681 seq.) may be taken as indicating its military importance for an attack on the Acropolis; the Persians used it as a *point d'appui* for their assault. The seat of the old oligarchical council and court for homicide was probably on its eastern height. Here were the altar of Athena Areia and two stones, the λίθος Ὕβρεως, on which the accuser, and the λίθος Ἀναιδείας, on which the accused, took their stand. Beneath, at the north-eastern corner, is the cleft which formed the sanctuary of the Σεμναί, or Erinyes. There is no reason for disturbing the associations connected with this spot as the scene of St Paul's address to the Athenians (E. Gardner, *Anc. Athens*, p. 505).

Hellenic Period.—While modern research has added considerably to our knowledge of prehistoric Athens, a still greater light has been thrown on the architecture and topography of the city in the earlier historic or "archaic" era, the subsequent age of Athenian greatness, and the period of decadence which set in with the Macedonian conquest; the first extends from the dawn of history to 480-479 B.C., when the city was destroyed by the Persians; the second, or classical, age closes in 322 B.C., when Athens lost its political independence after the Lamian War; the third, or Hellenistic, in 146 B.C., when the state fell under Roman protection. We must here group these important epochs together, as distinguished from the later period of Roman rule, and confine ourselves to a brief notice of their principal monuments and a record of the discoveries by which they have been illustrated in recent years.

The city in the "archaic" era.

The earliest settlement on the Acropolis was doubtless soon increased by groups of dwellings at its base, inhabited by the dependents of the princes who ruled in the stronghold. These habitations would naturally in the first instance lie in close proximity to the western approach; after the building of the Pelasgicum they seem to have extended beyond its walls towards the south and south-west—towards the sea and the waters of the Ilissus. The district thus occupied sloped towards the sun and was sheltered by the Acropolis from the prevailing northerly winds. The Thesean synoecism led to the introduction of new cults and the foundation of new shrines partly on the Acropolis, partly in the inhabited district at its base both within and without the wall of the Pelasgicum. Some of the shrines in this region are mentioned by Thucydides in a passage which is of capital importance for the topography of the city at this period (ii. 15). By degrees the inhabited area began to comprise the open ground to the north-west, the nearer portion of the later Ceramicus, or "potters' field" (afterwards divided by the walls of Themistocles into the Inner and Outer Ceramicus), and eventually extended to the north and east of the citadel, which, by the beginning of the 5th century B.C., had become the centre of a circular or wheel-shaped city, πόλιος τροχοειδέος ἄκρα κάρηνα (Oracle *apud* Herod, vii. 140). To this enlarged city was applied, probably about the second half of the 6th century, the special designation τὸ ἄστυ, which afterwards distinguished Athens from its port, the Peiracus; the Acropolis was already ἡ πόλις (Thucyd. ii. 15). The city is supposed to have been surrounded by a wall before the time of Solon, the existence of which may be deduced from Thucydides' account of the assassination of Hipparchus (vi. 57), but no certain traces of such a wall have been discovered; the materials may have been removed to build the walls of Themistocles.

The Agora.

The centre of commercial and civic life of the older group of communities, as of the greater city of the classical age, was the Agora or market. Here were the various public buildings, which, when the power of the princes on the citadel was transferred to the archons, formed the offices of the administrative magistracy. The site of the primitive Agora (ἀρχαία ἀγορά) was probably in the hollow between the Acropolis and the Pnyx, which formed a convenient meeting-place for the dwellers on the north and south sides of the fortress as well as for its inhabitants. In the time of the Peisistratids the Agora was enlarged so as to extend over the Inner Ceramicus on the north-west, apparently reaching the northern declivities of the Areopagus and the Acropolis on the south. After the Persian Wars the northern portion was used for commercial, the southern for political and ceremonial purposes. In the southern were the Orchestra, where the Dionysiac dances took place, and the famous statues of Harmodius and Aristogeiton by Antenor which were carried away by Xerxes; also the Metroum, or temple of the Mother of the Gods, the Bouleuterium, or council-chamber of the Five Hundred, the Prytaneum, the hearth of the combined communities, where the guests of the state dined, the temple of the Dioscuri, and the Tholus, or Skias, a circular stone-domed building in which the Prytaneis were maintained at the public expense; in the northern were the Leocorium, where Hipparchus was slain, the στοὰ βασιλική, the famous στοὰ ποικίλη, where Zeno taught, and other structures. The Agora was commonly described as the "Ceramicus," and Pausanias gives it this name; of the numerous buildings which he saw here scarcely a trace remains; their position, for the most part, is largely conjectural, and the exact boundaries of the Agora itself are uncertain. What are perhaps the remains of the στοὰ βασιλική, in which the Archon Basileus held his court and the Areopagus Council sat in later times, were brought to light in the winter of 1897-1898, when excavations were carried out on the eastern slope of the "Theseum" hill. Here was found a rectangular structure resembling a temple, but with a side door to the north; it possessed a portico of six columns. The north slope of the Areopagus, where a number of early tombs were found, was also explored, and the limits of the Agora on the south and north-west were approximately ascertained. A portion of the main road leading from the Dipylon to the Agora was discovered.

The Enneacrunus.

In 1892 Dörpfeld began a series of excavations in the district between the Acropolis and the Pnyx with the object of determining the situation of the buildings described by Pausanias as existing in the neighbourhood of the Agora, and more especially the position of the Enneacrunus fountain. The Enneacrunus has hitherto been generally identified with the spring Callirrhoe in the bed of the Ilissus, a little to the south-east of the Olympieum; it is apparently, though not explicitly, placed by Thucydides (ii. 15) in proximity to that building, as well as the temple of Dionysus ἐν λίμναις and other shrines, the temples of Zeus Olympius and of Ge and the Pythium, which he mentions as situated mainly to the south of the Acropolis. On the other hand, Pausanias (i. 14. 1), who never deviates without reason from the topographical order of his narrative, mentions the Enneacrunus in the midst of his description of certain buildings which were undoubtedly in the region of the Agora, and unless he is guilty of an unaccountable digression the Enneacrunus which he saw must have lain west of the Acropolis. It is now generally agreed that the Agora of classical times covered the low ground between the hill of the "Theseum," the Areopagus and the Pnyx; and Pausanias, in the course of his description, appears to have reached its southern end. The excavations revealed a main road of surprisingly narrow dimensions winding up from the Agora to the Acropolis. A little to the south-west of the point where the road turns towards the Propylaca was found a large rock-cut cistern or reservoir which Dörpfeld identifies with the Enneacrunus. The reservoir is supplied by a conduit of 6th-century tiles connected with an early stone aqueduct, the course of which is traceable beneath the Dionysiac theatre and the royal garden in the direction of the Upper Ilissus. These elaborate waterworks were, according to Dörpfeld, constructed by the Peisistratids in order to increase the supply from the ancient spring Callirrhoe; the fountain was furnished with nine jets and henceforth known as Enneacrunus. This identification has been hotly contested by many scholars, and the question must still be regarded as undecided. An interesting confirmation of Dörpfeld's view is furnished by the map of Guillet and Coronelli, published in 1672, in which the Enneacrunus is depicted as a well with a stream of running water in the neighbourhood of the Pnyx. The fact that spring water is not now found in this locality is by no means fatal to the theory; recent engineering investigations have shown that much of the surface water of the Attic plain has sunk to a lower level. In front of the reservoir is a small open space towards which several roads converge; close by is a triangular enclosure of polygonal masonry, in which were found various relics relating to the worship of Dionysus, a very ancient wine-press (ληνός) and the

remains of a small temple. Built over this early precinct, which Dörpfeld identifies with the Dionysium ἐν λίμναις, or Lenaeum, is a basilica-shaped building of the Roman period, apparently sacred to Bacchus; in this was found an inscription containing the rules of the society of the Iobacchi. There is an obvious difficulty in assuming that λίμναι, in the sense of "marshes," existed in this confined area, but stagnant pools may still be seen here in winter. Dörpfeld's identification of the Dionysium, ἐν λίμναις cannot be regarded as proved; his view that another Pythium and another Olympieum existed in this neighbourhood is still less probable; but the inconclusiveness of these theories does not necessarily invalidate his identification of the Enneacrunus, with regard to the position of which the language of Thucydides is far from clear. Another enclosure, a little to the south, is proved by an inscription to have been a sanctuary of the hitherto unknown hero Amynos, with whose cult those of Asclepius and the hero Dexion were here associated; under the name Dexion, the poet Sophocles is said to have been worshipped after his death. The whole district adjoining the Areopagus was found to have been thickly built over; the small, mean dwelling-houses intersected by narrow, crooked lanes convey a vivid idea of the contrast between the modest private residences and the great public structures of the ancient city. 835

The Academy and Lyceum.

The age of the Peisistratids (560-511 B.C.) marked an era in the history of Athenian topography. The greatest of their foundations, the temple of Olympian Zeus, will be referred to later. Among the monuments of their rule, in addition to the enlarged Agora and the Enneacrunus, were the Academy and perhaps the Lyceum. The original name of the Academy may have been Hecademia, from Hecademus, an early proprietor (but see Academy, Greek). The famous seat of the Platonic philosophy was a gymnasium enlarged as a public park by Cimon; it lay about a mile to the north-west of the Dipylon Gate, with which it was connected by a street bordered with tombs. The Lyceum, where Aristotle taught, was originally a sanctuary of Apollo Lyceius. Like the Academy, it was an enclosure with a gymnasium and garden; it lay to the east of the city beyond the Diocharean Gate.

The Acropolis before the Persian wars.

Little was known of the buildings on the Acropolis in the pre-Persian period before the great excavations of 1885-1888, which rank among the most surprising achievements of modern research. The results of these operations, which were conducted by the Archaeological Society under the direction of Kavvadias and Kawerau, must be summarized with the utmost brevity. The great deposits of sculpture and pottery now unearthed, representing all that escaped from the the ravages of the Persians and the burning of the ancient shrines, afford a startling revelation of the development of Greek art in the 7th and 6th centuries. Numbers of statues—among them a series of draped and richly-coloured female figures—masterpieces of painted pottery, only equalled by the Attic vases found in Magna Grecia and Etruria, and numerous bronzes, were among the treasures of art now brought to light. All belong to the "archaic" epoch; only a few remains of the greater age were found, including some fragments of sculptures from the Parthenon and Erechtheum. We are principally concerned, however, with the results which add to our knowledge of the topography and architecture of the Acropolis. The entire area of the summit was now thoroughly explored, the excavations being carried down to the surface of the rock, which on the southern side was found to slope outwards to a depth of about 45 ft. In the lower strata were discovered the remnants of Cyclopean or prehistoric architecture already mentioned. Of later date, perhaps, are the limestone polygonal retaining walls on the west front, which extended on either side of the early entrance. Of these a portion may probably be attributed to the Peisistratids, in whose time the Acropolis once more became the stronghold of a despotism. Its fortifications, though not increased, were apparently strengthened by the Tyrants. To its embellishment they probably contributed the older ornamental entrance, facing south-west, the precursor of the greater structure of Mnesicles (see Propylaea) and the colonnade of the "Hecatompedon," or earlier temple of Athena, at this time the only large sacred edifice on the citadel. The name was subsequently applied to the cella, or eastern chamber, of the Parthenon, which is exactly 100 ft. long, and also became a popular designation of the temple itself.

