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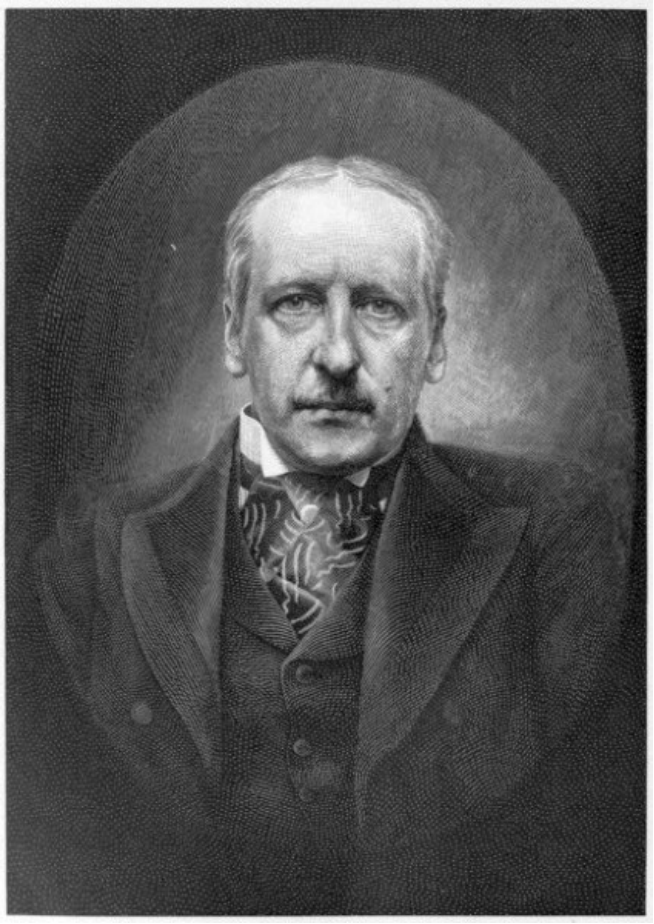


WILLIAM PEPPER.

APPLETONS' POPULAR SCIENCE MONTHLY.

OCTOBER, 1899.

THE HELP THAT HARMS.

By the Right Reverend HENRY C. POTTER.

The analogies between the life of an individual and that other organism which we call civilized society are as interesting as for any other reason because of their inexhaustible and ever-fresh variety. The wants, the blunders, the growth, the perils of the individual are matched at every step by those other wants and dangers and developments which rise in complexity and in variety as the individual and the social organism rise in intelligence, in numbers, and in wealth. It ought to interest us, if it never has, to consider from how much that is mischievous and dangerous we should be delivered if we could revert from the civilized to the savage state; and it is undoubtedly true that serious minds have sometimes been tempted to question whether civilization is quite worth all that it has cost us in its manifold departures from a simple and more primitive condition.

Such a question may, at any rate, not unnaturally arise when we ask ourselves the question, What, on the whole, is the influence upon manhood—by which I mean, here and for my present purpose, the qualities that make courage, self-reliance, self-respect, industry, initiative—in fact, those independent and aggressive characteristics by which great races, like great men, have climbed up out of earlier obscurity and inferiority into power, leadership, and distinction; what is the influence upon these of conditions which tend, apparently by an inevitable law, to beget or to encourage indolence, inertia, parasitic dependence?

One can not but be moved to such a question by either of two papers which have recently appeared in these pages: I mean that entitled Abuse of Public Charity, by Comptroller Bird S. [Pg 722] Coler; and that by Prof. Franklin H. Giddings, of Columbia University, on Public Charity and Private Vigilance. The community whose capable and efficient servant he is has reason to be thankful that, in the person of a public official intrusted with such large responsibilities, it has a thoughtful and far-seeing student of problems whose grave importance he has so opportunely pointed out. It needs the courage and the knowledge of such a one to affirm that "it is easier for

an industrious and shrewd professional beggar to live in luxury in New York than to exist in any other city in the world," which, if any social reformer or minister of religion or mere critic of the social order had said it, would probably have been denounced as an atrabilious and unwarranted exaggeration.

Concerning the comptroller's indictments of certain charitable societies and organizations as expensive mechanisms for the consumption of appropriations or contributions largely spent upon their salaried officials, I am quite willing to recognize the force of Professor Giddings's demurrer to the effect that a so-called charitable society may now and then rightly exist, and expend its income largely, if not wholly, upon the persons whom it employs as its agents, since these agents are the vigilant committees whose office it is to detect, discourage, and expose unworthy objects, whether of public or private charity. But that, besides such agencies, there are constantly called into being wholly spurious organizations, which profess to exist for the relief of certain classes of sufferers or of needy people; that these succeed, sooner or later, in fastening themselves upon the treasury of the city and of the State; and that they are, in a great many cases, monuments of the most impudent and unscrupulous fraud, there can be no smallest doubt.

Well, it may be asked, What are you going to do about it? Will you accept the inevitable evils that march in the rear of all public or private charity, or will you sweep all the various agencies, which have relieved such manifold varieties of human want and alleviated to such an incalculable degree human misery, out of existence? Will you care to contemplate what a great city like New York or London would be if to-morrow you closed the doors of all the hospitals, *crèches*, homes of the aged, asylums for the crippled, the blind, the insane, and the like, and turned their inmates one and all into the street?

That is certainly a very dramatic alternative to present; but suppose that we look at it a little more closely. And, in order that we may, I shall ask my reader to go back with me, not to that primitive or barbaric era to which I began by referring, but only to a somewhat earlier stage in our own social history, with which many persons now living are abundantly familiar. One of the [Pg 723] interesting and startling contrasts which might be presented to one anxious to impress a stranger with our American progress would be to take only our present century, and group together, out of its statistics, the growth and development, in its manifold varieties, during that period in any city, great or small, of institutional charity. But if such a one were just he would have, first of all, to put upon his canvas some delineation of that situation which, under so many varying conditions and amid such widely dissimilar degrees of privilege or of opportunity, preceded it. I listened the other day to the story of a charming woman, of marked culture and refinement, as she depicted, with unconscious grace and art, the life of a gentlewoman of her own age and class —she was young and fair and keenly sympathetic—on a Southern plantation before the civil war. One got such a new impression of those whom, under other skies and in large ignorance of their personal ministries or sacrifices, we had been wont to picture as indolent, exclusive, indifferent to the sorrow and disease and ignorance that, on a great rice or cotton or sugar plantation in the old days, were all about them; and one learned, with a new sense of reverence for all that is best in womanhood, how, in days that are now gone forever, there were under such conditions the most skillful beneficence and the most untiring sympathies.

But, in the times of which I speak, the service on the plantation for the sick slave (which, an ungracious criticism might have suggested, since a slave was ordinarily a valuable piece of property, had something of a sordid element in it) was matched in communities and under conditions where no such suspicion was possible. No one who knows anything of life in our smaller communities at the beginning of the century can be ignorant of what I mean. There was no village or smallest aggregation of families that had not its Abigail, its "Aunt Hannah," its "Uncle Ben," who, when there was sickness or want or sorrow in a neighbor's house, was always on hand to sympathize and to succor. I do not forget that it is said that, even under our greatly changed conditions, in modern cities this is still true of the very poor and of their kindness and mutual help to one another; and I thank God that I have abundant reason, from personal observation, to know that it is. But, happily, neither great cities nor small are largely made up of the very poor, and the considerations that I am aiming to present to those who will follow me through these pages are not concerned with these. What I am now aiming to get before my readers is that there was a time, and that it was not so very long ago, when that vast institutional charity which exists among us to-day, and which I believe to be in so many aspects of it so grave [Pg 724] a menace to our highest welfare, did not exist, because it had no need to exist. The ordinary American community, East or West, had, as distinguishing it, however small its numbers and narrow its means, two characteristics which our modern systems of institutional charity are widely conspiring to extinguish and destroy. One of these was that resolute endurance of straitness and poverty of which there is so fine and true a portraiture in Miss Wilkins's remarkable story Jerome. I venture to say that the charm of that rare book, to a great many of the most intelligent and appreciative of its readers, lay in the fact that they could match it, or something like it, in their own experience; that they had known silent and proud women, and brave and proud boys, to whom, whatever the hard pinch of want that they knew, to accept a dole was like accepting a blow, and who covered their poverty alike from the eye of inquisitive stranger or kin with a robe of secrecy that was at once impenetrable and all-concealing. Life to them was a battle, and they could lose it, as heroes have lost it on the tented field, without a murmur; but to sue for bread to some other, even if that other were of the same blood, would have smitten them as with the stain of personal dishonor.

And over against such, in the days and among the communities of which I speak, were those

whose gift and ministry it was—without an intrusive curiosity, without a vulgar ostentation, without a word or look that implied that they guessed the sore need to which they reached out—yet somehow to discover it, to succor it, and then to help, finest and rarest of all, to hide it.

Now, then, behind such a condition of things there was a sure and wise discernment, even if it was only instinctive, of a profound moral truth, which was this: that you can not help me, nor I you, without risk. For the most sacred thing in either of us is our manhood or womanhood—that thing which differentiates us from any mere mechanism, that thing in us which says, *I can, I ought, I will*. Take that out of human nature and what is left is not worth considering, save as one might consider any other clever mechanism. But the power to choose, the power to act, and the consciousness that choice and action are to be dominated by something that answers to the instinct of loyalty to God, to self-respect, to the ideals of honor and righteousness—that is what makes life worth living, and any conceivable thing worth seeking or doing. Now, the moment that the question of our mutual relations enters we have to be concerned with the way in which they will act on this power, quality, characteristic—call it what you will—that makes manhood. It is not enough, for example, that my impulse to give you a pint of gin is a benevolent impulse, if certain [Pg 725] tendencies in you make it antecedently probable that a pint of gin will presently convert you from the condition of a rational being into that of a beast. And so of any impulse of mine in the direction of beneficence which, in its gratification, threatens manhood—that is, self-reliance, self-respect, independence, the right and faithful use of powers in me.

And here we come to the problem which lies at the basis of the whole question of charitable relief, for whatever class and in whatever form. The wholesome elements in that earlier situation, to which I have just referred, were threefold, and in our modern situation each one of them is sorely attenuated, if not wholly absent:

1. In the first place, there was a relative uniformity of condition. In other words, at the beginning of the present century in almost all communities, whether industrial or agricultural, the disparities of estate were inconsiderable. There was perhaps the rich man of the village or town, or two or three or half a dozen of them; but they were rich only relatively, and they were marked exceptions. The great majority of the people were of comparatively similar employments and circumstances. Among these there were indeed considerable varieties of task work, but work and wage were not far apart; and, what was of most consequence, a certain large identity of condition brought into it a certain breadth of sympathy and mutual help, out of which came the outstretched hand and the open door for the man who was out of work and was looking for it.

2. Yes, *who was looking for it*. For here again was a distinguishing note of those earlier days of which I am speaking. Idleness was a distinct discredit, if not dishonor. In communities where everybody had to work, an idler or a loafer was an intolerable impertinence, and was usually made to feel it.

3. And yet, again, there was the vast difference in those days from ours that the industries of the world had not taken on their immensely organized and *mechanized* characteristics. A mechanic—e. g., out of a job—then could turn his hand to anything that ordinary tools and muscle and intelligence could do. But an ordinary mechanic now must be a skilled mechanician in a highly specialized department, and when he is out of a job there, he is ordinarily out of it all along the line.

I might, as my reader will have anticipated me in recognizing, go on almost indefinitely in this direction; but I have said enough, I trust, to prepare him for the point which I want to make in connection with our modern charities and their mischief. Our modern social order, in a word, has become more complex, more segregated, more specialized. A whole class of people in cities— [Pg 726] those, I mean, of considerable wealth—with a few noble exceptions (which, however, in our greater cities, thank God, are becoming daily less rare), live in profound ignorance of the condition of their fellow-citizens. Now and then, by some sharp reverse in the financial world or some national recurrence of "bad times," they are made aware that large numbers of their neighbors are out of work and starving. And, at all times, they are no less reminded that there is a considerable class—how appallingly large it is growing to be in New York Mr. Coler has told us—who need help, or think they do, and who, at any rate, more or less noisily demand it in the street, at the door, by begging letter, or in a dozen other ways that make the rich man understand why the prayer of Agur was, "Give me neither poverty nor riches."[1]

Well, something must be done, they agree. What shall it be? Shall the State do it, or the Church, or the individual? If only they could, as to that, agree! But it has been one of the most pathetic notes of our heedless and superficial treatment of a great problem that, here, there has not been from the beginning even the smallest pretense of a common purpose or any moderately rational course of action. Undoubtedly it is true that there is no imaginable mechanism that could relieve any one of these agencies from responsibility in the matter of relief to the unfortunate, nor is it desirable that there should be. Sometimes it has been the Church that has undertaken the relief of the poor and sick, sometimes it has been largely left to the individual, and sometimes it has been as largely left to the State. But, in any case, the result has been almost as often as otherwise mischievous, or corrupt and corrupting. For, in fact, the ideal mode of dealing with the problems of sickness, destitution, and disablement should be one in which the common endeavor of the State, the Church, and the individual should be somehow unified and co-ordinated. But, incredible as it ought to be, the history of the best endeavors toward such co-ordination has been a history of large inadequacy and of meager results. As an illustration of this it is enough to point to the history of the Charity Organization Society in New York, which, I presume, is not greatly

different from that of similar societies elsewhere. Antecedently it would have seemed probable that such a society, which aims simply to discourage fraud, to relieve genuine want, and to protect the community from being preyed upon by the idle and the vicious, would have the sympathy of that great institution, some of whose teachings are, "If any man will not work, neither shall he eat"; "Stand upright on thy feet"; "Provide things honest in the sight of all men"; [Pg 727] "Not slothful in business"; and the like. But, as a matter of fact, such societies have had no more bitter antagonists than the churches, and no more vehement opponents than ministers of religion. In a meeting composed of such persons I have heard one of their number denounce with the most impassioned oratory any agency which undertook, by any mechanism, to intrude into the question of the circumstances, resources, or worthiness of those who were the objects of ecclesiastical almsgiving. Who, he demanded, could know so well as the clergy all the facts needed to enable them wisely and judiciously to assist those worthy and needy brethren who were of their own household of faith? Nothing could sound more plausible or probable; but in a little while it happened that a woman who had for years been a beneficiary of this very pastor died, leaving behind her, among her effects, sundry savings-bank books which showed her to be possessed of some thousands of dollars, which she bequeathed to relatives in a distant land. Still more recently a case of a similar character has occurred in which a still larger amount having been paid over in small sums through a long series of years by a church, the whole, with interest, has been found to have been hoarded, the recipient having been a person entirely capable of self-support, and, as a matter of fact, during the whole period self-supporting, and the large accumulations are at present the subject of a suit in which the church is endeavoring to recover what it not unnaturally regards as its own misappropriated money.

And yet, as any one knows who knows anything of the delicacy, vigilancy, and thoroughness with which a well-organized society conducts its work, any such grotesque and deplorable result would, with a little wise co-operation between the Church and such a society, have been rendered impossible. I know how impatient many good people are of the services of any such association, and we have all heard *ad nauseam* of their protests against a "spy system which invades the sacred privacy of decent poverty," and the rest; but, in fact, such persons never seem to realize that, in one aspect of it, the Church stands, or, as a matter of common honesty, as the administrator of trust funds, ought to stand, on the same equitable basis, at least, as a life-insurance company. Now, when I seek the benefits of a life-insurance company I am asked certain questions which affect not only my physical resources but my diseases, my ancestry and their diseases, my personal habits, infirmities, and the like. If the company has the right, in the just interests of its other clients, to ask these questions, as administering a large trust, has not the Church, which is also the administrator of a trust no less in the interest of other clients?

But, indeed, this is the lowest aspect of such a question, and I freely admit it. The title of this [Pg 728] paper points to that gravest aspect of it, with which I am now concerned. The largest mischief of indiscriminate almsgiving is not its wanton waste—it is its inevitable and invariable degradation of its objects. I have spoken of the grave antagonism of the Church to wisely organized charity, but it is but the echo of the hostility of the individual, and often of the best and wisest men and women. Elsewhere (but not, I think, in print) I have related an incident in this connection of which one is almost tempted to say *ex uno disce omnes*. Approaching one day, when I was a pastor in a great city, the door of one of my clerical brethren, I observed a woman leaving it who, though she hastily turned her back upon me, I recognized as a member of my own congregation. On entering my friend's study I said to him:

"I beg your pardon, but was not that Mrs. —— whom I saw leaving your door a moment ago?"

"Yes."

"What was she after, may I ask?"

My friend—now, alas! no longer living—was a man distinguished by singular delicacy and chivalry of character and bearing, and he turned upon me with some surprise and *hauteur* and said:

"Well, yes, you may ask; but I do not know that, in the matter of the sad and painful circumstances of one of my own parishioners, I am called upon to answer."

"Precisely," I replied; "but, as it happens, she isn't your parishioner."

"What do you mean, sir?" he exclaimed, with some heat. "Do you suppose that I don't know the members of my own flock?"

"On the contrary," I said, "I have no doubt that you know not only them but the members of a great many other flocks, as in the instance of the person who has just left your door, who, as it happens, has been a member of the church of which I am rector for some fifteen years."

The remark and the abundant evidence with which I was able to re-enforce it at last persuaded my friend to institute further inquiries, which resulted in the discovery that the subject of those inquiries maintained similar relations with some seven parishes, from every one of which she was receiving, as a poor widow, a monthly allowance! And yet my reverend brother was one of the most strenuous opponents of any system or society, any challenge or interrogation which, as he said, came between him and *his* poor. Alas! though in one sense they were his poor, in another [Pg 729] they were as remote from him as if they and he had been living in different hemispheres. With every sympathy for their distresses, he had not come to recognize that, under those complex conditions of our modern life, to which I have already referred, a real knowledge of the classes

upon whom need and misfortune and the temptations to vice and idleness press most heavily has become almost a science, in which training, experience, most surely a large faith, but no less surely a large wisdom, are indispensable.

In this work there is undoubtedly a place for institutional charity, and also for that other which is individual. The former affords a sphere for a wise economy, for prompt and immediate treatment or relief, and for the utilization of that higher scientific knowledge and those better scientific methods which the home, and especially the tenement house, can not command. But over against these advantages we are bound always to recognize those inevitable dangers which they bring with them. The existence of an institution, whether hospital, almshouse, or orphanage, to the care of which one may easily dismiss a sick member of the household, or to which one may turn for gratuitous care and treatment, must inevitably act as strong temptations to those who are willing to evade personal obligations that honestly belong to them. In connection with an institution for the treatment of the eye and ear, with which I happen to be officially connected, it was found, not long ago, that the number of patients who sought it for gratuitous treatment was considerably increased by persons who came to the hospital in their own carriages, which they prudently left around the corner, and whose circumstances abundantly justified the belief that they were quite able to pay for the treatment, which, nevertheless, their self-respect did not prevent them from accepting as a dole. Such incidents are symptomatic of a tendency which must inevitably degrade those who yield to it, and which is at once vicious and deteriorating. How widespread it is must be evident to any one who has had the smallest knowledge of the unblushing readiness with which institutional beneficence is utilized in every direction. A young married man in the West, I have been told, wrote to his kindred in the East: "We have had here a glorious revival of religion. Mary and I have been hopefully converted. Father has got very old and helpless, and so we have sent him to the county house." One finds himself speculating with some curiosity *what* religion it was to which this filial scion was converted. Certainly it could not have been that which is commonly called Christian!

And at the other end of the social scale the situation is often little better. In our greater cities homes have been provided for the aged, and especially for that most deserving class of [Pg 730] gentlewomen who, having been reared in affluence, come to old age, after having struggled to maintain themselves by teaching, needlework, and the like, with broken powers and empty purses. But it has, I am informed, been often impossible to find places for them in institutions especially created for their care, because its lady managers have filled their places with their own worn-out servants, who, having spent their years and strength in their employer's service, are turned over in their old age, with a shrewd frugality which one can not but admire, to be maintained at the cost of other people. It is impossible to confront such instances, and they might be multiplied indefinitely, without recognizing how enormous are the possibilities of mischief even in connection with the most useful institutional charity.

And yet these are not so great as those which no less surely follow, as it is oftenest administered, in the train of individual beneficence. In an unwritten address, not long ago, I mentioned an illustration of this which I have been asked to repeat here. While a rector in a large city parish, I was called upon by a stranger who asked for money, and who, as evidence of his claims upon my consideration, produced a letter from my father, written some twenty-five years before, when he was Bishop of Pennsylvania. The writer had, when this letter was placed in my hands, been dead for some twenty years, but, in a community in which he had been greatly loved and respected, his words had not, even in that lapse of time, lost their power. The letter was a general letter, addressed to no one, and therein lay its mischief. When read, it had in each instance been returned to its bearer, and he soon discovered that he had in it a talisman that would open almost any pocket. He was originally a mechanic who had been temporarily disabled by a fit of sickness; when I saw him, however, he was obviously, and doubtless for years had been, in robust health. But he had discovered that if he were willing to beg he need not work, and he had long before made his choice on the side of ease and indolence. After reading the letter which he produced, and looking at its date and soiled condition, both revealing the long service that it had performed, I said to him, "No, I will not give you anything, but I will pay you ten dollars if you will let me have that letter." It would not be easy to describe the leer of cunning and contempt with which he promptly took it out of my hand, folded it, placed it in his pocketbook, and left the room. He was not so innocent as to surrender his whole capital in trade!

Now, here was a man to whom a well-meaning but inconsiderate act of kindness had been the cause of permanent degradation. The highest qualities in such a one—manhood, self-respect, [Pg 731] frugal and industrious independence—had been practically destroyed, and an act of charity had made of one who was doubtless originally an honest and hard-working young man, a mendicant, a loafer, and a fraud.

And yet for a sincere and self-sacrificing purpose to help our less fortunate fellow-men there were never so many inspiring and encouraging opportunities. Along with the undeniably increasing complexity of our modern life there have arisen those attractive instrumentalities for a genuine beneficence which find their most impressive illustrations in the improvements of the homes of the poor in college settlements, in young men's and young girls' clubs in connection with our mission churches, in the kindergartens and in the cooking schools founded by these and other beneficent agencies, in juvenile societies for teaching handicrafts and encouraging savings, and, best of all, in that resolute purpose to know how the other half live, of which the noble service of Edward Denison in England; of college graduates in England and in America, who have made the college and university settlements their post-graduate courses; of such women here

and in Chicago as Miss Jane Addams, and the charming group of gentlewomen living in the House in Henry Street, New York, maintained with such modest munificence by Mr. Jacob Schiff; of such laborious and discerning scrutiny and sympathy as have been shown in the studies and writings of my friend Mr. Jacob Riis—are such noble and enkindling examples.

These and such as these are indicating to us the lines along which our best work for the relief of ignorance and suffering and want may to-day be done, and the more closely they are studied, and the more intimately the classes with which they are concerned are known, the more abundantly they will vindicate themselves. For these latter have in them, far more commonly than we are wont to recognize, those higher instincts of self-respect and of manly and womanly independence that, in serving our fellow-men, we must mainly count upon. There are doubtless instinctive idlers and mendicants among the poor, as, let us not forget, there are chronic idlers, borrowers, "sponges," among the classes at the other end of the social scale. But the same divine image is in our brother man everywhere, and the better, more truly, more closely we know him, the more profoundly we shall realize it. During some six weeks spent, a few years ago, in the most crowded ward in the world, among thousands of people who lived in the narrowest quarter and upon the most scanty wage, I gave six hours every day to receiving anybody and everybody who came to me. During that time I had visits from dilapidated gentlemen from Albany and Jersey City and [Pg 732] Philadelphia and the like, who supposed that I was a credulous fool whose money and himself would be soon parted, and who gave me what they considered many excellent reasons for presenting them with five dollars apiece. But, during that whole period, not one of the many thousands who lived in the crowded tenements all around me, and to hundreds of whom I preached three times a week, asked me for a penny. Not one! They came to me by day and by night, men and women, boys and girls, for counsel, courage, sympathy, admonition, reproof, guidance, and such light as I could give them—but never, one of them, for money. They are my friends to-day, and they know that I am theirs; and, little as that last may mean to the weakest and the worst of them, I believe that, in the case of any man or woman who tries to understand and hearten his fellow, it counts for a thousandfold more than doles, or bread, or institutional relief.

THE HOPI INDIANS OF ARIZONA.

By GEORGE A. DORSEY.

As one approaches the center of Arizona, along the line of the Santa Fé Railroad, whether he come from the east or from the west, his attention is sure to be arrested by several tall, spire-like hills which are silhouetted against the sky to the far north. These peaks are the Moki Buttes, and to the north of them lies the province of Tusayan, the land of the Mokis, or the Hopis, as they prefer to be called. That country to-day contains more of interest to the student of the history of mankind than any other similar-sized area on the American continent. But very few of the great throng that roll by on the Santa Fé trains every year in quest of pleasure, of recreation, of new scenes and strange, stop off at Holbrook or Winslow to take the journey to the Hopis, and very few even know of the existence of these curiously quaint pueblos of this community, which to-day lives pretty much as it did before Columbus set out on his long voyage to the unknown West.

The term *pueblo*, a Spanish word meaning town, is by long and continued use now almost confined to the clusters of stone and adobe houses which to-day shelter the sedentary Indians of New Mexico and Arizona. Not only are these Indian towns called "pueblos," but we speak of the Indians themselves as the Pueblo Indians, and of the culture of the people—for they all have much in common—as the pueblo culture. This similarity of culture is not due to unity of race or of [Pg 734] language, but is the resultant of a peculiar environment. In recent times, the limits of the pueblo-culture area have contracted to meet the demands of the white man; we know also that before the advent of the Spaniard many once populous districts had been abandoned, and as a result there came to be fewer but larger villages. We know also, both from tradition and from archæological evidence, that in former days the pueblo people inhabited many of the villages of southern Colorado and Utah, and that the Hopis and their kin were numerous in many parts of Arizona. The silent houses of the cliffs, the ruins of central Arizona, and the great crumbling masses of adobe of the Salt and Gila River valleys and in northern Chihuahua are all former habitations of the Pueblo Indian. To-day there are no representatives of these people in Utah or Colorado, while the seven Hopi towns of Tusayan alone remain in Arizona. But there are still many pueblos scattered along the Rio Grande, Jemez, and San Juan Rivers in New Mexico. Alike in culture, we may divide the existing pueblos into four linguistic groups—namely, the Hopis of Arizona, the Zuñis of New Mexico, the Tehuas east of the Rio Grande, and the Queres to the west of the Rio Grande. Of the earlier home of the last three stocks we know but little. The ancestors of the Hopis we know came from different directions—some from the cliff dwellings of the north, others from central Arizona. To-day, however, they form a congeries of clans united and welded into a unit by similarity of purpose and by the more powerful influence of a peculiar environment.

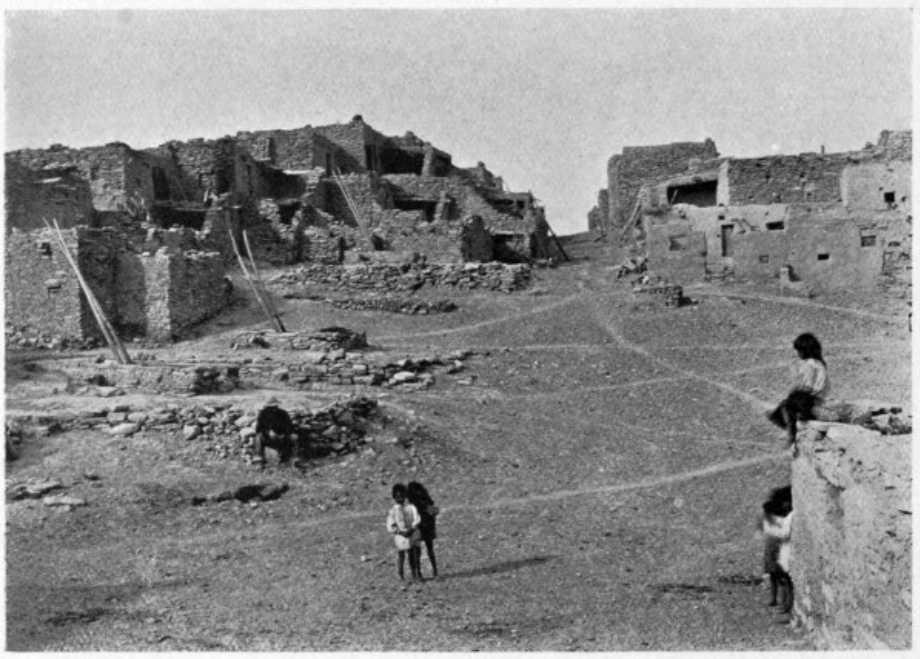
The opinion was held until within a very few years that the Hopis represented a small branch of the Shoshonean division of the Uto-Aztecan stock, but Dr. Fewkes, our greatest authority on the Hopi, has questioned the accuracy of this classification, and it can be stated that the true affinities of the Hopi have not yet been discovered.

The province of Tusayan, or the Moqui Reservation, as it is officially known to-day, contains about four thousand square miles and about two thousand Indians. It is in the northeastern part of Arizona, and its towns are about eighty miles by trail from the railroad. The present inhabitants are grouped in seven pueblos, located on three parallel *mesas*, or table-lands, which extend southward like stony fingers toward the valley of the Little Colorado River. The first or east mesa contains the pueblos of Walpi, Sitcomovi, and Hano; on the second or middle mesa are Miconinovi, Cipaulovi, and Cuñopavi; and on the third or west mesa stands Oraibi, largest and most ancient of all Hopi pueblos, and in many respects the best preserved and most interesting community in the world. A community without a church, separated by a broad, deep valley from [Pg 735] its nearest neighbor, with but a single white man within twenty miles, removed nearly thirty-five miles from a trading post, isolated, proud, spurning the advances of the Government, Oraibi could maintain its independence if every other community on the earth were blotted out of existence.

The journey from Winslow to Oraibi is not without great interest. The beautiful snow-capped peaks of the San Francisco Mountain are always in sight far away to the west, and when the eye tires of the rigid and immovable desert their graceful outlines check the often rising feeling of utter helplessness. Then there is a sweep and barrenness of the plain which is impressive and often awe-inspiring, and which at times produces a feeling similar to that created by the sea. Save for the stunted cottonwoods along the Little Colorado River, there is scant vegetation to relieve the bright reds, yellows, and blues of the painted desert over which the sun's heat quivers and dances, revealing here and there mirages of lakes and forests of wonderfully deceptive vividness. Arising out of the plain here and there are brief expanses of table-lands, with the soft under strata crumbled away and the higher strata having fallen down the sides, producing often the appearance of a ruined castle. At the foot of the mesas are clumps of sagebrush and grease wood, while the plain is dotted here and there with patches of cactus and bright-colored flowers. [Pg 736] Foxes and wolves are common enough, and we are rarely out of sight or sound of the coyote, bands of which make night hideous with their shrill, weird cry.

Although the Navajo country proper is to the north and east of Tusayan, their *hogans*, or thatched-roofed dugouts, are met with here and there along the valley of the river. The Navajos are the Bedouins of America. We often see the women in front of the hogans weaving, or the men along the trail tending their flocks of sheep and goats, for they are great herders and produce large quantities of wool, part of which they exchange to the traders; the remainder the women weave into blankets, which are in general use throughout the Southwest and which find their way through the trade to all parts of the relic-loving world. They raise, in addition, great quantities of beans, which they also send out to the railroad. They are better supplied with ponies than the Hopi, and with them make long journeys, for the Navajos do not live a communal life as do the pueblo people, but are scattered over an extensive territory, each family living alone and being independent of its neighbors.

After a long and tiresome journey of four days we arrive at the foot of the mesa and begin the long, upward climb, for Oraibi is eight hundred feet above the surrounding plain and seven thousand feet above the level of the sea. Just before the crest is reached the trail for fifty or more [Pg 737] feet is simply a path along and up the base of a rocky precipice, its steps worn deep by the never-ending line of Indians passing to and fro. Once upon the summit we have an unobstructed view over the dry, arid, sun-parched valleys for many miles—a view which, in spite of its desolation, is extremely fascinating.



Street Scene, Oraibi.

We often speak of this or of that town as the oldest on the continent. But here we are in the streets of a town which antedates all other cities of the United States—a pueblo which occupied this very spot when, in 1540, Coronado halted in Cibola and sent Don Pedro de Tobar on to the

west to explore the then unknown desert. Imagine seven rather irregularly parallel streets about two hundred yards long, with here and there a more open spot or plaza, lined on each side with mud-plastered, rough-laid stone houses, and you have Oraibi. The houses rise in the form of terraces to a height of two or three stories. As a rule there is no opening to the ground-floor dwellings save through a small, square hatch in the roof. Leading up to this roof are rude ladders, which in a few rare instances are simply steps cut in a solid log, differing in nowise from those found leading into the chambers of the old cliff ruins of southern Colorado. The roof of the first row or terrace of houses forms a kind of balcony or porch for the second terrace, and so the roof of the second-story houses serves a similar useful purpose for the third-story houses.

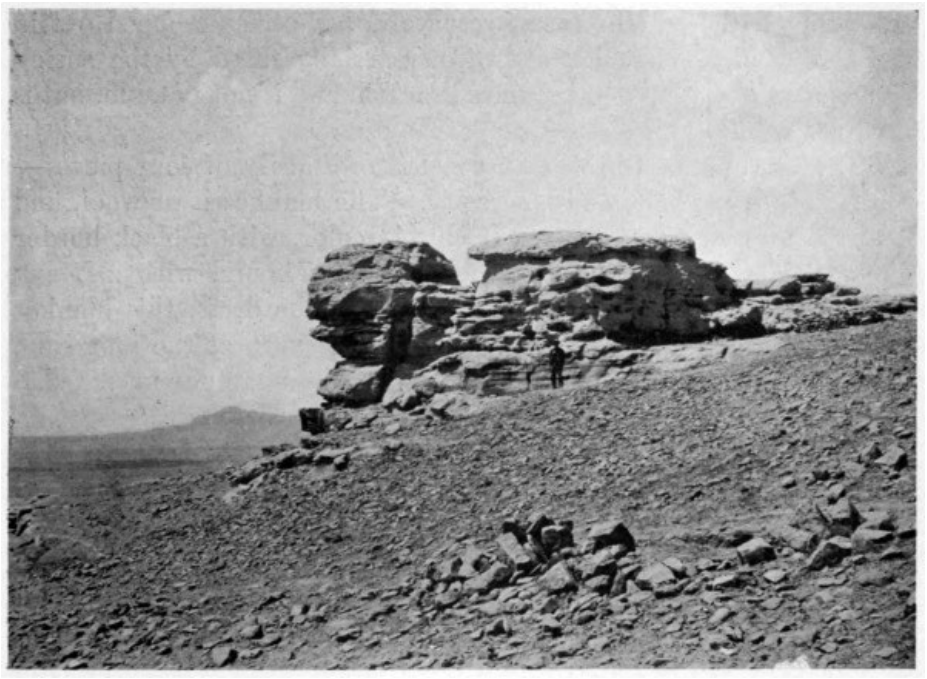
Terrace Scene, Streets of Oraibi.