The old temple of Athena.

The ancient Hecatompedon may in all probability be identified with an early temple, also 100 ft. long, the foundations of which were pointed out in 1885 by Dörpfeld on the ground immediately adjoining the south side of the Erechtheum. On this spot was apparently the primitive sanctuary of Athena, the rich temple πίων νηός of Homer (*Il.* ii. 549), in which the cult of the goddess was associated with that of Erechtheus; the Homeric temple is identified by Furtwängler with the "compact house of Erechtheus" (*Od.* vii. 81), which, he holds, was not a royal palace, but a place of worship, and traces of it may perhaps be recognized in the fragments of prehistoric masonry enclosed by the existing foundations. The foundations seem to belong to the 7th century, except those of the colonnade, which was possibly added by Peisistratus. According to Dörpfeld, this was the "old temple" of Athena Polias, frequently mentioned in literature and inscriptions, in which was housed the most holy image ξόανον of the goddess which fell from heaven; it was burnt, but not completely destroyed, during the Persian War, and some of its external decorations were afterwards built into the north wall of the Acropolis; it was subsequently restored, he thinks, with or without its colonnade—in the former case a portion of the peristyle must have been removed when the Erechtheum was built so as to make room for the porch of the maidens; the building was set on fire in 406 B.C. (Xen. *Hell.* i. 6. 1), and the conflagration is identical with that mentioned by Demosthenes (*In Timocr.* xxiv. 155); its "opisthodomos" served as the Athenian treasury in the 5th and 4th centuries; the temple is the ἀρχαῖος νεὼς τῆς Πολιάδος mentioned by Strabo (ix. 16), and it was still standing in the time of Pausanias, who applies to it the same name (i. 27. 3). The conclusion that the foundations are those of an old temple burnt by the Persians has been generally accepted, but other portions of Dörpfeld's theory—more especially his assumption that the temple was restored after the Persian War—have provoked much controversy. Thus J.G. Frazer maintains the hitherto current theory that the earlier temple of Athena and Erechtheus was on the site of the Erechtheum; that the Erechtheum inherited the name ἀρχαῖος νεώς from its predecessor, and that the "opisthodomos" in which the treasures were kept was the west chamber of the Parthenon; Furtwängler and Milchhöfer hold the strange view that the "opisthodomos" was a separate building at the east end of the Acropolis, while Penrose thinks the building discovered by Dörpfeld was possibly the Cecropeum. E. Curtius and J.W. White, on the other hand, accept Dörpfeld's identification, but believe that only the western portion of the temple or opisthodomos was rebuilt after the Persian War. Admitting the identification, we may perhaps conclude that the temple was repaired in order to provide a temporary home for the venerated image and other sacred objects; no traces of a restoration exist, but the walls probably remained standing after the Persian conflagration. The removal of the ancient temple was undoubtedly intended when the Erechtheum was built, but superstition and popular feeling may have prevented its demolition and the removal of the ξόανον to the new edifice. The temple consisted of an eastern cella with pronaos; behind this was the opisthodomos, divided into three chambers—possibly treasuries—with a portico at the western end. The peristyle, if we compare the measurements of the stylobate with those of the drums built into the wall of the Acropolis, may be concluded to have consisted of six Doric columns at the ends and twelve at the sides. In one of the pediments was a gigantomachy, of which some fragments have been recovered.

The grottoes of Pan and Apollo.

In 1896 excavations with the object of exploring the whole northern and eastern slopes of the Acropolis were begun by Kavvadias. The pathway between the citadel and the Areopagus was found to be so narrow that it is certain the Panathenaic procession cannot have taken this route to the Acropolis. On the north-west rock the caves known as the grottoes of Pan and Apollo were cleared out; these consist of a slight high-arched indentation immediately to the east of the Clepsydra and a double and somewhat deeper cavern a little farther to the east. In the first mentioned are a number of niches in which πίνακες (votive tablets) were placed: some of these, inscribed with dedications to Apollo, have been discovered. The whole locality was the seat of the ancient cult of this deity, afterwards styled "Hypacraeus," with which was associated the legend of Creüsa and the birth of Ion. The worship of Pan was introduced after the Persian wars, in consequence of an apparition seen by Pheidippides, the Athenian courier, in the mountains of Arcadia. Another cave more to the west was revealed by the demolition of the bastion of Odysseus. To the east a much deeper and hitherto unknown cavern has been revealed, which Kavvadias identifies with the grotto of Pan. Close to it are a series of steps hewn in the rock which connect with those discovered in 1886 within the Acropolis wall. Farther east is an underground passage leading eastward to a cave supposed to be the sanctuary of Aglaurus where the ephebi took the oath; with this passage is connected a secret staircase leading up through a cleft in the rock to the precinct of the Errephori on the Acropolis. It is conceivable that the priestesses employed this exit when descending on their mysterious errand. 836

The classical period: the walls of Themistocles.

In the fifty years between the Persian and the Peloponnesian wars architecture and plastic art attained their highest perfection in Athens. The almost complete destruction of the buildings on the Acropolis and in the lower city, among them many temples and shrines which religious sentiment might otherwise have preserved, facilitated the realization of the magnificent architectural designs of Themistocles, Cimon and Pericles, while the rapid growth of the Athenian empire provided the state with the necessary means for the execution of these sumptuous projects. Of the great monuments of this epoch few traces remain except on the Acropolis. After the departure of the Persians the first necessity was the reconstruction of the defences of the city and the citadel. The walls of the city, now built under the direction of Themistocles, embraced a larger area than the previous circuit, with which they seem to have coincided at the Dipylon Gate on the north-west where the Sacred Way to Eleusis was joined by the principal carriage route to the Peiraeus and the roads to the Academy and Colonus. The other more important gates were the Peiraic and Melitan on the west; the Itonian on the south leading to Phalerum, the Diomean and Diocharean on the east, and the Acharnian on the north. The wall, which was strengthened with numerous towers, enclosed the quarters of Collytus on the north, Melite on the west, Limnae on the south-west and south, and Diomea on the east. The scanty traces which remain have not been systematically excavated except in the neighbourhood of the Dipylon; the discovery of sepulchral tablets

built into the masonry illustrates the statement of Thucydides with regard to the employment of such material in the hasty construction of the walls. The circuit has been practically ascertained in its general lines, though not in details; it is given by Thucydides (ii. 13. 7) as 43 stades (about 5½ m.) exclusive of the portion between the points of junction with the long walls extending to the Peiraeus, but the whole circumference cannot have exceeded 37 stades. Possibly Thucydides, who in the passage referred to is dealing with the question of defence, included a portion of the contiguous long walls in his measurement; this explanation derives probability from his underestimate of the length of the long walls.

The "Long Walls".

The design of connecting Athens with the Peiraeus by long parallel walls is ascribed by Plutarch to Themistocles. The "Long Walls" (τὰ μακρὰ τείχη, τὰ σκέλη) consisted of (1) the "North Wall" (τὸ βόρειον τεῖχος), (2) the "Middle" or "South Wall" (τὸ διὰ μέσου τεῖχος, Plato, *Gorg.* 555 E; τὸ νότιον τεῖχος); and (3) the "Phaleric Wall" (τὸ Φαληρικὸν τεῖχος; The north and Phaleric walls were perhaps founded by Cimon, and were completed about 457 B.C. in the early administration of Pericles; the middle wall was built about 445 B.C. The lines of the north and middle walls have been ascertained from the remnants still existing in the 18th century and the scantier traces now visible. The north wall, leaving the city circuit at a point near the modern Observatory, ran from north-east to south-west near the present road to the Peiraeus, until it reached the Peiraeus walls a little to the east of their northernmost bend. The middle wall, beginning south of the Pnyx near the Melitan Gate, gradually approached the northern wall and, following a parallel course at an interval of 550 ft., diverged to the east near the modern New Phalerum and joined the Peiraeus walls on the height of Munychia where they turn inland from the sea. The course of the Phaleric wall has been much disputed. The widely-received view of Curtius that it ran to Cape Kolias (now Old Phalerum) on the east of the Phaleric bay is not accepted by recent topographers. The exigencies of the defensive system planned by Themistocles could only have been satisfied by a juncture of the Phaleric wall with that of the Peiraeus. The existence of any third wall was denied by Leake, according to whose theory the southern parallel wall would be identical with the Phaleric. The language of Thucydides, however, seems decisive with regard to the existence of three walls. The Phaleric wall, branching from the city circuit at some point farther east than the middle or south wall, may have followed the ridge of the Sikelia heights, where some traces of fortifications remain, and then traversed the Phalerum plain till it reached the Peiraeus defences at a point a little to the north-west of their junction with the middle wall. The Phaleric wall, proving indefensible, was abandoned towards the close of the Peloponnesian war; with the other two walls it was completely destroyed after the surrender of the city, and was not rebuilt when they were restored by Conon in 393 B.C. The parallel walls fell into decay, during the Hellenistic period, and according to Strabo (ix. 396) were once more demolished by Sulla.

The Peiraeus.

The great advantages which the Peiraic promontory with its three natural harbours offered for purposes of defence and commerce were first recognized by Themistocles, in whose archonship (493 B.C.) the fortifications of the Peiraeus were begun. Before his time the Athenians used as a port the roadstead of Phalerum at the north-eastern corner of Phalerum bay partly sheltered by Cape Kolias. As soon as the building of the city walls had been completed, Themistocles resumed the construction of the Peiraeus defences, which protected the larger harbour of Cantharus on the west and the smaller ports of Zea and Munychia (respectively south-west and south-east of the Munychia heights), terminating in moles at their entrances and enclosing the entire promontory on the land and sea sides except a portion of the south-west shore of the peninsula of Acte. The walls, built of finely compacted blocks, were about 10 ft. in thickness and upwards of 60 ft. in height, and were strengthened by towers. The town was laid out at great expense in straight, broad streets, intersecting each other at right angles, by the architect Hippodamus of Miletus in the time of Pericles. In the centre was the Agora of Hippodamus; on the western margin of the Cantharus harbour extended the emporium, or Digma, the centre of commercial activity, flanked by a series of porticoes; at its northern end, near the entrance to the inner harbour, was another Agora, on the site of the modern market-place, and near it the μακρὰ στοά, the corn depot of the state. This inner and shallower harbour, perhaps the κωφὸς λιμήν, was afterwards excluded from the town precinct by the walls of Conon, which traversing its opening on an embankment (τὸ διὰ μέσου χῶμα) ran round the outer shore of the western promontory of Eëtionea, previously enclosed, with some space to the north-west, by the wider circuit of Themistocles. In the harbours of Zea and Munychia traces may be seen of the remarkable series of galley-slips in which the Athenian fleet was built and repaired. The galley-slips around Zea were roofed by a row of gables supported by stone columns, each gable sheltering two triremes. Among the other noteworthy buildings of the Peiraeus were the arsenal (σκευοθήκη) of Philo and the temples of Zeus Soter, the patron god of the sailors, of the Cnidian Artemis, built by Cimon, and of Artemis Munychia, situated near the fort on the Munychia height; traces of a temple of Asclepius, of two theatres and of a hippodrome remain. The fine marble lion of the classical period which stood at the mouth of the Cantharus harbour gave the Peiraeus its medieval and modern names of Porto Leone and Porto Draco; it was carried away to Venice by Morosini.

The Dipylon and Ceramicus.

In 1870 the Greek Archaeological Society undertook a series of excavations in the Outer Ceramicus, which had already been partially explored by various scholars. The operations, which were carried on at intervals till 1890, resulted in the discovery of the Dipylon Gate, the principal entrance of ancient Athens. The Dipylon consists of an outer and an inner gate separated by an oblong courtyard and flanked on either side by towers; the gates were themselves double, being each composed of two apertures intended for the incoming and outgoing traffic. An opening in the city wall a little to the south-west, supposed to have been the Sacred Gate (ἱερὰ πύλη), was in all probability an outlet for the waters of the Eridanus. This stream, which has hitherto been regarded as the eastern branch of the Ilissus rising at Kaesariane, has been identified by Dörpfeld with a brook descending from the south slope of Lycabettus and conducted in an artificial channel to the north-western end of the city, where it made its exit through the walls, eventually joining the Ilissus. The channel was open in Greek times, but was afterwards covered by Roman arches; it appears to have served as the main drain of the city. Between this outlet and the Dipylon were found a boundary-stone, inscribed ὅρος Κεραμεικοῦ, which remains in its place, and the foundations of a large rectangular building, possibly the Pompeium, which may have been a robing-room for the processions which passed this way. On either side of the Dipylon the walls of Themistocles, faced on the outside by a later wall, have been traced for a considerable distance. The excavation of the outlying cemetery revealed the unique "Street of the Tombs" and brought to light a great number of sepulchral monuments, many of which remain *in situ*. Especially noteworthy are the *stelae* (reliefs) representing scenes of leave-taking, which, though often of simple workmanship, are characterized by a touching dignity and restraint of feeling. In this neighbourhood were found a great number of tombs containing vases of all periods, which furnish a marvellous record of the development of Attic ceramic art. A considerable portion of the district remains unexplored.

The Acropolis of the classical period: its fortifications and area.

The Acropolis had been dismantled as a fortress after the expulsion of Hippias; its defenders against the Persians found it necessary to erect a wooden barricade at its entrance. The fortifications were again demolished by the Persians, after whose departure the existing north wall was erected in the time of Themistocles; many columns, metopes and other fragments from the buildings destroyed by the Persians were built into it, possibly owing to haste, as in the case of the city walls, but more probably with the design of commemorating the great historic catastrophe, as the wall was visible from the Agora. The fine walls of the south and east sides were built by Cimon after the victory of the Eurymedon, 468 B.C.; they extend considerably beyond the old Pelasgic circuit, the intervening space being filled up with earth and the débris of the ruined buildings so as to increase the level space of the summit. On the northern side Cimon completed the wall of Themistocles at both ends and added to its height; the ground behind was levelled up on this side also, the platform of the Acropolis thus receiving its present shape and dimensions. The staircase leading down to the sanctuary of Aglaurus was enclosed in masonry. At the south-western corner, on the right of the approach to the old entrance, a bastion of early masonry was encased in a rectangular projection which formed a base for the temple of Nike. The great engineering works of Cimon provided a suitable area for the magnificent structures of the age of Pericles.

The monuments on the Acropolis.

The greater monuments of the classical epoch on the Acropolis are described in separate articles (see Parthenon, Erechtheum, Propylaea). Next in interest to these noble structures is the beautiful little temple of Athena Nike, wrongly designated Nike Apteros (Wingless Victory), standing on the bastion already mentioned; it was begun after 450 B.C. and was probably finished after the outbreak of the Peloponnesian War. The temple, which is entirely of Pentelic marble, is amphiprostyle tetrastyle, with fluted Ionic columns, on a stylobate of three steps; its length is 27 ft., its breadth 18½ ft., and its total height, from the apex of the pediment to the bottom of the steps, 23 ft. The frieze, running round the entire building, represents on its eastern side a number of deities, on its northern and southern sides Greeks fighting with Persians, and on its western side Greeks fighting with Greeks. Before the east front was the altar of Athena Nike. The irregularly shaped precinct around the temple was enclosed by a balustrade about 3 ft. 2 in. in height, decorated on the outside with beautiful reliefs representing a number of winged Victories engaged in the worship of Athena. The elaborate treatment of the drapery enveloping these female figures suggests an approach to the mannerism of later times; this and other indications point to the probability that the balustrade was added in the latter years of the Peloponnesian War. The temple was still standing in 1676; some eight years later it was demolished by the Turks, and its stones built into a bastion; on the removal of the bastion in 1835 the temple was successfully reconstructed by Ross with the employment of little new material. At either corner of the Propylaea entrance were equestrian statues dedicated by the Athenian knights; the bases with inscriptions have lately been recovered. From the inner exit of the Propylaea a passage led towards the east along the north side of the Parthenon; almost directly facing the entrance was the colossal bronze statue of Athena

(afterwards called Athena Promachos) by Pheidias, probably set up by Cimon in commemoration of the Persian defeat. The statue, which was 30 ft. high, represented the goddess as fully armed; the gleam of her helmet and spear could be seen by the mariners approaching from Cape Sunium (Pausanias i. 28). On both sides of the passage were numerous statues, among them that of Athena Hygeïa, set up by Pericles to commemorate the recovery of a favourite slave who was injured during the building of the Parthenon, a colossal bronze image of the wooden horse of Troy, and Myron's group of Marsyas with Athena throwing away her flute. Another statue by Myron, the famous Perseus, stood near the precinct of Artemis Brauronia. In this sacred enclosure, which lay between the south-eastern corner of the Propylaea and the wall of Cimon, no traces of a temple have been found. Adjoining it to the east are the remains of a large rectangular building, which was apparently fronted by a colonnade; this has been identified with the Χαλκοθήκη, a storehouse of bronze implements and arms, which was formerly supposed to lie against the north wall near the Propylaea. Beyond the Parthenon, a little to the north-east, was the great altar of Athena, and near it the statue and altar of Zeus Polieus. With regard to the buildings on the east end of the Acropolis, where the present museums stand, no certainty exists; among the many statues here were those of Xanthippus, the father of Pericles, and of Anacreon. Immediately west of the Erechtheum is the Pandroseum or temenos of Pandrosos, the daughter of Cecrops, the excavation of which has revealed no traces of the temple (ναός) seen here by Pausanias (i. 27). The site of this precinct, in which the sacred olive tree of Athena grew, has been almost certainly fixed by an inscription found in the bastion of Odysseus. At its north-western extremity is a platform of levelled rock which may have supported the altar of Zeus Hypsistus. Farther west, along the north wall of the Acropolis, is the space probably occupied by the abode and playground of the Errephori. Between this precinct and the Propylaea were a number of statues, among them the celebrated heifer of Myron, and perhaps his Erechtheus; the Lemnian Athena of Pheidias, and his effigy of his friend Pericles.

The city in the classical period.

The reconstruction of the city after its demolition by the Persians was not carried out on the lines of a definite plan like that of the Peiraeus. The houses were hastily repaired, and the narrow, crooked streets remained; the influence of Themistocles, who aimed at transferring the capital to the Peiraeus, was probably directed against any costly scheme of restoration, except on the Acropolis. The period of Cimon's administration, however, especially the interval between his victory on the Eurymedon and his ostracism (468-461 B.C.), was marked by great architectural activity in the lower city as well as on the citadel. To his time may be referred many of the buildings around the Agora (probably rebuilt on the former sites) and elsewhere, and the passage, or δρόμος, from the Agora to the Dipylon flanked by long porticos. The Theseum or temple of Theseus, which lay to the east of the Agora near the Acropolis, was built by Cimon: here he deposited the bones of the national hero which he brought from Scyros about 470 B.C. The only building in the city which can with certainty be assigned to the administration of Pericles is the Odeum, beneath the southern declivity of the Acropolis, a structure mainly of wood, said to have been built in imitation of the tent of Xerxes: it was used for musical contests and the rehearsal of plays. Of the various temples in which statues by Pheidias, Alcamenes and other great sculptors are known to have been placed, no traces have yet been discovered; excavation has not been possible in a large portion of the lower city, which has always been inhabited. The only extant structures of the classical period are the Hephaesteum, the Dionysiac theatre, and the choragic monument of Lysicrates. The remains of a small Ionic temple which were standing by the Ilissus in the time of Stuart have disappeared.

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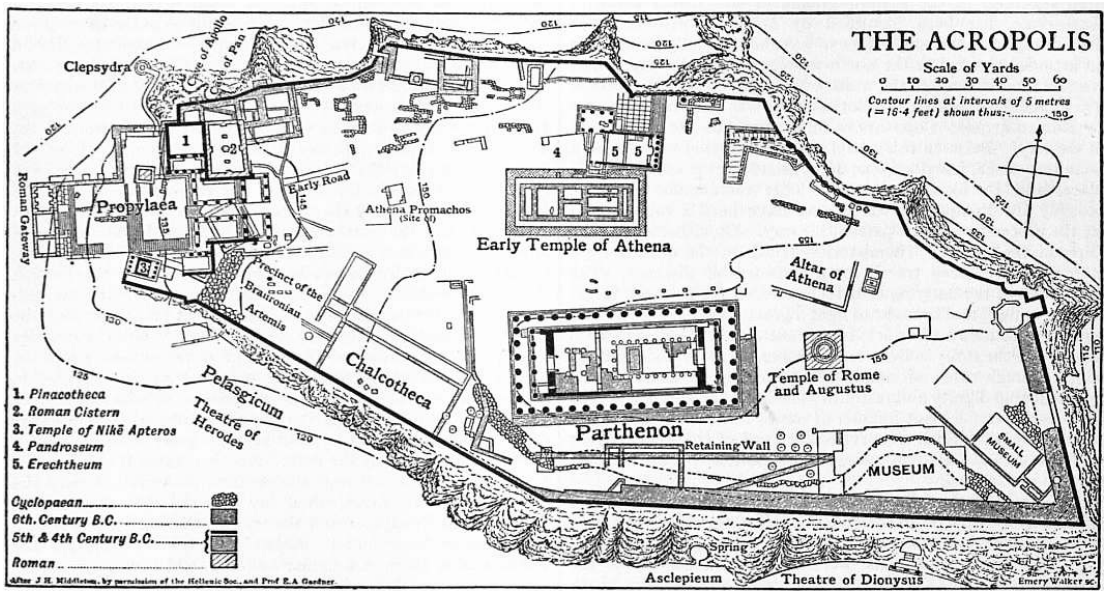