Two things impress one on entering a Hopi home for the first time—the small size of the rooms, with their low ceilings, and the cleanness of the floors. Both floors and walls are kept fresh and bright by oft-renewed coats of thin plaster, which is always done by the woman, for she owns the house and all within it; she builds it and keeps it in repair. The ceiling is of thatch held up by poles, which in turn rest on larger rafters. Apart from the mealing bins and the *piki* stones, to be described later, there is no furniture—no table, no chairs, no stools, simply a shelf or two with trays of meal or bread, and near the wall a long pole for clothing, suspended by buckskin thongs from the rafters. Their bed is a sheepskin rug and one or two Navajo blankets spread on the floor wherever there may be a vacant space. In one corner may be a pile of corn stacked up like cordwood, and in another corner melons or squashes and a few sacks of dried peaches or beans. Between the thatch and rafters you will find bows and arrows, spindles, hairpins, digging-sticks, and boomerangs, and from the wall may hang a doll or two, children's playthings. Such is an Oraibi home; but it always seems a happy home, and the traveler is always welcome.

Street Scene, Oraibi.

A prominent feature of almost every pueblo plaza is a squarish, boxlike elevation which extends about two feet above the level of the earth and measures about six feet in length, with a two-foot hole in the center, from which projects to a considerable height the posts of a ladder. If you descend this ladder you will find yourself in a subterranean chamber, rectangular in shape, and measuring about twenty-five feet in length by about fifteen feet in breadth, with a height from the floor to the ceiling of about ten feet. This underground room is the *kiva*, or the *estufa* of the [Pg 738]

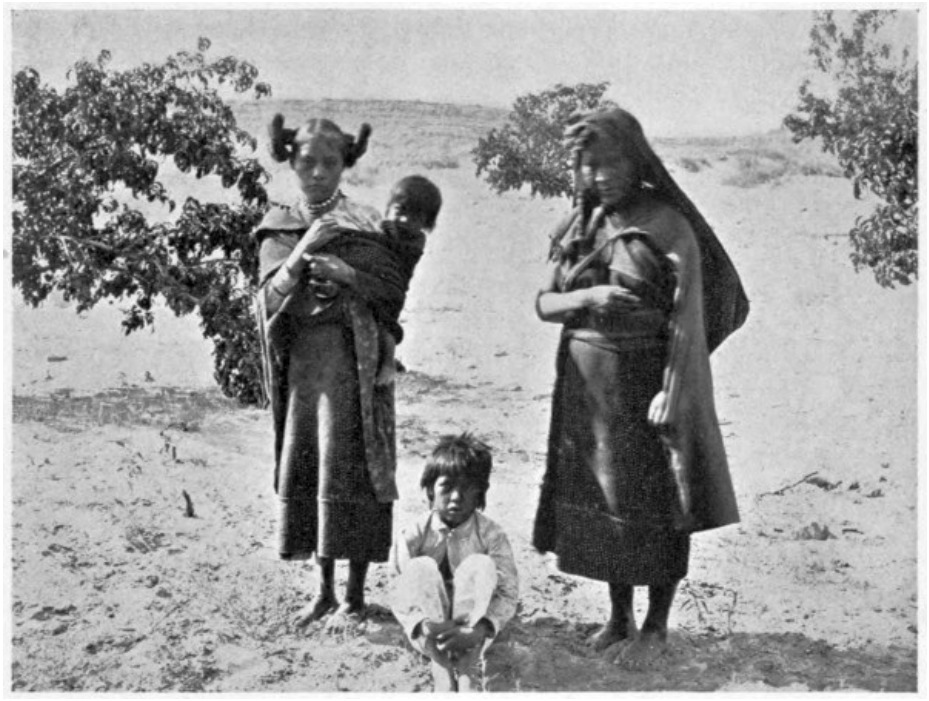
Spaniards. Here are held all the secret rites of religious ceremonies, and here the men resort to smoke, to gossip, to spin, and weave. The floor, to an extent of two thirds of the entire length, except for a foot-wide space extending around this portion, is excavated still farther to a depth of a foot and a half. The remaining elevated portion is for the spectators, while the banquette around the excavation is used by the less active participants in the ceremonies. Just under the hatchway and in front of the spectators' floor is a depression which is used as a fire hearth. The walls are neatly coated with plaster, and the entire floor is paved with irregularly shaped flat stones fitted together in a rough manner. There is sometimes inserted in the floor, at the end removed from the spectators, a plank with a circular hole about an inch and a half in diameter; this hole is called the *sipapu*, and symbolizes the opening in the earth through which the ancestors of the Hopi made their entrance into this world. The roof of the kiva is supported by great, heavy beams, which are brought from the San Francisco Mountain with infinite trouble and labor. In Oraibi there are thirteen kivas, each probably in the possession of some society, one of which belongs to women, who there erect their altar in the *mamzrouti* ceremony. Oraibi has the largest number of kivas of any of the Hopi pueblos; in a single plaza there are no less than four kivas. This plaza is on the west side of the village, and one of the kivas is of special interest, for in it are held the secret rites of the weird snake ceremony. A little to the west of this plaza is a small bit of the mesa, standing apart and separated from the main mesa by a depression. This is known as "Oraibi rock," whence the pueblo takes its name. The etymology of this name "Oraibi" is lost in a misty past, but the rock is still held in great veneration. On it stands a rude shrine, where one may always find sacrificial offerings of prayer-sticks, pipes, sacred meal, cakes, etc.



ORAIBI ROCK, UPON WHICH STANDS KATCIN KIKU, THE PRINCIPAL ORAIBI SHRINE.

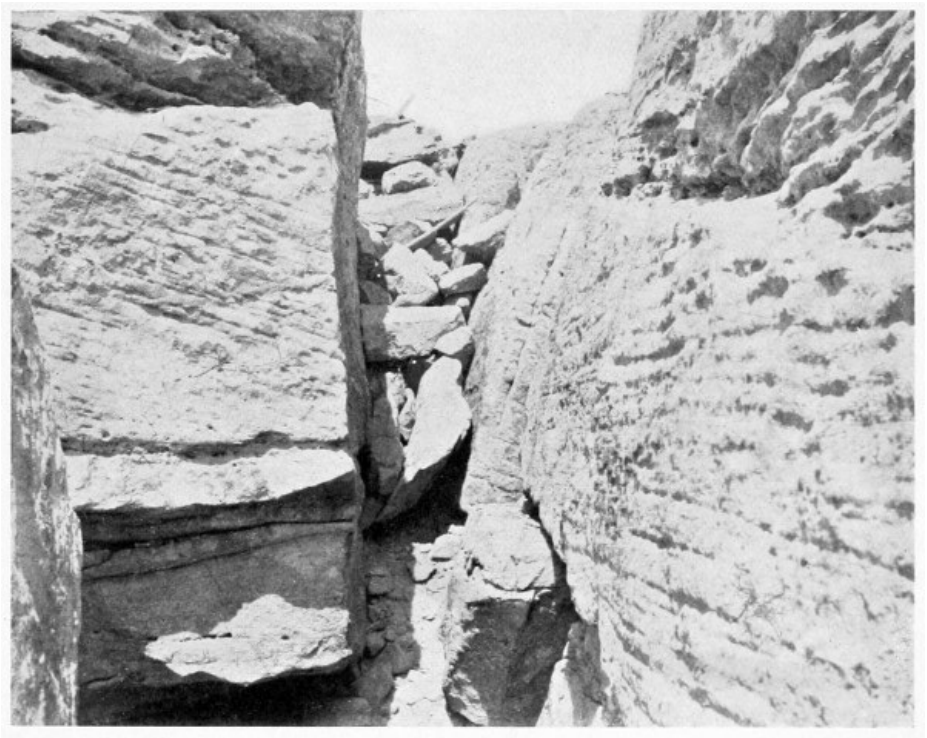
The roof of a Hopi house is always of interest. Here we may see corn drying in the sun or loads of fagots ready for use, women dressing their hair or fondling their babies, or groups of children playing or roasting melon seeds in an old broken earthenware vessel which rests on stones over a fire. From the projecting rafters are ears of corn hung up to dry, or pieces of meat placed there [Pg 739] to be out of reach of the dogs, or bunches of yarn just out of the dye pot. When a ceremony is being performed in some one of the plazas the roofs near by present a scene which is animated in the extreme, every square foot of space being occupied by a merry, good-natured throng of young and old. As one looks from one group to another it is impossible not to notice the stunted and dwarfed appearance of the women, which is in marked contrast to that of the men, who are beautifully formed, of medium height, and of well-knit frames. There is not, however, the same powerful ruggedness or splendid development among these pueblo dwellers which we find among the plains Indians, for the days of the Hopi women are spent in carrying water and grinding corn, while the men in summer till their fields and in winter spin and weave.

In considering the routine life of the Hopi it is hard to draw a sharp line between what we may call his regular daily occupations and his religious life, for they are closely interwoven. He is by nature a religionist, and he never forgets his allegiance and obligations to the unseen forces which control and command him.



An Oraibi Mother and Children.

In nothing is the primitiveness or the absence from contamination of the Hopi better revealed than in the children, for here, as elsewhere, is it shown that they are the best conservators of the habits and customs of ancestral life. What utter savages the little fellows are! Stark naked generally, whether it be summer or winter, dirty from head to foot, their long black hair disheveled and tangled and standing out in every direction, their head often resembling a thick matted bunch of sagebrush. They are never idle; now back of the village behind tiny stone ramparts eagerly watching their horsehair bird snares, or engaged in a sham battle with slings and corncobs, or grouped in threes or fours about a watermelon, eagerly and with much noise gorging themselves to absolute fullness, or down on the side of the mesa playing in the clay pits. A not uncommon sight is that of two or three little fellows trudging off in pursuit of imaginary game, armed with miniature bows and arrows or with boomerangs and digging-sticks. In their disposition toward white visitors they are extremely shy and reticent, but they are also very inquisitive and curious, and, furthermore, they have a sweet tooth, and one only need display a stick of candy to have half the infantile population of the pueblo at his heels for an hour at a time. If perchance one of the little fellows should die, he is not buried in the common cemetery at the foot of the mesa, but he is laid away among the rocks in some one of the innumerable crevices which are to be found on all sides near the top of the mesa, for the Hopis, in common with many other native tribes of America, believe that the souls of departed children do not journey to the spirit land, but are born again. [Pg 740]



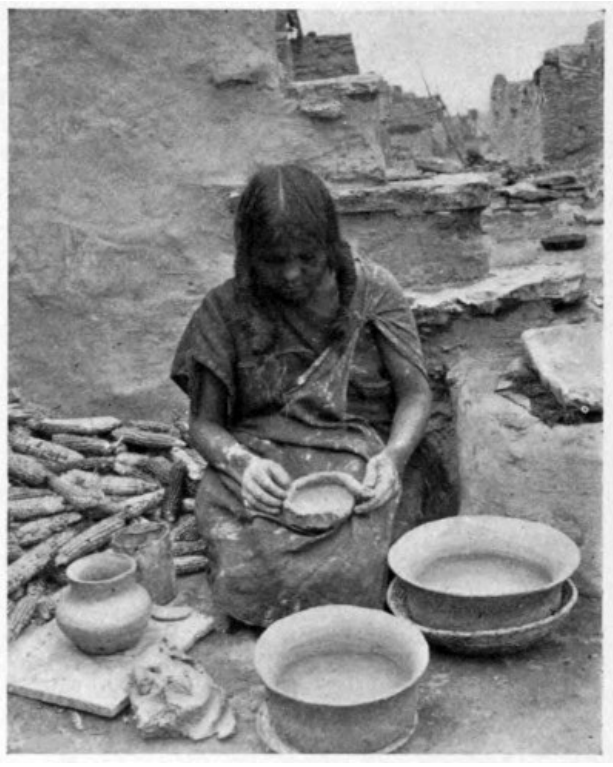
Grave of Child in Rock Crevice.

As the girls reach the age of ten or twelve they distinguish themselves by dressing their hair in a manner which is both striking and absolutely unique on the face of the earth. The hair is

gathered into two rolls on each side of the head, and then, at a distance of from one to two inches, is wound over a large U-shaped piece of wood into two semicircles, both uniting in appearance to form a single large disk, the diameter of which is sometimes as much as eight inches. After marriage the hair is parted in the middle over the entire head, and is gathered into two queues, one on each side, which are then wound innumerable times by a long hair string beginning a few inches from the head and extending about four inches. The ends of the queues are loose. Hopi maidens are, as a rule, possessed of fine, regular features, slender, lithe, and graceful bodies, and are often beautiful. But with the early marriage comes a daily round of drudgery, which prevents full development and stunts and dwarfs the body. But to old age she is generally patient, cheerful, nor does she often complain. Lines produced by toil and labor may show in her face, but rarely those of worry or discontent. Even long before marriage she has not only learned to help her mother in the care of her younger brothers and sisters, but she has [Pg 741] already trained her back to meet the requirements of the low-placed corn mills. From her tenth year to her last it has been estimated that every Hopi woman spends on an average three hours out of every twenty-four on her knees stooping over a *metate*, or corn-grinder, for corn forms about ninety per cent of the vegetable food of the Hopis.

In every house you will find, in a corner, a row of two, three, or four square boxlike compartments or bins of thin slabs of sandstone set on edge. Each bin contains a metate set at an angle with its lower edge slightly below the level of the floor. There is a clear space around each stone to permit of a better disposition of the corn and meal. The texture of the metates is graduated from the first to the last, the final one being capable of grinding the finest meal. Accompanying the metate is a crushing or grinding stone about a foot in length and from three to four inches wide. Its under surface is flat, while its upper surface is convex to a slight extent, so as to permit of its being grasped firmly by the thumb and fingers of both hands. The corn is ground between these two stones, the upper one being worked up and down the metate by a motion of the operator not unlike that of a woman washing clothes on a washboard. The favorite position assumed by the woman while working is to sit on her knees, her toes resting against the wall of the house behind her. Of the many colors of corn used by the Hopis, blue is the most common, and corn of this color is ordinarily employed in the making of bread; other colors, however, are used for the piki consumed in ceremonial feasts.

The stone used by the Oraibians for making piki is from a sandstone quarry near Burro Springs. It is about twenty inches long by fourteen broad, and is three inches thick. The upper surface is first dressed by means of stone picks, and is polished by a hard rubbing-stone, and then finally treated with pitch and other ingredients until its surface is as smooth as glass. It is mounted on its two long edges by upright slabs, so that it stands about ten inches from the level of the floor, [Pg 742] the floor itself being usually excavated to a depth of two or three inches beneath the stone. At a height of about four feet above this primitive griddle is a large rectangular hood which is extended above the roof in the form of a chimney made of bottomless pots, one resting on the other. Kneeling in front of the stone and supporting her body with her left arm, the woman coats the stone with the thin batter of corn and water with the fingers of her right hand. After a few seconds' time she lifts the waferlike sheet from the stone and transfers it to a mat which is made for this special purpose. For some time the piki remains soft and pliable, and while in this condition she rolls or folds the sheets according to her custom—some folding, others rolling it. It is a curious sight on the feast days of certain ceremonies to see women gathering from all quarters of the village at an appointed house, each carrying a tray heaped high with rolls of this paper bread.



Woman of Oraibi making Coiled Pottery.

The Hopis are among the foremost potters in North America, when we take into consideration the fineness of the clays used and the character of the decoration. But in many respects, especially in form, their ware is much inferior to that of the ancient Mexicans and Peruvians. They make pottery to-day as they did hundreds of years ago, but the quality of the work has greatly deteriorated and the earthenware now produced is not to be compared with that found in near-by Hopi ruins. It should be kept in mind, however, that the specimens found in the ancient graves are to a certain extent ceremonial, and consequently better made and more ornate in their decoration than those which were made simply for household purposes. Still, there are a fineness of texture and a delicacy of coloring in the ancient ware which can not now be produced. It is to be noted, also, that the Hopi woman of to-day can not decipher the designs on the earlier pottery, although she often copies them. The demand for earthenware vessels, however, is nearly as great at present as it was in prehistoric days, for you may search the homes of Oraibi for a long time without finding a tin pan or an iron pot. Thus it is that every Hopi woman must be a worker in clay, and one of the occasional sights is that of a woman on her "front porch" surrounded by vessels of all sizes and in varying degrees of completeness. The process of pottery-making is somewhat as follows: After the clay has been worked into a plastic mass she draws out from it a round strip the size of one's finger and about five inches in length. This is coiled flat in the bottom of the tray, and forms the base of the vessel. Other clay strips are kneaded out of the mass, and these are coiled in a gradually increasing spiral, the desired shape and proportion being acquired at the same time, until the vessel has reached its proper height. The sides of the [Pg 743] vessel are then thinned down, and both inside and outside are made smooth by means of small bits of gourds and polishing-stones. The vessel is then ready for a coat of wash, after which it is painted and fired. This method of making pottery is not peculiar to the pueblos, but is found among some of the tribes of South America.

The art of basketry was never brought to a high state among the Hopis, for they confine themselves chiefly to the manufacture of large shallow trays and rough baskets made of the long, pliable leaves of the yucca or of some other fiber. These answer all ordinary domestic requirements. From the reddish-brown branches of a willowlike bush which grows near, the Hopi mother interweaves a cradle board for her children. This cradle is peculiar in its shape, and especially so in its construction, and differs greatly from that in use among the plains Indians. Another singular point to be noted is the fact that this cradle board is not often strapped to the back, but is usually in the arms, or, more often still, is placed on the floor by the side of the mother as she works. The Oraibi mesa, like other table-lands of Tusayan, is destitute of water. The nearest spring is in the valley at the foot of the mesa nearly a mile away. From before sunrise to ten o'clock of every day there is an almost unbroken line of water carriers going and coming from the spring, bending under the weight of a large jar which they carry on their back by means [Pg 744] of a blanket, the ends of which are tied in a knot on their forehead. No wonder these women grow prematurely old. Winter for them, however, has its advantages, for they have an ingenious way of utilizing the snow to save them from the necessity of going down the mesa for water. One of the most extraordinary sights I saw was that of a Hopi woman and her little girl trudging along, each bent almost to the ground under the weight of an immense snowball. These they were carrying home on their backs, enveloped in a blanket. About half a mile from the pueblo, back on the mesa, reservoirs have been scooped out in the soft sandstone, which are often partially filled by the spring rains, but the water soon becomes brackish and is not potable, but is used for washing clothes.

The costume of the woman consists ordinarily of four pieces—a blanket, dress, belt, and moccasins. The blanket is of wool, and is about four feet square. It is blue in color, with a black border on two sides. These two edges are usually bound with a heavy green or yellow woolen thread. To make the dress, this blanket is once folded and is sewn together with red yarn at the long side, except for a space sufficiently large to accommodate one arm. The folded upper border is also sewn for a short space, which rests on one of the shoulders. The other shoulder and both arms are bare, except as they may be partially covered by the blanket. The belt or sash is of black and green stripes, with a red center, ornamented with geometric designs in black; it is about four inches wide, and is long enough to permit of being wound around the waist two or three times. The moccasins are of unpainted buckskin, one side of the top of which terminates in a long, broad strip, which is wound round the leg several times and extends up to the knee, thus forming a thick legging. More than half the time the Hopi woman is barefooted. The girls wear silver earrings, or suspend from the lobe of the ear small rectangular bits of wood, one side of which is covered with a mosaic of turquoise. This custom is of some antiquity, as ear pendants exactly similar to these have been found in the Hopi ruins of Homolobi, on the Little Colorado River.

In addition to this regulation costume, worn on all ordinary occasions, each Hopi woman is supposed to own a bridal costume and two special blankets, which are worn only in ceremonies, and hence need not here be described. The bridal costume consists of a pair of moccasins, two pure white cotton blankets, one large and the other small, both having large tassels of yellow and the black yarn at each corner, and a long, broad, white sash, each end of which terminates in a fringe of balls and long thread. All three garments, before being used, are covered with a thick [Pg 745] coat of kaolin, so that they are quite stiff. With these garments belongs a reed mat sufficiently large to envelop the small blanket and the sash.

So far as I am able to learn, the three pieces of this remarkable costume are never worn except on a single occasion, and at only one other time does the bride formally appear in any of them.

About a month after the marriage ceremony has been performed, during which time she has been living with the family of her husband, she completes the marriage ceremony by returning to the house of her mother. This is termed "going home," and this will be her place of abode until she and her husband own a dwelling of their own. For this ceremony she puts on the larger of the two blankets, which reaches almost to the ground and comes up high on the back of the head, covering her ears. The smaller blanket and the sash are rolled up in the mat, and with this in front of her on her two arms she begins her journey "home." This white cotton costume is probably a survival from times which antedate the introduction of wool into the Southwest.

Who makes all these garments, blankets, etc.? Not the women, as you might expect, but the men. A Hopi woman doesn't even make her own moccasins. If you will descend into one of the kivas on [Pg 746] almost any day of the year, except when the secret rites of ceremonies are being held, you will behold an industrious and an interesting scene. You will find a group of men, naked except for a loin cloth, all busy either with the carding combs, the spindle, or the loom; and to me the most interesting of these three operations is that of the spinning of wool. The spindle itself is long and heavy, and the whorl, in the older examples, is a large disk cut from a mountain goat's horn. There is no attempt at decoration, nor do the spindles compare with those found in Peru and other parts of America for neatness and beauty. An unusual feature of the method employed by the Hopi spinner is the manner in which the spindle is held under one foot while he straightens out the thread preparatory to winding it.

For weaving, two kinds of looms are used. One is a frame holding in place a fifteen-inch row of parallel reeds, each about six inches long and perforated in the center. This apparatus is used solely for making belts, sashes, and hair and knee bands. These are not commonly woven in the kiva, but in the open air on the terrace, one end of the warp being fastened to some projecting rafter. The other loom is much larger, and is used for blankets, dresses, and all large garments. It differs in no essential particular from other well-known looms in use by the majority of the aborigines of this continent. The method of suspending the loom is perhaps worth a moment's notice, as in nearly every house and in all kivas special provision is made for its erection. From [Pg 747] the wall near the ceiling project two wooden beams, on which, parallel to the floor, is a long wooden pole, and to this is fastened, by buckskin thongs, the upper part of the loom. Immediately under this pole is a plank, flush with the floor, in which at short intervals are partially covered U-shaped cavities in the wood, through which are passed buckskin thongs which are fastened to the lower pole of the loom. The sets of thongs are long enough to permit of the loom being lowered or raised to a convenient height. While at work the weaver generally squats on the floor in front of his loom, or he occasionally sits on a low, boxlike stool. It is no uncommon sight to see, at certain times of the year, as many as six or eight looms in operation at one time in a single kiva. The men also do all the sewing and embroidering. Practically all the yarn consumed by the Hopis is home-dyed, but the colors now used are almost entirely from aniline dyes and indigo. Cotton is no longer used except in the manufacture of certain ceremonial garments, all others being made of wool. They own their own sheep, which find a scant living in the valleys; for the better protection of the sheep from wolves they also keep large numbers of goats.

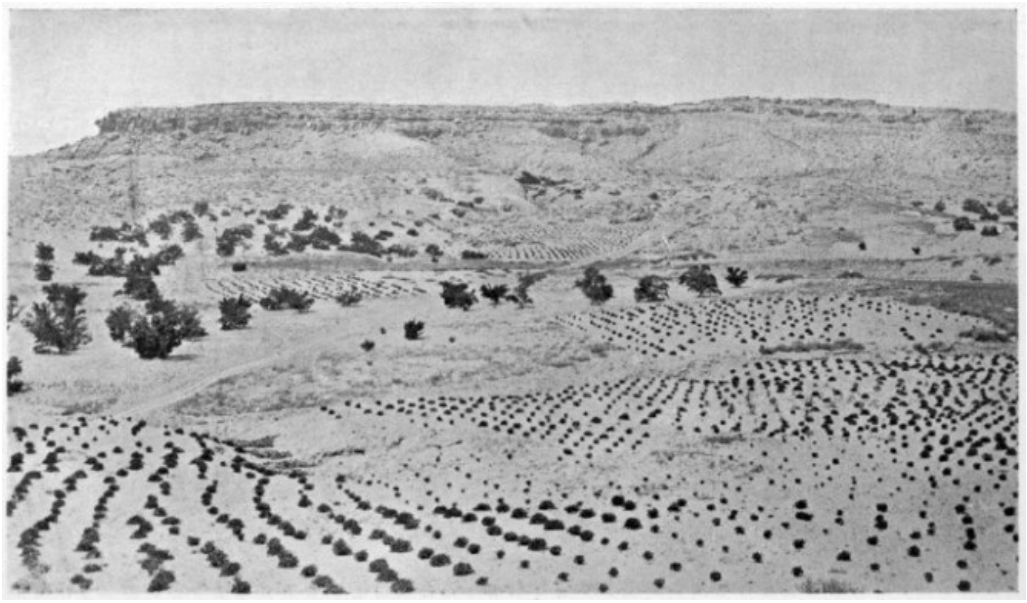
Although the men do all the weaving, they do but little of it for themselves. For the greater part of the year their only garment is the loin cloth—a bit of store calico. In addition, they all own a shirt of cheap black or colored calico, which is generally more or less in rags, and a pair of loose, shapeless pantaloons, made often from some old flour sack or bit of white cotton sheeting. It is a rather incongruous sight to see some old Hopi, his thin legs incased in a dirty, ragged pair of flour-sack trousers, on which can still be traced "XXX Flour, Purest and Best."

Neither sex scarifies, tattoos, or paints any part of the body except in ceremonies, when colored paints are used as each ceremony requires. The men often wear large silver earrings, and suspend from their neck as many strands of shell and turquoise beads as their wealth will allow. Some of the younger men wear, in addition, a belt of large silver disks and a shirt and pantaloons of velvet. Most of their silver ornaments, it should be noted, however, have been secured in trade from the Navajos, who are the most expert silversmiths of the Southwest.

When the Hopi isn't spinning or weaving, he is in his kiva praying for rain, or he is in the field keeping the crows from his corn. I was once asked if the Hopis plow with oxen or horses. They use neither; they do not plow. When they plant corn they dig a deep hole in the earth with a long, sharp stick until they reach the moist soil. When the corn is sprouted and has reached a height of [Pg 749] a few inches there is always the possibility of its being blown flat by the wind or overwhelmed in a sand storm. To provide against this the Hopi incloses the exposed parts of his little field with wind-breakers, made by planting in the earth thick rows of stout branches of brush. These hedges even are often overwhelmed by the sand and completely covered up.

And the crows, and the stray horses, and the cattle! Surely the poor Indian must fight very hard for his corn. For nearly two months he never leaves it unguarded, and that he may be comfortable he makes a shelter behind which he can escape the burning rays of the July and August sun. The shelters are occasionally rather pretentious affairs, at times consisting of a thick brush roof, supported by stout rafters which rest on upright posts. More often, however, they simply consist of a row of cottonwood poles, five or six feet high, set upright at a slight angle in the earth.

Although corn is by far the most important vegetable food, the rich though sun-parched soil yields large crops of beans and melons of all kinds.



Valley Scene; Fields and Peach Trees. Oraibi on Mesa to the Right.

Peach orchards also thrive in the sheltered valleys near the mesa, and in the fall great patches of peaches may be seen spread out to dry on the rocks of the mesa to the north of the village. Of both beans and peaches the Hopis generally have large quantities for the outside market, which they take over to the railroad on the backs of burros or ponies.

Before leaving the subject of the daily life of the male portion of Oraibi I have still to mention a curious weapon of which they make occasional use. This is the throwing-stick, or so-called boomerang, which differs only slightly from that used by the aborigines of Australia; the Hopi stick, however is better made, and is ornamented by short red and black lines. This is the weapon of the young men, and with it they work havoc with the rabbits which infest the valleys. But although they have good control over it, as can often be seen on their return from a hunt, they are not able to cause its return as can the Australians. At first thought it seems rather strange that the boomerang should have been evolved by two groups of mankind dwelling in parts of the world so remote, but we must look for the explanation of this phenomenon in the fact that the natural conditions of the two countries have much in common—a generally level, sandy country, with here and there patches of brush, a peculiar condition which would readily yield itself to the development of an equally peculiar and specialized weapon.

Oraibi Man transporting Firewood with Burros.

For fire the Hopi depends almost entirely on the rank growth of brush which is found along the ravines. This suffices to supply heat to the piki stone and the boiling pot, and enough to keep a [Pg 750] fire on the hearth in the kiva. But now and then he must make a distant journey to that part of the mesa where the supply of stunted and scrubby pines and piñons has not already been exhausted; for by custom four kinds of fuel are prescribed for the kivas, and to keep the hearth replenished with these often necessitates long journeys. As the woman bends under her water jar, so the man staggers along under his load of fagots, often carried from a distance of several miles.

REFORM OF PUBLIC CHARITY.

By BIRD S. COLER,

COMPTROLLER OF THE CITY OF NEW YORK.

Abuse of municipal charity in New York city has reached a stage where immediate and radical reform is necessary in order to prevent the application of public funds to the payment of subsidies to societies and institutions where professional pauperism is indirectly encouraged and sustained. More than fifty years ago the city began to pay money to private institutions for the support of public charges. The system has grown without check until to-day New York contributes more than three times as much public money to private or semiprivate charities as all the other large cities in the United States combined. The amounts so appropriated in 1898 by some of the chief cities were: Chicago, $2,796; Philadelphia, $151,020; St. Louis, $22,579; Boston, nothing; Baltimore, $227,350; Cincinnati, nothing; New Orleans, $30,110; Pittsburg, nothing; Washington, $194,500; Detroit, $8,081; Milwaukee, nothing; New York city, $3,131,580.51.

No serious attempt has heretofore been made to reform this system of using public funds for the subsidizing of private charities. One reason for this has doubtless been the fact that until recently the local authorities were powerless to avoid or modify the effects of mandatory legislation which has disposed of city moneys without regard to the opinions entertained by the representatives of the local taxpayers. It has always been easier to pass a bill at Albany than to persuade the Board of Estimate and Apportionment of the propriety of bestowing public funds on private charities, and the managers of private charities seeking public assistance have therefore generally proceeded along the line of least resistance. The effect of this system was to make beneficiaries the judges of their own deserts, for the bills presented by them to the Legislature were usually [Pg 751] passed without amendment or modification, and gross inequalities in disbursing public funds have arisen, different institutions receiving different rates of payment for the same class of work.

In 1890 the city paid for the support of prisoners and paupers in city institutions the sum of $1,949,100, and for paupers in private institutions the sum of $1,845,872. In 1898 these figures had increased to $2,334,456 for prisoners and public paupers, and $3,131,580 for paupers in private institutions. Private charity, so called, has prospered at the expense of the city until in some cases it has become a matter of business for profit rather than relief of the needy. The returns made by institutions receiving appropriations in bulk from the city treasury show that many of them are using the public funds for purposes not authorized by the Constitution. The Constitution authorizes payments to be made for "care, support, and maintenance." The reports of a large number of institutions show the money annually obtained from the city carried forward wholly or in part as a surplus. Different uses are made of this surplus, none of them, however, authorized by law or warranted by a proper regard for the interests of the taxpayers. In some cases this surplus is used to pay off mortgage indebtedness, in others for permanent additions to buildings, or for increase of investments and endowment. In one case the manager of an institution frankly explained a remarkable falling off in disbursements (so great that its charitable activities were almost suspended) by stating that it was proposed, by exercising great economy for a number of years, to let the city's annual appropriations accumulate into a respectable building fund. The flagrant nature of this abuse is so apparent that comment is unnecessary.

Appropriations for dependent children have reached enormous proportions. Out of a total of $3,249,623.81 appropriated for private charities in 1899, no less than $2,216,773, or sixty-nine per cent, is for the care and support of children. In no city in the United States will the number of children supported at the public expense compare, in proportion to the population, with the number so cared for in the city of New York. This may be partly accounted for by the extremes of poverty to be met with in the metropolis, especially among the foreign-born population, where the struggle for existence is so severe as to weaken the family ties; partly by the rivalry and competition which have existed between the several institutions devoted to this kind of work; partly by reason of the fact that the rate paid by the city for the care of these children is such as to enable the larger institutions, in all probability, to make a small profit; but, to a considerable extent, also from an insufficient inspection by public officers for the purpose of ascertaining [Pg 752] whether children are the proper subjects of commitment and detention. In the city of New York 50,638 children in private institutions are cared for at the public expense. This is one to every sixty-eight of the estimated population of the city.

So much for the abuse and extent of public charity. Now for the reforming of the system that was fast approaching the condition of a grave scandal. The last Legislature passed a bill placing in the hands of the local Board of Estimate absolute power over all appropriations for charitable purposes, and for the first time in many years reform is possible. The discretion conferred by this act upon the Board of Estimate and Apportionment carries with it a large responsibility. If hereafter the city, in its relation to private charitable institutions, should either, on the one hand, be wasteful of public funds, or, on the other hand, should fail to perform the duties owed by the community to the dependent classes, the blame can not be shifted to the Legislature, but will rest squarely upon the shoulders of the local authorities.

In treating a condition which has been allowed to exist for many years almost without challenge from the local authorities, and which has grown upon the passive or indifferent attitude of the public, sweeping and immediate reforms can be instituted only at the cost of serious temporary injury to certain charitable work of a necessary character. I believe that the best results will be

obtained if the city authorities first decide clearly the relations to be established between the city treasury and private charitable institutions, and then move toward that end by gradually conforming the appropriations in the budget to that idea, in such a manner that progress shall be made as rapidly as may be consistent with the desire to avoid crippling excellent charities which have been led to depend for many years upon public assistance. By this, of course, I do not mean to suggest that we should approach the subject with excessive timidity, for the evils that exist have assumed such proportions that a more or less severe use of the pruning knife must be made in dealing with appropriations, else the effect will be scarcely perceptible. I am convinced that ultimately the cause of charity will benefit rather than suffer from this course, for it is a serious objection to the whole subsidy system that it tends to dry up the sources of private benevolence.

In making up the budget for 1900 I shall urge my associates in the Board of Estimate to agree with me to limit the appropriations for charity to actual relief work accomplished. The giving of public money in lump sums to private societies and institutions for miscellaneous charitable [Pg 753] work, of which there is no public or official inspection, should be discontinued at once. It has been the practice for some years past, both in Brooklyn and New York, to donate annually lump sums of money to such organizations. In New York these amounts have been for the most part comparatively small, and principally derived from the Theatrical and Concert-License Fund. In Brooklyn the amounts have been larger, and were obtained originally from the Excise Fund, and later directly from the budget. This practice should be wholly discontinued. The charter itself contains stringent prohibitions against the distribution of outdoor relief by the Department of Public Charities, and the spirit of these provisions would certainly seem to disfavor accomplishing the same result in an indirect manner. Many of these recipients of public funds devote themselves exclusively to outdoor relief, and an examination of the purposes of some of these organizations shows that, however proper these may be as the result of private benevolence, they are extremely improper objects of the public bounty. The immediate and permanent discontinuance of appropriations to all such societies and institutions will correct one of the gravest abuses of the present system. If the persons conducting these miscellaneous charities are really sincere, and believe that they are doing good, they can readily obtain from private sources the funds necessary to carry on the work.

I shall urge that all appropriations to institutions of every kind not controlled by the city be limited to per-capita payment for the support of public charges, and that a system of thorough inspection be at once established to ascertain if present and future inmates are really persons entitled to maintenance at public expense. In addition to this precaution, the comptroller should have full power to withhold payments to any institution after an appropriation has been made if in his judgment, after examination, the money has not been earned. The payment of city money to dispensaries should be discontinued, except in special cases where the work done is clearly a proper charge against the public treasury. No money should be paid for the treatment of dependent persons in any private hospital while there is unoccupied room in the city hospitals.