The Hephaesteum, the so-called Theseum, is situated on a slight eminence, probably the Colonus Agoraeus, to the west of the Agora. The best preserved Greek temple in the world, it possesses no record of its origin; the style of its sculptures and architecture leads to the conclusion that it was built about the same time as the Parthenon; it seems to have been finished by 421 B.C. It has been known as the Theseum since the middle ages, apparently because some of its sculptures represent the exploits of Theseus, but the Theseum was an earlier sanctuary on the east of the Agora (see above). The building has been supposed by Curtius, Wachsmuth and others to be the Heracleum in Melite, but its identification with the temple of Hephaestus and Athena seen in this neighbourhood by Pausanias (i. 14. 6), though not established, may be regarded as practically certain, notwithstanding the difficulty presented by the subjects of the sculptures, which bear no relation to Hephaestus. The temple is a Doric peripteral hexastyle *in antis*, with 13 columns at the sides; its length is 104 ft., its breadth 45½ ft., its height, to the top of the pediment, 33 ft. The sculptures of the pediments have been completely lost, but their design has been ingeniously reconstructed by Sauer. The frieze of the entablature contains sculptures only in the metopes of the east front and in those of the sides immediately adjoining it; the frontal metopes represent the labours of Heracles, the lateral the exploits of Theseus. As in the Parthenon, there is a sculptured zophoros above the exterior of the cella walls; this, however, extends over the east and west fronts only and the east ends of the sides; the eastern zophoros represents a battle-scene with seated deities on either hand, the western a centauromachia. The temple is entirely of Pentelic marble, except the foundations and lowest step of the stylobate, which are of Peiraic stone, and the zophoros of the cella, which is in Parian marble. The preservation of the temple is due to its conversion into a church in the middle ages.

The Hephaesteum or Theseum.

The Dionysiac theatre, situated beneath the south side of the Acropolis, was partly hollowed out from its declivity. The representation of plays was perhaps transferred to this spot from the early Orchestra in the Agora at the beginning of the 5th century B.C.; it afterwards superseded the Pnyx as the meeting-place of the Ecclesia. The site, which had been accurately determined by Leake, was explored by Strack in 1862, and the researches subsequently undertaken by the Greek Archaeological Society were concluded in 1879. It was not, however, till 1886 that traces of the original circular Greek orchestra were pointed out by Dörpfeld. The arrangements of the stage and orchestra as we now see them belong to Roman times; the *cavea* or auditorium dates from the administration of the orator Lycurgus (337-323 B.C.), and nothing is left of the theatre in which the plays of Sophocles were acted save a few small remnants of polygonal masonry. These, however, are sufficient to mark out the circuit of the ancient orchestra, on which the subsequently built proscenia encroached. The oldest stage-building was erected in the time of Lycurgus; it consisted of a rectangular hall with square projections (παρασκήνια) on either side; in front of this was built in late Greek or early Roman times a stage with a row of columns which intruded upon the orchestra space; a later and larger stage, dating from the time of Nero, advanced still farther into the orchestra, and this was finally faced (probably in the 3rd century A.D.) by the "bema" of Phaedrus, a platform-wall decorated with earlier reliefs, the slabs of which were cut down to suit their new position. The remains of two temples of Dionysus have been found adjoining the stoa of the theatre, and an altar of the same god adorned with masks and festoons; the smaller and earlier temple probably dates from the 6th century B.C., the larger from the end of the 5th or the beginning of the 4th century.

The Dionysiac theatre and Asclepieum.

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Immediately west of the theatre of Dionysus is the sacred precinct of Asclepius, which was excavated by the Archaeological Society in 1876-1878. Here were discovered the foundations of the celebrated Asclepieum, together with several inscriptions and a great number of votive reliefs offered by grateful invalids and valetudinarians to the god of healing. Many of the reliefs belong to the best period of Greek art. A Doric colonnade with a double row of columns was found to have extended along the base of the Acropolis for a distance of 54 yds.; behind it in a chamber hewn in the rock is the sacred well mentioned by Pausanias. The colonnade was a place of resort for the patients; a large building close beneath the rock was probably the abode of the priests.

The choragic monument of Lysicrates.

The beautiful choragic monument of Lysicrates, dedicated in the archonship of Euaenetus (335-334 B.C.), is the only survivor of a number of such structures which stood in the "Street of the Tripods" to the east of the Dionysiac theatre, bearing the tripods given to the successful choragi at the Dionysiac festival. It owes its preservation to its former inclusion in a Capuchin convent. The monument consists of a small circular temple of Pentelic marble, 21½ ft. in height and 9 ft. in diameter, with six engaged Corinthian columns and a sculptured frieze, standing on a rectangular base of Peiraic stone. The delicately carved convex roof, composed of a single block, was surmounted by the tripod. The spirited reliefs of the frieze represent the punishment of the Tyrrhenian pirates by Dionysus and their transformation into dolphins. Another choragic monument was that of Thrasyllus, which faced a cave in the Acropolis rock above the Dionysiac theatre. A portion of another, that of Nicias, was used to make the late Roman gate of the Acropolis. In one of these monuments was the famous Satyr of Praxiteles.

The Cynosarges.

The Cynosarges, from earliest times a sanctuary of Heracles, later a celebrated gymnasium and the school of Antisthenes the Cynic, has hitherto been generally supposed to have occupied the site of the Monastery of the Asomati on the eastern slope of Lycabettus; its situation, however, has been fixed by Dörpfeld at a point a little to the south of the Olympieum, on the left bank of the Ilissus. Here a series of excavations, carried out by the British School in 1896-1897 under the direction of Cecil Smith, revealed the foundations of an extensive Greek building, the outlines of which correspond with those of a gymnasium; it possessed a large bath or cistern, and was flanked on two sides by water-courses. An Ionic capital found here possibly belonged to the palaestra. The identification, however, cannot be regarded as certain in the absence of inscriptions.

The Hellenistic period: the Stoa of Attalus.

With the loss of political liberty the age of creative genius in Athenian architecture came to a close. The era of decadence, of honorary statues and fulsome inscriptions, began. The embellishments which the city received during the Hellenistic and Roman periods were no longer the artistic expression of the religious and political life of a great commonwealth; they were the tribute paid to the intellectual renown of Athens by foreign potentates or dilettanti, who desired to add their names to the list of its illustrious citizens and patrons. Among the first of these benefactions was the great gymnasium of Ptolemy, built in the neighbourhood of the Agora about 250 B.C. Successive princes of the dynasty of Pergamum interested themselves in the adornment of the city: Attalus I. set up a number of bronze statues on the Acropolis; Eumenes II. built the long portico west of the Dionysiac theatre, which was excavated and identified in 1877; Attalus II. erected the magnificent Stoa near the Agora, the remains of which were completely laid bare in 1898-1902 and have been identified by an inscription. The Stoa consisted of a series of 21 chambers, probably shops, faced by a double colonnade, the outer columns being of the Doric order, the inner unfluted, with lotus-leaf capitals; it possessed an upper storey fronted with Ionic columns.

The Olympieum.

The greatest monument, however, of the Hellenistic period is the colossal Olympieum or temple of Olympian Zeus, "unum in terris inchoatum pro magnitudine dei" (Livy xli. 20), the remains of which stand by the Ilissus to the south-east of the Acropolis. The foundations of a temple were laid on the site—probably that of an ancient sanctuary-by Peisistratus, but the building in its ultimate form was for the greater part constructed under the auspices of Antiochus IV. Epiphanes, king of Syria, by the Roman architect Cossutius in the interval between 174 B.C. and 164 B.C., the date of the death of Antiochus. The work was then suspended and its proposed resumption in the time of Augustus seems not to have been realized; finally, in A.D. 129, the temple was completed and dedicated by Hadrian, who set up a chryselephantine statue of Zeus in the cella. The substructure was excavated in 1883 by F.C. Penrose, who proved the correctness of Dörpfeld's theory that the building was octostyle; its length was 318 ft., its breadth 132 ft. With the exception of the foundations and two lower steps of the stylobate, it was entirely of Pentelic marble, and possessed 104 Corinthian columns, 56 ft. 7 in. in height, of which 48 stood in triple rows under the pediments and 56 in double rows at the sides; of these, 16 remained standing in 1852, when one was blown down by a storm. Fragments of Doric columns and foundations were discovered, probably intended for the temple begun by Peisistratus, the orientation of which differed slightly from that of the later structure. The peribolos, a large artificial platform supported by a retaining wall of squared Peiraic blocks with buttresses, was excavated in 1898 without important results; it is to be hoped that the stability of the columns has not been affected by the operations.

The Horologium of Andronicus.

The Roman Period.—After 146 B.C. Athens and its territory were included in the Roman province of Achaea. Among the earlier buildings of this period is the Horologium of Andronicus of Cyrrhus (the "Tower of the Winds"), still standing near the eastern end of the Roman Agora. The building may belong to the 2nd or 1st century B.C.; it is mentioned by Varro (*De re rust.* iii. 5. 17), and therefore cannot be of later date than 35 B.C. It is an octagonal marble structure, 42 ft. in height and 26 ft. in diameter; the eight sides, which face the points of the compass, are furnished with a frieze containing inartistic figures in relief representing the winds; below it, on the sides facing the sun, are the lines of a sun-dial. The building was surmounted by a weathercock in the form of a bronze Triton; it contained a water-clock to record the time when the sun was not shining.

Monuments of the Roman period.

The capture and sack of Athens by Sulla (March 1, 86 B.C.) seems to have involved no great injury to its architectural monuments beyond the burning of the Odeum of Pericles; a portion of the city wall was razed, the groves of the Academy and Lyceum were cut down, and the Peiraeus, with its magnificent arsenal and other great buildings, burnt to the ground. After this catastrophe the benefactors of Athens were for the most part Romans; the influence of Greek literature and art had begun to affect the conquering race. The New, or Roman, Agora to the north of the Acropolis, perhaps mainly an oil market, was constructed after the year 27 B.C. Its dimensions were practically determined by excavation in 1890-1891. It consisted of a large open rectangular space surrounded by an Ionic colonnade into which opened a number of shops or storehouses. The eastern gate was adorned with four Ionic columns on the outside and two on the inside, the western entrance being the well-known Doric portico of Athena Archegetis with an inscription recording its erection from donations of Julius Caesar and Augustus. The whole conclave may be compared with the enclosed bazaars or khans of Oriental cities which are usually locked at night. The Agrippeum, a covered theatre, derived its name from Vipsanius Agrippa, whose statue was set up, about 27 B.C., beneath the north wing of the Acropolis propylaea, on the high rectangular base still remaining. At the eastern end of the Acropolis a little circular temple of white marble with a peristyle of 9 Ionic columns was dedicated to Rome and Augustus; its foundations were discovered during the excavations of 1885-1888. The conspicuous monument which crowns the Museum Hill was erected as the mausoleum of Antiochus Philopappus of Commagene, grandson of Antiochus Epiphanes, in A.D. 114-116. Excavations carried out in 1898-1899 showed that the structure was nearly square; the only portion remaining is the slightly curved front, with three niches between Corinthian pilasters; in the central niche is the statue of Philopappus.

Novae Athenae: the buildings of Hadrian.

The emperor Hadrian was the most lavish of all the benefactors of Athens. Besides completing the gigantic Olympieum he enlarged the circuit of the city walls to the east, enclosing the area now covered by the royal public gardens and the Constitution Square. This was the City of Hadrian (Hadrianapolis) or New Athens (Novae Athenae); a handsome suburb with numerous villas, baths and gardens; some traces remain of its walls, which, like those of Themistocles, were fortified with rectangular towers. An ornamental entrance near the Olympieum, the existing Arch of Hadrian, marked the boundary between the new and the old cities. The arch is surmounted by a triple attic with Corinthian columns; the frieze above the keystone bears, on the north-western side, the inscription αἵδ᾽ εἵσ᾽ Ἀθῆναι, Θησέως ἡ πρὶν πόλις and on the south-eastern, αἵδ᾽ εἵσ᾽ Ἀδριανοῦ καὶ οὐχὶ Θησέως πόλις. One of the principal monuments of Hadrian's munificence was the sumptuous library, in all probability a vast rectangular enclosure, immediately north of the New Agora, the eastern side of which was explored in 1885-1886. A portion of its western front, adorned with monolith unfluted Corinthian columns, is still standing—the familiar "Stoa of Hadrian"; another well-preserved portion, with six pilasters, runs parallel to the west side of Aeolus Street. The interior consisted of a spacious court surrounded by a colonnade of 100 columns, into which five chambers opened at the eastern end. A portico of four fluted Corinthian columns on the western side formed the entrance to the quadrangle. This cloistered edifice may be identified with the library of Hadrian mentioned by Pausanias; the books were, perhaps, stored in a square building which occupied a portion of the central area. Strikingly similar in design and construction is a large quadrangular building, the foundations of which were discovered by the British School near the presumed Cynosarges; this may perhaps be the Gymnasium of Hadrian, which Pausanias tells us also possessed 100 columns. A Pantheon and temples of Hera and Zeus Panhellenius were likewise built by Hadrian; the aqueduct, which he began, was completed by Antoninus Pius (A.D. 138-161); it was repaired in 1861-1869 and is still in use.

The Stadium, in which the Panathenaic Games were held, was first laid out by the orator Lycurgus about 330 B.C. It was an oblong

The Stadium and Odeum of Herodes Atticus.

structure filling a natural depression near the left bank of the Ilissus beneath the eastern declivity of the Ardettus hill, the parallel sides and semicircular end, or σφενδόνη around the arena being partially excavated from the adjoining slopes. The immense building, however, which was restored in 1896 and the following years, was that constructed in Pentelic marble about A.D. 143 by Tiberius Claudius Herodes Atticus, a wealthy Roman resident, whose benefactions to the city rivalled those of Hadrian. The seats, rising in tiers, as in a theatre, accommodated about 44,000 spectators; the arena was 670 ft. in length and 109 ft. in breadth. The Odeum, built beneath the south-west slope of the Acropolis after A.D. 161 by Herodes Atticus in memory of his wife Regilla, is comparatively well preserved; it was excavated in 1848 and in 1857-1858. The plan is that of the conventional Roman theatre; the semicircular auditorium, which seated some 5000 persons, is, like that of the Dionysiac theatre, partly hollowed from the rock. The orchestra is paved with marble squares. The façade, in Peiraic stone, displays three storeys of arched windows. The whole building was covered with a cedar roof. The Stadium had been already completed and the Odeum had not yet been built when Pausanias visited Athens; these buildings were the last important additions to the architectural monuments of the ancient city.

(J. D. B.)

II. The Modern City

At the conclusion of the Greek War of Independence, Athens was little more than a village of the Turkish type, the poorly built houses clustering on the northern and eastern slopes of the Acropolis. The narrow crooked lanes of this quarter still contrast with the straight, regularly laid-out streets of the modern city, which extends to the north-west, north and east of the ancient citadel. The greater commercial advantages offered by Nauplia, Corinth and Patras were outweighed by the historic claims of Athens in the choice of a capital for the newly founded kingdom, and the seat of government was transferred hither from Nauplia in 1833. The new town was, for the most part, laid out by the German architect Schaubert. It contains several squares and boulevards, a large public garden, and many handsome public and private edifices. A great number of the public institutions owe their origin to the munificence of patriotic Greeks, among whom Andreas Syngros and George Averoff may be especially mentioned. The royal palace, designed by Friedrich von Gärtner (1792-1847), is a tasteless structure; attached to it is a beautiful garden laid out by Queen Amalia, which contains a well-preserved mosaic floor of the Roman period. On the south-east is the newly built palace of the crown prince. The Academy, from designs by Theophil Hansen (1813-1891), is constructed of Pentelic marble in the Ionic style: the colonnades and pediments are richly coloured and gilded, and may perhaps convey some idea of the ancient style of decoration. Close by is the university, with a colonnade adorned with paintings, and the Vallianean library with a handsome Doric portico of Pentelic marble. The observatory, which is connected with the university, stands on the summit of the Hill of the Nymphs; like the Academy, it was erected at the expense of a wealthy Greek, Baron Sina of Vienna. In the public garden is the Zappeion, a large building with a Corinthian portico, intended for the display of Greek industries; here also is a monument to Byron, erected in 1896. The Boulē, or parliament-house, possesses a considerable library. Other public buildings are the Polytechnic Institute, built by contributions from Greeks of Epirus, the theatre, the Arsakeion (a school for girls), the Varvakeion (a gymnasium), the military school (σχολὴ εὐελπίδων), and several hospitals and orphanages. The cathedral, a large, modern structure is devoid of architectural merit, but some of the smaller, ancient, Byzantine churches are singularly interesting and beautiful. Among private residences, the mansion built by Dr Schliemann, the discoverer of Troy, is the most noteworthy; its decorations are in the Pompeian style.

Museums.

The museums of Athens have steadily grown in importance with the progress of excavation. They are admirably arranged, and the remnants of ancient art which they contain have fortunately escaped injudicious restoration. The National Museum, founded in 1866, is especially rich in archaic sculptures and in sepulchral and votive reliefs. A copy of the Diadumenos of Polyclitus from Delos, and temple sculptures from Epidaurus and the Argive Heraeum, are among the more notable of its recent acquisitions. It also possesses the famous collection of prehistoric antiquities found by Schliemann at Tiryns and Mycenae, other “Mycenaean” objects discovered at Nauplia and in Attica, as well as the still earlier remains excavated by Tsountas in the Cyclades and by the British School at Phylakopi in Melos; terra-cottas from Tanagra and Asia Minor; bronzes from Olympia, Delphi and elsewhere, and numerous painted vases, among them the unequalled white *lekythi* from Athens and Eretria. The Epigraphical Museum contains an immense number of inscriptions arranged by H.G. Lolling and A. Wilhelm of the Austrian Institute. The Acropolis Museum (opened 1878) possesses a singularly interesting collection of sculptures belonging to the “archaic” period of Greek art, all found on the Acropolis; here, too, are some fragments of the pedimental statues of the Parthenon and several reliefs from its frieze, as well as the slabs from the balustrade of the temple of Nike. The Polytechnic Institute contains a museum of interesting objects connected with modern Greek life and history. In the Academy is a valuable collection of coins superintended by Svoronos. Of the private collections those of Schliemann and Karapanos are the most interesting: the latter contains works of art and other objects from Dodona. There is a small museum of antiquities at the Peiraeus.

Scientific institutions.

Owing to the numbers and activity of its institutions, both native and foreign, for the prosecution of research and the encouragement of classical studies, Athens has become once more an international seat of learning. The Greek Archaeological Society, founded in 1837, numbers some distinguished scholars among its members, and displays great activity in the conduct of excavations. Important researches at Epidaurus, Eleusis, Mycenae, Amyclae and Rhamnus may be numbered among its principal undertakings, in addition to the complete exploration of the Acropolis and a series of investigations in Athens and Attica. The French École d’Athènes, founded in 1846, is under the scientific direction of the Académie des Inscriptions et Belles-lettres. Among its numerous enterprises have been the extensive and costly excavations at Delos and Delphi, which have yielded such remarkable results. The monuments of the Byzantine epoch have latterly occupied a prominent place in its investigations. The German Archaeological Institute, founded in 1874, has carried out excavations at Thebes, Lesbos, Pares, Athens and elsewhere; it has also been associated in the great researches at Olympia, Pergamum and Troy, and in many other important undertakings. The British School, founded in 1886, has been unable, owing to insufficient endowment, to work on similar lines with the French and German institutions; it has, however, carried out extensive excavations at Megalopolis and in Melos, as well as researches at Abae, in Athens (presumed site of the Cynosarges), in Cyprus, at Naucratis and at Sparta. It has also participated in the exploration of Cnossus and other important sites in Crete. The American School, founded in 1882, is supported by the principal universities of the United States. In addition to researches at Sicyon, Plataea, Eretria and elsewhere, it has undertaken two works of capital importance—the excavation of the Argive Heraeum and of ancient Corinth. An Austrian Archaeological Institute was founded in 1898.

Industry and commerce.

Notwithstanding certain disadvantages inherent in its situation, the trade and manufactures of Athens have considerably increased in recent years. Industrial and commercial activity is mainly centred at the Peiraeus, where cloth and cotton mills, 45 cognac distilleries, 14 steam flour mills, 8 soap manufactories, 13 shipbuilding and engineering works, chair manufactories, dye works, chemical works, tanneries and a dynamite factory have been established. The shipbuilding and engineering trades are active and advancing. The export trade is, however, inconsiderable, as the produce of the local industries is mainly absorbed by home consumption. The principal exports are wine, cognac and marble from Pentelicus. As a place of import, the Peiraeus surpasses Patras, Syra and all the other Greek maritime towns, receiving about 53% of all the merchandise brought into Greece. The principal imports are coal, grain, manufactured articles and articles of luxury. The total value of exports in 1904 was £459,565; of imports, £2,459,278. The number of ships entered and cleared in 1905 was 5020 with a tonnage of 5,796,590 tons, of which 416, with a tonnage of 609,822 tons, were British.

The Peiraeus.

The Peiraeus, which had never revived since its destruction by the Romans in 86 B.C., was at the beginning of the 19th century a small fishing village known as Porto Leone. When Athens became the capital in 1833 the ancient name of its port was revived, and since that time piers and quays have been constructed, and spacious squares and broad regular streets have been laid out. The town now possesses an exchange, a large theatre, a gymnasium, a naval school, municipal buildings and several hospitals and charitable institutions erected by private munificence. The harbour, in which ships of all nations may be seen, as well as great numbers of the picturesque sailing craft engaged in the coasting trade, is somewhat difficult of access to larger vessels, but has been improved by the construction of new breakwaters and dry docks. The port and the capital are now connected by railway with Corinth and the principal towns of the Morea; the line opening up communication with northern Greece and Thessaly, when its proposed connexion with the Continental railway system has been effected, will greatly enhance the importance of the Peiraeus, already one of the most flourishing commercial towns in the Levant.