The city maintains its own hospitals, while at the same time subsidizing private institutions which compete with them. During the last few years great improvements have been made in the city hospitals, but their condition is still capable of considerable further improvement. While sometimes overcrowded, it frequently happens that the city hospitals are not filled to the limits of their capacity, and it would seem as though the city should not deal with private hospitals except [Pg 754] as subsidiary aids or adjuncts to the public institutions. It stands to reason that so long as there are vacant beds in the city hospitals and the city is at the same time subsidizing private hospitals at a cost greater than the expense of caring for patients in its own institutions, a wrong is being done to the taxpayers. If private hospitals are to receive public assistance at all, payments should be made only at some uniform rate, approximately the same as the cost per capita of maintenance in the public institutions.

The gravest problem of public charity is the support and training of dependent children, because that has to do with the making of future citizens of the republic as well as the relief of immediate suffering. This work is entirely in the hands of private societies and institutions. The rearing of large numbers of children in either private or public institutions is in itself an evil—a necessary evil—and likely to continue as long as there is extreme poverty, but still an evil, and not to be fostered by subventions of public money in unnecessary cases, when parents are really able to provide for their support.

To build, equip, and maintain public buildings for the care of dependent children seems to me entirely impracticable. Regardless of the matter of expense, which would be enormous, all the disadvantages of the "institutional system" would continue, and it is not likely that public employees could be obtained who would rear children as economically, as efficaciously, or with the same devotion and self-denial as is the case with the religious orders and associations now performing this work—in many respects so successfully. The care of these children by direct governmental agencies being therefore practically impossible, in the city of New York at least, and it being recognized that the present system is likely to continue for many years, if not permanently, the most should be made of it. With the religious training of children the city has nothing to do. Their moral training may also be left safely to those now responsible therefor. On the other hand, the State is vitally concerned with their mental and physical development, and visitation and control for the purpose of maintaining a proper standard in these respects is essential. This form of public charity, like many others, has been abused, and many children are now supported in institutions who probably should not be there. For the rearing of a child into a possible useful man or woman a poor home is better than a good institution, and it is the duty of

the city authorities to extend the work of inspection and investigation of such cases until they make it impossible for fraud in the commitment and retention of children to escape detection.

The reduction and regulation of appropriations as outlined can not be classed as a radical reform, and will work no hardship upon any dependent person who is a proper charge upon the city. The saving to the taxpayers, if the plan I have suggested is adopted, will approximate one million dollars in 1900, and a steady reduction of expenditures for charitable work should continue for several years to come. [Pg 755]

CHRISTIAN SCIENCE FROM A PHYSICIAN'S POINT OF VIEW.

By JOHN B. HUBER, A. M., M. D.

Christian science is stated to be a religious system which was "discovered," in 1866, by Mrs. Mary Baker G. Eddy, a lady now living in the vicinity of Boston, Mass., who has passed her eightieth year, and who is called by her followers the "Mother of the Christian Science Church," or "Mother Mary." Mrs. Eddy has formulated Christian Science in a book entitled Science and Health, with Key to the Scriptures, in which book are to be found the principles upon which this system rests. We are told that to him who studies this book reverently and conscientiously there will be revealed "the Truth," for which man has been searching without avail since the beginning of his existence; that the faithful student will find in Christian Science an infallible guide for the conduct of life in all its phases; and that the Christian Scientist has the power to heal without any therapeutic means, other than that of the influence of mind upon mind, all imaginable ills, surgical or medical, which afflict mankind and the lower animals. Mrs. Eddy tells us that she and her followers have had this power transmitted to them from Jesus Christ, and that they are able to heal the sick and to perform miracles as He is said to have done. In Science and Health all religious systems other than "Christian Science" are held to have been erroneous and pernicious in their influence upon mankind, and the practice of medicine, as it is taught in the medical colleges, is considered to be hurtful rather than helpful to humanity, and to have increased disease rather than ameliorated human suffering.

It is said that in 1898 there were in the Greater City of New York three thousand Christian Scientists and seven Christian Science churches. The whole number of Christian Scientists is declared to be one million, of whom one hundred thousand, it is said, are engaged in the business of "healing," and are called "healers." The movement has been and is spreading day by day.

In religious matters Christian Science has divided many homes, and has destroyed not a few through the mischief produced by its propaganda. It is claimed that Christian Science has cured many who have not been benefited by the efforts of regular practitioners of medicine. On the other hand, many have died during the exclusive ministrations of Christian Scientists. Moreover, Christian Science considers itself entitled to disregard such sanitary laws, including those concerning infectious diseases, as have been found effectual to preserve intact the general health of communities and peoples. [Pg 756]

Christian Science, then, is a cult unusually powerful and far reaching in its influence, and it is therefore entitled to and should invite correspondingly careful investigation of all its various aspects.

I have been interested in Christian Science from the view-point of the medical man, and I have felt quite unaffected, for the reason which I shall presently give, by Mrs. Eddy's stricture that "a person's ignorance of Christian Science is a sufficient reason for his silence on the subject." The system of medicine, as it is taught in the great medical colleges of to-day, is an epitome of the accumulated study and experience of mankind from the time human beings first became ill up to the present day. All systems of cure, or of alleged cure, have been examined by men who have made it the work of their lives to treat the sick. Whatever has been found curative has been retained, and unsubstantiated claims to cure have been discarded; so that the regular degree of doctor of medicine states that its recipient has acquired a knowledge of the system of treating disease which is a crystallization of the world's best medical thought, study, and experience.

As the possessor of such a degree, I have been engaged during several months in an investigation of the cures which Christian-Science healers are said to have accomplished.

Before beginning this work I reflected that mental suggestion, or the influence of the mind of the physician upon that of the patient, is a potent factor in the treatment of such diseases as are not characterized by permanent pathological changes in the tissues, and I remembered that when judiciously influenced by the physician's mind, the mind of the patient can affect his body favorably both in functional disorders and in disorders which may result from nervous aberration —such as hysteria in all its protean forms, the purely subjective, as headache and hyperæsthesia, and also those exhibiting objective manifestations, as hysterical dislocations and paralyses.

I knew that medical men, in their own unadvertised work, employ mental suggestion as a therapeutic means, rely upon it as a part of their armamentarium, and use it in appropriate cases, either alone or combined with other means of cure, as electricity, hydrotherapy, and drugs [Pg 757]

—which last, despite Mrs. Eddy's foolish denunciation, are quite as much entitled to be considered divinely appointed therapeutic agents as is mental suggestion.

What I did want especially to discover was whether the Christian Scientist could cure such diseases as are considered by the medical man to be incurable—as cancer, locomotor ataxia, or advanced phthisis—and also what were the results of their treatment of typhoid fever, pneumonia, diphtheria, malaria, etc. And I wanted also to investigate the claims of Christian Science concerning the alleged cure of surgical conditions, such as necrosis or hæmorrhage from severed arteries, by no other means than the sole exercise of thought. If the Christian Scientist could have healed in such cases, I for my part would have declared him a worker of miracles. Therefore I searched diligently for such cases.

In the beginning I had the honor to meet Mrs. Stetson, the "pastor," or the "first reader," of the "First Church of Christ, Scientist," at 143 West Forty-eighth Street, New York city. I had prepared a number of questions concerning Christian Science which I wished to ask Mrs. Stetson. She preferred, however, not to answer them herself, but told me that she would be pleased to forward them to Mrs. Eddy. I then wrote out these questions and put them, together with a letter to Mrs. Eddy, very respectfully requesting her consideration of them, in Mrs. Stetson's hands. Mrs. Stetson then very kindly forwarded them to Mrs. Eddy. Among the questions which I asked were the following:

Is the treatment of the sick a part of Christian Science?

Upon what principles is the Christian Scientist's method of treatment founded?

How do you define health?

How do you define disease?

When a patient presents himself to you, do you inquire concerning the causes of his illness?

Do you investigate symptoms? (Symptoms, I stated, are the signs of disease.)

Do you make diagnoses? (A diagnosis, I stated, is a consideration of symptoms by which one disease is distinguished from another or others.)

In what does your treatment consist?

In treating a patient, do you administer any material substance, and require that it be taken into the body as one would food?

Do you consider cleanliness, good order, and the attainment of æsthetic effects in a patient's environment a part of treatment? [Pg 758]

Do you take any steps to isolate the patient sick of an infectious disease, or to protect those about the patient from the disease?

Do you treat structural diseases, as cancer or locomotor ataxia? Do you consider you have cured such diseases? If so, how do you know you were treating a structural disease, such as cancer or locomotor ataxia?

Would you treat cases of fracture of bones or violent injury? If so, what would you do in such cases?

Will you give me the names of patients whom you have treated, with permission to inquire concerning their illnesses, your treatment of them, and the effects of your treatment upon them—upon the distinct understanding that their names are not to be published?

Do you deny the existence of matter? In Science and Health it is stated that "all is mind, there is no matter." How is it possible, in treating disease, for you to separate mind from matter?

Animals sometimes become sick; could they be cured by Christian-Science methods?

From Mrs. Eddy I received no answer nor any communication whatever. But, some time afterward, Mrs. Stetson informed me that the matter had been turned over to Judge Septimus J. Hanna, Mrs. Eddy's "counsel." Just here I reflected how Jesus Christ, whose representative Mrs. Eddy declares herself to be, would have acted under those circumstances, and I wondered how he would have appeared in this odd atmosphere hedged about by "counsel" and other legal paraphernalia. Presently thereafter I had the honor to receive a note from Mrs. Stetson, appointing a time for me to call. When I did this, Mrs. Stetson gave me a letter which had been sent her by Judge Hanna, and which she permitted me to use as I should see fit. This is the letter:

"BOSTON, MASS., *November 18, 1898.*

"*Editorial Office of The Christian Science Journal, Mrs. A. E. Stetson, New York City*:

"DEAR SISTER: Mr. Metcalf handed me the questions submitted by Dr. Huber. I have also received and carefully read your letters. As I think Mr. Metcalf has informed you, this matter was referred to me from Concord. I have been so very busy that I have not had time to give this matter the thorough attention it needs until now.

"I have carefully read and considered the entire paper. My conclusion is that it will be wholly impractical—indeed, I may say impossible—to answer these questions in such a

manner as to make an entire paper fit for publication in a medical journal, or in any other magazine or periodical. The questions submitted touch the entire subject of Christian Science, both in its theology and therapeutics. These questions can be answered only in one way so that they can be understood, and that is by just such study of the Bible and Science and Health with Key to the Scriptures as the earnest, sincere Christian Scientists are giving them every day of their lives, and have been for years. When we think of the helps provided by our leader, the Rev. Mary Baker Eddy, for her own students in arriving at a correct interpretation and putting in practice the teachings of these text-books, such as the publications established by her, the Bible Lessons made up of selections from the Bible and our text-book, constituting the sermons for our service in all the Christian-Science churches; the many auxiliaries she has published and is publishing in further illucidation of the text-books—when we stop to consider that even those of her students who may be considered the most advanced are as yet infants in the understanding and ability to demonstrate the truth contained in these text-books, can we not easily see, and will not your friend the doctor at a glance see, the utter futility of attempting to answer his questions so as to make the answers intelligible to the medical profession and their readers? I admire greatly the kindly spirit manifested by the doctor and those for whom he is acting,[2] and the entire fairness, from their standpoint, of the questions submitted, but this does not relieve the difficulty of the situation. I therefore return the doctor's questions, with many thanks in behalf of our leader and the cause for the impartial spirit manifested.

"Yours in Truth,
"S. J. HANNA."

I wrote Judge Hanna a note of thanks, and in reply received a letter in which he stated: "I should have been very glad if I could have seen my way clear to answer your questions in such a way as could have been intelligible and satisfactory. But it was impossible for me to do so."

Now, all this seems to me much worse than preposterous. I fail utterly to see why he who asks the question, "Do you isolate a patient suffering from an infectious disease?" would have to spend months or years in Nirvana-like abstraction before he would be able to appreciate an answer to it. No doubt Judge Hanna, who is evidently a lawyer, could, if he chose, tell the reason why.

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To all who had been "healed in Christian Science" whom I met I stated plainly my object—to investigate how they had been "healed." I stated that my findings would be published, but that no names would be printed. The cases were to be numbered. I stated that I did not wish to examine nervous manifestations of a hysterical sort or purely functional disorders. I wished to see cases of disease in which the structure of the organs was likely to be or to have been involved, such as Bright's disease or cancer. Having, to begin with, explained this fully, I took the subject's history and ascertained whenever possible the name of any physician who may have treated the patient before he or she went "into Christian Science." Almost all these physicians who live in New York I visited; to the others residing in New York and to those living out of town I wrote, the form of the letter being generally as follows:

"DEAR DOCTOR: I am investigating Christian Science from the physician's view-point, and am examining a number of people, in the hope of presenting some twenty histories. These histories would, I think, be valuable only in so far as they are scientifically accurate. Therefore, whenever possible, I request a medical account from any physician who may formerly have been in attendance. I have now under observation the case of Mr. X——, who believes himself to have been cured 'in Christian Science.' I would thank you very kindly if you would send me whatever medical information you can concerning this case, with records of examinations if possible. The cases will be numbered, not named."

In each case, having set down the subject's statements and the physician's statement, I recorded my own observations of the subject's condition.

I examined in succession *and without exception* the case of every willing Christian Scientist up to the number of twenty.[3] All these cases were of their own choosing; no doubt, then, they would be considered to be among their "good" cases. Their "failures" I had no opportunity to examine. There were many others who refused to testify, no doubt justifiably. Others refused for reasons not easily comprehended, considering the fact that these people hold weekly "experience meetings," in which they "rejoice to testify to the power of Christian Science." It is difficult to see, therefore, why such cases should not invite scientific investigation.

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I could find in all these twenty cases no "cure" that would have occasioned the medical man the slightest surprise. What did surprise me was the vast disproportion between the results they exhibited and the claims made by Christian-Science healers. One of these cases may be cited as an example of the loose generalization upon which many of the claims of these healers rest. A lady stated that she had had pneumonia. I asked how she knew she had had pneumonia. She declared she knew, because her nurse "could tell at a glance she had pneumonia." No medical examination had been made. I asked what symptoms she had had—how she had suffered. She told me she had purposely forgotten—she had tried to dismiss from her mind all recollection of this distressing illness. Well, this is no doubt commendable enough; but how do we know, then, if she really had pneumonia, or anything more than an ordinary cold?

I heard during my investigation of cases of yellow fever, phthisis, cancer, and locomotor ataxia which had been "healed in Christian Science." But truth compels the statement that my efforts to examine these cases were defeated by the cheapest sort of subterfuge and elusion. To be explicit: On November 2, 1898, a man arose in an "experience meeting" which I attended and stated that he had been one of a party of twelve who, while in Central America, contracted yellow fever, he having suffered with the rest. All took medicine but himself; instead, he read Science and Health. Among his companions seven died; he recovered completely. Several days later I called at the church and asked for the name and address of this gentleman, and twice, on this and a subsequent visit, the clerk promised to send me his address. Not having received it, I called a third time, on November 21st. The clerk told me he could not find this eel-like specimen, and could not get his address. This man was, however, a member of that church, and had, on the evening I was present, a number of acquaintances in the congregation.

Again, I had been told that a young lady living out of town had been "healed" of consumption. I wrote her mother, who sent me a kind note, inviting me to call several evenings later, and inclosing a time-table. She stated, "I shall be happy to give you any information in my power, as Christian Science has been a great blessing in my family." Before the appointed evening I received a note, breaking the engagement. Again, at an "experience meeting" a man arose and declared he had cured a case of locomotor ataxia, "so that the patient's two former physicians had been lost in amazement at the change." I learned also that his wife, another "healer," had cured a case of cancer of the tongue. I wrote this gentleman, and he sent me an answer, kindly inviting me to call at his house. He lived out of town. I went to his house, and spent the greater [Pg 762] part of an evening trying to prevail upon these two people to show me or to introduce me to these subjects of locomotor ataxia and cancer of the tongue. They utterly refused to do so. Their line of argument was quite of the same sort as that contained in the letter of their better-known "brother in the church," which appears earlier in this paper. I was not investigating in the right way. What I ought to do was to study Science and Health and the other elucidatory works—above all with an obedient spirit, and "the truth" would come to me in time. Or it may be this pair of "healers" had in mind this reasoning, not new in my observation of this odd cult: In the mind of the Christian Scientist the locomotor-ataxia patient was healed, but he was withheld from inspection by the deceptive senses of those outside the Christian-Science pale, to which senses the patient might appear to stagger about and be as ill or more ill than ever before. Following is this "healer's" letter to me:

> "My dear Dr. Huber: I received your letter with Joy, and name next Monday eveng as a time to give you for your enquiry into the workings of Truth as it has come under my notice. Our field is a broad one coverig several towns, and we have not lately had an eveng free for discussin the subject coverig this sublime and stately Science That leads into all Truth even to the solving of the problem of Being. The healing of the sick is only the primary steps this step however is an important one as its demonstration with proof attests its divine origen even God—Good, its principle source and ultimates in Eternal Life. For the Life is in his Son and Divine Science reveals this son Even our own Christ our spiritual Individuality God being our Father and mother,
>
> "Yrs. in Truth
> "——."

The writer of this letter is the leader of that Christian-Science church in New Jersey a member of which was a woman who died, in June of this year, of consumption,[4] and this woman's "healer" was the writer's wife. The woman who died left the Episcopalian Church and became a Christian Scientist in January, 1899. In April she contracted a heavy cold, to which she gave no attention. Her husband remonstrated with her, and wished her to consult a physician, but she would not do so. She declared she could not be ill, but that she was well and happy. The services of her "healer" were the only ministrations she received. In the beginning of June her condition was so [Pg 763] bad that her husband prevailed upon her to see a physician, who examined her and found her hopelessly ill with consumption. Another physician examined her and reached the same conclusion. She then turned "longingly and earnestly to the religion in which she had been brought up." Two weeks after, she died, "asking the prayers of her co-religionists in behalf of herself, her husband, and her children."

Mrs. Eddy declares that she "healed consumption in its last stages, the lungs being mostly consumed"; that she "healed carious bones which could be dented with the finger"; and that she "healed in one visit a cancer that had so eaten the flesh of the neck as to expose the jugular vein so that it stood out like a cord." Judge Hanna has published statements to the effect that "cancer, malignant tumors, consumption, broken bones, and broken tissues have been healed in Christian Science, without the assistance of any material means whatever." Mr. Carol Norton, a Christian-Science lecturer, has publicly announced that Christian Science has healed "locomotor ataxia, softening of the brain, paresis, tumor, Bright's disease, cancer," etc. And many other Christian Scientists have made like claims. Very well, then. Who are these people that have thus been cured? What are their names? Where do they live? How can they be found? Will Mrs. Eddy and her followers submit these cases for scientific examination? I and other investigators are asking, and have for years been asking, these questions, and we are all of us still waiting for answers.

The importance of all this is no doubt manifest. The healing of disease is, we are told, the outward and visible evidence upon which Christian Science expects to be judged and accepted. Therefore the cult must stand or fall upon the results of an investigation of the healer's claims.

"By their fruits ye shall know them."

There are Christian Scientists who will say that these statements of Mrs. Eddy and her associates must be taken upon faith and as *ipse dixit* utterances. This is in the last degree silly. With such statements faith has absolutely nothing to do. They are solely matters for scientific inquiry.

Every Christian Scientist may be a healer. A little child may be a healer in Christian Science. The treatment is said to consist in thinking, speaking, and writing. It is declared that no material substances are used. The following oddity in mental processes is here to be noted: A healer told her patient to take a certain drug during her illness, and that she would then demonstrate the power of Christian Science *over this drug*.

The healer does not need to see his patient. He may, if he will, treat "absently," by a species of thought transference. He would consider his treatment effectual if he were in New York and his patient were in Hong Kong. [Pg 764]

I have rheumatism, let us say, and at midnight my swollen and inflamed joint gives me pain. I send for a Christian-Science healer. In all probability my messenger will call upon a person who has had no preliminary medical education whatever. He is likely to find some one who is quite illiterate, as witness the letter last presented. He may, as I have, come upon some one who has been engaged in the occupation of amusing the *habitués* of beer saloons by playing upon the zither before he took up the more remunerative business of Christian-Science healing. Or he may, as I have, come upon some one who is engaged simultaneously both in the business of selling drugs and in the practice of healing by mental therapeutics alone.

Having been found, the healer, first requiring a fee from my messenger, treats me "absently," while lying abed in his own home. His treatment consists in sending me word that I only imagine I am ill, that my joint is really not swollen, that it is really not inflamed, and that it really does not pain me, but that, on the contrary, I am really very well and very happy indeed.

Some diseases are in Christian Science considered to take longer to heal than others; I have not understood why. If "all is mind, and there is no matter,"[5] as the Christian Scientist holds, and if, therefore, the varying densities of tissues need not be considered, why should not cancer or locomotor ataxia be healed as easily and as rapidly as a headache or a hysterical manifestation? Christian Science despises bodily cleanliness, the use of baths, and the most ordinary sanitary regulations. "To bow down to a flesh-brush, bath, diet, exercise, and air is a form of idolatry."[6] We learn, finally, that "the heart, the lungs, the brain, have nothing to do with life."[7]

Christian Science has stood by the bedside of an infant sick with diphtheria, has prevented interference with its incantations, and has seen this infant choke, grow livid, gasp, and expire, without so much as putting a drop of water to its lips.

Most Christian Scientists are well to do. Their tenet is that "no one has any business to be poor." In New York their churches are in the neighborhood of the wealthy, and there are no missions by means of which the professed blessings of Christian Science may be disseminated among the poor. Christian Science is demonstrably a powerful organization for the accumulation of wealth, and by easy calculation one may see that her propaganda has made Mrs. Eddy, who is said to have been at one time very poor, conspicuously rich even in these days of enormous fortunes. [Pg 765] When we consider that this woman claims to be actuated by the spirit of the poor Nazarene, has hypocrisy ever gone to greater length?

Mrs. Eddy despises all metaphysical systems, yet her writings display her inability to think logically through half a dozen consecutive lines.

Mrs. Eddy declares that "no human being or agency taught me the truths of Christian Science, and no human agency can overthrow it."[8] But there are published statements,[9] of the truth of which the writer offers to give legal proof, in which it is shown, by means of the "deadly parallel," that the essential ideas underlying her system are all plagiarized from the writings of an irregular practitioner to whom, many years ago, she went for treatment. Published accounts of her illness at that time present a picture of hysteria pure and simple.

Mrs. Eddy claims to possess healing powers nothing short of miraculous, yet the writer just mentioned declares that she has probably not been a well woman these forty years past. Certain it is she almost never appears in public, and only a few of her followers have ever seen her face except in copyrighted photographs.

The medical profession is most stupidly reprobated by Mrs. Eddy and her associates, especially for its "mercenary motives." A specific statement may here be not malapropos. In the year 1895 there were 1,800,000 inhabitants in the lesser city of New York, and on the rolls of its hospitals and dispensaries were more than 793,000 names of people for the treatment of whom New York's medical men received practically no pecuniary reward whatever.

It is declared that Christian Science is a religious system, that the treatment of the sick is a part of this system, and that, as the Constitution forbids interference by the States with religion, no laws can be enacted which could compel the healer to desist from his work. But there is a sharp distinction between religious liberty and license to commit, in the name of religion, unlawful acts. A man would not be justified in killing his child in obedience to a fanatical belief, as Abraham was about to do; but Christian Science has sacrificed the lives of little children upon the altar of its pseudo-religion. Had not these children rights which ought to have been safeguarded? If the

Christian Scientist's position be admitted, a thug might, upon the same principles, be justified in committing murder, on the ground that murder is a practice required by his religion; and a Mormon might, on the same basis, practice polygamy. When a healer treats for hire a sufferer from typhoid fever, is he acting in a religious capacity? [Pg 766]

The observer will find in Christian Science much charlatanry (by which many honest fanatics are deceived), much to surprise reason and common sense, to offend good taste and the proprieties, to outrage justice and the law, and to mortify the pious.

And in the last degree reprehensible will appear this cult's ghastly masquerade in the garb of Him that prayed in the Garden of Gethsemane, "the pale, staggering Jew, with the crown of thorns upon his bleeding head," the tenderest, the divinest, the most mankind-loving personality the world has ever known.

THE WHEAT LANDS OF CANADA.

By SYDNEY C. D. ROPER.

When Sir W. Crookes, in his inaugural address as President of the British Association, startled a large number of people by stating that, unless some radical change was made in the present system of wheat cultivation, there would be a bread famine in 1931, because the world's supply of land capable of producing wheat would have been exhausted, there was undoubtedly a considerable feeling of uneasiness engendered, and more attention was paid to the address than is usual even to so valuable a contribution as the inaugural address of the President of that Association must always be. It was, therefore, with a feeling of relief that we found one person after another, well qualified to speak, coming, as it were, to the rescue, and pointing out that Sir W. Crookes's conclusions were not warranted; and in the minds of the majority, no doubt, the last feeling of uneasiness was dispelled by the able letter in The Times, in December last, in which Sir John Lawes and Sir Henry Gilbert, who are *facile principes* as scientific agriculturists, and whose opinions carry greater weight than even those of the President of the British Association, gave most satisfactory reasons for being unable to believe in Sir W. Crookes's predictions.

It is true that, in a subsequent letter, Sir W. Crookes stated that his remarks were intended more as a serious warning than as a prophecy; but, seeing that his conclusions were based on definite statements of definite facts and figures, it is difficult to treat them as other than prophetic.

In order, however, to establish the probability of a wheat famine in the near future it became necessary for Sir W. Crookes to seriously misrepresent and underestimate the wheat resources of some of the principal countries most interested in producing that cereal, and it is to a large extent by exposing the magnitude of these misrepresentations that the validity of his conclusions is called in question and disproved. The two countries which, with perhaps the exception of Russia, are most concerned in the wheat production of the future, and therefore in the correction of these misstatements, are Canada and the United States. [Pg 767]

Mr. Atkinson, the well-known writer on economic subjects, took up the cudgels for the United States, and their case could hardly have been in better hands; but so far no champion has appeared on behalf of Canada; and while Sir W. Crookes may not have been alone in his views about the possible exhaustion of the wheat area in the United States, he certainly stood quite alone when he committed himself to the remarkable statements that are to be found in the address, in order to decry the capabilities of the Canadian wheat fields. I did not immediately reply to them myself, thinking that some one better qualified would do so, but this has not been done, and as I feel that they can not be allowed any longer to remain unanswered, I propose to deal with them in the present article.

Mr. Atkinson's defense has been criticised, in the March number of The Forum, by Mr. C. Wood Davis, who naturally upholds Sir W. Crookes's views, seeing that they appear to have been largely induced by his own figures and agree with his own ideas, but his argument in that article is more one of fault finding with the statements of others than an attempt to justify his own position. As a specimen of his style of criticism, Mr. Davis takes Mr. Atkinson to task for saying that "the present necessities of the world are computed by Sir W. Crookes at 2,324,000,000 bushels," and says that in no part of his address was an estimate of the whole world's requirements so much as mentioned; and yet, on turning to the address, we find that Sir W. Crookes said: "The bread eaters of the whole world share the perilous prospect.... The bread eaters of the world at the present time number 516,500,000.... To supply 516,500,000 bread eaters will require a total of 2,324,000,000 bushels for seed and food." The requirements of the whole world are distinctly stated here, for bread is required only for the bread-eating population, and therefore the requirements of that population are, as far as bread is concerned, the requirements of the whole world. Mr. Atkinson, however, is well able to take care of himself, and he and Mr. Davis can fight out for themselves the question as to when, or if ever, the United States will cease to export wheat; but it is amusing to find Mr. Atkinson charged by Mr. Davis, of all men, with dealing in "purely speculative computations," for if there is any one who has freely indulged in these same purely speculative computations it is Mr. Davis himself, as we shall presently see. [Pg 768]

The value of the various calculations that statisticians indulge in is largely discounted by the fact that allowance is rarely made for changing conditions. Such has been the ratio, such is the ratio, and therefore in so many years' time such will be the ratio, is the burden of their calculations, so that while their figures for the past and present may be both correct and instructive, their calculations for the future are frequently of little practical utility; and it is this failure to allow for any variation in conditions that renders Mr. Davis's figures of so little value, and Sir W. Crookes's conclusions, which are based on them, of no greater importance.

It is surprising to find how much value Sir W. Crookes attaches to Mr. Davis's figures, and it leads one to the conclusion that he has either not examined them very closely, or shares with Mr. Davis a fondness for "purely speculative computations"; and while it is not seemly to accuse, as has been done, a man of Sir W. Crookes's standing and reputation of resorting to "bucket-shop" methods to support his conclusions, it is difficult to avoid thinking that the anxiety to establish those conclusions has not only led him to accept Mr. Davis's calculations without proper examination, but has also influenced the preparation of some of his antecedent data and led him to subordinate facts as a means to a required end. Since Sir W. Crookes thinks so highly of Mr. Davis's figures and upon them has based some of the most important conclusions of his address, and as Mr. Davis himself is so ready to find fault with the calculations of others, it might be well just here to see how some of Mr. Davis's own calculations have been verified and what amount of dependence should be placed upon his figures or on deductions from them.

In An Epitome of the Agricultural Situation, published by Mr. Davis in 1890, he predicted an annually increasing deficit in the world's wheat supply and the almost immediate inability of the United States to do more than grow enough wheat for home consumption, and, as a consequence, that "After 1895 we (United States) must either import breadstuffs, cease to export cotton, or lower the standard of living," this latter prophecy being emphasized by being printed in capital letters. These predictions were made ten years ago—ample time, surely, for at least some evidence of their fulfillment to be apparent. But what are the facts? The Chief of the Bureau of Statistics, in his report on the foreign commerce of the United States for 1898, says: "The total exportation of meats and dairy products amounted in the last fiscal year (1898) to $167,340,960, [Pg 769] against $145,270,643 in the highest year prior to that date (1894), while the value of animals exported in 1898 was greater than that of any preceding year; of wheat the exports of the year were the largest in value, save the exceptional years of 1880, 1881, and 1892. Of cotton the exports of the year were the largest in quantity in the history of the country.... Thus, in the great agricultural products—breadstuffs, provisions, and cotton—the exports have been phenomenally large, while the total of products of agriculture exceed by $54,000,000 the exports of agricultural produce in any preceding year of our history." So much for exports; now for the imports of breadstuffs. The total value of breadstuffs, both dutiable and free, entered for consumption in 1898 was $957,455, of which $628,775 were for imports of macaroni, vermicelli, etc., articles not in any case manufactured in the country. I have not seen any explanation by Mr. Davis of the failure of his predictions, but it is probable that he had them in mind when he wrote in The Forum (March, 1899), "Had not the herds of hay- and maize-eating animals shrunk greatly since 1892, thus rendering vast areas of hay and maize lands available for wheat production, we should probably have reduced the wheat area, instead of adding ten million acres to it since 1895." This, however, is a purely arbitrary assumption, unsupported by anything more substantial than Mr. Davis's personal opinion. In the same article he says: "But herds being insufficient for present needs must be added to in the measure of the existing deficit, as well as in that of the animal products and services required by all future additions to the population. This will necessitate and force a restoration to other staples of acres recently diverted to wheat." But, in the face of the figures quoted above, the evidence is clear that herds are not only ample for present needs, but afford a larger margin than ever of exportable surplus. If herds were insufficient, there would have been a curtailment of exports and an increase in the consumption of breadstuffs, but neither have happened; neither has there been any reduction in the standard of living. Is not the inference irresistible that the country was carrying a larger number of animals than conditions absolutely required, since farm animals have declined from 169,000,000 in 1892 to 138,000,000 in 1898, without in any way disturbing the conditions of food supply or reducing the exports of provisions? In 1890, Mr. Davis assumed that 44,800,000 acres of hay would be required in 1895 and 49,200,000 acres in 1900, yet in 1898, 42,800,000 acres were found to be ample for the needs of the country.

Do not the foregoing figures clearly indicate that it is not safe to assume that the area employed in the cultivation of certain staples at any given time, or the average of that area for any given [Pg 770] period, must necessarily be the proportion always to be required for the cultivation of those articles, and that any calculations or predictions made on that assumption are liable to be completely upset by events unforeseen and unprovided for? Does it not seem probable that if Sir W. Crookes had examined Mr. Davis's figures more closely than apparently he did, he would have found that "average acre yields for long periods" are not "essential factors"; that "unit requirements for each of the primary food staples of the temperate zones" can not be so easily determined; that "the ratio existing during recent periods between the consuming element and acres employed in the production of each of such primary food staples" are not necessarily indicative of the ratio that will require to exist in the years to come; and that Mr. Davis's "scientific method" does not "enable him to ascertain the acreage requirements of the separate national populations and of the bread-eating world as a whole"?

In order to insure a famine in 1931 it was necessary for Sir W. Crookes to assume a given increase of population during the intervening period and no change in the existing conditions of

wheat cultivation and consumption, and also to limit by hard-and-fast lines the sources of supply. It is to the manner in which Sir W. Crookes has limited and underestimated the wheat resources of Canada that we now propose to take exception; and it is difficult to understand how, with ample means of information available, he could have committed himself to the statements he has made. What does he say about Manitoba? "In the year 1897 there were 2,371,441 acres under cultivation in Manitoba, out of a total of 13,051,375 acres. The total area includes water courses, lakes, forests, towns and farms, land unsuitable for wheat growing, and land required for other crops." Now, the facts are that the total area of Manitoba is 73,956 square miles, and if from that area 9,890 square miles of water surface are deducted there remain 64,066 square miles, or 41,002,240 acres of land, so that even after making due allowance for forests, towns, etc., there are nearly three times the number of acres available than are given by Sir W. Crookes. Attempts have been made in vain to find out whence these figures were obtained, but there is apparently no clew; and while it is not to be supposed for a moment that the figures were purposely misstated, surely the important conclusions drawn from them deserved that some attempt at least should have been made to ascertain their accuracy. Sir W. Crookes claims to be indebted to the official publications of the Government of Canada, but it is certain that none of them ever contained the figures used by him.

"The most trustworthy estimates," says Sir W. Crookes, "give Canada a wheat area of not more [Pg 771] than six millions of acres in the next twelve years, increasing to a maximum of twelve millions of acres in twenty-five years." Who prepared these estimates, and upon what are they based? Were they prepared by the same authority that supplied Sir W. Crookes with the figures of the area of Manitoba? If so, we may well dismiss them at once; but supposing that these estimates are, as far as the rate of increase is concerned, perfectly correct, and that the wheat area of Canada will be only twelve million acres in twenty-five years, there would still remain at least twelve million acres in Manitoba alone available for wheat. It is no exaggerated estimate to say that from sixty to seventy per cent of the land available for cultivation in Manitoba is well adapted for the production of wheat. Sir W. Crookes says that his area of Manitoba of 13,051,375 acres includes water courses, lakes, forests, towns, etc. Now, the water area alone of Manitoba is 6,329,600 acres, so that after deducting this area and the 1,630,000 acres already under wheat and making due allowance for the other conditions mentioned, he would have us believe that wheat-growing in Manitoba has already nearly reached its limit, which all who know anything about the province will unite in saying is absurd.