Population.

The population of Athens has rapidly increased. In 1834 it was below 5000; in 1870 it was 44,510; in 1879, 63,374; in 1889, 107,251; in 1896, 111,486. The Peiraeus, which in 1834 possessed only a few hundred inhabitants, in 1879 possessed 21,618; in 1889, 34,327; in 1896, 43,848. The total population of Athens in 1907 was 167,479 and of Peiraeus 67,982.

(J. D. B.)

1. *The Prehistoric Period.*—The history of primitive Athens is involved in the same obscurity which enshrouds the early development of most of the Greek city-states. The Homeric poems scarcely mention Attica, and the legends, though numerous, are rarely of direct historical value. In the Minoan epoch Athens is proved by the archaeological remains to have been a petty kingdom scarcely more important than many other Attic communities, yet enjoying a more unbroken course of development than the leading states of that period. This accords with the cherished tradition which made the Athenians children of the soil, and free from admixture with conquering tribes. Many legends, however, and the later state organization, point to an immigration of an "Ionian" aristocracy in late Mycenaean days. These Ionian newcomers are almost certainly responsible for the absorption of the numerous independent communities of Attica into a central state of Athens under a powerful monarchy (see Theseus), for the introduction of new cults, and for the division of the people into four tribes whose names—Geleontes, Hopletes, Argadeis and Aegicoreis—recur in several true Ionian towns. This centralization of power (*Synoecism*), to which many Greek peoples never attained, laid the first foundations of Athenian greatness. But in other respects the new constitution tended to arrest development. When the monarchy was supplanted in the usual Greek fashion by a hereditary nobility—a process accomplished, according to tradition, between about 1000 and 683 B.C.—all power was appropriated by a privileged class of Eupatridae (*q.v.*); the Geomori and Demiurgi, who formed the bulk of the community, enjoyed no political rights. It was to their control over the machinery of law that the Eupatridae owed their predominance. The aristocratic council of the Areopagus (*q.v.*) constituted the chief criminal court, and nominated the magistrates, among whom the chief archon (*q.v.*) passed judgment in family suits, controlled admission to the genos or clan, and consequently the acquisition of the franchise. This system was further supported by religious prescriptions which the nobles retained as a corporate secret. Assisted no doubt by their judicial control, the Eupatridae also tended to become sole owners of the land, reducing the original freeholders or tenants to the position of serfs. During this period Athens seems to have made little use of her militia, commanded by the polemarch, or of her navy, which was raised in special local divisions known as Naucraries (see Naucrary); hence no military *esprit de corps* could arise to check the Eupatrid ascendancy. Nor did the 842
commons obtain relief through any commercial or colonial enterprises such as those which alleviated social distress in many other Greek states. The first attack upon the aristocracy proceeded from a young noble named Cylon, who endeavoured to become tyrant about 630 B.C. The people helped to crush this movement; yet discontent must have been rife among them, for in 611 the Eupatrids commissioned Draco (*q.v.*), a junior magistrate, to draft and publish a code of criminal law. This was a notable concession, by which the nobles lost that exclusive legal knowledge which had formed one of their main instruments of oppression.

2. *The Rise of Athens.*—A still greater danger grew out of the widespread financial distress, which was steadily driving many of the agricultural population into slavery and threatened the entire state with ruin. After a protracted war with the neighbouring Megarians had accentuated the crisis the Eupatridae gave to one of their number, the celebrated Solon (*q.v.*), free power to remodel the whole state (594). By his economic legislation Solon placed Athenian agriculture once more upon a sound footing, and supplemented this source of wealth by encouraging commercial enterprise, thus laying the foundation of his country's material prosperity. His constitutional reforms proved less successful, for, although he put into the hands of the people various safeguards against oppression, he could not ensure their use in practice. After a period of disorder and party-feud among the nobles the new constitution was superseded in fact, if not in form, by the autocratic rule of Peisistratus (*q.v.*), and his sons Hippias and Hipparchus. The age of despotism, which lasted, with interruptions, from 560 to 510, was a period of great prosperity for Athens. The rulers fostered agriculture, stimulated commerce and industry (notably the famous Attic ceramics), adorned the city with public works and temples, and rendered it a centre of culture. Their vigorous foreign policy first made Athens an Aegean power and secured connexions with numerous mainland powers. Another result of the tyranny was the weakening of the undue influence of the nobles and the creation of a national Athenian spirit in place of the ancient clan-feeling.

The equalization of classes was already far advanced when towards the end of the century a nobleman of the Alcmaeonid family, named Cleisthenes (*q.v.*), who had taken the chief part in the final expulsion of the tyrants, acquired ascendancy as leader of the commons. The constitution which he promulgated (508/7) gave expression to the change of political feeling by providing a national basis of franchise and providing a new state organization. By making effective the powers of the Ecclesia (Popular Assembly) the Boulē (Council) and Heliaea, Cleisthenes became the true founder of Athenian democracy.

This revolution was accompanied by a conflict with Sparta and other powers. But a spirit of harmony and energy now breathed within the nation, and in the ensuing wars Athens worsted powerful enemies like Thebes and Chalcis (506). A bolder stroke followed in 500, when a force was sent to support the Ionians in revolt against Persia and took part in the sack of Sardis. After the failure of this expedition the Athenians apparently became absorbed in a prolonged struggle with Aegina (*q.v.*). In 493 the imminent prospect of a Persian invasion brought into power men like Themistocles and Miltiades (*qq.v.*), to whose firmness and insight the Athenians largely owed their triumph in the great campaign of 490 against Persia. After a second political reaction, the prospect of a second Persian war, and the naval superiority of Aegina led to the assumption of a bolder policy. In 483 Themistocles overcame the opposition of Aristides (*q.v.*), and passed his famous measure providing for a large increase of the Athenian fleet. In the great invasion of 480-479 the Athenians displayed an unflinching resolution which could not be shaken even by the evacuation and destruction of their native city. Though the traditional account of this war exaggerates the services of Athens as compared with the other champions of Greek independence, there can be no doubt that the ultimate victory was chiefly due to the numbers and efficiency of the Athenian fleet, and to the wise policy of her great statesman Themistocles (see Salamis, Plataea).

3. *Imperial Athens.*—After the Persian retreat and the reoccupation of their city the Athenians continued the war with unabated vigour. Led by Aristides and Cimon they rendered such prominent service as to receive in return the formal leadership of the Greek allies and the presidency of the newly formed Delian League (*q.v.*). The ascendancy acquired in these years eventually raised Athens to the rank of an imperial state. For the moment it tended to impair the good relations which had subsisted between Athens and Sparta since the first days of the Persian peril. But so long as Cimon's influence prevailed the ideal of "peace at home and the complete humiliation of Persia" was steadily unheld. Similarly the internal policy of Athens continued to be shaped by the conservatives. The only notable innovations since the days of Cleisthenes had been the reduction of the archonship to a routine magistracy appointed partly by lot (487), and the rise of the ten elective strategi (generals) as chief executive officers (see Strategus). But the triumph of the navy in 480 and the great expansion of commerce and industry had definitely shifted the political centre of gravity from the yeoman class of moderate democrats to the more radical party usually stigmatized as the "sailor rabble." Though Themistocles soon lost his influence, his party eventually found a new leader in Ephialtes and after the failure of Cimon's foreign policy (see Cimon) triumphed over the conservatives. The year 461 marks the reversal of Athenian policy at home and abroad. By cancelling the political power of the Areopagus and multiplying the functions of the popular law-courts, Ephialtes abolished the last checks upon the sovereignty of the commons. His successor, Pericles, who commonly ranked as the "completer of the democracy," merely developed the full democracy so as to secure its effectual as well as its theoretical supremacy. The foreign policy of Athens was now directed towards an almost reckless expansion (see Pericles). The unparalleled success of the Athenian arms at this period extended the bounds of empire to their farthest limits. Besides securing her Aegean possessions and her commerce by the defeat of Corinth and Aegina, her last rivals on sea, Athens acquired an extensive dominion in central Greece and for a time quite overshadowed the Spartan land-power. The rapid loss of the new conquests after 447 proved that Athens lacked a sufficient land-army to defend permanently so extensive a frontier. Under the guidance of Pericles the Athenians renounced the unprofitable rivalry with Sparta and Persia, and devoted themselves to the consolidation and judicious extension of their maritime influence.

The years of the supremacy of Pericles (443-429) are on the whole the most glorious in Athenian history. In actual extent of territory the empire had receded somewhat, but in point of security and organization it now stood at its height. The Delian confederacy lay completely under Athenian control, and the points of strategic importance were largely held by cleruchies (*q.v.*; see also Pericles) and garrisons. Out of a citizen body of over 50,000 freemen, reinforced by mercenaries and slaves, a superb fleet exceeding 300 sail and an army of 30,000 drilled soldiers could be mustered. The city itself, with its fortifications extending to the port of Peiraeus, was impregnable to a land attack. The commerce of Athens extended from Egypt and Colchis to Etruria and Carthage, and her manufactures, which attracted skilled operatives from many lands, found a ready sale all over the Mediterranean. With tolls, and the tribute of the Delian League, a fund of 9700 talents (£2,300,000) was amassed in the treasury.

Yet the material prosperity of Athens under Pericles was less notable than her brilliant attainments in every field of culture. Her development since the Persian wars had been extremely rapid, but did not reach its climax till the latter part of the century. No city ever adorned herself with such an array of temples, public buildings and works of art as the Athens of Pericles and Pheidias. Her achievements in literature are hardly less great. The Attic drama of the period produced many great masterpieces, and the scientific thought of Europe in the departments of logic, ethics, rhetoric and history mainly owes its origin to a new movement of Greek thought
which was largely fostered by the patronage of Pericles himself. Besides producing numerous men of genius herself Athens attracted all 843
the great intellects of Greece. The brilliant summary of the historian Thucydides in the famous Funeral Speech of Pericles (delivered in 430), in which the social life, the institutions and the culture of his country are set forth as a model, gives a substantially true picture of

Athens in its greatest days.

This brilliant epoch, however, was not without its darker side. The payment for public service which Pericles had introduced may have contributed to raise the general level of culture of the citizens, but it created a dangerous precedent and incurred the censure of notable Greek thinkers. Moreover, all this prosperity was obtained at the expense of the confederates, whom Athens exploited in a somewhat selfish and illiberal manner. In fact it was the cry of "tyrant city" which went furthest to rouse public opinion in Greece against Athens and to bring on the Peloponnesian War (*q.v.*) which ruined the Athenian empire (431-404). The issue of this conflict was determined less by any intrinsic superiority on the part of her enemies than by the blunders committed by a people unable to carry out a consistent foreign policy on its own initiative, and served since Pericles by none but selfish or short-sighted advisers. It speaks well for the patriotic devotion and discipline of her commons that Athens, weakened by plague and military disasters, should have withstood for so long the blows of her numerous enemies from without, and the damage inflicted by traitors within her walls (see Antiphon, Theramenes).

4. *The Fourth Century*—After the complete defeat of Athens by land and sea, it was felt that her former services on behalf of Greece and her high culture should exempt her from total ruin. Though stripped of her empire, Athens obtained very tolerable terms from her enemies. The democratic constitution, which had been supplanted for a while by a government of oligarchs, but was restored in 403 after the latter's misrule had brought about their own downfall (see Critias, Theramenes, Thrasybulus), henceforth stood unchallenged by the Greeks. Indeed the spread of democracy elsewhere increased the prestige of the Athenian administration, which had now reached a high pitch of efficiency. Athenian art and literature in the 4th century declined but slightly from their former standard; philosophy and oratory reached a standard which was never again equalled in antiquity and may still serve as a model. In the wars of the period Athens took a prominent part with a view to upholding the balance of power, joining the Corinthian League in 395, and assisting Thebes against Sparta after 378, Sparta against Thebes after 369. Her generals and admirals, Conon, Iphicrates, Chabrias, Timotheus, distinguished themselves by their military skill, and partially recovered their country's predominance in the Aegean, which found expression in the temporary renewal of the Delian League (*q.v.*). By the middle of the century Athens was again the leading power in Greece. When Philip of Macedon began to grow formidable she seemed called upon once more to champion the liberties of Greece. This ideal, when put forward by the consummate eloquence of Demosthenes and other orators, created great enthusiasm among the Athenians, who at times displayed all their old vigour in opposing Philip, notably in the decisive campaign of 338. But these outbursts of energy were too spasmodic, and popular opinion repeatedly veered back in favour of the peace-party. With her diminished resources Athens could not indeed hope to cope with the great Macedonian king; however much we may sympathize with the generous ambition of the patriots, we must admit that in the light of hard facts their conduct appears quixotic.

5. *The Hellenistic Period*.—Philip and Alexander, who sincerely admired Athenian culture and courted a zealous co-operation against Persia, treated the conquered city with marked favour. But the people would not resign themselves to playing a secondary part, and watched for every opportunity to revolt. The outbreak headed by Athens after Alexander's death (323) led to a stubborn conflict with Macedonia. After his victory the regent Antipater punished Athens by the loss of her remaining dependencies, the proscription of her chief patriots, and the disfranchisement of 12,000 citizens. The Macedonian garrison which was henceforth stationed in Attic territory prevented the city from taking a prominent part in the wars of the Diadochi. Cassander placed Athens under the virtual autocracy of Demetrius of Phalerum (317-307), and after the temporary liberation by Demetrius Poliorcetes (306-300), secured his interests through a dictator named Lachares, who lost the place again to Poliorcetes after a siege (295). After a vain attempt to expel the garrison in 287, the Athenians regained their liberty while Macedonia was thrown into confusion by the Celts, and in 279 rendered good service against the invaders of the latter nation with a fleet off Thermopylae. When Antigonus Gonatas threatened to restore Macedonian power in Greece, the Athenians, supported perhaps by the king of Egypt, formed a large defensive coalition; but in the ensuing "Chremonidean War" (266-263) a naval defeat off Andros led to their surrender and the imposition of a Macedonian garrison. The latter was finally withdrawn in 229 by the good offices of Aratus (*q.v.*). At this period Athens was altogether overshadowed in material strength by the great Hellenistic monarchies and even by the new republican leagues of Greece; but she could still on occasion display great energy and patriotism. The prestige of her past history had now perhaps attained its zenith. Her democracy was respected by the Macedonian kings; the rulers of Egypt, Syria, and especially of Pergamum, courted her favour by handsome donations of edifices and works of art, to which the citizens replied by unbecoming flattery, even to the extent of creating new tribes named after their benefactors. If Athens lost her supremacy in the fields of science and scholarship to Alexandria, she became more than ever the home of philosophy, while Menander and the other poets of the New Comedy made Athenian life and manners known throughout the civilized world.

6. *Relations with the Roman Republic*.—In 228 Athens entered into friendly intercourse with Rome, in whose interest she endured the desperate attacks of Philip V. of Macedonia (200-199). In return for help against King Perseus she acquired some new possessions, notably the great mart of Delos, which became an Athenian cleruchy (166). By her treacherous attack upon the frontier-town of Oropus (156) Athens indirectly brought about the conflict between Rome and the Achaean League which resulted in the eventual loss of Greek independence, but remained herself a free town with rights secured by treaty. In spite of the favours displayed by Rome, the more radical section of the people began to chafe at the loss of their international importance. This discontent was skilfully fanned by Mithradates the Great at the outset of his Roman campaigns. His emissary, the philosopher Aristion, induced the people to declare war against Rome and to place him in chief command. The town with its port stood a long siege against Sulla, but was stormed in 86. The conqueror allowed his soldiers to loot, but inflicted no permanent punishment upon the people. This war left Athens poverty-stricken and stripped of her commerce: her only importance now lay in the philosophical schools, which were frequented by many young Romans of note (Cicero, Atticus, Horace, &c.). Greek became fashionable at Rome, and a visit to Athens a sort of pilgrimage for educated Romans (cf. Propertius iv. 21: "Magnum iter ad doctas proficisci cogor Athenas"). In the great civil wars Athens sided with Pompey and held out against Caesar's lieutenants, but received a free pardon "in consideration of her great dead." Similarly the triumvirs after Philippi condoned her enthusiasm for the cause of Brutus. Antony repeatedly made Athens his headquarters and granted her several new possessions, including Eretria and Aegina—grants which Octavian subsequently revoked.

7. *The Roman Empire*.—Under the new settlement Athens remained a free and sovereign city—a boon which she repaid by zealous Caesar-worship, for the favours bestowed upon her tended to pauperize her citizens and to foster their besetting sin of calculating flattery. Hadrian displayed his special fondness for the city by raising new buildings and relieving financial distress. He amended the constitution in some respects, and instituted a new national festival, the Panhellenica. In the period of the Antonines the endowment of professors out of the imperial treasury gave Athens a special status as a university town. Her whole energies seem henceforth devoted to academic pursuits; the military training of her youth was superseded by courses in philosophy and rhetoric; the chief organs of administration, the revived Areopagus and the senior Strategus, became as it were an education office. Save for an incursion by Goths in A.D. 267 and a temporary occupation by Alaric in 395, Athens spent the remaining centuries of the ancient world in quiet prosperity. The rhetorical schools experienced a brilliant revival under Constantine and his successors, when Athens became the *alma mater* of many notable men, including Julian, Libanius, Basil and Gregory of Nazianzus, and in her professors owned the last representatives of a humane and moralized paganism. The freedom of teaching was first curtailed by Theodosius I.; the edict of Justinian (529), forbidding the study of philosophy, dealt the death-blow to ancient Athens.

The authorities for the history of ancient Athens will mostly be found under Greece: *History*, and the various biographies. The following books deal with special periods or subjects only:—(1) *Early Athens*: W. Warde Fowler, *The City-State*, ch. vi. (London, 1893). (2) *The fifth and fourth centuries*: the "Constitution of Athens," ascribed to Xenophon; W. Oncken, *Athen und Hellas* (Leipzig, 1865); U. v. Wilamowitz-Moellendorff, *Aus Kydathen* (Berlin, 1880); L. Whibley, *Political Parties at Athens* (Cambridge, 1889); G. Gilbert, *Beiträge zur inneren Geschichte Athens* (Leipzig, 1877); J. Beloch, *Die attische Politik seit Perikles* (Leipzig, 1884). (3) *The Hellenistic and Roman periods*: J.P. Mahaffy, *Greek Life and Thought*, from 323 to 146 (London, 1887), chs. v., vi., xvii.; A. Holm, *Greek History* (Eng. trans., London, 1898), iv. chs. vi. and xxiii.; Wilamowitz-Moellendorff, *Antigonos von Karystos* (Berlin, 1881), pp. 178-291; W. Capes, *University Life in Ancient Athens* (London, 1877); A. Dumont, *Essai sur l'Ephebie attique* (Paris, 1875). (4) *The Latin rule*: G. Finlay, *History of Greece* (Oxford ed., 1877), vol. iv. ch. vi. (5) *Constitutional History*: The Aristotelian "Constitution of Athens"; U. v. Wilamowitz-Moellendorff, *Aristoteles und Athen* (Berlin and Leipzig, 1893), vol. ii.; G. Gilbert, *Greek Constitutional Antiquities* (Eng. trans., London, 1895), pp. 95-453; A.H.J. Greenidge, *Handbook of Greek Constitutional History* (Oxford, 1896), ch. vi.; J.W. Headlam, *Election by Lot at Athens* (Cambridge, 1891). (6) *Finance and statistics*: A. Boeckh, *The Public Economy of the Athenians* (Eng. trans., London, 1828); Ed. Meyer, *Forschungen zur alten Geschichte* (Halle, 1899), vol. ii. pp. 149-195. (7) *Inscriptions*: *Corpus Inscriptionum Atticarum*, with supplements (Berlin, 1873-1895). (8) *Coins*: B.V. Head, *Historia Numorum* (Oxford, 1887), pp. 309-328.

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8. *Byzantine Period*.—The city now sank into the position of a provincial Byzantine town. Already it had been robbed of many of its works of art, among them the Athena Promachos and the Parthenos of Pheidias, for the adornment of Constantinople, and further spoliation took place when the church of St Sophia was built in A.D. 532. The Parthenon, the Erechtheum, the "Theseum" and other temples were converted into Christian churches and were thus preserved throughout the middle ages. The history of Athens for the next four centuries is almost a blank; the city is rarely mentioned by the Byzantine chronicles of this period. The emperor Constantine II. spent

some months here in A.D. 662-663. In 869 the see of Athens became an archbishopric. In 995 Attica was ravaged by the Bulgarians under their tsar Samuel, but Athens escaped; after the defeat of Samuel at Belasitza (1014) the emperor Basil II., who blinded 15,000 Bulgarian prisoners, came to Athens and celebrated his triumph by a thanksgiving service in the Parthenon (1018). From the Runic description on the marble lion of the Peiraeus it has been inferred that Harold Hardrasda and the Norsemen in the service of the Byzantine emperors captured the Peiraeus in 1040, but this conclusion is not accepted by Gregorovius (bk. i. pp. 170-172). Like the rest of Greece, Athens suffered greatly from the rapacity of its Byzantine administrators. The letters of Acominatus, archbishop of Athens, towards the close of the 12th century, bewail the desolate condition of the city in language resembling that of Jeremiah in regard to Jerusalem.