Now let us turn to the Northwest Territories, where, according to Sir W. Crookes, there is practically no amount of land of any consequence available for wheat, and let us remember that the same authority limits the wheat area of Canada to a maximum of twelve million acres. The area of the three provisional districts, with which alone we will deal, is as follows, viz.: Assiniboia, 57,177,600 acres; Saskatchewan, 69,120,000 acres; and Alberta, 63,523,200 acres (these figures being exclusive of water surface), making a total of 189,820,000 acres. Some of this large area is possibly not particularly well adapted for agricultural purposes, but a careful examination of all available data on the subject justifies one in saying that fully one half is suitable for successful wheat cultivation, while in eastern and southern Assiniboia there are some 20,000,000 acres, in the valley of the Saskatchewan 14,000,000 acres, and in northern Alberta 15,000,000 acres that are especially adapted for the production of wheat as a staple crop. The area is so large and settlement at present so sparse, that it is impossible to do more than give its capabilities in general terms, founded on the opinions of experienced men who have traveled over it. Professor Saunders, Director of the Experimental Farm at Ottawa, than whom there is no better authority on the subject in the Dominion, told me that, from what he saw of the country in driving over it, [Pg 772] he became more and more impressed every year with the vast area of good land in the Northwest, and no practical man has ever traveled through those regions but has been amazed at the prospect of their capabilities.

But we have not yet reckoned with the rich and fertile province of Ontario. This province has a land area of 140,576,000 acres, of which 11,888,853 acres were under cultivation in 1898, and of this latter quantity 1,437,387 acres, or twelve per cent, were in wheat, being an increase of 163,860 acres over the wheat area of 1897, and of 62,573 acres over the average of 1882-'98. According to the census of 1881 there were nearly 2,000,000 acres in wheat in 1880, but, under the influence of an unremunerative market, the area declined year by year until in 1895 there were but 967,156 acres so employed; since then, however, stimulated by a more profitable price, the area has increased by 470,471 acres, and an increase of twenty per cent upward is reported in the area for 1899. Fall wheat in this province is a very successful crop, having averaged in the last two years twenty-five bushels and twenty-four bushels per acre respectively, while the average for the period 1882-'98 has been 20.5 bushels per acre, so that nothing but a continuance of good prices is needed to largely increase the production of wheat in Ontario. In no part of the province, where agriculture is possible, has wheat failed to grow, but the area is so large that it would be unwise to put into figures the extent available for wheat cultivation, it being sufficient to show that a very large portion, if not indeed the whole, of the twelve million acres to which Sir W. Crookes has limited Canada could, other conditions being favorable, be supplied by Ontario alone.

The "trustworthy estimates" quoted by Sir W. Crookes limit, as has been stated, the wheat area of Canada to a maximum of twelve million acres under cultivation in twenty-five years; whence the estimates were derived or on what grounds they are entitled to be considered trustworthy there is no information; but is it of any consequence? Let them come from whatever source they may, are they not perfectly useless? The progress of wheat cultivation during the next twenty-five

years does not depend upon any mathematical ratio of progression, but on the course of certain events absolutely unknown at the present time. The point is that Sir W. Crookes adopts these estimates and gives out to the world a statement, on the strength of them, that, in addition to the 3,500,000 acres at present in use, there are not more than 8,500,000 acres in Canada available for wheat cultivation—a statement calculated, if believed, to seriously damage Canada's prospects of settlement, and a statement that is as much at variance with the actual facts as it is [Pg 773] possible for such things to be. Is it fair to the country for a man of such high standing and reputation to make such unfounded assertions? Five minutes' real consideration of the question would have convinced him that there are more than that number of acres in the province of Manitoba alone. The figures already given, which have been prepared from the most reliable available information, go to show that there are upward of seventy-five million acres of land in Canada especially adapted for the production of wheat, and this estimate is confined to those portions of the country which may be considered as essentially wheat-producing areas; and no account has been taken of the vast extent of land, not only in the provinces of Ontario and Manitoba and in the Northwest Territories, but also in the otherwise unnoticed provinces of Quebec, Nova Scotia, New Brunswick, Prince Edward Island, and British Columbia, that is not only suitable for the production of wheat, but on which a large quantity of wheat will undoubtedly be grown, which, entering into home consumption, will increase the exportable surplus.

I am well aware that there are a number of people who will say that my figures underestimate the resources of the country, but I would rather that it were so than indulge in figures that seem too extravagant to be realized; and if, in the future, it appears that the wheat area is larger than I have stated, then so much the better for Canada. I do not mind how much evidence can be brought to increase my figures, as long as I am satisfied that they can not be truthfully reduced.

It is not intended to accuse Sir W. Crookes of deliberately misrepresenting Canada, but rather of almost criminal carelessness in the preparation of his case; but it is intended to accuse Mr. C. Wood Davis of the former offense and of intentionally garbling extracts from an official handbook issued by the Canadian Minister of the Interior in order to decry that country's wheat-bearing capabilities. By taking a line here and there which seems to serve his ends, and by leaving out everything that would have a contrary tendency, Mr. Davis, in his article in The Forum, makes it to appear that, according to the Minister of the Interior, the greater part of the Canadian Northwest is not only incapable of producing wheat, but is actually unfit for settlement, and summarizes his extracts by saying, "Available data do not show that any part of the Canadian districts named, except southern Manitoba and the eastern half of Assiniboia, is adapted to wheat culture, while they do show that over the greater part of these vast regions neither summer heats nor rainfalls are sufficient." This statement is false in every particular. The official handbook from which Mr. Davis professes to quote says of Manitoba that there are thirty-seven million acres available for active farm cultivation, giving therefore no warrant for the limiting of the wheat [Pg 774] area to the southern part of the province. Mr. Davis quotes a line here and there about southern Alberta in order to convey the impression that that part of the country is good for nothing, whereas, while it is essentially a ranching and dairying country, producing a most luxurious and nutritious growth of native grasses, with a bountiful supply of water for irrigation purposes, by which means most satisfactory crops of grain and fodder are produced, it has never been contended that it is particularly well adapted for wheat-growing; but, on the other hand, Mr. Davis carefully omits all mention of northern Alberta, and has no room for the following remarks about it which appear on the same page of the handbook: "Northern Alberta is essentially an agricultural district; ... the principal advantages of the district will insure settlement by immigrants who desire to engage in grain farming.... The rainfall in northern Alberta during the summer months is sufficient to insure good crops." Concerning the district of Saskatchewan, Mr. Davis quotes a remark about some of the wooded portion being unsuited to the immediate requirements of settlement, as if it applied to the whole district, and deliberately omits the following: "The southern half of the district" (Saskatchewan) "is traversed from east to west by the Saskatchewan River, and the valley of this important stream, with the country immediately adjacent thereto, has long been famed as a desirable field for immigration." With reference to precipitation, Mr. Davis has so garbled his extracts as to convey the impression that the handbook states that over the greater part of the Northwest the rainfall is not sufficient for the pursuit of agriculture, whereas what the book really says is, "So far as the Canadian Northwest is concerned, out of about two hundred million acres of land between the Red River of the North to the Rocky Mountains, available for agricultural and pastoral purposes, not more than about one fourth, or fifty million acres in all, require the artificial application of water."

Mr. Davis's attempts to prejudice the interests of the Northwest by remarks on the severity of the climate do not need serious attention; the experience of the inhabitants and the annual production of the country speak for themselves, and it is well understood that mere thermometer readings afford little indication in themselves of the nature of a climate, and that temperatures unendurable in some countries are enjoyable, salubrious, and advantageous in others. It seems difficult to believe that Mr. Davis ever wrote the following sentence, but having written it, it would be well if he would take it to heart: "Truly 'honesty is the best policy' in the employment of statistics, whether by scientists, by plain people, or by professional statisticians; while the ability [Pg 775] to eschew bucket-shop methods, to read correctly, to state facts and to state them clearly, and to criticise with intelligence and entire fairness, is especially desirable."

Sir W. Crookes is not content with reducing Canada's wheat resources to an insignificant minimum, but he must also retard as much as possible the development even of the small area that he admits to exist, for he says: "The development of this promising area necessarily must be

slow, since prairie land can not be laid under wheat in advance of a population sufficient to supply the needful labor at seed time and harvest. As population increases so do home demands for wheat." To say that prairie land can not be laid under wheat in advance of population, and that as population increases so do home demands for wheat, are mere truisms, but it is incorrect to say that therefore the development must be slow. The rate of development depends entirely upon the rate of increase of population, and that increase depends upon the price of wheat, and the area of production will increase concurrently with the demand. According to Mr. Davis—and we will assume that his figures are in this case correct—the population in the United States in fourteen years from 1871 increased forty-four per cent and the cultivated area one hundred and twelve per cent, and, if that was the case, no estimates, however trustworthy, could have provided for such results.

It has been perfectly true, as Sir W. Crookes says, that as the wheat area of Manitoba and the Northwest increased, the wheat area of Ontario and the eastern provinces decreased, but this was in consequence of the continued low price of wheat, which led the farmers of Ontario to turn their attention more and more to dairy and mixed farming, substituting hay and root crops for wheat and barley, until the province became a dairying rather than a cereal-producing country; but that this was a movement to suit the times, and that the area available for wheat is no less in consequence, is evidenced by the rapid increase in the wheat acreage in the last two years. The farmer produces what pays him best, and it is certain that before Sir W. Crookes's failure of the wheat supply comes to pass prices will have been such that every acre of land suitable for wheat and that can be spared from other uses will have been taken advantage of; and if this is not the case, then some other staple for food will have been substituted, which will necessarily change the whole economic situation as viewed at present.

It is also true that "thus far performance has lagged behind promise," but the reasons for this are the same, and in the low values we find a ready explanation of the apparent lack of progress. [Pg 776] What inducement has the immigrant had of late years to take up land for, or the farmer to grow, wheat that he could hardly sell for the actual cost of production? And yet Sir W. Crookes would argue that because the land has not been utilized for this particular purpose the land can not be there, and that land upon which wheat once was grown, but which is now employed for other purposes, can never again be included in the wheat-bearing area.

Progress may appear to have been slow, but it has kept pace with the demand, and in any case has been considerably more rapid than Sir W. Crookes allows. He says, "The wheat-bearing area of all Canada has increased less than 500,000 acres since 1884," whereas the actual increase since 1880 has been over 1,100,000 acres, and since 1890 upward of 760,000 acres. The area under wheat in Canada in 1898 was 3,508,540 acres, so that Sir W. Crookes only allows for an increase of 2,500,000 acres in the next twelve years. Perhaps it will not be as much, but if it is not, it will only be putting the predicted day of famine still farther away, and will prove nothing more than the fact that the state of the market has not warranted any more extended cultivation.

The statements made by Sir W. Crookes about the wheat acreage in the States are as incorrect as those about Canada, for he says, in his letter to The Times of December 8, 1898, that "the whole wheat acreage in the United States is less than it was fifteen years ago," whereas the official figures for 1897 and 1898, which were before him at the time, told him that the wheat acreage in 1897 was 3,000,000 acres in excess of the average of the preceding fifteen years, and in 1898 was in the neighborhood of 5,000,000 acres in excess of any year in the history of that country. Do not the fluctuations in the wheat acreage of the United States in recent years prove conclusively that they were solely the result of the movement of prices, and had no bearing whatever on the question of exhaustion of land? Under the depressing influence of an unprofitable market, the wheat area fell from 39,900,000 acres in 1891 to 34,000,000 acres in 1895, but, under the stimulus of a substantial appreciation, increased again, in three years, to 44,000,000 acres. If, in spite of a rising and remunerative market, the area had remained stationary or shown signs of decrease, it would have been in order to call attention to the fact as indicating exhaustion; but when, in immediate response to a rising market, the area increases by leaps and bounds, the question of exhaustion becomes less and less one of actual probability, and more and more one of theoretical possibility. [Pg 777] A precisely similar line of reasoning is applicable to the fluctuations in the province of Ontario, and goes to show just as clearly that the decrease in area has had absolutely no bearing on the wheat-producing capabilities of the province.

"A permanently high price for wheat is, I fear, a calamity that ere long must be faced," says Sir W. Crookes; but, with due deference to so great an authority, I believe that the day of a permanent high price for wheat is yet far distant. There will be appreciations undoubtedly, but the sources of supply as yet undrawn upon are so great that it will be long before those appreciations are of any prolonged duration; but in the meantime they mean periods of great prosperity to the farmer and therefore to the world. Is a higher price for wheat such an unmixed calamity, after all? Has the average consumer of wheat benefited by the low price of wheat of late years in proportion to the hardships endured by the producer? I think not. Let those who are qualified by literary and scientific knowledge point out if they will the possibility, or even perhaps the probability, of at some period in the future the time coming when there may be, if present conditions continue to exist, a scarcity in the wheat supply, and urge as strongly as they like the advisability of taking steps in good time to prevent such a calamity; but nothing is to be gained by frightening the world with predictions of evil based only on a series of unfounded assertions, mathematical calculations, and "purely speculative computations." When, if ever, the day of scarcity will come is unknown. That it is yet far off appears to be tolerably certain; but it is

sufficient for the purposes of this article that it should be understood that Sir W. Crookes's statements concerning the wheat area of Canada are absolutely unreliable and incorrect, and that there are millions of acres of good wheat land waiting for occupation by the surplus population of the world, which, when under cultivation, will assist in deferring for many years the threatened day of famine.

Dr. Sven Hedin, in his account of travel through Asia, mentions as the most remarkable feature in the central region of internal drainage (in which the rivers drain into inland lakes) "the process of leveling which goes on unceasingly. The detritus which results from the disintegrating action of the weather, and the more or less mechanical agency of the wind and water and gravity, is constantly being carried down from the mountains all round its borders toward the lower parts of its depressions, and being deposited there. In this way the natural inequalities in the configuration of the ground are being gradually smoothed away." Mr. Curzon refers to the same phenomenon in the central districts of the Pamirs—the process being the exact reverse to that where the streams hew out deep ravines in their course to the sea-going river.

BEST METHODS OF TAXATION.

[Pg 778]

By the Late Hon. DAVID A. WELLS.

PART III (*concluded*).

The universal and admitted failure of the general property tax to attain good results and the great difficulty, indeed the impossibility, of reducing it to a form in which it can operate with efficiency and an approach to justice, must lead to its abolition and the gradual substitution of other and more simple taxes. However well adapted to a community in which the taxable property was in evidence and easily assessed for purposes of taxation, it becomes antiquated, unequal, and inquisitorial in a people where credit and credit investments have been highly developed, and where the greater social activities, whether in commerce or industry, transportation or production, are conducted by corporations issuing various kinds of securities, none of which can easily be reached by a taxing authority away from the center of incorporation. To undertake to include these securities, evidences of debt, or obligations in a general property tax is to invite evasion, put a heavy inducement on concealment, and, whenever effective, to give rise to shocking inequalities of burden. The widow and orphan, whose property is in the hands of a trustee, pay the full tax; in any other direction the holder of stocks or bonds, money or notes, escapes according to the elasticity of his conscience. The very exemptions recognized by law give an opportunity for new evasions, based upon analogy or upon some technicality under which the business is conducted. Bonds of the United States, the legal-tender notes, or money are beyond the reach of State authorities for the purpose of taxation. In the same category come also all imported goods in original packages, in the possession of the importers, and all property in transit. These exemptions alone amount to thousands of millions of dollars, and the tendency has been to increase the number of items exempted. But every such exception under the law adds to the burdens of the honest taxpayer, and every evasion of taxation also renders his charge the greater. Here is not distributive justice, but concentrated injustice.

Another large proportion of the personal property owned by the citizens of the State is of the most intangible character, and in great part invisible and incorporeal, such, for instance, as negotiable instruments in the form of bills of exchange, State, municipal, and corporate bonds, and, if actually situated in other States, exempt from taxation where they are held; acknowledgments of individual indebtedness, and a number of similar matters. All property of this character is, through a great variety of circumstances, constantly fluctuating in value; is [Pg 779] offset by indebtedness which may never be the same one hour with another; is easy to transfer, and by simple delivery is, in fact, transferred continually from one locality to another, and from the protection and laws of one State to the sovereignty and jurisdiction of some other. It is not to be wondered, therefore, that all attempts to value and assess this description of property have proved exceedingly unsatisfactory, and that nearly every civilized community, with the exception of the States of the Federal Union, have long ago abandoned the project as something wholly inexpedient and impracticable.

The differences among the States in the interpretation of residence, of the *situs* of the property taxed, are also an objection to this system and an obstacle to its application. The want of uniformity can not be abolished by enactments of law, because absolute uniformity of laws would not insure as uniform interpretation of their provisions. The rules for assessment are uniform for the officers of a State, but the returns made involve such differences in the application of the rules that one is forced to the conclusion that a misunderstanding of the spirit of the law exists, coloring differently the view of each returning officer. Discrimination against the county or municipality and discrimination against the individual are to be met at every turn. No wording of the law can eliminate this personal judgment of each assessing authority, and the supervision of the returns by State boards of equalization has introduced an even greater departure from

justice, as a majority, based upon selfish interests, may be had, and its decision may readily be defended as based upon good and sufficient reasons. An appeal to the last resort, the higher courts, may produce redress against unjust assessments, but each case must be decided upon its merits, and only under very exceptional circumstances—as in the recent case at Tarrytown, New York, where striking and general, even personal, spite had been shown in the tax levy—can a number of taxpayers find it their interest to combine and carry the question into the courts for adjudication.

Imperfect in theory, the machinery of the general property tax is imperfect. With at present fully two thirds of the personal property of the State exempted from taxation by law or by circumstances growing out of its condition, or the natural depravity and selfishness of the average taxpayer, and with a large part of the other third exempted by competing nations or neighboring States, what becomes of the theory so generally accepted in the United States that in order to tax equitably it is necessary to tax everything? A very slight examination leads to the conclusion that it is the most imperfect system of taxation that ever existed; that, with the [Pg 780] exception of moneyed corporations, it is a mere voluntary assessment, which may be diminished at any time by an offset of indebtedness which the law invites the taxpayers to increase *ad infinitum*, borrowing on pledge of corporate stocks, United States bonds, legal-tender notes, etc., all exempt from taxation; that its administration in respect to justice and equity is a farce and more uncertain and hazardous than the chances of the gaming table; and that its continuance is more provocative of immorality and more obstructive of material development than any one agency that can possibly be mentioned. A stringent enforcement only leads to greater perversions and a wider evasion. A lax enforcement does not reduce its inequalities and general want of application to actual conditions.[10]

The problem, then, is what taxes to introduce in place of this confessed failure of the general property tax.

There can be little doubt that the desire for greater simplicity in taxation is generally felt, and in part put into practice. The mass of various kinds of imposts, added without any system or real connection or relation one to another, has often resulted in so large a number of charges on Government account as to defeat itself. The French taxes at the end of the last century, with their added fault of inequality and injustice in distribution, led naturally to the theory of a single tax—the *impôt unique* of the physiocrats—which did not become a fact, yet registered the protest against the multiplicity and crying oppressiveness of the remains of feudal dues and fiscal experiments undertaken under the stress of an empty treasury. So it has been noted at the present time that where an opportunity has offered there is a tendency in European countries to simplify their taxes, and, as in the case of Switzerland, prepare the way for income and property taxes. It is a greater dependence on such direct taxes in place of indirect taxes that has distinguished the great fiscal changes in recent years. Germany may have wished to establish a brandy monopoly, and Russia may resort to a monopoly of the manufacture and sale of distilled spirits. But England increases her death duties, France and the United States seek to frame [Pg 781] acceptable taxes on income, and Switzerland succeeds in modifying her system in the line of direct taxes.

There is an earnest movement in favor of a single tax on the value of land, exclusive of other real property connected with it. As involving a question of abstract justice the proposition has much in its favor, but it can not be denied that practical obstacles oppose its adoption. The recent commission on taxation in Massachusetts thus treats of it: "It proposes virtually a radical change in the ownership of land, and therefore a revolution in the entire social body. In this form of taxation all revenue from land alone is to be appropriated—that is, the beneficial ownership of land is to cease. Whether or not this system, if it had been adopted at the outset and had since been maintained, would have been to the public advantage may be an open question, but it would certainly seem to be too late now to turn to it in the manner proposed. In any event, it involves properly not questions of taxation, but questions as to the advantage or disadvantage of private property in land."[11]

If securities are to be taxed, the methods adopted should avoid a double taxation, and an attempt to reach capital outside of the State. It is evident that a State, like Massachusetts, which taxes the foreign holder of shares in its corporations as well as the shares of foreign corporations held by its own citizens, is inviting a dangerous reprisal from other States. "Wherever the owner may be, if the corporation is chartered within the State the Commonwealth collects the tax on the shares. Wherever the corporation may be, if the owner is within the State the Commonwealth also collects the tax (in theory of law at least)." If this be the best possible system, and it is supposed Massachusetts assumes it to be, general double taxation would follow its adoption by the other States. The effort to carry this rule into practice proves its injustice as well as futility. The most searching and inquisitorial methods of seeking such property will not avail to reach a good part of it, and this results in adding inequality of burden to its other difficulties. Evasion is too simple a process to be unused, and the heavier the rate of tax the greater will be the resort to evasion and even to perjury, express or implied. The fundamental cause of the failure lies in this, "the endeavor to tax securities, which are no more than evidences of ownership or interest in property, and which offer the easiest means of concealment and evasion, by the same methods and at the same rate as tangible property situated on the spot."

This inherent difficulty can be cured only by abandoning the attempt to tax directly securities or evidences of debt, representing ownership or interest in property beyond the limits of the taxing [Pg 782]

authority. In the case of the securities of home companies they may be readily taxed at the source, but in the case of foreign corporations it is only by methods almost revolting in their injustice and treatment of the taxpayer that even a partial success can be secured. The dependence upon the sworn statement or declaration of the taxpayer is known to be extremely faulty and to offer a premium on untruthfulness. So long as this dependence is retained in whole or in part in a system for taxing personal property, the results must be unsatisfactory. The most judicious, even if it seems the most radical, remedy is to abandon the taxation of securities. Certainly it would be well to put an end to the Massachusetts plan of taxing securities representing property outside of the State, for that involves double taxation wherever it has been possible to impose the tax. What can be reached only by methods at all times trying and difficult, and sometimes very demoralizing, should not be permitted to remain a permanent feature of the revenue system of a State.

The New York commission of 1870 proposed to limit the State taxes to a very few number of objects. That they be "levied on a comparatively broad basis—like real estate—with certainty, proportionality, and uniformity on a few items of property, like the franchises of all moneyed corporations enjoying the same privileges within the State, and on fixed and unvarying signs of property, like rental values of buildings"—such was the scheme proposed. The leading object to be attained was equality of burdens, and a second object of quite as great importance, was simplicity in assessment and collection. Granting that real estate, lands, and buildings were taxed on a full and fair market valuation, and that corporations contributed their share toward the expenses of the State, it remained to devise a tax that should reach all other forms of property that could be properly and easily assessed. This tax was to be known as the "building-occupancy" tax, and was to be levied on an additional assessment of a sum equal to three times the annual rent or rental value of all the buildings on the land.[12] Nearly thirty years later the [Pg 783] Massachusetts commission proposed a modified form of this tax. An annual rental value of four hundred dollars was to be exempt from taxation, but ten per cent was to be levied on all rental values in excess of that amount.

"The advantages of a tax on house rentals," said the commission, "can be easily stated. It is clear, almost impossible of evasion, easy of administration, well fitted to yield a revenue for local uses, and certain to yield such a revenue. It is clear, because the rental value of a house is comparatively easy to ascertain. The tax is based on a part of a man's affairs which he publishes to all the world. It requires no inquisition and no inquiry into private matters; it uses simply the evidence of a man's means which he already offers."[13] If this tax were to be given it would be possible to wipe out all the tax on incomes from "profession, trade, or employment," to abolish the existing assessments on personal property. The effects would be far-reaching. If loans of money are free from taxation, the purchasing power of money in the same degree must diminish, which simply means that the purchasing power of farms and products of farms for money must to the same extent increase; hence, the borrower on bond and mortgage will not be subject to double taxation—first, in the form of increased rate of interest, and then in taxation of his real estate—and hence the farmer or landowner who is not in the habit of either lending or borrowing money will find his ability to meet additional taxation on his land increased in additional value of land and products of land in proportion as the tax is removed from money at interest. Also, the exemption of the products of farms and things consumed on farms from taxation will give a corresponding increased value to compensate for the "building-occupancy" tax. Tenants controlled by all-pervading natural laws can and will give increased rents, if their personal property is exempt primarily from taxation. The average profits of money at interest or of dealings in visible personal property free from taxation can not exceed, for any considerable length of time, the average profits of real estate, risk of investment and skill in management taken into consideration; and therefore the real pressure of taxation under the proposed system will finally be, like atmospheric pressure or pressure of water, on all sides, and by a natural uniform law executed upon all property in every form used and consumed in the State. Persons must occupy buildings and business must be done in buildings, and through these visible [Pg 784] instrumentalities capital can be reached by a rule of fractional uniformity, and by a simple, plain, and economical method of assessment and collection.

This building-occupancy tax, or tax on rental value, does not preclude a supplementary tax on corporations.

Much has been said of the onerous burdens of taxation endured by individuals compared with those of corporations, and especially corporations enjoying certain rights or franchises in public streets and highways or corporations of a more or less public character. The phenomenal growth of municipalities has been one of the notable social movements of the last twenty-five years. The drift of population from the country districts to cities has increased with each year, and finds an explanation in many causes. The opportunities offered in a city for advancement are greater and more numerous; the monotony of the farm life does not keep the young at home, but drives them for excitement and profit to the great centers of population. The economic changes of a half century also have their influence. The competition of new regions, better adapted for certain cultures on a commercial scale, has reduced the profitableness of older and more settled localities, where comparatively costly methods must be resorted to if the fertility of the land is to be maintained. The wheat fields of the West narrowed the margin of profit in New England farming, while the sheep and cattle ranges of the West made it impossible for the same quality of live stock to be raised for profit in the East. Farms were abandoned, and the younger blood went West to grow up with the country, or into the cities to struggle for a living. Further, the advances in agriculture, the application of more productive methods, and the introduction of machinery

have reduced the demand for labor in the rural districts, and this has led to a migration to the cities.

The result of this has been an immense development of city life, and with it an ever-increasing field for investment in corporate activities. The supply of water is usually in the city's control, but the manufacture and sale of gas, the production and distribution of electricity, the street railways, telegraph, and telephone interests are private corporations formed for profit and using more or less the public highways in the conduct of their various enterprises. A grant of a street or highway for a railway or electric-wire subway generally involves a monopoly of that use, and the privilege or franchise may become more valuable with the mere growth in the population of the cities. Assured against an immediate competition, there is a steady increment in the value of the franchise, and in the case of a true monopoly there seems to be no limits to its possible growth.

An instance of this nature is so striking in its relations and so pertinent to the present discussion [Pg 785] that attention is asked to it. In the reign of James I water was supplied by two or three conduits in the principal streets of London, and the river and suburban springs were the sources of supply. Large buildings were furnished with water by tapping these conduits with leaden pipes, but other buildings and houses were supplied by "tankard bearers," who brought water daily. A jeweler of the city, Hugh Myddleton by name, believed something better could be done, and he proposed to bring water from Hertfordshire by a "new river." He embarked in the undertaking, sank his fortune in its conduct, and appealed to the king for assistance. James granted this aid, taking one half of the shares of the company—thirty-six out of the seventy-two shares into which it was divided. The shares that remained received the name of "adventurer's moiety." The work was completed in 1613, and water was then let into the city.

So little was the measure appreciated that its first years were troublous ones for the shareholders. The squires objected to the river, believing it would overflow their lands or reduce them to swamps and destroy the roads. The city residents adopted the use of the water slowly. The shares were nominally worth £100 apiece, but for nearly twenty years the income was only 12*s.*, or $3, per share. In 1736 a share was valued at £115 10*s.*, and by 1800 it had risen to £431 8*s.* With the first years of this century the company prospered, and its benefits were widely applied, reflecting this change in the value of its capital. In 1820 a share was worth £11,500 and in 1878 the fraction of a share was sold at a rate which made a full share worth £91,000. In 1888 the dividend distributed to each share was £2,610. Eleven years later, in July, 1889, a single share was sold for £122,800, or nearly $600,000. The nominal capital of the company in 1884 was £3,369,000, and besides its water franchise it holds large estates and valuable properties. While the actual real estate controlled by the corporation accounts for some of this remarkable rise in the value of the shares, a greater and more lasting cause was the possession of an almost exclusive privilege or franchise which assured a handsome and ever-increasing return on the investment. Had all the other property been deducted from the statement of the company's assets, there would have remained this intangible and immeasurable right created and conceded by its charter and long usance.

A definition of a franchise has been given by the Supreme Court in terms of sufficient general accuracy to be adopted: "A franchise is a right, privilege, or power of public concern which ought not to be exercised by private individuals at their mere will and pleasure, but which should be [Pg 786] reserved for public control and administration, either by the Government directly or by public agents acting under such conditions and regulations as the Government may impose in the public interest and for the public security."[14] A necessary condition, then, is a public interest in the occupation or privileges to be followed. The good will of a person or individual trader is not a franchise in this sense, though a franchise may be enjoyed by an individual as well as by a corporation, and good will may rest upon the privilege implied in the franchise.

The recognition of franchises, a species of property "as invisible and intangible as the soul in a man's body," as a proper object for taxation is now beyond any dispute. It is peculiarly appropriate as a source of revenue for the exclusive use of the State, inasmuch as the grant of franchises emanates from the State in its sovereign capacity. In the case of Morgan *vs.* the State of Louisiana, Justice Field, of the Supreme Court of the United States, said: "The franchises of a railroad corporation are rights or privileges which are essential to the operation of the corporation and without which its roads and works would be of little value, such as the franchise to run cars, to take tolls, to appropriate earth and gravel for the bed of its road, or water for its engines, and the like. They are positive rights or privileges, without the possession of which the road or company could not be successfully worked. Immunity from taxation is not one of them." [15] Further, the extent to which this taxation of franchises may be carried rests entirely in the discretion of the taxing power, subject only to constitutional restrictions.

The great difficulty in applying such a tax lies in the methods of reaching an understanding on the value of the franchise. How can this indefinite something be made visible on the tax books? In many instances the franchise may be regarded as inseparable from the real property of the corporation. The rails of a tramway, the poles and wires of a telegraph company, the pipes and conduits of a gas company, are real and tangible things, necessary to a proper conduct to the respective functions of the corporations. But the right to lay tracks in the public streets, to sink pipes under the streets, or to string wires overhead is as necessary a possession and as essential to the performance of what the corporation was created to accomplish. Whether this permits the franchise to be regarded as "real estate" and so offers it for taxation is a question of some theoretical interest, but of little practical importance.[16] Unless the franchise is regarded in this [Pg 787]

way, as belonging to real estate, or as forming a taxable entity apart from other property, it would be simpler to reach it through a corporation tax in one of the many ways open for applying that tax.

Enough has been said to demonstrate the extremely faulty condition of tax methods in the United States. Uniformity is highly desirable, but equality of burden is even more to be desired. The advances in this direction have been few, and accomplished only partially in a few States. The machinery for making assessments is only a part of the problem, as the intention of the law, the spirit of the act, is of even higher importance in securing justice and moderation. If these essays, incomplete as they must of necessity be, have led to a better comprehension of the chaotic condition existing now and of the difficulties to be overcome, their object will have been attained. The remedy may be left for time to effect.

In connection with the celebration of the centenary of the death of the naturalist Lazaro Spallanzani, at Reggio, Italy, in February last, a booklet has been published containing articles on various aspects of the life and work of Spallanzani and matters associated with him. Among the authors represented are Mantegazza, Ferrari, and others well known in Italian science.

BACON'S IDOLS: A COMMENTARY.

[Pg 788]

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In the first book of the *Novum Organon* the great leader of the new philosophy undertook to set forth the dangers and difficulties which stand always in the way of clear and fruitful thought. Conscious that he was breaking entirely with the schools of the past, and ambitious of laying the firm foundations on which all future inquirers would have to build, it was natural that Bacon should pause on the threshold of his vast enterprise to take stock of the mental weaknesses which had rendered futile the labors of earlier thinkers, and which, if not carefully guarded against, would jeopardize the efforts of times to come. That the understanding may direct itself effectively to the search for truth it is necessary, he insisted, that it should have a full apprehension of the lapses to which it is ever liable, the obstacles with which it will constantly have to contend. A vague sense of peril is not enough. As a first condition of healthy intellectual activity we must learn to know our frailties for what they really are, estimate their consequences, and probe the secrets of their power.

Bacon's statement of the sources of error and vain philosophizing is regarded by him as merely the *pars destruens* or negative portion of his work—as it were, "the clearing of the threshing floor." But his aphorisms are packed close with solid and substantial thought, and well deserve the attention of all who would seriously devote themselves to the intellectual life. "True philosophy," as he conceived it, "is that which is the faithful echo of the voice of the world, which is written in some sort under the direction of things, which adds nothing of itself, which is only the rebound, the reflection of reality." To reach for ourselves, as nearly as we may, a philosophy which shall meet the terms of this exigent definition is, or should be, one chief purpose of our study and our thought. We may very well ask, then, what help so great and suggestive a thinker may give us on our way.

With his characteristic fondness for fanciful phraseology, Bacon describes the causes which distort our mental vision as *Idola*—idols or phantoms of the mind.[17] Of such he distinguishes four classes, which he calls, respectively: Idols of the Tribe (*Idola Tribus*); Idols of the Cave (*Idola Specus*); Idols of the Market Place (*Idola Fori*); and Idols of the Theater (*Idola Theatri*). It is not [Pg 789] to be claimed for Bacon's analysis that it is exhaustive or always scientifically exact. In many places, too, it opens up difficult philosophic questions, which for the present must be disregarded. But, as Professor Fowler has said, there is something about his diction, "his quaintness of expression, and his power of illustration which lays hold of the mind and lodges itself in the memory in a way which we can hardly find paralleled in any other writer, except it be Shakespeare."[18] Moreover, though he often deals with matters of merely technical and temporary interest, his leading thoughts are of permanent and universal applicability. Let us see, then, what suggestions we can gather from a brief consideration of his Idols, one by one.

Idols of the Tribe are so called because they "have their foundation in human nature itself"; in other words, they are the prepossessions and proclivities which belong to men as men, and as such are common to the whole race or tribe. "Let men please themselves as they will," says Bacon, "in admiring and almost adoring the human mind, this is certain: that as an uneven mirror distorts the rays of objects according to its own figure and section, so the mind, when it receives impressions of objects through the sense, can not be trusted to report them truly, but in forming its notions mixes up its own nature with the nature of things." In many lines of thought there is no more pregnant source of fallacy and confusion than the tendency, innate in all and seldom properly checked, to accept man as the measure of all things, and to translate the entire universe

into terms of our own lives. Theology, though it is slowly outgrowing its cruder anthropomorphism, still talks about the "will" of God, an "intelligent" First Cause, the "moral governor," and "lawgiver"; and outside theology we have ample evidence of the persistency with which we humanize and personify Nature by endowing it with attributes belonging to ourselves. Darwin confessed that he found it difficult to avoid this tendency.[19] It is a pitfall into which men constantly stumble in their attempts to interpret the processes at work about them.

One important result of our habit of thus forcing the universe to become "the bond-slave of human thought" is to be found, as Bacon notes, in our proneness to "suppose the existence of more order and regularity in the world" than is actually to be discovered there. While we read design and purpose into the phenomena of Nature because we are conscious of design and purpose in our own activities, thus allowing ourselves to drift into the metaphysical doctrine of Final Causes, we also do our best to bring Nature's multitudinous operations into such definite [Pg 790] formulas as will satisfy our love of plan and symmetry. We are not content till we can systematize and digest, whence our continual recourse to loose analogies and fanciful resemblances. We start from an imagined necessity of order, or from some conception of things attractive because of its apparent simplicity, and then reason out from this into the facts of Nature. Mill furnishes some telling examples. "As late as the Copernican controversy it was urged, as an argument in favor of the true theory of the solar system, that it placed the fire, the noblest element, in the center of the universe. This was a remnant of the notion that the order of the universe must be perfect, and that perfection consisted in conformity to rules of procedure, either real or conventional. Again, reverting to numbers, certain numbers were *perfect*, therefore these numbers must obtain in the great phenomena of Nature. Six was a perfect number—that is, equal to the sum of all its factors —an additional reason why there must be exactly six planets. The Pythagoreans, on the other hand, attributed perfection to the number ten, but agreed in thinking that the perfect numbers must be somehow realized in the heavens; and knowing only of nine heavenly bodies to make up the enumeration, they asserted 'that there was an *antichthon*, or counter-earth, on the other side of the sun, invisible to us.' Even Huygens was persuaded that when the number of heavenly bodies had reached twelve it could not admit of any further increase. Creative power could not go beyond that sacred number."[20] Do these concrete illustrations of perverse reasoning strike us as ludicrous? It is because they are taken from an order of ideas long since outgrown. The tendencies they exemplify have not been outgrown. We have only to keep a vigilant eye on our own mental conduct to be convinced that we are very apt to begin with some general notion of "the fitness of things," or what "ought to be," and to argue thence to conclusions not a whit less absurd essentially than those just referred to.

While these universal mental habits are conspicuous enough in the higher regions of thought and begin to play tricks with us the moment we undertake on our own accounts any serious speculation, there are other Idols of the Tribe whose influence is perhaps more commonly fatal. We all jump at conclusions, the mind feigning and supposing "all other things to be somehow, though it can not see how, similar to those few things by which it is surrounded"; we all allow ourselves to be unduly "moved by those things most which strike and enter the mind simultaneously and suddenly, and so fill the imagination." Hasty judgments are thus daily and hourly passed on men and things, and rash generalizations permitted to circulate untested. Even [Pg 791] more disastrous, perhaps, in the long run, is the power of prepossessions. When once, says Bacon, the human understanding has "adopted an opinion (either as being the received opinion, or as being agreeable to itself)" it straightway "draws all things else to support and agree with it." Illustrations may be found in every direction. Note, for instance, the vitality, even in the teeth of positive disproof, of many long-accepted and often-challenged ideas—belief in dreams, omens, prophecies, in providential visitations and interpositions, in the significance of coincidences, in popular saws about natural phenomena, in quacks and quackery, in old wives' tales, vulgar and pseudo-scientific. The story of witchcraft is only another example of the same kind, though written large in the chronicles of the world in letters of fire and blood; the human understanding had "adopted" a belief in witches, and drew "all things else to support and agree with it." In all such cases of prepossession the mind obstinately dwells on every detail that favors its accepted conclusions, while disregarding or depreciating everything that tells against them; it is always, in Bacon's phrase, "more moved and excited by affirmatives than by negatives." Thus, we hear much of the one dream that is fulfilled, and of the ninety and nine that are unfulfilled—nothing. Bacon illustrates this perversity by the well-known anecdote of the ancient cynic, which may be left to convey its own moral: "And therefore it was a good answer that was made by one who, when they showed him hanging in a temple a picture of those who had paid their vows as having escaped shipwreck, and would have him say whether he did not now acknowledge the power of the gods —'Ay,' asked he again, 'but where are they painted that were drowned after their vows?'"

Finally, among these Idols of the Tribe we must include the disturbance caused by the play of feeling upon the mind. "The human understanding is no dry light, but receives an infusion from the will and affections, whence proceed sciences which may be called 'sciences as one would.'" We all know, to our cost, how passion will warp judgment; how difficult it is to see clearly when the emotions are thoroughly aroused; how tenaciously men cling to opinions they are familiar with, or would fain have to be true; how fiercely they contest ideas that are unfamiliar or repugnant. Had it been contrary to the interest of authority, observed shrewd old Hobbes, that the three angles of a triangle should be equal to two angles of a square, the fact would have been, if not disputed, yet suppressed.[21] Similarly, if the passions of men had been called into play over the most clearly demonstrable of abstract mathematical truths, we may be sure that [Pg 792] furious controversy would have attended the issue, and some way found to overthrow the

demonstration. That two and two make four would have been denied had any strong emotion been excited against the proposition. "Men," said Whateley, "are much more anxious to have truth on their side than to be on the side of truth." And the danger is greater because we are frequently not aware of the bias given by feeling. There are cases in plenty where men more or less consciously and deliberately espouse "sciences as one would," but there are many others in which the emotional interference is insidious and obscure. "Numberless, in short, are the ways, and sometimes imperceptible, in which the feelings color and infect the understanding."

These Idols of the Tribe are of course inherent in our intellectual constitution, and are ineradicable. The simple consideration that all knowledge is relative—that by no effort and under no circumstances can we escape beyond the conditions and limitations of our own minds—suffices to show that intelligence must ever mix up its own nature with the nature of things, though this fact need not make us doubt the validity of knowledge as is sometimes hastily inferred. For the rest, clear recognition of these common obstacles to thought should put us in the way of anticipating and withstanding their more serious effects. In practice it must be our object to maintain watchfulness and a careful skepticism; to test evidence and check passion; to cultivate candor, flexibility, and alertness of mind; to avoid loose generalizations; and to be ever ready to accept, revise, reject. Above all must we steadily resist the seductions of what is called common sense, and overcome that mental inertness which too often leads us to drift unthinking along the current of popular opinion.[22]

But, in addition to errors arising from the common intellectual nature of men, there are others, the sources of which are to be found in the idiosyncrasies of the individual mind. These Bacon calls Idols of the Cave;[23] for every one, he says, "has a cave or den of his own, which refracts and discolors the light of Nature, owing either to his own proper and peculiar nature; or to his education and conversation with others; or to his reading of books, and the authority of those whom he esteems and admires; or to the differences of impressions, accordingly as they take place in a mind preoccupied and predisposed, or in a mind indifferent and settled; and the like." This summary is comprehensive enough to indicate the character and point to some of the causes of individual aberrations of judgment; that it does no more than this is due to the simple fact that [Pg 793] the personal bias is as varied as humanity itself, and that the deflecting impulses in any given case are to be referred to a complex of factors almost eluding analysis. To follow this part of the subject into detail would, therefore, manifestly be impossible. But certain of the larger and more widely influential of these disturbing forces may be roughly marked out by way of illustration.

In the first place, there is what we may call the professional bias. Exclusive devotion to separate lines of activity, study, or thought inevitably gives the mind a particular set or twist. Bacon complains that Aristotle, primarily a logician, made his natural philosophy the slave of his logic. Few specialists can escape the insulation consequent upon living too continuously in a confined area of problems and ideas. Their intellectual outlook is necessarily circumscribed, facts are seen by them out of proper perspective, and one-sidedness of training and discipline renders their judgment of things partial and incomplete. The lawyer carries his legal, the theologian his theological, the scientist his scientific bent of mind into every inquiry; with what grotesque results is only too frequently apparent. Accustomed to move in a single narrow groove, and wholly absorbed in the contemplation of certain isolated classes of phenomena, they unconsciously allow their particular interests to dominate their thought, and impose disastrous restrictions upon their view of whatever lies outside their own chosen field.

Secondly, we have the bias of nation, rank, party, sect. Here the mental disturbances are too numerous to permit and too obvious to require special exemplification. Intellectual provincialism of any kind is fatal to large and fertile thought, alike by limiting the range of our knowledge and sympathies and by inducing mental habits and implanting prejudices which prevent us from seeing things in wide relations and under a clear light. So long as our point of view is simply that of our country, our class, our party, or our church, so long, it is evident, our minds will lack the breadth and flexibility necessary for free inquiry, fruitful comparisons, sane and balanced judgments.[24]

Finally, among the Idols of the Cave "which have most effect in disturbing the clearness of the understanding," mention must be made of the temperamental bias. Every man, it has been said, is born Platonist or Aristotelian; it is certain that the great divisions in thought—religious, philosophical, political—answer roughly to fundamental differences in human nature, and that every one not checked or turned aside by extraneous influences will spontaneously gravitate in one or another direction. Bacon is only recording a fact of the commonest experience when he [Pg 794] says that "there are found some minds given to an extreme admiration of antiquity, others to an extreme love and appetite for novelty, but few so duly tempered that they can hold the mean, neither carping at what has been well laid down by the ancients nor despising what is well introduced by the moderns." Many instinctively brace themselves against authority and tradition; by others again, whatever is handed down to us by authority and tradition is for this reason alone treated with contempt. That the crowd believes a thing is enough to convince this man of its truth, and that of its falsehood.

> "The vulgar thus through imitation err;
> As oft the learned by being singular."

These and similar congenital differences in men's intellectual constitutions might be illustrated indefinitely if it were necessary. A further remark of Bacon's must, however, be quoted, for it

goes deeper in mental analysis and touches a less obvious point. "There is one principal and, as it were, radical distinction between different minds in respect of philosophy and the sciences, which is this: that some minds are stronger and apter to mark the differences of things, others to mark their resemblances. The steady and acute mind can fix its contemplations and dwell and fasten on the subtlest distinctions; the lofty and discursive mind recognizes and puts together the finest and most general resemblances." Men belonging to the former class we should call logical and critical; those belonging to the latter, imaginative and constructive. Each class tends to the excesses of its own predominant powers, and in each case excess interferes with calm reasoning and sound judgment.

To correct the personal equation it is imperative that we should study ourselves conscientiously, consider dispassionately the natural tendencies of our birth, early surroundings, education, associations, and interests, and do our utmost to conquer, or at least to make allowance for, every individual peculiarity, temperamental or acquired, likely to turn the mind aside from the straight line of thought. Such self-discipline every one must strenuously undertake on his own account if he would wish to see things as they really are. Stated in more general terms, our aim must be to rise above all kinds of provincialism and personal prejudice, and to overcome our natural proneness to rest content in our own particular point of view. Bacon quotes with approval the words of Heraclitus: "Men look for sciences in their own lesser worlds, and not in the greater or common world." We must strive to escape from our own lesser world, and to make ourselves citizens of the greater, common world. For this we need the widest and most generous culture— [Pg 795] the culture that is to be found in books, in travel, in intercourse with men of all classes and every shade of opinion. Left to ourselves we only too sedulously cultivate our own insularity; we mingle simply with the people who agree with us, belong to our own caste, and share our own prejudices; we read only the papers of our own party, the literature of our own sect; we allow our own special interests in life to absorb our energies, color all our thoughts, and narrow our horizon. In this way the Phantoms of the Cave secure daily and yearly more despotic sway over our minds. Self-detachment, disinterestedness, the power of provisional sympathy with alien modes of thought and feeling, must be our ideal. "Let every student of Nature," says Bacon, "take this as a rule, that whatever his mind seizes and dwells on with particular satisfaction is to be held in suspicion, and that so much the more care is to be taken in dealing with such questions to keep the understanding even and clear." A hard saying, truly, yet one that must be laid well to heart.

While the Idols of the Tribe, then, are common human frailties in thought, and the Idols of the Cave the perturbations resulting from individual idiosyncrasies, there are other Idols "formed by the intercourse and association of men with each other," which Bacon calls "Idols of the Market Place, on account of the commerce and consort of men there." By reason of its manifold and necessary imperfections—its looseness, variability, ambiguity, and inadequacy—the language we are forced to employ for the embodiment and interchange of ideas plays ceaseless havoc with our thought, not only introducing confusion and misconception into discussion, but often, "like the arrows from a Tartar bow," reacting seriously upon our minds. A large part of the vocabulary to which we must perforce have recourse, even when dealing with the most abstruse and delicate subjects, is made up of words taken over from vulgar usage and pressed into higher service; they carry with them long trains of vague connotations and suggestions; the superstitions of the past are often imbedded in them; no one can ever be absolutely certain of their intellectual values. While, therefore, they may do well enough for the rough needs of daily life, they prove sadly defective when required for careful and exact reasoning. And even with that small and comparatively insignificant portion of our language which is not inherited from popular use, but fabricated by philosophers themselves, the case is not much better. Every word, no matter how cautiously employed, inevitably takes something of the tone and color of the particular mind through which it passes, and when put into circulation fluctuates in significance, meaning now a [Pg 796] little more and now a little less.[25] What wonder, then, that "the high and formal discussions of learned men" have so often begun and ended in pure logomachy, and that in discussions which are neither high nor formal and in which the disputants talk hotly and carelessly the random bandying of words is so apt to terminate in nothing beyond the darkening of counsel and the confusion of thought?

Bacon notes two ways particularly in which words impose on the understanding—they are employed sometimes "for fantastic suppositions ... to which nothing in reality corresponds," and sometimes for actual entities, which, however, they do not sharply, correctly, and completely describe. The eighteenth century speculated at length on a state of Nature and the social contract, unaware that it was deluding itself with unrealities, and we have not yet done with such abstractions as the Rights of Man, Nature (personified), Laws of Nature (conceived as analogous to human laws), and the Vital Principle. The more common and serious danger of language, however, lies in the employment of words not clearly or firmly grasped by the speaker or writer—words which, in all probability, he has often heard and used, and which he therefore imagines to represent ideas to him, but which, closely analyzed, will be found to cover paucity of knowledge or ambiguity of thought. Cause, effect, matter, mind, force, essence, creation, occur at once as examples. Few among those who so glibly rattle them off the tongue have ever taken the trouble to inquire what they actually mean to them, or whether, indeed, they can translate them into thought at all.

Among the Idols of the Market Place we must also class the evils arising from the tendency of words to acquire, through usage and association, a reach and emotional value not inherent in their original meanings. This is what Oliver Wendell Holmes happily described as the process of

polarization. "When a given symbol which represents a thought," said the Professor at the Breakfast Table, "has lain for a certain length of time in the mind it undergoes a change like that which rest in a certain position gives to iron. It becomes magnetic in its relations—it is traversed by strange forces which did not belong to it. The word, and consequently the idea it represents, is [Pg 797] *polarized*." The larger part of our religious and no small portion of our political vocabulary consist of such polarized words—words which, on account of their acquired magnetism, unduly attract and influence the mind. We can never hope to think calmly and clearly while the very symbols of our thoughts thus possess a kind of thaumaturgic power over us, which in turn readily transfers itself to our ideas.

If, then, "words plainly force and overrule the understanding and throw all into confusion and lead men away into numberless empty controversies and idle fancies," it behooves us to watch closely the interrelations of language and thought. To put it in the vernacular, we must at all times make sure that we know what we are talking about and say what we mean. To this end the study of language itself is useful, but the habits of precise thought and expression will never be acquired by linguistic exercise alone. To use no word without a distinct idea of what it means to us as we speak or write it; to check, when necessary, the process of thought by constant redefinition of terms; to depolarize all language that has become, or threatens to become, magnetic, thus translating familiar ideas into "new, clean, unmagnetic" phraseology, these may be set down as first among the rules to which we should tolerate no exception.

We now come to the last group of Idols—those "which have immigrated into men's minds from the various dogmas of philosophies, and also from wrong laws of demonstration." These Bacon calls Idols of the Theater, "because in my judgment all the received systems are but so many stage-plays, representing worlds of their own creation after an unreal and scenic fashion." And perhaps this conceit carries further than Bacon himself intended, for it not only suggests the unsubstantial character of philosophic speculations, but also reminds us how, in the world's history, these airy fabrics have succeeded each other as on a stage, some to be hissed and some applauded, but all sooner or later to drop out of popular favor and be forgotten.

Dealing with these Idols of the Theater, or of Systems (of which there are many, "and perhaps will be yet many more"), Bacon takes the opportunity of criticising, briefly but incisively, the methods and results of ancient and mediæval philosophers. His classification of false systems is threefold: The sophistical, in which words and the finespun subtilties of logic are substituted for "the inner truth of things"; the empirical, in which elaborate dogmas are built up out of a few hasty observations and ill-conducted experiments; and the superstitious, in which philosophy is corrupted by myth and tradition. Under the first head, Bacon again instances Aristotle, whom he [Pg 798] accuses of "fashioning the world out of categories"; under the second he glances especially at the alchemists; and under the third he refers to Pythagoras and Plato. To follow Bacon into these historic issues does not belong to our present purpose. Suffice it to notice the continued vitality of these three classes of speculative error. Bacon's judgment of Aristotle—that "he did not consult experience as he should have done, in order to the framing of his decisions and axioms; but, having first determined the question according to his will, he then resorts to experience, and, bending her into conformity with his placets, leads her about like a captive in a procession"—is at least equally applicable to thinkers like Hegel and his followers. Empiricism has by no means been eliminated from the scientific or would-be scientific world. And as for the philosophy which is corrupted by myth and tradition, the countless attempts that are still made to "reconcile" the facts of science with the data and prepossessions of theology are enough to prove that, *mutato nomine*, the methods of Pythagoras and Plato and of those who in Bacon's day sought "to found a system of natural philosophy on the first chapter of Genesis, on the book of Job, and other parts of the sacred writings," are as yet far from obsolete.

It is hardly necessary to call attention to the fact that there is a close similarity between systematic empiricism and some of the dangers brought out in connection with the Idols of the Tribe, for in each case stress must be laid on the tendency to generalize hastily, depend on scattered and inadequate data, and seek for light in the "narrowness and darkness" of insufficient knowledge. This matter is important only as showing how a common weakness may be caught up and dignified in a philosophic system and rendered more dangerous by the adventitious weight and influence which it gains thereby. Another point, not distinctly dealt with by Bacon, calls, however, for special remark. While the various Idols of the Theater, or of Systems, exercise their own peculiar and characteristic influences for evil, they all tend to the debasement of thought by reason of the authority which they gradually acquire. Associated with great names, promulgated by schools, officially expounded by disciples and commentators, they finally settle into a creed which is regarded as having oracular and dogmatic supremacy. The formula "Thus saith the Master" closes discussion. Not the fact itself, but what this or that teacher has said about the fact, comes at last to be the all-important question. In the condition of mind thus engendered there is no chance for intellectual freedom, self-reliance, growth. Lewes related an anecdote of a mediæval student "who, having detected spots in the sun, communicated his discovery to a [Pg 799] worthy priest. 'My son,' replied the priest, 'I have read Aristotle many times, and I assure you that there is nothing of the kind mentioned by him. Go rest in peace, and be certain that the spots which you have seen are in your eyes, and not in the sun.'"[26] Such an incident forms an admirable commentary on the saying of the witty Fontenelle that Aristotle had never made a true philosopher, but he had spoiled a great many. The position assumed is simple enough: Aristotle *must* be right, therefore whatever does not agree with the doctrines of the Stagirite must be wrong. Are your facts against him, then revise your facts. Come what may of it, you must quadrate knowledge with accepted system. Here is the theological method in a nutshell. And the

theological method has only too often been the method also of the established philosophic schools.

In our own relations with these Idols of the Theater the first and last thing to remember is that all systems are necessarily partial and provisional. "They have their day and cease to be," and at the best they only mark a gradual progress toward the truth. There can be no finality, no closing word authoritatively uttered. Our attitude toward the systems of the past and the present, toward long-accepted traditions, and dogmatically enunciated conclusions, must be an attitude of firm and steady—of respectful, it may be, but still firm and steady—independence. We must resist the tendency to passive acquiescence, and endeavor to combine with generous hospitality to all ideas the habit of not accepting anything merely because it is stated *ex cathedra*, or is backed by an influential name, or can "plead a course of long observance for its use." Perhaps to wean ourselves from this particular form of idolatry there is nothing so helpful as a wide and constant study of the history of thought. The pathway of intellectual development is strewn with outgrown dogmas and exploded systems. How fatuous, then, to accept, whole and untested, the doctrine of any master, new or old, believing that his word will give us complete and undiluted truth!

So much, then, we may say with Bacon "concerning the several classes of Idols and their equipage, all of which must be renounced and put away with a fixed and solemn determination, and the understanding thoroughly freed and cleansed; the entrance into the kingdom of man, founded on the sciences, being not much other than the kingdom of heaven, whereinto none may enter except as a little child." It may perhaps be urged that the result of such a survey as we have taken of the obstacles to clear thought is to leave the mind dazed and discouraged, partly [Pg 800] because the suggestions made for the conquest of these obstacles, though easily formulated in theory are difficult and sometimes impossible in practice, and partly because the general if not expressed tendency of our analysis is (it may be said) in the direction of that Pyrrhonic skepticism which "doomed men to perpetual darkness." To the former objection I have only to reply that it is one to which all discussions of the principles and problems of conduct are necessarily open. "If to do were as easy as to know what were good to do, chapels had been churches, and poor men's cottages princes' palaces."[27] None the less, to state as lucidly as we can what were good to do under certain circumstances is properly regarded as part of the business of ethics. The other point is touched upon by Bacon himself in words which it would be impertinent to seek to better: "It will also be thought that by forbidding men to pronounce and set down principles as established until they have duly arrived through the intermediate steps at the highest generalities, I maintain a sort of suspension of the judgment, and bring it to what the Greeks call *acatalepsia*—a denial of the capacity of the mind to comprehend truth. But in reality that which I meditate and propound is not *acatalepsia*, but *eucatalepsia*; not denial of the capacity to understand, but provision for understanding truly; for I do not take away authority from the senses, but supply them with helps; I do not slight the understanding, but govern it. And better surely it is that we should know all that we need to know, and yet think our knowledge imperfect, than that we should think our knowledge perfect, and yet not know anything we need to know."

MATHEMATICS FOR CHILDREN.

By M. LAISANT.

Except with persons having specially favorable surroundings, I believe that the vast majority of parents have a feeling of dread at the thought of putting their children to the study of mathematics. They know that the child must learn something about it in order to pass his examinations; but with this knowledge goes an apprehension of loading his mind with those ideas which are so complicated and hard to acquire, and we put off the dreaded moment of setting him to work as late as possible.

While I believe it is wise to spare the child all useless overwork, I am persuaded also that the best way of sparing him is not to shrink from initiating him into hard work, if that can be done in a [Pg 801] rational way.

I regard all the sciences as, at least to a certain extent, experimental, and, notwithstanding the views of those who would regard the mathematical sciences as a series of operations in pure logic, resting upon strictly ideal conceptions, I believe that we may affirm that there does not exist a mathematical idea that can enter our brain without the previous contemplation of the outer world and the facts it offers to our observation. This affirmation, the discussion of which now would carry us too far, may help to a clear idea of the way we should try to convey the first mathematical ideas to the mind of the child.

The outer world is the first thing the child should be taught to regard and concerning which he should be given as much information as possible—information which he will have no trouble in storing, we may well believe, and from this outer world the first mathematical notions should be borrowed; to these should succeed later an abstraction, which is less complicated than it seems.

Our primary teaching of arithmetic now follows in the tracks of that of grammar, as we might as well say that the teaching of grammar follows in the tracks of that of arithmetic. That is, in either case we teach the child a number of abstract and confusing definitions which he can not comprehend, imposing on him a series of rules to follow under the pretext of giving him a good practical direction, and we force him to learn and memorize these rules whether they are good for anything or not.

When the child has grown older he is given two or three short lessons a week in science, nine tenths of which, with his fleeting memory, he forgets before the next week's lessons come on. He can not relish anything that is taught him in that way, and it would be vastly better to give him no scientific ideas at all than to scatter them around in such a way, for all teachers agree that a fresh pupil is more easily dealt with and can be taught more satisfactorily and thoroughly than one who has been mistaught.

When the student has passed through it all and has established himself in life he is apt to look back upon his experiences under such teachings in no very amiable mood, and to regard such matters in the light of barriers that were set up to prevent his getting his diploma with too little work; and even if his profession is one that calls for applications of mathematics he prepares himself with sets of formulas that enable him to dispense with the imperfect instruction he has received.

When we think of giving a child a mathematical education we are apt to ask whether he has special aptitudes fitting him to receive it. Do we ask any such questions when we talk of teaching [Pg 802] him to read and write? Oh, no! we all acknowledge that reading and writing are useful, practical, and indispensable arts, which every human being not infirm or defective should learn. Now, elementary mathematics, which represents a tolerably extended equipment, is no less useful and indispensable than the knowledge of reading and writing, and I assert further, what may seem paradoxical to many, that it can be assimilated with much less fatigue than the earliest knowledge of reading and writing, provided always that instead of proceeding in the usual way and giving lessons bristling with formulas and rules, appealing to the memory, imposing fatigue, and producing nothing but disgust, we adopt the philosophical method of conveying ideas to the child by means of objects within reach of his senses. The teaching should be wholly concrete and applied only to the contemplation of external objects and their interpretation, and the instruction should be given continually, especially during the primary period, under the form of play. Nothing is easier than this, then, in arithmetic; for instance, to use dice, beans, balls, sticks, etc., and by their aid give the child ideas of numbers.

Do we do anything of this kind? When I was taught to read and write I knew how to write the figure 2 before I had any idea of the number two. Nothing is more radically contrary to the normal working of the brain than this. The notion of numbers—up to 10, for example—should be given to the child before accustoming him to trace a single character. That is the only way of impressing the idea of number independently of the symbol or the formula which is only too ready to take the place in the mind of the object represented by it.

When a child has learned to count through the use of such objects as I have mentioned he may be taught what is called the addition table. This table can be learned by heart easily enough, but when we reach the multiplication table we come upon one of the tortures of childhood. Would it not be simpler and easier to make the children construct these tables, instead of making them learn them?

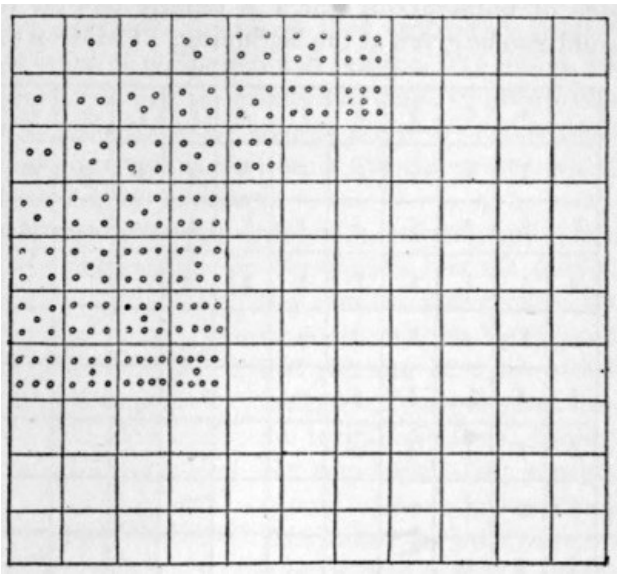

Fig. 1.

Let us first take the addition table, and suppose that we trace ten columns on suitably ruled paper, at the top of which we write the first ten numbers, for example, and then write them again at the beginning of a certain number of horizontal lines (Fig. 1). Let us suppose, too, that we have a box divided into compartments arranged like the squares in our table, into which we put heaps of balls, beans, or dice corresponding to the numbers indicated in the table. The child will take,

[Pg 803]

for example, two balls from one compartment and three from another, will put them together and place his five balls in the case corresponding with the point where the lines of two and three will meet, and will thus gradually accustom himself to the idea that two added to three are equal to five, four and two to six, etc., before he knows how to write the corresponding figures. As soon as he has learned how to write them he can himself make the table with figures (Fig. 2), showing that one and one make two, one and three four, etc.

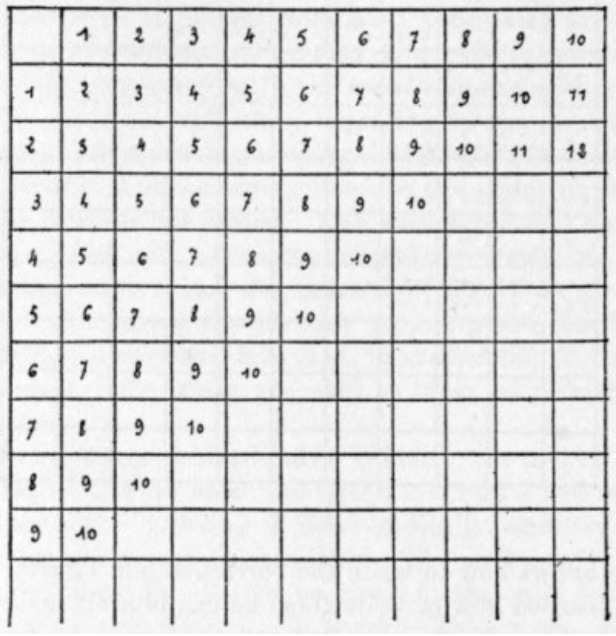

Fig. 2.

This will be all the easier for him because he will only have to write the figures in their order in the lines and the columns. This furnishes an excellent writing exercise after the children have begun to write figures, and affords besides a certain method of teaching them the addition table up to nineteen at least. I insist that all this can be done even before the child knows how to write the figures by means of an arrangement like a printer's case, and that it will be as a play, rather than a study, to the child. Hardly anything more will be required than to bring the toy to the child's notice and leave him to himself after he has been started with it, and he will get along the faster the less he is bothered.

A similar process may be adopted with the multiplication table. With a case like the other, it is only necessary to tell the child that if he wants to know how much are three times four he has only to make heaps of four things each, take three of them and put them in the box at the intersection of the line three and the column four. If he can write the figures he will write 12, instead of gathering up the twelve objects that represent the product. When he has played at this [Pg 804] for some time he may become acquainted with all the products up to ten times ten or beyond without having to make any abnormal effort of memory.

The idea of numeration, which is usually put off till a later period, should also be given at the beginning. Children soon understand the decimal numeration and learn to write 10 for ten, and other numbers composed of one of the nine ciphers and zero. But the fact which, however, though quite essential to know, receives very little attention is that there is nothing particular about this number ten, and that systems of numeration can be devised resting on any basis that may be taken; that the principle of every system of numeration consists in taking a certain number of units and grouping them. Take, for example, a system having five as its basis. All the numbers of such a system can be represented with the figures 1, 2, 3, and 4, the symbol 10 standing in this case for five. To construct a number we have only to group the units by fives and observe the result.

To learn decimal numeration by this process we put tens of objects into little boxes, tens of little boxes into larger ones, and so on. The child can in this way acquire an exact idea of the units of successive order in any system that may be desired.

This method of teaching was developed in a remarkable way about thirty years ago by Jean Macé [Pg 805] in a little book entitled *L'Arithmétique du Grand-Papa*—Grandpa's Arithmetic—which made some impression when it appeared, but has been substantially forgotten.

In this method I attach much importance to giving these exercises a form of play. I believe that nothing in primary instruction should savor of obligation and fatigue. It would, on the other hand, be better to try to induce the child to desire himself to go on, and it would always be well to try to give him the illusion, in all stages of instruction, that he is the discoverer of the facts we wish to impress upon his mind.

We need not stop with arithmetic, but may go on and give the child a little geometry. To accomplish this we should give him the idea of geometrical objects, and to some extent their nomenclature, and this can be done without causing fatigue. To accomplish this he should be taught to draw, however rudely. He can begin with straight lines, of which he soon learns the properties; then, when he has drawn several lines side by side, he will learn that they are

parallels and will never meet. He will learn, too, after he has drawn three intersecting lines, that the figure within them is called a triangle, that the figure formed by two parallel lines meeting two other parallels is a parallelogram, and he can go on to make and learn about polygons, etc (Fig. 3). All this nomenclature will get into his head without giving abstract definitions, but in such a way that when he sees a geometrical object of definite form he will recognize it at once and give it the name that belongs to it.

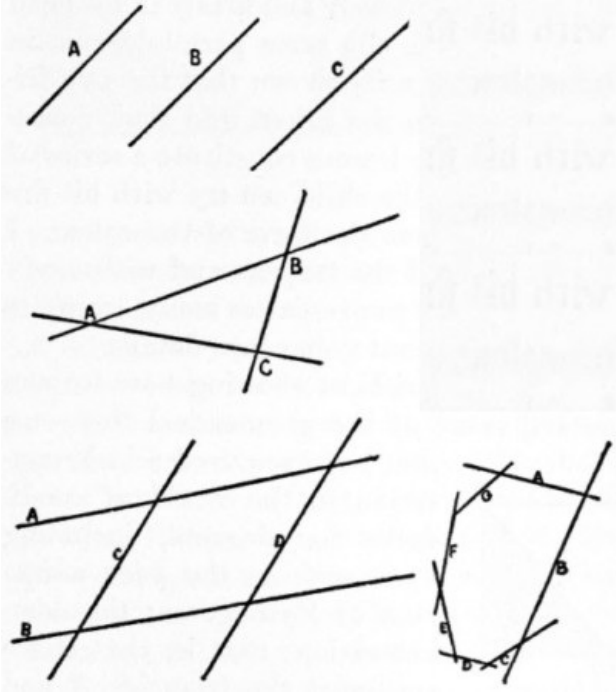

Fig. 3.

In the practical matter of the measurement of areas we convey immediate comprehension as to many figures without special effort, provided we do not present the demonstration in professional style, limiting ourselves to making the pupil comprehend or feel things so clearly and definitely that it shall be equivalent, as to the satisfaction of his mind, to an absolutely rigorous demonstration. At any rate, he will be better provided for the future than by rigorous [Pg 806] demonstrations that he does not understand. Taking the parallelogram, for example, let us suppose a figure made like Fig. 4, and we saw through it along the lines *A A'* and *B C*. It does not need a very great effort of attention to recognize, experimentally if need be, that the two triangles *A A' D* and *B B' C* may be placed one upon the other and are identical. If, from the figure thus formed, we take away the right-hand triangle the parallelogram will remain; if we take away the other triangle a rectangle will be left, or a peculiar parallelogram, of which also we give the idea to the child as a figure in which the angles are formed by straight lines perpendicular to one another. Here, then, the child gains the notion of the equivalence of a parallelogram and a rectangle of the same base and height; and this notion, obtained by cutting up a piece of board or pasteboard, he will carry so seriously and firmly in his head that he will never lose it. By cutting the same parallelogram in two, along a diagonal *A C*, it may be easily shown that the two triangles can be placed exactly one upon the other, and that, consequently, they have equal areas. These lessons constitute a series of classical theorems in geometry which the child can try with his fingers and learn without even giving them the form of theorems. I might show the same as to the area of the trapeze and with many other theorems, but my purpose is only to present as many examples as will make my idea understood, without going into details.

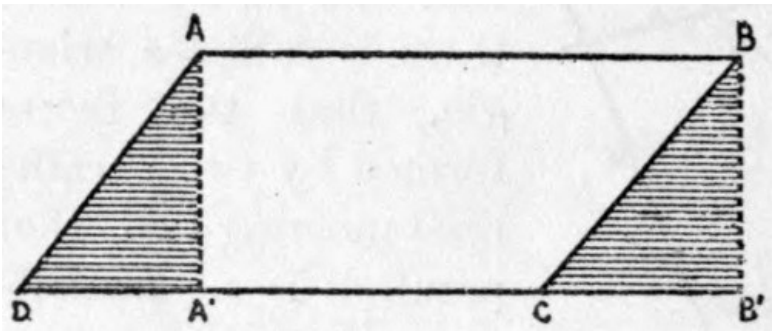

Fig. 4

Yet I can not leave this subject without showing how we can make a very child understand some of the geometrical theorems that have acquired a bad reputation in the world of candidates for degrees, including even such as the *pons asinorum* of Pythagoras; the demonstration, that is, that if we construct the triangles *B* and *C* on the sides of a right-angled triangle, their sum will be equal to the square *A* constructed on the hypotenuse. The usual demonstration of this theorem is not very complicated, but there is something tiresome, artificial, and hard in it. The demonstration I propose is almost intuitive, and the reasoning of it is both simple and rigorous.