9. *Period of Latin Rule: 1204-1458.*—After the Latin conquest of Constantinople in 1204, Otho de la Roche was granted the lordship of Athens by Boniface of Montferrat, king of Thessalonica, with the title of Megaskyr (μέγας κύριος = great lord). His nephew and successor, Guy I., obtained the title duke of Athens from Louis IX. of France in 1258. On the death of Guy II., last duke of the house of la Roche, in 1308, the duchy passed to his cousin, Walter of Brienne. He was expelled in 1311 by his Catalonian mercenaries; the mutineers bestowed the duchy "of Athens and Neopatras" on their leader, Roger Deslaur, and, in the following year, on Frederick of Aragon, king of Sicily. The Sicilian kings ruled Athens by viceroys till 1385, when the Florentine Nerio Acciajuoli, lord of Corinth, defeated the Catalonians and seized the city. Nerio, who received the title of duke from the king of Naples, founded a new dynasty. His palace was in the Propylaea; the lofty "Tower of the Franks," which adjoined the south wing of that building, was possibly built in his time. This interesting historical monument was demolished by the Greek authorities in 1874, notwithstanding the protests of Penrose, Freeman and other scholars. The Acciajuoli dynasty lasted till June 1458, when the Acropolis after a stubborn resistance was taken by the Turks under Omar, the general of the sultan Mahommed II., who had occupied the lower city in 1456. The sultan entered Athens in the following month; he was greatly struck by its ancient monuments and treated its inhabitants with comparative leniency.

10. *Period of Turkish Rule: 1458-1833.*—After the Turkish conquest Athens disappeared from the eyes of Western civilization. The principal interest of the following centuries lies in the researches of successive travellers, who may be said to have rediscovered the city, and in the fate of its ancient monuments, several of which were still in fair preservation at the beginning of this period. The Parthenon was transformed into a mosque; the existing minaret at its south-western corner was built after 1466. The Propylaea served as the residence of the Turkish commandant and the Erechtheum as his harem. In 1466 the Venetians succeeded in occupying the city, but failed to take the Acropolis. About 1645 a powder magazine in the Propylaea was ignited by lightning and the upper portion of the structure was destroyed. Under Francesco Morosini the Venetians again attacked Athens in September 1687; a shot fired during the bombardment of the Acropolis caused a powder magazine in the Parthenon to explode, and the building was rent asunder. After capturing the Acropolis the Venetians employed material from its ancient edifices in repairing its walls. They withdrew in the following year, when the Turks set fire to the city. The central sculptures of the western pediment of the Parthenon, which Morosini intended to take to Venice, were unskilfully detached by his workmen, and falling to the ground were broken to pieces. Several ancient monuments were sacrificed to provide material for a new wall with which the Turks surrounded the city in 1778.

During the 18th century many works of art, which still remained *in situ*, fell a prey to foreign collectors. The removal to London in 1812 of most of the remaining sculptures of the Parthenon by Lord Elgin possibly rescued many of them from injury in the period of warfare which followed. In 1821 the Greek insurgents surprised the city, and in 1822 captured the Acropolis. Athens again fell into the hands of the Turks in 1826, who bombarded and took the Acropolis in the following year; the Erechtheum suffered greatly, and the monument of Thrasyllus was destroyed. The Turks remained in possession of the Acropolis till 1833, when Athens was chosen as the capital of the newly established kingdom of Greece; since that date the history of the city forms part of that of modern Greece. (See Greece: *History, modern*.)

General Bibliography.—W.M. Leake, *Topography of Athens and the Demi* (2nd ed., London, 1841); C. Wachsmuth, *Die Stadt Athen im Alterthum* (vol. i., Leipzig, 1874; vol. ii. part i., Leipzig, 1890); E. Burnouf, *La Ville et l'acropole d'Athènes aux diverses époques* (Paris, 1877); F.C. Penrose, *Principles of Athenian Architecture* (London, 1888); J.E. Harrison, *Mythology and Monuments of Ancient Athens* (London, 1890); E. Curtius and A. Milchhöfer, *Stadtgeschichte von Athen* (Berlin, 1891); H. Hitzig and H. Blümner, *Pausanias* (text and commentary; vol. i., Berlin, 1896); J.G. Frazer, *Pausanias* (translation and commentary; 6 vols., London, 1898. The commentary on Pausanias' description of Athens, contained in vol. ii. with supplementary notes in vol. v., is an invaluable digest of recent researches); H. Omont, *Athènes au XVII^e siècle* (Paris, 1898, with plans and views of the town and acropolis and drawings of the sculptures of the Parthenon); J.H. Middleton and E.A. Gardner, *Plans and Drawings of Athenian Buildings* (London, 1900); E.A. Gardner, *Ancient Athens* (London, 1902); W. Judeich, *Topographie von Athen* (Munich, 1905; forming vol. iii. part ii. second half, in 3rd edition of I. von Müller's *Handbuch der klass. Altertumswissenschaft*). The history of excavations on the Acropolis is summarized in M.L. d'Ooge, *Acropolis of Athens* (1909); see also A. Bötticher, *Die Akropolis von Athen* (Berlin, 1888); O. Jahn, *Pausaniae descriptio arcis Athenarum* (Bonn, 1900); A. Furtwängler, *Masterpieces of Greek Sculpture* (appendix; London, 1895); A. Milchhöfer, *Über die alten Burgheiligtümer in Athen* (Kiel, 1899). For the Parthenon, A. Michaelis, *Der Parthenon* (texts and plates, Leipzig, 1871); L. Magne, *Le Parthénon* (Paris, 1895); J. Durm, *Der Zustand der antiken athenischen Bauwerken* (Berlin, 1895); F.C. Penrose in *Journal of Royal Institute of British Architects* for 1897; N.M. Balanos in Ἐφήμερις τῆς κυβερνήσεως (Athens, August 25, 1898). For the Dionysiac theatre, A.E. Haigh, *The Attic Theatre* (Oxford, 1889); W. Dörpfeld and E. Reisch, *Das griechische Theater* (Athens, 1896); Puchstein, *Die griechische Bühne* (Berlin, 1901). For the "Theseum," B. Sauer, *Das sogenannte Theseion* (Leipzig, 1899). For the Peiraeus, E.I. Angelopoulos, Περὶ Πειραιῶς καὶ τῶν λιμένων αὐτοῦ (Athens, 1898). For the Attic Demes, A. Milchhöfer, *Untersuchungen über die Demenordnung des Kleisthenes* (in transactions of Berlin Academy, Berlin, 1892); Pauly-Wissowa, *Realencyclopädie der class. Altertumswissenschaft* (supplement, part i., article "Athenai"; Stuttgart, 1903). For the controversies respecting the Agora, the Enneacrunus and the topography of the town in general, see W. Dörpfeld, *passim* in *Athenische Mittheilungen*; C. Wachsmuth, "Neue Beiträge zur Topographie von Athen," in *Abhandlungen der sächsischen Gesellschaft der Wissenschaften* (Leipzig, 1897). A. Milchhöfer, "Zur Topographie von Athen," in *Berlin. philol. Wochenschrift* (1900), Nos. 9, 11, 12. For the Byzantine and medieval periods, William Miller, *Latins in the Levant* (London, 1908); F. Gregorovius, *Geschichte der Stadt Athen im Mittelalter* (2 vols., Stuttgart, 1889). Periodical Literature. *Mittheilungen des kais. deutsch. arch. Instituts* (Athens, from 1876); *Bulletin de correspondance hellénique* (Athens, from 1877); *Papers of the American School* (New York, 1882-1897); *Annual of the British School* (London, from 1894); *Journal of Hellenic Studies* (London, from 1880); *American Journal of Archaeology* (New York, from 1885); *Jahrbuch des kais. deutsch. arch. Instituts* (Berlin, from 1886). The best maps are those in *Die Karten van Attika*, published with explanatory text by the German Archaeological Institute (Berlin, 1881). See also Baedeker's *Greece* (London, 1895); Murray's *Greece and the Ionian Islands* (London, 1900); Guide Joanne, vol. i. *Athènes et ses environs* (Paris, 1896); Meyer's *Turkei und Griechenländer* (5th ed., 1901).

(J. D. B.)

ATHENS, a city and the county-seat of Clarke county, Georgia, U.S.A., in the N.E. part of the state, about 73 m. E. by N. of Atlanta. Pop. (1890) 8639; (1900) 10,245, of whom 5190 were negroes and only 114 were foreign-born; (1910, census) 14,913. It is served by the Georgia, the Central of Georgia, the Southern, the Seaboard Air Line and the Gainesville Midland railways. Athens is an important educational centre. It was founded in 1801 as the seat of the university of Georgia, which had been chartered in 1785. Franklin College, the academic department of the university, was opened in 1801, and afterwards the State College of Agriculture and Mechanic Arts (the School of Science, 1872), the State Normal School (co-educational, 1891), the School of Pharmacy (1903), the University Summer School (1903), the School of Forestry (1906), and the Georgia State College of Agriculture (1906), also branches of the university, were established at Athens, and what had been the Lumpkin Law School (incorporated in 1859) became the law department of the university in 1867. Branches of the university not in Athens are: the North Georgia Agricultural College (established in 1871; became a part of the university in 1872), at Dahlonega; the medical department, at Augusta (1873; founded as the Georgia Medical College in 1829); the Georgia School of Technology (1885), at Atlanta; the Georgia Normal and Industrial College for Girls (1889), at Milledgeville; and the Georgia Industrial College for Colored Youth (1890), near Savannah. At Athens also are several secondary schools, and the Lucy Cobb Institute (for girls), opened in 1858 and named in honour of a daughter of its founder, Gen. T.R.R. Cobb (1823-1862). The city has various manufactures, the most important being fertilizers, cotton goods, and cotton-seed oil and cake; the value of the total factory product in 1905 was $1,158,205, an increase of 70.9% in five years. Athens was chartered as a city in 1872.

ATHENS, a village and the county-seat of Athens county, Ohio, U.S.A., in the township of Athens, on the Hocking river, about 76 m. E.S.E. of Columbus. Pop. (1890) 2620; (1900) 3066; (1910) 5463; of the township (1910) 10,156. It is served by the Baltimore & Ohio Southwestern, the Toledo & Ohio Central (Ohio Central Lines), and the Hocking Valley railways. The village is built on rolling ground rising about 70 ft. above the river (which nearly encircles it), and commands views of some of the most beautiful scenery in the state. There are several ancient mounds in the vicinity. Athens is the seat of Ohio University (co-educational), a state institution established in 1804, and having in 1908 a college of liberal arts, a state normal college (1902), a commercial college, a college of music and a state preparatory school. In 1908 the University had 53 instructors and 1386 students. South of the village, and occupying a fine situation, is a state hospital for the insane. In the vicinity there are many coal mines, and among the manufactures are bricks, furniture, veneered doors, and shirts. The municipality operates the water-works. When the Ohio Company, through Manasseh Cutler, obtained from congress their land in what is now Ohio, it was arranged that the income from two townships was to be set aside “for the support of a literary institution.” In 1795 the townships (Athens and Alexander) were located and surveyed, and in 1800 Rufus Putnam and two other commissioners, appointed by the Territorial legislature, laid out a town, which was also called Athens. Settlers slowly came; the town became the county-seat in 1805, was incorporated as a village in 1811, and was re-incorporated in 1828.

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