Suppose we take two equal squares, and, making equal lengths on the four sides of one of them, join the points so obtained as indicated in the first of the two figures (Figs. 5 and 6) so as to form four right-angled triangles, and then place four other squares in the corners of the original square. These right-angled triangles are of such sort that the sum of their sides is equal to the side of the square. This can be demonstrated, but it strikes the eyes without that. We see, too, [Pg 807] that the interior figure is a square, and that it is constructed on the hypotenuse of the triangles in question.

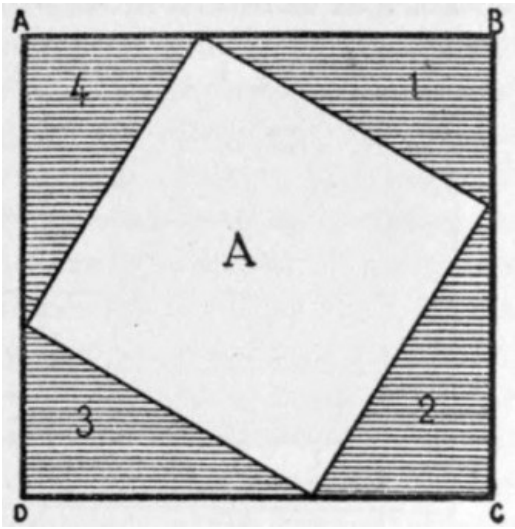

FIG. 5.

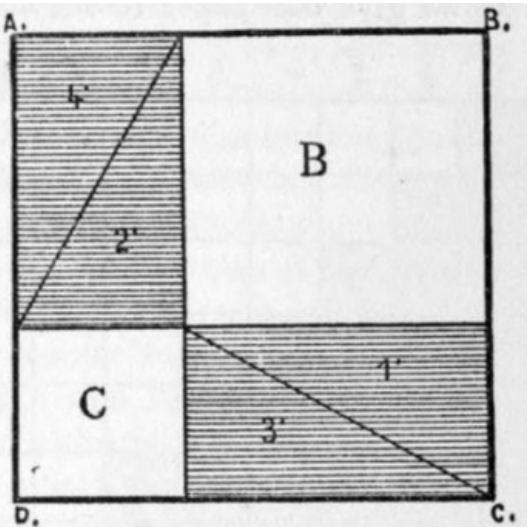

FIG. 6.

It is easy to see in the other figure, which is formed after the same measures as its alternate, that the triangles 1, 2, 3, 4 can be arranged so as to occupy the positions 1', 2', 3', 4' in such way as to leave in the main square two smaller squares constructed on the sides of one of the right-angled triangles. It follows that the square A is equivalent to the sum of the squares *B* and *C*. The theorem thus becomes a kind of intuition, a thing evidently indisputable.

It is a curious fact that the origin of this demonstration is lost in the obscurity of the past; it probably goes back to thirty or forty centuries, at least, before the Christian era, and apparently to India. Bhascara, in his *Bija Ganita*, after tracing a figure, a simple combination of these two, says, "There you see it." I remark that such a demonstration, even if dressed with geometrical terms, assuming a character that conforms to existing ways of teaching, would be vastly superior, even in secondary schools, to the demonstrations of Legendre and others, which are much harder. The return to what was done very long ago in this case constitutes a great advance upon what we are doing now.

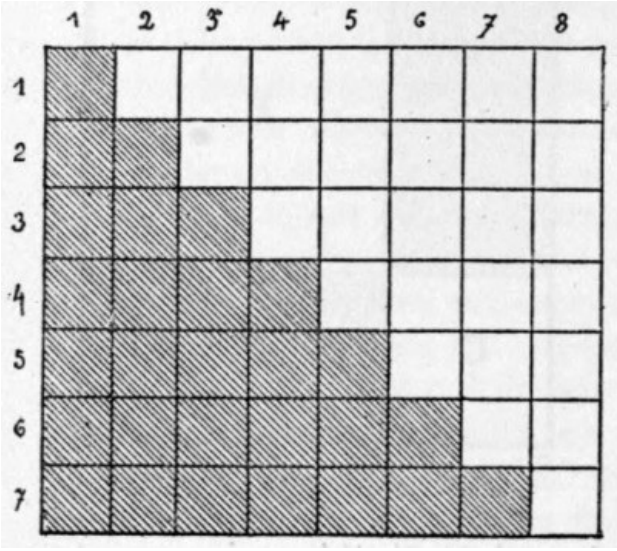

FIG. 7.

Having given our little one an initiation into the mysteries of arithmetic and geometry, we introduce him to algebra, a branch which passes in the majority of families as the hardest, most complicated, and most abstruse that can be imagined. I do not pretend that algebraic theories enter easily into the child's delicate brain; rather the contrary; but I declare that some ideas in algebra can be made comprehensible to children without fatigue. We can, for instance, make them understand, in the way of amusement and without great difficulty, the formula that gives the sum of the first numbers. We take a sheet of paper ruled in squares and shade the first [Pg 808] square of the first line, then the first two squares of the second line, the first three of the third, etc. (Fig. 7). The whole number of squares shaded in this manner represents visibly the sum of the first whole numbers up to any one we may choose—to 7 in the figure. If we give this paper to the child and ask him to return it, he will very easily perceive that the figures formed by the white and the black squares are alike. The number sought for will therefore be equal to half the

sum of the squares—that is, in the present example

$$1 + 2 + 3 + 4 + 5 + 6 + 7 = (7 \text{ X } 8) : 2 = 28,$$

we can prove by reasoning that if n be taken to represent the last number we shall have for the sum

$$S = \frac{n\,(n + 1)}{2}$$

I introduce this formula to define my thought better, but one can make the child perceive the numbers that are wanted without writing down a single character.

Somewhat similar is the method of finding the sum of the odd numbers. For this it will be enough to take our square-ruled sheet of paper and shade the first square on the left, then the three squares around it, which will form with it a square (1 + 3 = 4); continuing thus we obtain, as the figure readily shows (Fig. 8), a square formed of a series of shaded zones, representing the series of odd numbers, the examination of which will illustrate the property to the child.

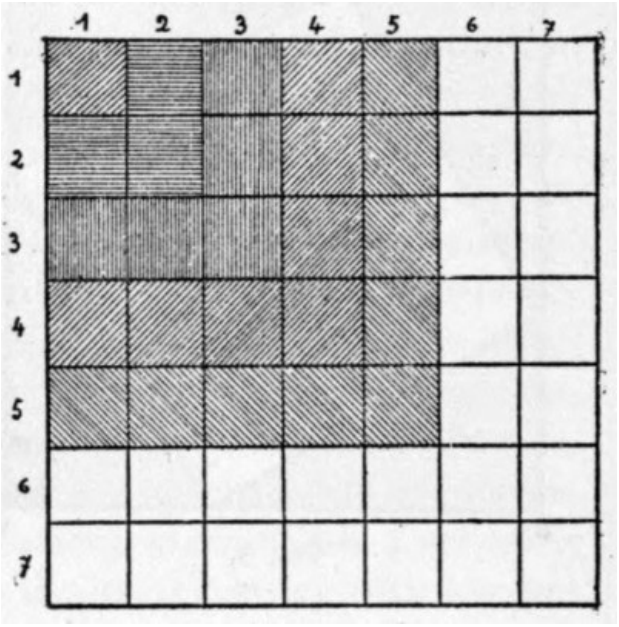

Fig. 8.

In another direction it is possible to give the child algebraic ideas much beyond anything we would imagine. Suppose, for example, we want to give him a conception of addition. He easily realizes that objects—material bars, for example—can be selected so as to represent numbers by [Pg 809] their length. He can be readily made to understand that if he has one bar three and another five inches long he can obtain the sum of these lengths, in what we might call a material way, by placing them lengthwise, one at the end of the other—an essentially practical notion and easily carried into effect. If we take a line and mark a starting point on it, calling it zero, then measure off segments on it representing the bars we have been talking about one after another, we can get the sum represented by the length of the two segments. If, instead of measuring three plus five inches I measure three plus two I reach another point. If, instead of adding two and three, I wish to take one of the bars or numbers away (3-2), or subtract, the operation will be easily performed by measuring the two in the opposite direction. The difference will be represented by the length that is left. If we try to form the quantity 3-5 in arithmetic we can not do it; but in proceeding in this method and measuring back on the bar we get to a point back of the original starting point which represents this difference—say two inches behind where we began. Here we have in the germ the whole theory of negative quantities, concerning which thousands and thousands of pages have been written. Yet we find that by carefully graduating our lines we can make it intuitive and accessible to a child who has learned that the common operations of addition and subtraction can be represented with material objects. The generation of negative and positive quantities follows quite naturally.

These examples, I think, are sufficient to show that we might considerably enlarge the field of the investigations within reach of the child. For this purpose a small amount of very simple material, which we can vary as we please, is needful. The first element of this material is paper ruled in squares, a wonderful instrument, which everybody dealing with mathematics or with science generally should have. It is of special pedagogic use in giving children their first ideas of form, size, and position, without which their early instruction is only a delusion. Add to this paper dice, buttons, beans, and match-sticks—things always easy to get—and we have all the material we need.

There is no amusement, however puerile it may appear, not even a play of words, that can not be utilized in teaching of this sort. For instance, when your child has learned his addition table, if you put him to a demonstration, assuming to prove to his comrades that six and three make eight, his curiosity will be excited, and you may be very sure that, once his attention has been given to this amusement, he will never forget that six and three make nine and not eight. To [Pg 810]

make the demonstration, we have only to group the nine match-sticks as in the figure (Fig. 9) below. We might demonstrate in a like way that half of twelve is seven by cutting the Roman numeral XII in two, leaving the upper part visible. Such pleasantries have a pedagogical value, because the paradox is precisely of a kind to attract the attention of the child, and he will always afterward be sure not to fall into the trap.

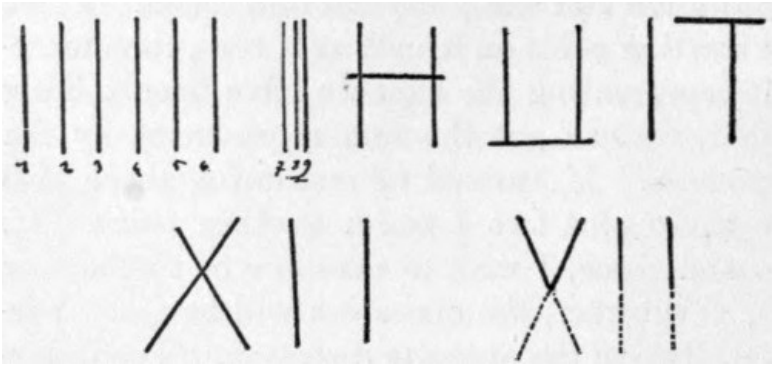

Fig. 9.

The side of this kind of instruction on which I insist most is that, given under the form of play, it is free from every sort of dogmatic character. No truth should be imposed on the child; on the contrary, he should be allowed to discover it as a fruit of his own activity. He will be thoroughly impressed with the truths which he has thus found out himself. They had better be few at first; the important thing is for him to know them completely.

The instruction should also be essentially objective and free from all abstraction. The absence of abstraction should, however, be rather apparent than real. Abstraction is indeed one of the elements that contribute most to give mathematical science a fearful air to outsiders, and yet it is most usually a simplification of matters—quite the contrary of what is generally supposed. It is, in fact, such a simplification and so necessary that we all make it as if by instinct, and the child makes it, not in mathematics only, but in all the considerations of life.

Thus, when I want to give the child his first idea of the number two I put two beans in his hand and let him contemplate them. He gets a perfect notion of the collection two. Yet, if you look at them a little closer and he himself looks at them closer he will find that the two beans, whatever else they may be, are not identical, for there exist no two objects in Nature that are not different. So when the child introduces this idea of collection into his mind in a wholly instinctive way, by identifying the things he sees, he begins to perform abstraction. This abstraction delivers him from all the complications and all the annoyances that come to him from the contemplation of real objects. By the philosophic process of abstraction it has been possible to construct all the sciences, and especially the science of magnitudes.

The ideas I have been setting forth in outline are not mine, and are, unfortunately, not recent. [Pg 811] They may be found in somewhat different form, but substantially the same in principle, in *l'Essai d'education nationale*, published by Le Chalotais in 1763. The paper furnishes a programme of studies and education which, if put into execution, would, I believe, constitute a long advance over the present conditions. At a later period Condorcet was occupied with the subject. At the close of the nineteenth century the name of Jean Macé, which I have already cited, should be held among those of men who have tried to infuse sound and just views concerning the pedagogy of mathematics. Another man, from whom I have borrowed a considerable part of the examples I have cited, is Edouard Lucas, who, in his *Récréations mathématiques*, of which one volume was published during his lifetime and two others after his death, and in his lectures before the Conservatoire des Arts et Métiers, strove to develop views concerning the primary mathematical education of childhood—views which did not differ, except in form, from those which I have presented.—*Translated for the Popular Science Monthly from the Revue Scientifique.*

PRESENT POSITION OF SOCIOLOGY.

By F. SPENCER BALDWIN.

The present condition of sociological thought is confused, if not chaotic. It needs only a brief examination of the writings of professed sociologists to discover the want of agreement among them. There is no consensus of opinion regarding either the scope and method of the new science, so called, or its fundamental laws and principles. The name sociology stands for no definite body of systematic knowledge. It is applied to an inchoate mass of speculation, often vague and conflicting, which represents the thought of various thinkers about social phenomena.

A few years ago a student of sociology in Chicago wrote to "all the teachers of sociology in the United States, and to others known to be deeply interested in the subject and entitled to express an opinion," asking them to answer a number of pertinent questions regarding the nature and function of the "science."[28] About forty replied; of these, three discreetly pleaded knowledge insufficient to entitle them to an opinion. Comparison of the views expressed in the remaining

twenty-seven replies led the investigator to conclude that the science is in a more or less undefined and tentative position. So little progress toward unanimity of opinion has been made by sociologists since the date of this census that its results may be taken as typical of present conditions. Among the questions asked were these: "Do you think the study is entitled to be called a science?" "In what department does it belong?" "What is its relation to political economy, history, political science, ethics?" [Pg 812]

The question whether sociology is entitled to be called a science is answered by "fully three fourths" of the correspondents in the affirmative. Some hedge, by affirming that it is "becoming a science." Prof. John Bascom, of Williams College, appears to have entered into the humor of the situation; he writes, "It will do no harm to call it a science if we do not abate our effort to make it one."

The opinions regarding the department in which sociology belongs are entertainingly diverse. Prof. John Dewey, of the University of Chicago, is frank enough to admit that he doesn't "feel at all sure" where it belongs. "It would seem well," he adds, "to have it a separate branch, in order to make sure that it received proper attention." This feeling of uneasiness lest the claims of sociology be slightingly treated appears to be general among the representatives of the new study. Most of the teachers of sociology are of the opinion that it ought to form a department by itself. Some would place it in the department of the social sciences, along with politics, economics, jurisprudence, and the like. Others would change the order, making all the social sciences divisions of sociology. On the other hand, Professor Giddings, of Columbia University, says: "General sociology can not be divided into special social sciences, such as economics, law, and politics, without losing its distinctive character. It should be looked on as the foundation or groundwork of these sciences, rather than as their sum or as their collective name." Scattering replies place it under psychology, moral and political science, political economy, and anthropology. One teacher thinks it belongs under the "humanities"; while two say it has no natural boundaries, and is therefore not included in any one department. Altogether the impression left by the replies to this question is that the teachers of sociology are quite at a loss to know where to put the study in the university curriculum. They appear to realize confusedly that they have on their hands a pedagogical white elephant, which defies classification.

The opinions concerning the relation of sociology to political economy, history, political science, and ethics are almost delphic in their vagueness. Says one, "History is its material, ethics its guide, political economy its interpreter, and a rational system of political science its proposed end." Says another, "Sociology is political economy in practice, history in the making, political science as an art, and ethics applied." After worrying over these oracular epigrams it is refreshing to be told by another teacher that "the relation of sociology to political economy, history, etc., is *close*." [Pg 813]

It would be superfluous to cite further illustrations of the unsettled state of sociological thought. The quotations that have been made show conclusively that the accredited representatives of the new "science" are at loggerheads upon fundamental questions. This fact the sociologists themselves readily admit. The author of a recent treatise on sociology speaks of the "confusion and perplexity among its teachers, and declares that its forms are as yet varied, and perhaps would suggest a series of pseudo-sciences instead if one genuine science."[29] Even Professor Giddings confesses in the preface of his Principles of Sociology that "much sociology is as yet nothing more than careful and suggestive guesswork." Professor Small, of the University of Chicago, in his Introduction to the Study of Society, speaks of sociology as an "inchoate science," and remarks that "only ignoramuses, incompetent to employ the method of any science, could claim for sociology the merit of a completed system."

Sociologists themselves, then, confess that differences of opinion exist among them. Let us look more carefully at the nature of these differences. They relate to the scope, the method, the object, and the ground-principles of the "science."

The province of sociology is defined by some very broadly, to include the whole range of the phenomena of human association. By others the scope of the study is limited to a narrower range of social phenomena. Among the latter, again, there are some who would identify sociology with the study of social origins, or the genesis of social institutions. Others would restrict sociology to a study of the history and function of the family. Still others understand by sociology merely the pathology of society, devoting themselves to the diagnosis of social diseases, as crime and pauperism.

Professor Giddings has called attention to the natural tendency on the part of each social philosopher to create a sociology in the image of his professional specialty. "To the economist," he says, "sociology is a penumbral political economy—a scientific outer darkness—for inconvenient problems and obstinate facts that will not live peaceably with well-bred formulas. To the alienist and the criminal anthropologist it is a social pathology. To the ethnologist it is that subdivision of his own science which supplements the account of racial traits by a description of social organization. To the comparative mythologist and the student of folklore it is an account of the evolution of culture."

The narrower conceptions of sociology, however, have been discarded by the best-known sociologists of the present time. There is a general tendency to adopt a broad definition of the province of sociology, to include in the field of investigation all the phenomena of social structure and growth. [Pg 814]

But what is the relation of this general social science to the special social sciences—that is, the sciences dealing with special groups of social phenomena, as economics, politics, and jurisprudence? Is sociology anything more than a convenient collective name for the sum of all these? Touching this point opinions differ.[30]

At least three different conceptions of the relation of sociology to the various special social sciences may be distinguished. Sociology has been defined as (1) the "inclusive," as (2) the "co-ordinating," and as (3) the "fundamental" science of society. 1. The first conception is that of Spencer and De Greef. Spencer defines sociology as "the science of society," and defends his adoption of the term on the ground that "no other name sufficiently comprehensive existed." This implies that he conceives of sociology as an inclusive science. De Greef, the Belgian sociologist, makes the science all comprehensive; his scheme of classification "includes everything, from the husbanding of corn and wine to electioneering contests in the Institute of France."[31] 2. The second conception is that of Professor Small, of Chicago. He defines sociology as "the synthesis of all the particular social sciences." It does not include, it coordinates these sciences. It concerns itself with the relations which the various special groups of social phenomena hold to each other and to society as a whole, leaving to special social sciences the study of each group in minute detail. The conclusions won by these special sciences are taken by sociology and worked over into a body of correlated social principles. Sociology is, therefore, subsequent to the particular social sciences and dependent upon them. 3. The third conception is that of Professor Giddings, of Columbia University. He defines sociology as "the science of social elements and first principles." It is "not merely the sum of the social sciences; it is rather their common basis." It undertakes to analyze the general characteristics of social phenomena and to formulate the laws of social organization and evolution. Sociology furnishes a body of fundamental principles which make a common basis for the special social sciences. The latter rest on sociology, which is the antecedent and fundamental social science.

Now a little reflection will show that these three conceptions of sociology do not conflict, but harmonize. There is no real opposition between them, rightly understood. Each emphasizes [Pg 815] correctly one phase of the relation between sociology and the special social sciences. Sociology is both an inclusive, a co-ordinating, and a fundamental science. In the first place, sociology is a general science, having as its subject-matter social phenomena of all kinds. Therefore it comprehends all the sciences dealing with special kinds of social phenomena. These particular sciences are, in the nature of things, closely related to each other. They must possess in common certain laws and principles. These it is the task of sociology to formulate; for as the inclusive social science it should exhibit the mutual relations of the included social sciences. Thus sociology becomes a co-ordinating as well as an inclusive science. Furthermore, the laws and principles of the special social sciences, which sociology, as the co-ordinating science, undertakes to formulate, are necessarily fundamental. And in this respect sociology may be regarded as the fundamental social science. The three rival conceptions of sociology must be combined in the correct view. As Mr. Arthur Fairbanks remarks in his admirable Introduction to Sociology: "Sociology may embrace all the sciences dealing with society, but it does not destroy the partial independence of any of these branches. It includes economics, politics, and the like, but, instead of supplanting them, its sphere is to lay the foundation of these particular social sciences."

It appears, then, that the disagreement among the leaders of sociological thought regarding the scope of their "science" is more apparent than real. The same may be said regarding the contention about method. The debate here is over the question whether deduction or induction is the proper method of investigation in the social sciences. One party holds that the only legitimate method is the abstract-deductive, the investigator arriving at his conclusions by reasoning *a priori* from certain fundamental assumptions regarding the nature of man in general. What these thinkers aim at is a subjective interpretation of social phenomena in terms of human motives, principles, and ideals. Another party maintains that the only fruitful method is the concrete-inductive, the investigator reaching his conclusions by observing the facts of social life and reasoning from them to general laws and principles. The aim here is to give an objective interpretation of society in terms of race, environment, and historical conditions. The controversy has been especially violent among the economists. The English classical school of political economy made exclusive use of the deductive method; economic laws were deduced from the fundamental postulate of human selfishness. The German historical school employed the inductive method; economic laws were inferred from a study of the concrete facts of industrial life.

This academic discussion over method is tiresome and futile. Neither method will ever drive the [Pg 816] other from the field. The exclusive employment of either deduction or induction will yield only half results in the social sciences. The two methods effectually supplement each other and should be used together. They are not rivals, but allies. Induction without deduction is blind; deduction without induction untrustworthy. This fact is recognized by recent writers on sociology. So Professor Giddings remarks that "history without deductive illumination is chaos. Deduction without verification is undoubtedly the very light that never was on sea or land!"

The principal method in the social sciences must undoubtedly be the inductive. The nature of the subject-matter determines this. The social sciences deal with the facts of social structure and growth. The task of the investigator is the explanation of these facts. He has first, then, to observe and compare the facts. But his observation must be guided and his conclusions verified by deduction.

Concerning the purpose of sociology, as touching its method, there are two conflicting opinions. But here again the seeming disagreement is not absolutely irreconcilable. It is held by some that the purpose of the sociologist should be merely the acquisition of knowledge, without further thought of the practical use to which the results of his researches might be put. He should aim to discover and formulate the laws of social forces, not to propose ideals of social reform. Sociology is a pure science and has no utilitarian end. By others it is held that the purpose of the sociologist should be the regulation of social forces in the interest of human progress. The object of sociology is the betterment of society, the acceleration of social evolution. It is an applied science and has a practical end.

Both these views are tenable. In fact, sociology, like all sciences, has a double purpose. The primary purpose is to acquire knowledge; the secondary purpose is to apply that knowledge to the attainment of practical ends. This duality of purpose is clearly set forth by Mr. Lester F. Ward in a recent essay.[32] "Sociology," he says, "has both a pure and an applied stage." It "should be studied first for the sake of information relating to the laws of human association and co-operative action, and finally for the purpose of determining in what ways and to what extent social phenomena may, with a knowledge of their laws, be modified and directed toward social ideals."

Modern society is a complex of difficult problems. And this fact furnishes a background of motive for the studies of the sociologist. Not even the veriest stickler for pure science can deny the imperative need of established knowledge of the laws of social activity. The people perish for lack [Pg 817] of wisdom. To enlighten the public mind on vital social questions and thus to promote an intelligent direction of social conduct toward rational ends is the high function of sociology. This practical purpose, however, should be kept always secondary to the pursuit of knowledge. "The knowledge is the important thing. The action will then take care of itself."[33] The discussion of the what-ought-to-be must wait on the investigation of the what-is. The neglect of this caution has been responsible for much false doctrine and foolish counsel. Sociologists have allowed their enthusiasm for ideals to blind the eye and bias the judgment. Panacea hawkers of all sorts have attempted to prescribe for social diseases, without making any study of social structure and function. Communistic quackery has masqueraded as sociological wisdom. The wild-cat sociology of the present day is a result of the over-addiction to social reform which besets students of society. It can not be too strongly emphasized that the primary object of the sociologist is the impartial investigation of facts. The man who forgets this becomes dangerous. He is liable to run amuck.

The differences of opinion as to the scope, method, and purpose of sociology have been found upon examination to be less serious than they at first sight appeared. But in regard to the fundamental principles of sociology, the confusion is hopeless. The student will search in vain in the systematic treatises on sociology for any definite body of established doctrine which he can accept as the ground-principles of the science. He finds only an unmanageable mass of conflicting theories and opinions. Each treatise contains an exposition of what the author is pleased to label the Principles of Sociology. But the "principles" are not the same in any two treatises; and by no process of analysis and synthesis can they be brought into harmony. They are fundamentally contradictory. It is impossible, I believe, to discover a single alleged ground-principle of sociology that has commanded general assent.

Some of the recent writers on sociology have devoted themselves particularly to the task of establishing one basal principle which may be applied to the interpretation of all social phenomena. At least half a dozen claims to the discovery of such a principle have been put forward. Prof. Ludwig Gumplowicz finds the elementary social fact to be conflict; Prof. Guillaume De Greef finds it to be contract; M. Gabriel Tarde contends that the fundamental principle of society is imitation; Prof. Emile Durkheim argues that it is "the coercion of the individual mind by modes of action, thought, and feeling external to itself." Professor Giddings criticises all these explanations of society, as either too special or too general, and undertakes to prove that "the [Pg 818] original and elementary fact in society is the consciousness of kind." This is the determining principle to which all social phenomena are to be referred.[34] But Professor Giddings's sociological postulate has been promptly rejected by his American colleagues, Prof. Albion W. Small and Mr. Lester F. Ward. The former speaks contemptuously of the consciousness of kind as a remote metaphysical category, and declares that the whole system of sociology based on the principle is "an impossible combination of contradictions."[35] This opinion is approved by Ward, who riddles Giddings's book with criticism, and complains of the author's inability to handle principles correctly.[36]

It is hardly necessary to penetrate further into this debate over first principles. The most exhaustive examination of the writings of the leaders in sociological thought would fail to discover any fundamental unity of opinion. The so-called principles of the science are multiform. They represent merely the unsupported conclusions of individual thinkers. If we except the barest commonplaces, no truths have been established; no scientific laws have been agreed upon. The content of the science of sociology, as expounded in treatises bearing this name, varies with the particular bias of the writer. In fine, there are systems of sociology galore, but there is hardly a sociology.

Of the various systems of sociology that have been developed since the new "science" was first outlined by Auguste Comte, that of Herbert Spencer is undoubtedly the most coherent and self-consistent. But even the genius of Mr. Spencer has been unequal to the task of working out a

body of firmly grounded principles which should furnish a basis for the convergence of opinion on social questions. He has not succeeded in giving permanent form and content to sociology. His work is disparagingly criticised by other living sociologists. Small declares that "Spencer's sociology ends precisely where sociology proper should begin," and quotes approvingly De Greef's assertion that "Mr. Spencer not only fails to show that there is a place for sociology, but his own reasoning proves more than anything else that there is no social science superior to biology."[37] Ward, while commending the logical consistency of Mr. Spencer's work, pronounces him "unsystematic, nonconstructive, and nonprogressive."[38]

There is much justice in these criticisms of Mr. Spencer's system. His sociology is almost entirely descriptive; and his description of social phenomena has taken the form of an elaborate analogy between society and the animal organism. The utility of this biological analogy has rightly been [Pg 819] called in question. The particular resemblances traced by Mr. Spencer between a society and a living body are these: both grow and increase in size; while they increase in size they increase in structure; increase in structure is accompanied by progressive differentiation of functions; and differentiation of functions leads to mutual interdependence of the parts. Furthermore, in the case both of a society and of a living body the lives of the units continue for some time if the life of the aggregate is suddenly arrested; while if the aggregate is not suddenly destroyed by violence its life greatly exceeds in duration the lives of its units. Since, therefore, the permanent relations among the parts of a society are analogous to the permanent relations among the parts of an organism, society is to be regarded as an organism.

Now the trouble with this clever analogy is that it breaks down completely when the comparison is carried beyond a certain point. Mr. Spencer himself notices some differences between the social body and the animal body, but declares that they are not of such fundamental character as to weaken the force of his analogy. One of these differences, however, can not be so lightly dismissed. If we compare a high type of animal organism with a high type of society, this striking unlikeness is discovered. In the former there is but one center of consciousness; in the latter there are many. "In the one," to quote Mr. Spencer's own words, "consciousness is concentrated in a small part of the aggregate. In the other it is diffused throughout the aggregate." The animal body has one brain, one center of thought, feeling, and life; the social body has numberless such centers.

When we go back and compare the course of development in the two cases the difference noted comes into even greater prominence. The evolution of animal life is characterized by progressive centralization, the evolution of social life by progressive decentralization. In the lowest form of animal, the amœba, there is no single center of life. The life is in all the parts; reproduction takes place simply by division. But with each successive advance above this lowest form there is developed more and more definitely a single center of consciousness. One part becomes distinctly differentiated as the sole seat of life. If that part is destroyed, the organism dies. Thus, "animal development has meant a concentration of the more important nervous elements and a merging of their separate activity in the common activity of a single consciousness."[39]

The law of progress is quite the reverse in social development. At a primitive stage there is a marked subjection of the individual elements of society to a central authority, whether that of the [Pg 820] patriarch, the tribal head, or the tribal assembly. The individual has no economic, legal, or moral independence. But as society develops, the control which the whole exerts over the parts through authority and custom is gradually diminished. The individuality of the members of the social body becomes more and more marked. Individual freedom and responsibility are definitely recognized. Thus, the development of society has meant "the development of individuality in each of its members." It is a development of persons; the "social consciousness exists only in the discrete social elements which have become individual."[40]

In a word, social evolution is accompanied by a growing individualization of the component elements of society, whereas animal development leads to ever-stronger concentration of the life of the organism in a single part.

This difference between the physical organism and society is fundamental and essential. It is far more striking than the superficial likenesses ingeniously adduced by Mr. Spencer. His analogy tends to obscure the real nature of social relations. Unless used with cautious qualifications it "suggests false and one-sided views" and thus hinders the progress of sociology. The biological analogy has, it may be conceded, a certain value as a convenient way of describing some of the aspects of social structure and growth. It may aid the student to comprehend certain facts, but, if followed blindly, it will lead him to overlook other facts of even greater importance.

The biological analogy has been carried to absurd lengths by some writers. There is wearisome enumeration of social aggregates and organs, and exhaustive description of the social nervous system. We learn that the individual may be either a communicating cell or a terminal cell, otherwise known as an end organ. The girl in the central telephone office acts as a communicating cell when she telephones to Mr. Smith a message from Mr. Brown. "But when, Mr. Smith having asked her the exact time by the chronometer in the exchange, she looks at the dial and reports her observation to him, she is primarily a terminal cell or end organ."[41] The lookout man at sea, on the other hand, is invariably an end organ. This is far-fetched and fanciful. To clothe mere commonplaces in the borrowed rags and tags of biological terminology is not social science, nor does it aid one to get a correct conception of social reality.

The unsettled state of sociological thought which has been here set forth is a natural result of the peculiar difficulties that stand in the way of the social sciences. These have been described by Mr. Spencer with great fullness of illustration.[42] They arise from three sources—namely, (1) from the intrinsic nature of the facts dealt with; (2) from the natures of the observers of these facts; and (3) from the peculiar relation in which the observers stand toward the facts observed. [Pg 821]

1. In the first place the peculiar nature of social phenomena is such as to render scientific observation difficult. They are not of a directly perceptible kind like the phenomena which form the subject-matter of the natural sciences. Quantitative measurement and experiment are not possible. Social facts "have to be established by putting together many details, no one of which is simple, and which are dispersed, both in space and time, in ways that make them difficult of access."

2. Again, to these objective difficulties are added the subjective difficulties resulting from the intellectual and the emotional limitations of the investigators. There is, very generally, a lack of intellectual faculty sufficiently complex and plastic to comprehend the involved and changing phenomena of society. The scientific judgment is disturbed by a variety of emotional prejudices, which Mr. Spencer classifies as the educational bias, the bias of patriotism, the class bias, the political bias, and the theological bias.

3. And, finally, the peculiar position which the sociological observer occupies with reference to the phenomena puts further obstacles in the way of trustworthy observation. The sociologist has to study an aggregate in which he is himself included. He is a member of society and can not wholly free himself from the beliefs and sentiments generated by this connection.

These peculiar difficulties which beset sociology have naturally impeded the development of the department compared with other branches of knowledge. They furnish adequate explanation of the unsettled condition of sociological thought which has been described in this paper.

In conclusion, it is hardly necessary to state that in the writer's opinion sociology is not, at present, entitled to be called a science. In order to establish the right of a body of knowledge to the title of science, the claimants must be able to show that they have a definitely bounded field of investigation, that they employ recognized scientific methods, and that they have established certain truths of unquestioned value. Sociology in its present state fails to meet these conditions. Its province is not yet agreed upon, its methods have been often unscientific, and its first principles are yet to be formulated. It is not, therefore, a science.

"Sociology," says one of its critics, "no more demonstrates its claim to existence as a science than astronomy would if we found some astronomers insisting that the sun went around the earth and others contending that the earth went around the sun."[43] [Pg 822]

After all, the question whether sociology deserves to be called a science or not is one of merely academic interest. It has received far more attention than it really deserves. Nor will any amount of discussion upon this point help to make sociology a science. "It is safe to say," remarks the critic from whom we have just quoted, "that no great scientific work was ever done by a man who was fretting over the question whether he was a scientist or not. The work is the thing and not what it is called. On the other hand, no name can dignify a work which is petty and futile."

It is not by talking about it, but by working over it, that a body of knowledge is developed into a science. And sociologists would do well to heed the advice of Tarde, the French writer: "Instead of discoursing upon the merits of this infant—sociology—which men have had the art to baptize before its birth, let us succeed, if possible, in bringing it forth."[44]

A FEATHERED PARASITE.

By LEANDER S. KEYSER.

Nothing could more clearly prove that a common law runs through the whole domain of Nature than the fact that in every division of her realm there seems to be a class of parasites. In the vegetable world, as is well known, there are various plants that depend wholly upon other plants for the supply of their vital forces. And in the human sphere there are parasites in a very real and literal sense—men and women who rely upon the toil and thrift of others to sustain them in worthless idleness.

In view of the almost universal character of this law it would be strange if these peculiar forms of dependence did not appear in the avian community. We do find such developments in that department of creation. Across the waters there is one bird which has won an unenviable reputation as a parasite, and that is the European cuckoo, which relies almost wholly on the efforts of its more thrifty neighbors to hatch and rear its young, and thereby perpetuate the species. Strangely enough, our American cuckoos are not given to such slovenly habits, but build their own nests and faithfully perform the duties of nidification, as all respectable feathered folk should. However, this parasitical habit breaks out, quite unexpectedly it must be conceded, in another American family of birds which is entirely distinct from the cuckoo group. [Pg 823]

In America the cowbird, often called the cow bunting, is the only member of the avian household

that spirits its eggs into the nests of other birds. The theory of evolution can do little toward accounting for the anomaly, and even if it should venture upon some suggestions it would still be just as difficult to explain the cause of the evolution in this special group, while all other avian groups follow the law of thrift and self-reliance.

The cowbird belongs to the family of birds scientifically known as *Icteridæ*, which includes such familiar species as the bobolinks, orioles, meadow larks, and the various kinds of blackbirds, none of which, I am glad to say, are parasites. The name *Molothrus* has been given to the genus that includes the cowbirds. They are confined to the American continent, having no analogues in the lands across the seas. The same may be said, indeed, of the whole *Icteridæ* family. It may be a matter of surprise to many persons that there are twelve species and subspecies of cowbirds in North and South America, for most of us are familiar only with the common cowbird (*Molothrus ater*) of our temperate regions. Of these twelve species only three are to be found within the limits of the United States, one is a resident of western Mexico and certain parts of Central America, while the rest find habitat exclusively in South America. A fresh field of investigation is open to some enterprising and ambitious naturalist who wishes to study several of these species, as comparatively little is known of their habits, and indeed much still remains to be learned of the whole genus, familiar as one or two of the species are. Their sly, surreptitious manners render them exceedingly difficult to study at close range and with anything like detail.

Are all of them parasites? It is probable they are—at least to a greater or less degree—except one, the bay-winged cowbird of South America, which I shall reserve for notice later on in this article. We might assert that our common cowbird is the parasite *par excellence* of the family, for, so far as I can learn from reading and observation, they never build their own nests or rear their own young, but shift all the duties of maternity, save the laying of the eggs, upon the shoulders of other innocent birds.

These avian "spongers" have a wide geographical range, inhabiting the greater part of the United States and southern Canada, except the extensive forest regions and some portions of the Southern States. The center of their abundance is the States bordering on the upper Mississippi [Pg 824] River and its numerous tributaries. They occur only as stragglers on the Pacific coast west of the Cascade and Sierra Nevada Mountains. The most northern point at which they have been known to breed is the neighborhood of Little Slave Lake in southern Athabasca. In the autumn the majority of these birds migrate to southern Mexico, although a considerable number remain in our Southern States, and a few occasionally tarry for the winter even as far north as New England and southern Michigan.

The male cowbird looks like a well-dressed gentleman—and may have even a slightly clerical air—in his closely fitting suit of glossy black, with its greenish and purplish iridescence, and his cloak of rich metallic brown covering his head, neck, and chest. He makes a poor shift as a musician, but his failure is not due to lack of effort, for during courtship days he does his level best to sing a variety of tunes, expanding and distorting his throat, fluffing up his feathers, spreading out his wings and tail, his purpose evidently being to make himself as fascinating as possible in the eyes of his lady love. One of his calls sounds like the word "spreele," piped in so piercing a key that it seems almost to perforate your brain.

One observer maintains that the cowbirds are not only parasitical in their habits, but are also absolutely devoid of conjugal affection, practicing polyandry, and seldom even mating. This is a serious charge, but it is doubtless true, for even during the season of courtship and breeding these birds live in flocks of six to twelve, the males almost always outnumbering the females. However, if their sexual relations are somewhat irregular, no one can accuse them of engaging in family brawls, as so many other birds do, for both males and females seem to be on the most cordial terms with one another, and are, to all appearances, entirely free from jealousy. Who has ever seen two cowbirds fighting a duel like the orioles, meadow larks, and robins? Their domestic relations seem to be readily adjusted, perhaps all the more so on account of their lax standards of sexual virtue.

In obtruding her eggs into the nests of other birds Madame Cowbird is sly and stealthy. She does not drive the rightful owners from their nests, but simply watches her opportunity to drop her eggs into them when they are unguarded. No doubt she has been on the alert while her industrious neighbors have been constructing their domiciles, and knows where every nest in the vicinity is hidden. Says Major Charles Bendire: "In rare instances only will a fresh cowbird's egg be found among incubated ones of the rightful owners. I have observed this only on a single occasion." From one to seven eggs of the parasite are found in the nests of the dupes. In most cases the number is two, but in the case of ground builders the cowbird seems to have little fear [Pg 825] of overdoing her imposition. Major Bendire says that he once found the nest of an ovenbird which contained seven cowbird's eggs and only one of the little owner's.

If parasitism were the only crime of the cowbird one would not feel so much disposed to put her into the avian Newgate Calendar; but she not only inflicts her own eggs upon her innocent victims, but often actually tosses their eggs out of the nests in order to make room for her own. Nor is that all; she will sometimes puncture the eggs of the owners to prevent their hatching, and thus increase the chances of her own offspring. Whether this is done with her beak or her claws is still an open question, Major Bendire inclining to the belief that it is done with the claws.

Her finesse is still further to be seen in the fact that she usually selects some bird for a victim that is smaller than herself, so that when her young hopefuls begin to grow they will be able to crowd or starve out the true heirs of the family. In this way it is thought that many a brood comes

to an untimely end, the foster parents having no means of replacing their own little ones when they have been ejected from the nest. However, I am disposed to think that the cowbird's impositions are not usually so destructive as some observers are inclined to believe. I once found a bush sparrow's nest containing one cowbird and four little sparrows, all of which were in a thriving condition. The sparrows were so well fed and active that as soon as I touched the nest they sprang, with loud chirping, over the rim of their cottage and scuttled away through the grass. They were certainly strong and healthy, in spite of the presence of their big foster brother. Before they flitted away I had time to notice how the little family were disposed. The cowbird was squatted in the center of the nest, while his little brothers and sisters were ranged around him, partly covering him and no doubt keeping him snug and warm. They were further advanced than he, for while they scrambled from the nest, he could do nothing but snuggle close to the bottom of the cup, where he was at my mercy.

A wood thrush's nest that I found contained two young thrushes and two buntings. All of them were about half fledged. Being of nearly the same size, the queerly assorted bantlings lived in apparent peace in their narrow quarters. I watched them at frequent intervals, but saw no attempts on the part of the foundlings to crowd out their fellow-nestlings. The cowbirds were the first to leave the roof-tree. Thus it appears that the intrusion of the cowbird's eggs does not always mean disaster to the real offspring of the brooding family, but of course it always prevents the laying of the full complement of eggs by the builders themselves.

Even after the youngsters have left the nest the mother cowbird does not assume the care of them, but still leaves them in charge of the foster parents. It is laughable, almost pathetic, to see a tiny ovenbird or redstart feeding a strapping young cowbird which is several times as large as herself. She looks like a pygmy feeding a giant. In order to thrust a tidbit into his mouth she must often stand on her tiptoes. Why the diminutive caterer does not see through the fraud I can not say. She really seems to be attached to the hulking youngster. By and by, however, when he grows large enough to shift for himself, he deserts his little parents and nurses and seeks companionship among his own blood kindred, who will doubtless bring him up in the way all cowbirds should walk. [Pg 826]

It is surprising how many species are imposed on successfully by the cowbird. The number, so far as has been observed, is ninety, with probably more to be added. Among the birds most frequently victimized are the phœbes, the song sparrows, the indigo birds, the bush sparrows, and the yellow-breasted chats. Even the nests of the red-headed woodpecker and the rock wrens are not exempt. Some species, notably the summer warblers, detect the imposture and set about defeating the purposes of the interloper. This they do by building another story to their little cottage, leaving the obtruded eggs in the cellar, where they do not receive enough warmth to develop the embryo.

While it is surprising that acute birds should allow themselves to be imposed on in this way, perhaps, after all, they look upon the cowbird as a kind of blessing in disguise; at least, he may not be an unmixed evil. They may act on the principle of reciprocity—that "one good turn deserves another." What I mean is this: In my rambles I have often found the cowbirds the first to give warning of the approach of a supposed danger. Having no domestic duties of their own, they can well secrete themselves in a tall tree overlooking the entire premises, and thus play the useful rôle of sentinel. This, I am disposed to believe, is one of the compensating uses of this parasite, and may furnish the reason for his being tolerated in birdland. And he *is* tolerated. Has any one ever seen other birds driving the cowbird away from their breeding precincts, or charging him with desperate courage as they do the blue jays, the hawks, the owls, and other predatory species? He evidently subserves some useful purpose in the avian community, or he would not be treated with so much consideration.

A young cowbird that I purloined from the nest and reared by hand did not prove a very pleasant pet. He was placed in a large cage with several other kinds of young birds. At first he was quite docile, taking his food from my hand and even allowing some of his feathered companions to feed him; but in a few weeks he grew so wild and manifested such a fierce desire for the outdoor world that I was glad to carry him out to the woods and give him his freedom. A young red-winged blackbird and a pair of meadow larks developed a different disposition. [Pg 827]

The dwarf cowbird (*Molothrus ater obscurus*) is similar to his relative just described, except that he is smaller and his geographical range is more restricted. He is a resident of Mexico, southern Texas, southwestern Arizona, and southern California. His habits resemble those of the common cowbird. Another bunting, having almost the same range, although a little more southerly, is the red-eyed cowbird, which is larger and darker than our common cowbird and has the same parasitical habits.

In South America three species have been studied by Mr. W. H. Hudson, who, in collaboration with Mr. P. L. Sclater, has published a most valuable work on Argentine ornithology. One of these is called the Argentine cowbird (*Molothrus bonariensis*). It is a *bona fide*, blue-blooded parasite, and has been seen striking its beak into the eggs of other birds and flying away with them. The males, it is said, show little discrimination in pecking the eggs, for they are just as likely to puncture the cowbird eggs as those of other birds. Every egg in a nest is frequently perforated in this way. These buntings lay a large number of eggs, often dropping them on the ground, laying them in abandoned nests, or depositing them in nests in which incubation has already begun, in which cases all of them are lost. However, in spite of this wastefulness the birds thrive, thousands of them being seen in flocks during the season of migration.

And, by the way, a description of their habits by Mr. Hudson has thrown an interesting light on the subject of migration in the southern hemisphere. South of the equator the recurrence of the seasons is the exact reverse of their recurrence north of the equator, and therefore the breeding season of the birds is in the autumn instead of the spring; the flight from winter cold occurs in the spring instead of in the autumn, and is toward the north instead of toward the south. Thus, in February and March the Argentine cowbirds are seen flying in vast battalions in the direction of the equatorial regions—that is, northward—in whose salubrious clime they spend the winter. As our northern autumn draws near and the southern summer approaches these winged migrants take the air line for their breeding haunts in the Argentine Republic and Patagonia. At the same time the migrants of the northern hemisphere are pressing southward before the blustering mien of old Boreas. It all seems wonderful and solemn, this world-wide processional of the seasons and the birds.

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Naturally, one would expect to find some other eccentricities in this aberrant family besides that of parasitism, and in this expectation one is not disappointed. There are two other species of cowbirds in the Argentine country—the screaming cowbird (*Molothrus rufoaxillaris*) and the bay-winged cowbird (*Molothrus badius*). The latter is only partly a trencher on the rights of other birds—that is, it is only half a parasite. Indeed, it sometimes builds its own nest, which is quite a respectable affair; but, as if to prove that it still has some remnants of cowbird depravity in its nature, it frequently drives other birds from their rightful possessions, appropriates the quarters thus acquired, lays its eggs into them, and proceeds to the performance of its domestic duties like its respectable neighbors. Its virtue is that it never imposes the work of incubation and brood rearing on any of its feathered associates, even though it does sometimes eject them from their premises.

But what is to be said of the screaming cowbird? Instead of inflicting its eggs on its more distant avian relatives it watches its chance and slyly drops them into the domicile of its bay-winged cousins, and actually makes them hatch and rear its offspring! This seems to be carrying imposture to the extreme of refinement, or possibly developing it into a fine art, and reminds one of those human good-for-naughts who "sponge" off their relatives rather than go among strangers. One can scarcely refrain from wondering whether grave questions of pauperism and shiftlessness ever enter into the discussion of "the social problem" in the bird community.

THE COLUMBUS MEETING OF THE AMERICAN ASSOCIATION.

By Prof. D. S. MARTIN.

The Columbus meeting of the American Association for the Advancement of Science was looked forward to with considerable interest as the first in the new half century of that body. Would the impression and stimulus of the great semicentennial gathering at Boston last year be found to continue, or be followed by a reaction? The meetings west of the Alleghanies are always smaller than the eastern ones, and the brilliancy of the Boston meeting could not be looked for in any interior city. The general expectation was for an "off-year" gathering.

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But only in point of attendance was this impression verified. The register of those present showed three hundred and fifty-three names—a good number for an interior meeting, very few of the Western gatherings having exceeded it. In all other respects the general feeling of the members indicates that the meeting was notably successful and enjoyable, and the remarks made by the writer a year ago as to the real value of the smaller and less conspicuous meetings he feels to have been well exemplified. It was a scientific working meeting, with enough of social intercourse and attentions to be delightful, but not distracting. In these aspects the "golden mean" was markedly preserved.

The arrangements of the local committee for the convenience of the members and the success of the meeting in general were remarkable in their completeness. Nothing seems to have been overlooked, and some advances were made upon any previous year. The daily programmes were well printed and on hand early every morning—a most important point, not always heretofore attained. A complete telephone service between the section rooms and the central hall was a feature of special advantage, each section reporting to headquarters every paper as it was taken up. This was then posted on a bulletin, so that any one could know at any time what was going on in each section. A great amount of delay and disappointment, that has often been felt by members anxious to hear certain papers in different sections, was thus entirely obviated. Columbus has set an example in this feature that must be followed in the arrangements for all future meetings. The entire service on these telephones was rendered not by professional operators, but by young lady students of the university, and it was well and gracefully done.

It is fitting also that recognition should be given to some who have been less prominent in the local arrangements, but have had a large share in their preparation. While the public resolutions of thanks have made well-deserved mention of the local committee and its officers, especially Prof. B. F. Thomas, the indefatigable secretary, it is known in Columbus that much of the planning and arranging was the work of Prof. Edward Orton, Jr., the son of the president of the meeting, and that very much is owing to his laborious activity in the perfection of the local

adjustments.

The place of meeting was eminently pleasant and suitable—the wide campus and fine buildings of the Ohio State University. To members from the East it was a matter of great interest to see this noble institution, one of the best examples of the great educational enterprises of the central States. In his address of welcome at the opening of the association the president of the university, Dr. William O. Thompson, outlined the history of public education in the West as dating back to provisions in the "Ordinance of 1787," looking to educational advantages for the great "Northwest Territory." The State University of Ohio is one of the youngest of its kind, but [Pg 830] now one of the most important, among the States formed from that great region, although Ohio was the first to be organized into Statehood.

Among the numerous fine structures scattered over the broad area of the campus, one of the most interesting is Orton Hall, containing the collections in geology and archæology, which are very extensive, as well as the laboratories, workrooms, and classrooms of the geological department, and at present the University Library. Here the meetings of Section E (Geology and Geography) were held. In the adjacent Botanical Hall, with its greenhouses, etc., Section G held its meetings. But most of the sections met in Townshend Hall, where the telephone service above described connected all the rooms.

The Ohio State University not only welcomed and accommodated the association, but had a strong representation among the officers of the meeting. The venerable president, Dr. Orton, has long been professor of geology in the university, and his collections are displayed in the hall that so appropriately bears his name. Section C (Chemistry) and Section G (Botany) both had secretaries from the university faculty—Professors Weber and Kellerman, respectively—while the arrangements for the meeting have been already spoken of as largely due to Professor Thomas and Professor Orton, Jr.

The ladies' reception committee did everything for the comfort and convenience of the visiting ladies. Their musicale and garden party in the grounds were described as extremely enjoyable, and the provision of private carriages to convey ladies and aged members across the broad spaces of the campus to and from the entrances was a very delicate and highly esteemed convenience, especially on warm days. The association was favored in the weather, which, though somewhat hot out of doors, was not severe, and the rooms were pleasant and airy.

The excursions given to the members were all of them scientific; they were not merely pleasure trips. This point was a marked feature of the Columbus meeting, and one well worthy of future imitation as far as may be. Not every place, however, has such marked facilities in this respect. On Saturday, August 26th, three free excursions were provided to points of geological or archæological interest. They were about equally shared by the members, together with representatives of the local committee. One party left on Friday evening, passing the night at Sandusky, and going by boat thence to the celebrated islands of Lake Erie, there to see the wonderful glacial furrows in the corniferous limestone on Kelley's Island and the recently opened [Pg 831] strontia cave on Put-in-Bay Island. These islands are also favorite pleasure resorts for the whole neighborhood, and the trip was one of great interest and enjoyment. Another party, on Saturday morning, went to points of special importance in the coal region of the Hocking Valley, under the direction of Mr. R. M. Haseltine, chief mine inspector of Ohio. At Corning the party went down into Mine No. 8, owned by the Sunday Creek Coal Company, which has recently been equipped with electric power generated by utilizing the waste gas from neighboring gas-wells. This is said to be the first mine in Ohio to improve this natural source of power. At a depth of sixty-five feet the visiting party were taken by mine cars to a point where a remarkably fine exposure has been made of a carboniferous "forest," with upright trunks of *Sigillaria* and associated forms of coal vegetation finely displayed. At a point somewhat nearer the entrance, but at a lower level, lunch was served by the company, in a chamber lighted by electricity, two hundred feet underground and a mile from daylight! Another mine was visited later, and the machinery and appliances examined; this was No. 16, at Hollister, owned by the Courtright Coal Company.

The third party went to Fort Ancient to examine the great aboriginal earthworks at that place, owned by the State, and in charge of the Ohio Archæological Society. Here, on a hill widely overlooking the Little Miami Valley, are some of the most extensive prehistoric works in the country. The State has purchased two hundred and eighty-seven acres, and of these about one hundred acres are included within the walls. These ramparts, overgrown with large trees, follow closely the contour of the hills, and show that, whatever their age, there has been no change and little erosion since they were built. Their form is very irregular, consisting of two main areas—a northern one, called the "new fort," rudely square, and a southern one, called the "old fort," rudely triangular—connected by a narrow portion, called the "isthmus," with crescent-shaped transverse walls crossing it, and high conical mounds at the entrance to the "old fort." From the main gateway of the "new fort," starting from two mounds, two parallel walls can be traced, exactly eastward, for half a mile or more. Irregular as these works are, from the contour of the hills and the course of the ravines that bound them, yet there is also seen at times in their shaping a singular exactness of orientation that is striking and suggestive. Their use is problematical, but they must have been defensive, although an enormous force would be required to hold them, as their entire circumference is three miles and a half. At one point within [Pg 832] the "old fort," in front of the gateway to the "isthmus," was found a burial place where a number of skeletons lay as though thrown together, not carefully and separately buried. The suggestion is strongly made that this spot marks an unsuccessful attack by enemies, who were roughly buried where they fell. At other points graves have been found, some containing copper implements and

overlaid with plates of mica. Great regret was felt that Mr. W. K. Moorehead, who has explored so extensively here and in the vicinity and has published such interesting accounts of Fort Ancient and similar remains, was unable to be at the meeting on account of severe illness.

The public spirit that has secured this spot for the State, and the work of the Ohio Archæological Society in caring for it properly, are matters for pride and congratulation, and evidences of the highest type of civilization. The society is clearing away the dense undergrowth so as to display the works and the trees upon them; is guarding and repairing the walls at points where injury has occurred by "washing"; has sunk a well in the "old fort," with fine water; and built a pavilion for visitors. Here lunch was served to the party, and addresses given by archæologists present and officers of the Archæological Society.

On Thursday a large number of the geologists spent most of the day in examining moraines and glacial phenomena near Lancaster, and in the evening nearly the entire association was taken by special train to see the gas-wells in the same neighborhood, at Sugar Grove, which were lighted and "blown off" for their benefit. The city of Columbus itself is to a considerable extent supplied with natural gas.

Turning to the proceedings of the meeting, there may be noted in the character of the papers certain tendencies which are independent of the association and belong to the general line of thought of the present, and doubtless yet more of the future. The papers presented may be roughly grouped into two classes: those relating to technical details, and those involving or seeking practical results and applications. Of course, there is no conflict between these two lines of thought and work—the latter, to be really attained being dependent upon the former—but there is this tendency distinctly shown, to consider scientific questions in their bearing on the welfare or the needs of humanity. Naturally, this aspect appeared more clearly in some of the sections than in others, but no one who looks over the titles in the daily programmes can fail to note it. The whole work of Section I (Social and Economic Science) is of this character, and it is marked in Sections G (Botany), D (Mechanics and Engineering), and H (Anthropology). It would [Pg 833] be impossible to mention all the papers bearing upon such relations; a very few only can here be noted, even of those that were important. In Section I no more suggestive title has ever been presented to such a body than that of Miss Cora A. Benneson, of Cambridge, Mass., on Federal Guarantees for Maintaining Republican Government in the States. Miss Benneson is a graduate in law, and has already achieved distinction in her profession in subjects relating to questions of government. In Section G, Prof. H. A. Weber, the secretary, read a paper on Testing Soils for the Application of Commercial Fertilizers—the outcome of twelve years' intercourse with farmers' institutes and many more years of experimentation—aiming to avoid unwise and unprofitable use of fertilizers on soils to which they are not adapted, and to provide ready and accurate methods of determination as to the needs and the capacities of soils. Sections D and I united to hear a paper before the former, by Principal Morrison, of the Manual Training High School, of Kansas City, Mo., on Thermal Determinations in Heating and Ventilating Buildings, with special reference to schools. These are merely given as instances. Agriculture, electrical appliances, educational methods, and social conditions, all received important attention.

Another paper of great practical moment was read before Section C by Prof. H. W. Wiley, chemist to the United States Department of Agriculture, and Mr. H. W. Krug, on New Products from Maize Stalks. Careful analyses of the pith and stalks of corn, and important suggestions as to their great utility in various ways, were presented. Some of these were very surprising, not only pointing out the value of these substances as fodder, when properly prepared and used, but in the realm of war as well as in peace, for protecting the sides of naval vessels as a light and most effective armor, and in the manufacture of smokeless powder of a superior quality. Professor Wiley claimed that from these hitherto almost waste products of American farms immense results may be obtained.

Very naturally, the recent war and questions connected with it called forth some striking contributions. Prof. William S. Aldrich, of the University of Illinois, addressed Section D and a large proportion of members from other sections on Engineering Experiences with Spanish Wrecks, and the story of the Maria Teresa. Professor Aldrich was connected with the United States repair-ship Vulcan, and described the remarkable character of that vessel—an entire novelty in naval warfare—with her complete outfit of engineering tools and machinery, even to brass and iron furnaces of large capacity. Never before, he said, had such castings been made on [Pg 834] board ship, or a foundry operated on the ocean. The effects of the American rapid-fire guns on Admiral Cervera's ships were fully described and illustrated, and the paper closed with a vivid and detailed account of the floating of the Maria Teresa, her repairing by the crew of the Vulcan through five weeks of most difficult work, and the unsuccessful attempt to bring her to Norfolk, ending in her abandonment and loss. The public lecture of Wednesday evening was by Prof. C. E. Monroe, of Washington, D. C., on the Application of Modern Explosives, very fully illustrated. Detailed accounts were given of the manufacture of gun cotton and various recent forms of high explosives and smokeless powders. In regard to the use of the latter, Professor Monroe emphasized the fact that France and Germany had adopted smokeless powders in 1887, and Italy and England a year or two later, and characterized as "unpardonable" the fact that our own service was unprovided with any such material when we began the war with Spain. He further discussed recent and very important experiments in the matter of throwing from ordinary guns shells charged with high explosives, especially that known as Joveite, with which tremendous effects have been produced in penetrating the heaviest plating.

Very different in character was the interesting and pleasing programme carried out by the

Section of Botany in memory of two eminent workers in bryology who were long identified with Columbus—Dr. William S. Sullivant and his colaborer, Prof. Leo Lesquereaux, who was eminent also in fossil botany. Wednesday was set apart as "Sullivant day," and was marked by an extensive display of portraits, books, and specimens, and a series of memorial addresses, with notes on the progress of bryology. Twelve North American species of mosses have been named for Dr. Sullivant, and specimens of all these, with drawings made by him, were loaned for this occasion from his collection, now at the museum of Harvard University. Sets of duplicates of these species, from the herbarium of Columbia University, were prepared and presented as souvenirs to the botanists in attendance. Some members of Dr. Sullivant's family were present, and naturally felt a very deep sense of gratification at such a tribute to his name and fame.

The address of the retiring president, Prof. F. W. Putnam, had a special interest in that it was the last official appearance of one who has been for so many years closely and prominently identified with the association as its permanent secretary, and whose presence and personality have seemed an essential element in every meeting. Professor Putnam, in opening, paid an especial [Pg 835] tribute to the late Dr. D. G. Brinton, of Philadelphia, a former president and leading member of the association, devoted to the same branch of research with himself—North American ethnology—although holding different theories therein. Professor Putnam dealt with the prehistoric peoples of this continent, and argued for distinct racial types as expressed in the remains that they have left, and for resemblances as due to intercourse and mingling of tribes, and not to autochthonous development of arts and customs as the result of corresponding stages of evolution without contact or outside influence—the view maintained by Dr. Brinton.

There is not space here to dwell further upon many valuable papers and discussions. The Section of Geology had a full and interesting session, in which glacial phenomena, especially as displayed in Ohio, bore a considerable part. One of the papers had a very wide and painful interest for all Americans—that of Mr. E. H. Barbour, on the Rapid Decline of Geyser Activity in the Yellowstone Basin. Careful and extended comparison of the present state of the geysers and hot springs with that to be seen a few years ago shows that these wonderful and impressive phenomena have greatly decreased in both the amount and the frequency of their manifestations, and Mr. Barbour warned all who desire to witness anything of their grandeur to visit the region without delay, as the indications point to their speedy cessation as probable if not inevitable.

In reference to the future of the association, it is gratifying to observe that the various special societies, whose relations to the association were considered in the article by the present writer a year ago, have not only continued to hold their summer sessions in connection with that of the association, but have shown a very cordial spirit of co-operation, and that some others are proposing to affiliate in a similar way. This is as it should be; but there is in it also the suggestion of a broader and more definite relationship of all these special societies to each other through the medium of the association. The tendency is apparently toward affiliation and co-operation among them, and the American Association for the Advancement of Science could have no more fitting or useful function than as a sort of federative or representative body for all the others.

The next meeting is to be held in New York, two months earlier than usual—at the end of June. Both the place and the time were determined by the Paris Exposition. It was thought best to arrange the meeting so that it might easily be attended by the large number of scientists from all [Pg 836] over the country who will be going abroad next summer. This plan is doubtless wise, although it is much to be regretted that the time—the last week in June—will cut off from attendance almost all the members who are teachers in public schools, who will be just then in the pressure of their closing days and examinations. The peculiar circumstances of the year, however, justify what would otherwise be a most unfortunate time. New York will do her best, and give the association a welcome worthy of the great metropolis of America.

SKETCH OF DR. WILLIAM PEPPER.

By LEWIS R. HARLEY.

Philadelphia has long been regarded as the home of medical science in America. Here was founded the first medical school in the United States, among whose alumni are numbered some of the most brilliant names in the profession. The spirit of scientific research has always been most active in Philadelphia. Here Franklin made his experiments in electricity, and Rittenhouse observed the transit of Venus; while Rush, Morgan, Williamson, and Physick gave the city a name abroad as a great medical center. Each generation has contributed something to her fame as the abode of scientific culture.

In recent times no name has been so closely associated with the intellectual progress of the city as that of the subject of this sketch. Dr. William Pepper was reared in a scientific atmosphere. His father, William Pepper, the elder, was born in Philadelphia, January 21, 1810. He graduated with first honors at Princeton in 1829. He afterward studied medicine for a time with Dr. Thomas T. Hewson, and in 1832 graduated in medicine at the University of Pennsylvania. He then spent two years in study in Paris, and in 1834 he entered upon his profession in Philadelphia, where he rose rapidly in reputation. He was physician to the Pennsylvania Hospital for twenty-six years. In 1860 he was elected Professor of the Theory and Practice of Medicine in the University of Pennsylvania. He held this position until the time of his death, October 15, 1864. Dr. Pepper had

two sons, who became distinguished in the medical profession. The eldest son, George, was born April 1, 1841, and died September 14, 1872. He graduated from the college department of the University of Pennsylvania in 1862, and completed the course in the Medical School in 1865. He served with distinction in the civil war, and died at the beginning of a successful professional career. Another son, Dr. William Pepper, the subject of this sketch, was born in Philadelphia, August 21, 1843. [Pg 837]

Dr. Pepper received his educational training solely in the city of his birth, having graduated from the college department of the University of Pennsylvania in 1862, in the same class with Provost Charles C. Harrison, Thomas McKean, Dr. Persifor Fraser, and many other men prominent in university circles. He graduated from the Medical School in 1864, and at once began the practice of medicine. His connection with the University of Pennsylvania began in 1868, when he was appointed lecturer on morbid anatomy. From 1870 to 1876 he was lecturer on clinical medicine. In 1876 Dr. Pepper was given a full professorship of clinical medicine, in which he continued until 1887, when he succeeded Dr. Alfred Stillé in the chair of the Theory and Practice of Medicine.

During this early period of his career Dr. Pepper labored with untiring zeal in the practice of his profession, and he also became eminently successful as a teacher. In 1877 he set forth his views on higher medical education in an address at the opening of the one hundred and twelfth course of lectures in the University Medical School.[45] At that time a very low standard existed in the medical schools of our country, and Dr. Pepper, in his address, urged the following reforms:

1. The establishment of a preparatory examination.

2. The lengthening of the course to at least three full years.

3. The careful grading of the course.

4. The introduction of ample practical instruction of each student both at the bedside and in laboratories.

5. The establishment of fixed salaries for the professors, so that they may no longer have any pecuniary interest in the size of their classes.

It was a source of gratification to Dr. Pepper that he lived to see all these reforms in medical education adopted. On the extension of the medical course to four years he subscribed $50,000 toward a permanent endowment of $250,000. As early as 1871 he began to urge the establishment of a university hospital, the subject being first discussed in a conversation with Dr. H. C. Wood and Dr. William F. Norris. An appeal was made to the public, and Dr. Pepper was made chairman of a finance committee. By May, 1872, a splendid site and $350,000 for building and endowment had been secured. Dr. Pepper was selected as chairman of the building committee, and work on the hospital was pushed so rapidly that it was ready for patients on July 15, 1874. [Pg 838]

When Dr. Charles J. Stillé resigned the provostship of the university in 1881, Dr. Pepper was elected as his successor. The executive abilities which he had displayed in connection with the founding of the new hospital made him the natural choice of the trustees. Although his private practice had increased to immense proportions, besides being occupied with his duties as a clinical professor, Dr. Pepper accepted the provostship. To the duties of this office he devoted the best years of his life. The extent of his practice and the demands made upon his time by the university would have appalled an ordinary man, but his capacity for labor appeared to be without limit, his working day often exceeding eighteen hours. His administration was characterized by the unification of the various schools of the university, besides the founding and equipment of several new departments. In one of his annual reports Dr. Pepper defined the broad policy of the university in the following appropriate language: "The university is truly the voluntary association of all persons and of all agencies who wish to unite in work for the elevation of society by the pursuit and diffusion of truth."[46] In other words, Dr. Pepper regarded the functions of the university as not simply an institution of instruction, but also of research. To this end every effort was made to open up new fields of investigation and to widen the scope of the university. During his provostship thirteen new buildings were erected, and the following departments, or schools, were organized:

1. The Department of Finance and Economy.
2. The Department of Philosophy.
3. The Department of Veterinary Medicine.
4. The Department of Biology.
5. The Department of Physical Education.
6. The Department of Archæology and Paleontology.
7. The Department of Hygiene.
8. The Graduate Department for Women.
9. The School of Architecture.
10. The School for Nurses in the University Hospital.
11. The Veterinary Hospital.
12. The Wistar Institute of Anatomy and Biology.

Dr. Pepper took particular interest in the Department of Archæology and Paleontology connected

with the university. For a number of years he was president of its board of trustees, while it was [Pg 839] largely through his efforts that the Babylonian Exploration Fund was formed.[47] It was Dr. Pepper's ambition to have at the university well-equipped laboratories that would offer an opportunity for original investigation in medical science. The establishment of the Laboratory of Hygiene, in 1892, was the first step in this direction, soon to be followed by Dr. Pepper's gift of the Laboratory of Clinical Medicine. This laboratory was founded in memory of his father, the late Dr. William Pepper. The gift is unique in that it is made for the purpose of promoting and stimulating original research, and improving the methods of diagnosing and treating the diseases of human beings. Another field of work in the laboratory is that of giving advanced and special instruction to men who have already obtained the degree of Doctor of Medicine. At the opening of the laboratory in 1895 Dr. William H. Welch, of Johns Hopkins University, said, "To the small number of existing clinical laboratories the William Pepper Laboratory of Clinical Medicine is a most notable addition, being the first laboratory of the kind in this country, and it is not surpassed by any in foreign countries."[48]

Dr. Pepper realized more and more every year that the vast extent of the university interests demanded the undivided activity of its head. In 1894 he resigned the office of provost, stating at the time that, as it became necessary for him to choose between administration work and medical science, his devotion to the latter determined his choice. His administration was an eventful one, during which the university evolved from a group of disconnected schools to a great academic body. In 1881 its property in land amounted to fifteen acres, while in 1894 it controlled fifty-two acres in a continuous tract. In 1881 the university property was valued at $1,600,000; in 1894 it exceeded $5,000,000. The teaching force in 1881 numbered 88 and the students in all departments 981; in 1894 the former were 268, and the attendance had reached 2,180, representing every State in the Union, as well as thirty-eight foreign countries.

Dr. Pepper became well known as an author on medical subjects. He founded the Philadelphia Medical Times, and was its editor for two years. In 1885 he edited a System of Medicine by American Authors, a work that has been considered a leading authority on medical subjects. He also edited a book of medical practice by American authors, and, with Dr. J. F. Meigs, issued a [Pg 840] work on Diseases of Children. He was Medical Director of the Centennial Exposition in 1876, and for his services he received from the King of Sweden the decoration of Knight Commander of the Order of St. Olaf.

Dr. Pepper showed an unbounded interest in behalf of any movement that would benefit the community in general. He was one of the first to realize the advantage that would accrue to Philadelphia should she become a museum center. The Philadelphia Commercial Museum was established in October, 1893, with Dr. Pepper as president of the board of trustees. The old offices of the Pennsylvania Railroad Company were leased, and exhibits were secured from the Latin-American countries, Africa, Australia, Japan, and India, forming the largest permanent collection of raw products in existence. Referring to the great value of the museum, Dr. Pepper spoke as follows in his address of welcome at the first annual meeting of the advisory board:

"It would seem clear, however, that no method of studying industries and commerce can be scientific and complete which does not include the museum idea as now comprehended. The museum aims to teach by object lesson the story of the world, past and present. The Biological Museum presents the objects of human and comparative anatomy, arranged scientifically and labeled so fully as to constitute the best text-book for the study of those subjects. The Museum of Natural History does the same in its field. The Museum of Archæology shows the progress of the race from the most archaic times, the different types of human beings, their mode of living, their forms of worship, their games, their weapons, their implements, the natural products which they used for subsistence, in their industries, and in their arts, the objects of manufacture or of art which they produced, and the manner in which they disposed of their dead.

"The natural products and manufactured articles, which constitute the material of commerce, come necessarily into such a scheme, and the long-looked-for opportunity of establishing a commercial museum upon a truly scientific basis presented itself when, at the close of the Columbian Exposition at Chicago, it was possible, through the enlightened liberality of the municipal authorities of Philadelphia and the invaluable services of Prof. W. P. Wilson, to secure vast collections of commercial material, which was so liberally donated to the Philadelphia museums by nearly all the foreign countries of the globe."

It was Dr. Pepper's idea to have the University Museum and the Commercial Museum situated near each other, on the plan of the South Kensington Museum. To this end the City Councils, in [Pg 841] 1896, passed an ordinance giving over to the trustees of the Commercial Museum sixteen acres of land for the erection of suitable buildings. When all the plans are carried out the city will have unrivaled facilities for the study of civilization, past and present.

One of the most enduring monuments to Dr. Pepper's zeal and generosity is the Free Library of Philadelphia. In 1889 his uncle, George S. Pepper, bequeathed the sum of one hundred and fifty thousand dollars "to the trustees of such Free Library which may be established in the city of Philadelphia." From the beginning Dr. Pepper took a warm interest in the Free Library movement. It was under his leadership that the library was organized, and he was made the first president of its board of trustees. Speaking of his activity in this direction, the librarian, Mr. John Thomson, said: "No detail was too small for his personal attention. No plan for its future growth was too large for his ambitious hope of both public and private support. The remarkable and rapid increase in the circulation of the Free Library, the multiplication of its branches, the

organization of all its departments on a broad and generous plan, his success in enlisting a large number of able fellow-workers, his clear, plain statements to Councils and the city authorities, his activity in securing needed legislation at Harrisburg, were some of the results of that intelligent energy which enabled him to do so much and to do it so well." The bequest of the Pepper family has been supplemented by ample appropriations by the City Councils, and the Free Library is now one of the most important institutions in Philadelphia. The library at present has twelve flourishing branches, while the combined circulation of the system for the year 1898 was 1,738,950 volumes.

Dr. Pepper was also connected with many scientific bodies. He was Vice-President of the American Philosophical Society, and President of the first Pan-American Medical Congress in 1893. He was a Fellow of the College of Physicians; President of the Philadelphia Pathological Society from 1873 to 1876; Director of the Biological Section, Academy of Natural Sciences; President, in 1886, of the American Climatological Association; President of the Foulke and Long Institute for Orphan Girls; President of the First Sanitary Convention of Pennsylvania; and in 1882 he was a member of the Assay Commission of the United States Mint. He received the degree of LL. D. from Lafayette College in 1881, and from the University of Pennsylvania in 1893.

In 1873 Dr. Pepper married Miss Frances Sargeant Perry, a lineal descendant of Benjamin Franklin, and a granddaughter of Commodore Oliver Hazard Perry. Four sons were born, of whom three survive—Dr. William Pepper, Jr., Benjamin Franklin Pepper, and Oliver Hazard Perry Pepper. Failing in health, Dr. Pepper went to California early in the summer of 1898, where he died of heart disease on July 28th of that year. His body reached Philadelphia on August 6th. Funeral services were held in St. James's Protestant Episcopal Church, after which the body was cremated, and the ashes interred in Laurel Hill Cemetery. The American Anthropometric Society received, by the conditions of his will, Dr. Pepper's brain. Among the members of this society were Dr. Joseph Leidy, Phillips Brooks, and Prof. E. D. Cope. The articles of membership of the Anthropometric Society require that each member contribute his brain in the interests of science. [Pg 842]

Dr. Pepper's death was followed by many expressions of sorrow from learned societies in various parts of the world. One of the most beautiful tributes was the memorial meeting held in the city of Mexico on September 12th. The leading medical and scientific societies of Mexico assembled in the hall of Congress to do honor to the work and character of Dr. Pepper. President Diaz occupied the chair, and about him were gathered the leading citizens, officials, and scientists of Mexico. Representatives of the National Medical School and the Board of Health eulogized Dr. Pepper, while Hon. Matias Romero spoke of him not as a physician, but as an "altruist who had consecrated himself to doing good for his fellow-men."

In Philadelphia, steps have been taken to erect a substantial memorial to Dr. Pepper. At a memorial meeting, held on March 6th last, a proposition was made to place a statue of the deceased scientist on the City Hall plaza, after the style of the Girard Monument. A committee was appointed with power to raise funds for the proposed statue, the cost not to exceed ten thousand dollars.

> One of the letters of William Pengelly, geologist, of Torquay, England, printed in the memoir published by his daughter, gives this sketch of Babbage, the mathematician and inventor of the calculating machine: "I then called on Babbage, and could not get away until after one. He is a splendid talker. He seemed much pleased to see me, and complimented me very much on my lecture (at the Royal Institution), in which he was evidently much interested. He is the most marvelous worker I ever met with. I never saw anything like the evidence of multifarious and vast labor which his 'workshop' presents; he sticks at nothing. One drawer full of riddles, another of epigrams, one of squared words, etc.... It is appalling! And then the downright fun of the fellow; it is almost intoxicating to be with him!"

Correspondence. [Pg 843]

"DO ANIMALS REASON?"

Dr. Edward Thorndike's interesting account, in our August number, of his investigations touching the reasoning power of animals has brought us a large number of letters questioning some of the main conclusions set forth in the article, and criticising the method of the inquiry. Not having room for all these communications, we print one of them, and add extracts from two others. These represent the principal objections urged by the various writers against the conclusions drawn by the author of the article from his experiments.

Editor Popular Science Monthly:

Sir: The first reading of Dr. Thorndike's article Do Animals Reason? in the August Popular Science Monthly, gave the impression, which has been deepened by subsequent perusal, that his experiments were not only inadequate to solve the

question, but unfairly chosen.

A dog or a cat, utterly hungry, is placed in a box, from which it can escape "by performing some simple (?) action, such as pulling a wire loop, stepping on a platform or lever, clawing down a string, or turning a wooden button."

In the first place, what tends to destroy the reasoning power more than utter hunger? This intense physical craving begets frenzy rather than reason. The more intense this primeval desire, the greater the demand upon primitive instinct for its satisfaction. In the open the cat will jump at a bird, the dog at a bone. If the bird be up a tree, the cat will climb; if the bone be buried, the dog will burrow. Climbing and burrowing are deep-rooted developments of the feline and the canine nature.

Put a dog or a cat, utterly hungry, in a box and hang a piece of meat outside. Instinct prompts a jump through the bars of the box at the meat, and the greater the number of unsuccessful attempts the less the likelihood of the animal with a gnawing stomach sitting down to scrutinize the mechanical construction of the box to the point of perceiving that by stepping on a lever it will open a door. How many millions of years did it take two-legged man to arrive at the perception of the use of the lever? Did the shaggy biped arrive at that perception by sitting down when utterly hungry and looking at a lever; or did he, through countless generations, by some such chance as lifting a stone with a stick, come to the knowledge of weight and fulcrum?

Put an anthropoid ape, some several degrees nearer man in intelligence than a cat, in a modern office elevator that moves by the push of an electric button, suspend the elevator between two stories, and what do you suppose that anthropoid ape will do?

Put a schoolgirl fresh from belles-lettres and matinées in the cab of a locomotive and tell her to run it to the next station. She can not but know that steam will make the wheels go round, but what will she do in the maze of throttles, handles, disks, and rods that confronts her? What will she do if utterly hungry?

Take a laborer from his pick and shovel on the railway embankment and put him at the desk of the general manager. He can read and write. Let the messenger boys and clerks shower him with the letters and telegrams that bombard that desk every day, and let him try to settle the questions to which they give rise.

Now, why can not the schoolgirl run the locomotive, the laborer the railroad? Because the relations of things necessary to the tasks have never been imprinted upon their registering cells; because, in the latter case at least, of the lack of power of co-ordination—that is, the lack of the power of abstract reasoning that the task involves.

Why can not anybody do anything as well as anybody else? Because certain relations have been more deeply impressed upon certain brains than upon others; because of the greater power of certain brains to co-ordinate certain relations, their greater ability to give concrete manifestation of the result of such co-ordination through the efferent nerves. Otherwise any one of us could design a bridge, compose a symphony, or organize a trust.

The oftener relations are impressed upon the registering cells, the more readily are those relations co-ordinated, provided the brain structure be of the requisite caliber. Reiterated impression through the ages of the relations between their needs and surrounding things, together with the development of structural capacity, has led the [Pg 844] beaver to build his dam, the bee the honeycomb, the ant its village, the bird its nest. In each case the registered impressions have led to action made possible by long-continued contact between structure and environment; the actions are the result of development that has proceeded mite by mite through unknown time. The brain of neither bird nor beast nor man will immediately co-ordinate radically new impressions received in a radically new environment into coherent action that leads to definite result.

Here is an example within the writer's immediate knowledge: At the age of seventeen a boy entered the service of one of the large railway systems as a clerk in the passenger department. Through eleven years of enthusiastic and concentrated endeavor to master the details of the service he rose to the head of the clerical force—that is, the reiterated impression upon his brain cells of the functions of the passenger service led to that co-ordination which resulted in efficient action. Then he became employed in the office of a large coal-mining company. For several days it was with the utmost difficulty that he could bring his attention to bear upon the new tasks. While seated at the desk in the coal office the old railway problems would chase through his mind; when he began to write the initials of the Pittsburg Consolidated Coal Company, he would find that he had written the initials of the Pittsburg, Cincinnati, Chicago and St. Louis Railway Company; instead of the initials of the Pittsburg, Fairport and Northwestern Dock Company, the initials of the Pittsburg, Fort Wayne and Chicago Railway Company. The latter initials in each case would appear upon the paper before he knew it, actually without his knowing that he had written them. The entirely unfamiliar routine entailed by the custody of bank accounts, coal leases, deeds and contracts, reports of coal shipments, and the handling of vouchers, became adjusted in his brain bit by bit

through many weeks, and it was months before he could co-ordinate the new impressions into broad and well-defined reasoning. If he had been utterly hungry through all the period of the new service, it might have taken years.

Now, what can be expected of a dog or a cat, whose mental processes have been adjusted by inheritance and experience to life in the fields and jungles, when placed in a box, utterly hungry, to study mechanical contrivances? It is manifest that if the brain of a dog or a cat would become adjusted to the radically unfamiliar steps necessary to release it from such a radically unfamiliar environment, that adjustment could only come by extremely slow degrees. Voluntary perception is almost beyond the limits of expectation, and the leading of the animal through the necessary steps would have to be repeated time after time before the impressions upon its brain would reach any degree of permanence, especially as its brain would be lacking in attention, and the repeated handling be an annoyance to it. But that by such tutelage the animals, or a proportion of them, arrived at a knowledge of the means necessary to escape from the box is shown by Dr. Thorndike himself. "If one repeats the process, keeps putting the cat back into the box after each success, the amount of useless action gradually decreases, the right movement is made sooner and sooner, until finally it is done as soon as the cat is put in." But he says: "This sort of a history is not the history of a reasoning animal. It is the history of an animal who meets a certain situation with a lot of instinctive acts.... Little by little the one act becomes more and more likely to be done in that situation, while the others slowly vanish. This history represents the wearing smooth of a path in the brain, not the decisions of a rational consciousness."

Wherein, however, does this differ from the manner in which hundreds of clerks in offices finally learn routine work and mechanically go through the motions necessary to its performance? Do not the actions of thousands of laborers in field and factory seem to proceed from a wearing smooth of a path in the brain, rather than from rational consciousness? Yet they can not be said to be devoid of reason. Is not a great proportion of the daily actions of any one of us gone through from force of habit, almost by instinct?

The word reason does not apply alone to the mental processes of a Helmholtz, but to the co-ordination, however slight, of relations that result in definite action even of a humble organism. Herbert Spencer has clearly shown that instinct and reason differ in degree and not in kind.

Dr. Thorndike lays stress upon the fact that a "cat which, when first put in, took sixty seconds to get out, in the second trial eighty, in the third fifty, in the fourth sixty, in the fifth fifty, in the sixth forty," etc., and remarks: "Suppose the cat had, after the third accidental success, been able to reason? She would then have, the next time and all succeeding times, performed the act as soon as put in." Not long ago the writer and a man whose high intelligence can not be questioned, in moments of relaxation were trying to do one of the familiar ring puzzles—endeavoring to separate a ring from two others of peculiar shape and then to join the three. After repeated trials, one would loosen it, but could not replace it; the other finally succeeded in replacing it, but could not loosen it. Then the one could replace it, but not loosen it; the other loosen, but not replace it, and each was closely watching the other all the time. It was half an hour or more before either could both loosen and replace the ring, occasional successful attempts not being repeated until after several succeeding failures. Contrast the relation of the brain of the dazed and indifferent and peculiarly bedeviled cat to the puzzle presented to it by the inside of the box with the earnest effort of the two men to solve the ring puzzle. Who has not found a task more difficult the fifth or sixth time than the second or third, and has only performed it with ease after repeated attempts of varying degrees of success and failure?

[Pg 845]

In conclusion, the writer begs leave to relate an incident, which has not before appeared in print, that profoundly impressed him with the belief that at least in one instance one particular animal displayed reason. One Sunday morning, a dozen years or more ago, he was standing on the bank of the Ohio River at the Sewickley Ferry. A family group, accompanied by a large Newfoundland dog, hailed the ferryman and got in his boat, leaving the dog, which persuasively barked and wagged his tail, on the bank. As the boat pulled out into the stream the dog whined, and then made ready to leap in after it. Then he stopped at the water's edge, and, with head down, gazed intently at the river for several seconds—it seemed a minute or more. Then he ran up the bank more than a hundred feet, stopped, looked at the receding boat, plunged into the stream, and swam vigorously. The current, bearing him down, made his course diagonal to the bank. A boy standing by my side said: "Isn't that a smart dog? If he'd been a crazy dog he'd have jumped in where he was, but he ran up the bank so the current wouldn't wash him down away from the boat."

But the dog, swimming with all his vigor, was borne past the boat when within twenty feet or so of it; he endeavored to straighten his course without success, and then, in a long semicircle, swam around to the near bank, landing two or three hundred feet below the place whence the ferryboat had started.

What this dog would have done if placed, utterly hungry, in a box from which he could

only liberate himself by stepping on a platform or turning a wooden button, I do not know.

LOGAN G. MCPHERSON.
PITTSBURGH, *August 3, 1899.*

MR. FREDERIC D. BOND, of 413 South Forty-fourth Street, Philadelphia, writes: Of the accuracy of Dr. Thorndike's experiments I have no doubt, but certain facts connected with them seem to deprive the observations of much of their relevance.

Dr. Thorndike states that he arranged his experiments to give reasoning every chance to display itself, if it existed, and to observe those in which the acts required and the thinking involved were not far removed from the acts and feelings of ordinary animal life. Of these experiments one of the chief was to determine whether and in what way a cat would escape from a box opening by turning a button. Now, I submit that in this and the succeeding experiments the conditions Dr. Thorndike fancied to exist by no means did so. Simple as the release of a door by a button seems to us, the apparent simplicity arises merely from our empirical knowledge of what does happen in such a situation. Actually to think out the rationale of the matter, as an animal having no experience either personally or from heredity would have to do, involves very complex mental processes. The environment of a human being is vastly different from an animal's, though of this fact we constantly lose sight in reasoning; of mechanical appliances and principles, for example, an animal knows nothing, and yet we are too apt to suppose it regarding the world with a store of ancestral and individual experiences utterly foreign to it; and then, on its failing to do what, in the light of such experience, seems to us easy, we proceed to call into question its possession of reason....

That the cats did finally learn to escape shows, according to Dr. Thorndike, "the wearing smooth of a path in the brain, not the decisions of a rational consciousness." May I ask Dr. Thorndike [Pg 846] what possible reason could a cat have to suppose that what happened once must needs happen again? Does Dr. Thorndike fancy his own knowledge of a million like matters was acquired by reason, and not empirically elaborated by processes of exactly the same sort as the cats went through? Let this experiment be tried on a healthy infant of two years, and I am of the opinion that the results would be the same as with the cat; yet the infant undoubtedly carries on "thinking processes similar, at least in kind, to our own," which Dr. Thorndike implicitly denies to his cats.

The chief cause of the inability of students to reach concordant results in this matter of animal intelligence appears to lie in a certain uncritical assumption often made. That all consciousnesses have a certain field of presentations, that to this field they attain, that because of it they feel and will, are fundamental facts; but the belief that attention or feeling or will differs per se in different consciousnesses, other than as the field to which they are at the moment related, differs —this is an utterly unwarranted assumption. According to the action of its environment, each conscious being must know the world just so far as is needed to conform its existence thereto, or else it must perish; but whether such knowledge, which is acquired by experience only, be quite small, as with animals, or somewhat larger, as with man, there is no reason to suppose that the attention, feeling, or will of the animal differs in itself from the same psychological state in man.

MR. ANDREW VAN BIBBER, of Cincinnati, Ohio, says: Animals, and especially wild ones, have no bank account or reserve, and have to face new conditions daily, and yet they make a living where man would starve.

When I was out in Colorado and Utah, years ago, I used to know of animals removing the bait nicely from dangerous traps without springing the trap. I knew of a dog who went over a mile to call his owner to the aid of a boy who had broken his leg, and who would not be refused till understood. This is brutish "instinct," is it?—something that Dr. Thorndike can't define. Will "instinct" teach a tired, half-starved horse to eat oats if you set them before him? Dr. Thorndike would say "Yes," but Dr. Thorndike would be wrong unless that horse knew from personal past experience what oats were. What animals learn (like the human animal) they learn chiefly by experience. They accumulate facts in their minds and use them.

I served in the cavalry of the Armies of the Tennessee and the Cumberland, and I know that instinct will not cause a hungry horse to touch oats unless he knows from his own experience what oats are. We used to capture horses in Mississippi which had never seen oats. It is all corn down there. We would bring them into camp tired out and hungry, and would pour out our oats for them. Not one of them would touch the oats. You could leave the hungry horses hitched for twenty-four hours before oats, and not one grain would they touch. They would stand there and starve. We had to throw up their heads and fill their mouths full of oats. If we stopped there, they would spit them out. We had to grab their jaws and work them sideways until they had a good taste. Then they understood, and ate oats right along. Plenty of such horses in Mississippi to-day....

If Dr. Thorndike tried his intelligent "Experiment No. 11" with a two-year-old cat, why didn't he try it with a two-year-old human? I guess he would have found an equal amount of ignorance of the mechanism of door fastenings, which comes only with teaching, and would have produced only struggles and screaming.

THE TREND OF POPULATION IN MAINE.

Editor Popular Science Monthly:

SIR: In the article contributed to your magazine for the month of August on Recent Legislation against the Drink Evil, I notice what appears to me to be a misstatement of fact. The writer speaks of the results of prohibition in the State of Maine, and says, "In sixty-three years Maine has seen her commerce disappear and her population dwindle."

I have not investigated the matter of Maine's commerce, but I find that her population has not dwindled in any possible sense of the term during the period indicated above.

It is, perhaps, a common impression that Maine has had such an exodus of her people to other States of the Union that she has suffered a loss in population. What are the real facts of the case? The census taken by the Government in 1840 gave the State 501,000 people, and that taken in 1890, 661,000, which shows, during the interval between 1840 and 1890, an increase of 160,000. The increase in population even [Pg 847] during the decade 1880-'90 was 13,000. Whether there has been a decrease since 1890 nobody at present knows, and will not know until the decennial census is taken next year.

In view of these facts, I feel justified in challenging the correctness of the gentleman's statement, quoted above.

There can be no room for doubt that Maine has sustained considerable losses in population from farm desertion, but no statistics can be presented to show that the State has, during the time stated above, been dwindling in the number of people living within her borders.

J. EARLE BROWN.
WOONSOCKET, R. I., *August 17, 1899.*

Editor's Table.

EDUCATION AND CHARACTER-BUILDING.

It is many years ago now since Mr. Spencer, in his Study of Sociology, remarked upon the exaggerated hopes commonly built upon education. With the courage that is characteristic of him, he went counter to a current of opinion which was then running with perhaps its maximum force. He said that the belief in the efficacy of education to remold society had taken so strong a hold of the modern world that nothing but disappointment would avail to modify it. This was in the year 1872; since then the disappointment has in a measure come, and many are prepared to accept his views to-day, who, twenty-seven years ago, thought they proceeded from a mind fundamentally out of sympathy with modern progress. Facts indeed are accumulating from year to year to prove the soundness of the philosopher's contention that "cognition does not produce action," and that a great variety of knowledge may be introduced into the mind without in the least inclining the individual to higher modes of conduct.

We are reminded of Mr. Spencer's line of argument by an article lately published in the London Spectator, entitled Influence on the Young. The writer sees clearly that enthusiastic educationists undertake far more than they can perform. "The character forms itself," he says, "assimilating nutriment or detriment, as it were, from the air, which the parents or teachers, for all their pains, can in no way change." There seems indeed to be in the young, he remarks, a distinct tendency to resist influence. Father and son will be opposed in politics; very pious people too often find, to their sorrow, their children growing up far otherwise than they could wish. The man who is very settled in his habits is as like as not to have a boy who can not be persuaded to take a serious view of life. The most unexceptionable home lessons seem to be of no avail against the attractive power of light companions. Evidently, Nature is at work in ways that men can not control. If there is a law of "recoil," as the writer in the Spectator hints, we may be pretty sure it serves some good purpose. It introduces, we can see at once, a diversity which makes for the progress, and perhaps also for the stability, of society. Two practical questions, however, suggest themselves: (1) What can we reasonably hope from education? and (2) What can we do to make a wholesome *milieu* for the rising generation?

With regard to education, it is evident that we can not know the best it can do until it has been reduced to a science—until, that is to say, as a result of the joint labors of practical educators and [Pg 848] psychologists, we can claim to possess a reasonable degree of certainty as to the best arrangement and sequence of studies and the best methods of stimulating the mind and imparting knowledge. Upon these important questions there is still considerable diversity of opinion. Some educators think we should be very sparing of abstractions in the instruction of younger pupils. Others are of a contrary opinion. Professor Baldwin, for example, in his little work on The Mind, says that "grammar is one of the very best of primary-school subjects." He also recommends mathematics. These are questions which, it seems to us, admit of being finally settled. Allowance must of course be made for the varying capacities of individual children, but this need not stand in the way of the establishment of some general doctrine as to the law of development of the human mind. We shall then further require a true theory of method in

education, so that we may know by what means the best results in the imparting of knowledge and the development of the capacities of the individual mind may be obtained. Assuming that these vantage points have been gained, education should be for every mind an eminently healthful and invigorating process, which is more than can be said for the forms of education that have prevailed in the past. These, while developing certain faculties, have, to a great extent, stunted others—have indeed, in too many cases, fatally impaired the natural powers of the mind. A notable paper, which appeared in the first number of this magazine, was one by the late Dr. Carpenter on The Artificial Cultivation of Stupidity in Schools. Professor Baldwin, in the work already cited, seems to be of the opinion that the process of cultivating stupidity, or at least mental shiftlessness, is in full blast to-day in many of our secondary schools owing to the prominence given to language studies. The science of education must at least put an end to this, and insure that the youths who are committed to the public schools shall not be subjected to any mind-destroying exercises. We can hope, however, that it will do much more. The mind, like the body, grows by what it feeds upon; and it is hard to conceive that suitable kinds of knowledge could be imparted in a natural manner, so as to awaken interest and develop the perceptive and reasoning powers, without at least preparing the mind for the reception of right sentiments.

So much the science of education, when it is fairly established, may reasonably be expected to do. It will deal with the mind upon true hygienic principles. There remains the more serious question how such a moral atmosphere can be created as will incline the young to take a right view of knowledge and its uses. Knowledge, it is hardly necessary to say, is power, just as money is power; and it is quite as needful that the idea of social service should be associated with the one as with the other. The best social service which, perhaps, any man can render is to give to the world the example of high disinterestedness and general nobility of character; and knowledge should be valued not as conferring individual distinction, but according as it expands and liberalizes the mind. The poet Coleridge has said with some truth that

> "Fancy is the power
> That first unsensualizes the dark mind,
> Giving it new delights; and bids it swell
> With wild activity; and peopling air,
> By obscure fears of beings invisible,
> Emancipates it from the grosser thrall
> Of the present impulse, teaching self-control,
> Till Superstition with unconscious hand
> Seat Reason on her throne."

The mind having been "unsensualized," the next step is to moralize and humanize it, otherwise Reason on her throne may act not much more wisely than other monarchs have done. The classic example of the worship of reason is not reassuring as to the infallibility of the goddess. The question, then, as to how intellectual education and the education of the moral sentiments may go hand in hand is one that comes home to every member of the community. We all help to make the moral atmosphere and create the moral ideals of our time; and there is no use in looking for high standards in our colleges and other institutions of learning if we have low standards in our homes. The youth who hears nothing talked of at home but money is not likely to take much interest in instruction that does not bear directly on the question of making money. The youth who hears money spoken of in the home circle simply as a means of personal enjoyment and glorification will need something more than a few lectures on political or social economy to make him take a different view of it. We may employ excellent men and women as teachers, but their success from a moral point of view will always be limited by the general tone of the community. [Pg 849]

It is evident, then, that no very special directions can be given for solving the problem with which we are concerned. Still, the posing of the problem and the indication of the conditions on which its solution depends may awaken in a few minds a new sense of their responsibility in the matter, and it is a gain for even one to go over to the right side. It would be quite as easy for *the whole* of society to live on a somewhat higher plane as it is for it to live on its present plane. It would simply mean that the average man would treat the average man a little better than he does now: whatever one gave he would thus get in return, and the burdens which are always associated with mutual distrust would be proportionately lightened.

The philosopher whom we began by quoting has indicated ways in which the craze for legislative shortcuts is working against the moral improvement of society. He holds that parental responsibility has been seriously impaired by legislative encroachments in the matter of education and otherwise. Book learning has become to the modern world a kind of fetich; and minds that ought to be in contact with the facts of life are stupefied, and so far prevented from getting their normal moral growth by being drilled in studies that bring no real profit. We can not bear the idea that one of our human brethren should not be able to read and write; but, provided he possesses these accomplishments, we ask no questions as to what use he makes of them. We have before us a police description of a criminal who graduated at one of the most celebrated universities on the Continent, who studied afterward for the Church, who was for several years an elder, and who possesses—so we are distinctly informed—fine literary tastes. The gentleman with all these advantages is a fugitive from justice. With all his knowledge and accomplishments he got no hold of the principles of right conduct, and—there are not a few like him. We need not only a science of education, but a science of government, the most valuable part of which will probably be that which shows us with demonstrative force what things government ought to leave alone. It is quite possible we should find the moral atmosphere materially improving if only

the natural reactions between the individual and his environment were not interfered with. The course of Nature, we may feel assured, provides not less for moral than for mental growth, and if either process is defectively carried on we may safely attribute it to some ill-advised attempt we are making to improve on natural institutions. Science has done much for the world in the past, but it has yet to do much more. It will yet give us a light to our feet in matters educational and political, and will liberate us from many of the yokes and trammels we have foolishly imposed upon ourselves. Mankind will then look into the face of Nature and see in it a new beneficence and brighter promises for the future of the race. [Pg 850]

THE AMERICAN ASSOCIATION AT COLUMBUS.

A fairly good attendance, with an unusually large proportion of men prominent in science, and most cordial welcome and painstaking care of the members by the Ohio State University and the citizens of Columbus, combined to make the forty-eighth annual meeting of the American Association for the Advancement of Science a most enjoyable and instructive one. The two features of the meeting which seem to deserve the most attention are: First, the tendency which was shown in every section to direct the papers and discussions to practical subjects, so that all could participate in the proceedings and each member feel justified in having a word to say in them; and, secondly, the perfect cordiality with which the association was received and the assiduous attention with which it was taken care of by the local committee. The smaller and apparently less important details, but at the same time those which so largely determine one's comfort in a strange community, were thoughtfully arranged, and to this alone much of the success of the meeting was due. The numerous excursions were not only exceedingly enjoyable, but were arranged in every case primarily for their instructive and scientific features, and an Easterner, at any rate, could not take any of them without learning something. Another feature of the meeting that was especially satisfactory was the possibility it afforded for the younger workers in science to meet their elders, who had hitherto led the way—who were present, as we have already said, in larger proportion than usual. The importance of this feature, as President Orton pointed out in these pages a few months ago, can not be overestimated. The instruction and encouragement which a new worker in the scientific field gains from a personal acquaintance with the older men who have already achieved success and reputation in his branch of science are obvious enough. With the increasing specialization which modern research is making absolutely unavoidable, the social feature of the annual gathering of such a company of scientists is coming to be its most important function. A slight extension of it might very readily lead to the adoption of a specific policy by the several sections of devoting at least a part of their time to such a general statement of what has been accomplished in their department or to some especially important work of general interest that some of the members have been engaged in as would be most instructive to the members of the other sections. In the earlier meetings of the association the sectional chairmen often made such presentations in their stated addresses, but as times and men have changed, the idea has been departed from and this feature has become an exceptional one. If it could be restored, in a modified if not an identical form, and made a regular part of the programme of at least one of the sections at each meeting, the interest would be greatly enhanced, and in this way the chemist, the geologist, the botanist, and the others could be given regularly an authoritative account of what is being done in the other branches of science, and an important step would be taken toward doing away with the unfortunate narrowing influence which special scientific work is too apt to exercise. [Pg 851]

The fixing of the last week in June as the time for holding the next meeting of the association, which is to be in New York, is a departure from recent practice as to date, but, aside from the special reason for it in this particular case—the probability that many of the members will be at the Paris Exposition during the following August—the experiment seems a desirable one because of the almost invariably excessive heat to which August meetings are exposed.

Scientific Literature.

SPECIAL BOOKS.

Evidences are apparent in many quarters of a reaction against the headlong rush toward aggression and territorial aggrandizement in which the American people have allowed themselves to be carried away. For a time the lovers of the Constitution of the United States as the fathers of the republic left it and Lincoln glorified it were bewildered, stunned by the revolution suddenly precipitated upon us from Washington, while the people at large seemed to be wild with enthusiasm for they knew not what, and men suffered themselves to be led—they knew not whither. Very slowly the true patriots recovered their voices, and signs appear that the people are at last getting into a mood to listen to reason. President *David Starr Jordan's Imperial Democracy*[49] comes very opportunely, therefore, to call to the minds of those who can be induced to think some of the forgotten principles of American policy, and to depict, in the terse, incisive style of which the author is master, the true nature and bearing of those iniquitous proceedings to which the American people, betrayed by treacherous leaders, have allowed themselves to become a party. President Jordan was one of the first who dared, in this matter, to make a public protest against this scheme of aggression. His first address on the subject—Lest

we Forget—delivered to the graduating class of Leland Stanford University, May 25, 1898, was separated only a few days in time from Prof. Charles Eliot Norton's exposure of the reversal of all our most cherished traditions and habits which the precipitation of the war with Spain had brought about. The two men must share the honor of leadership in the awakening movement. In this address President Jordan gives a true definition of patriotism as "the will to serve one's country; to make one's country better worth saving"—not the shrilling of the mob, or trampling on the Spanish flag, or twisting the lion's tail. Even so early he foresaw the darkness of the future we were bringing upon ourselves, and said: "The crisis comes when the war is over. What then? Our question is not what we shall do with Cuba, Puerto Rico, and the Philippines. It is what these prizes will do to us." This, with the wickedness of the whole business, is the burden of most of the other papers in the volume. In the paper on Imperial Expansion we are told of three "world [Pg 852] crises" in our history when we were confronted with momentous questions. The first was after the Revolution. The second came through the growth of slavery. The third is upon us now. "It is not the conquest of Spain, not the disposition of the spoils of victory which first concerns us. It is the spirit that lies behind it. Shall our armies go where our institutions can not? Shall territorial expansion take the place of democratic freedom? Shall our invasion of the Orient be merely an incident, an accident of a war of knight-errantry, temporary and exceptional? Or is it to mark a new policy—the reversion from America to Europe, from democracy to imperialism?" President Jordan has an answer to the question, What are we to do in the shape affairs have assumed? The right thing would be "to recognize the independence of the Philippines, under American protection, and to lend them our army and navy and our wisest counselors; not our politicians, but our jurists, our teachers, with foresters, electricians, manufacturers, mining engineers, and experts in the various industries.... The only sensible thing to do would be to pull out some dark night and escape from the great problem of the Orient as suddenly and as dramatically as we got into it." Yet President Jordan recognizes that some great changes in our system are inevitable, and belong to the course of natural progress. They must not be shirked, but should be met manfully, soberly, with open eyes. A paper on Colonial Lessons of Alaska presents as an object lesson the muss we have made with colonial government in that Territory.

Mr. *A. H. Keane's Man Past and Present*[50] is a part fulfillment of a promise held out in his Ethnology, the first volume of the Cambridge Geographical Series, that it might be followed by another dealing more systematically with the primary divisions of mankind. In it the "four varietal divisions" of man over the globe are treated more in detail, with the primary view of establishing their independent specialization in their several geographical zones, and of elucidating the difficult questions associated with the origins and interrelations of the chief subgroups. The work consequently deals to a large extent with the prehistoric period, when the peoples had already been fully constituted in their primeval homes and had begun their subsequent developments and migratory movements. The author has further sought to elucidate those general principles which are concerned with the psychic unity, the social institutions, and religious ideas of primitive and later peoples. The two principles, already insisted upon in the Ethnology, of the specific unity of all existing varieties of the human family and the dispersion of their generalized precursors over the whole world in Pleistocene times are borne in view throughout. Subsequent to this dispersion, the four primary divisions of man have each had its Pleistocene ancestor, from whom each has sprung independently and divergently by continuous adaptation to their several environments. Great light is believed to have been thrown on the character of the earliest men by the discovery of the *Pithecanthropus erectus*, and this is supplemented as to the earliest acquirements by Dr. Noetling's discovery, in 1894, of the works of Pliocene man in upper Burmah. The deductions made from these discoveries strengthen the view Mr. Keane has always advocated, that man began to spread over the globe after he had acquired the erect posture, but [Pg 853] while in other physical and in mental respects he still did not greatly differ from his nearest of kin. As to the age when this development was taking place, agreement is expressed with Major Powell's remark that the natural history of early man becomes more and more a geological and not merely an anthropological problem. The human varieties are shown to be, like other species, the outcome of their environments, and all sudden changes of those environments are disastrous. In both hemispheres the isocultural bands follow the isothermal lines in all their deflections—temperate regions being favorable, and tropical and severe ones unfavorable, to development. Of the metal ages, the existence of a true copper age has been placed beyond reasonable doubt. The passage from one metal to another was slow and progressive. In art the earliest drawings were natural and vital. The apparent inferiority of the drawings of the metal period to those of the cave dwellers and of the present Bushmen is due to the later art having been reduced to conventions. The development of alphabetical writing from pictographs is briefly sketched. Thus light is sought from all quarters in dealing with the questions of the book, and due weight is given to all available data—physical and mental characters, usages, religion, speech, cultural features, history, and geographical range. The general discussion of these leading principles is brief but clear and comprehensive. The bulk of the volume, following them, is occupied with the detailed and minute studies of the four main groups of mankind—the Negro, Mongol, American Indian, and Caucasic—and their subgroups, the discussion of each being preceded by a conspectus showing its Primeval Home, Present Range, Physical Characters, Mental Characters (Temperament, Speech, Religion, and Culture), and Main Divisions. The text is full, clear, good reading, instructive and suggestive, and in it the author has sought to make the volume a trustworthy book of reference on the multifarious subjects dealt with.

GENERAL NOTICES.

The fact that Mr. *Charles A. Dana* stood in close personal relations with Secretary Stanton and

was officially associated with him during a considerable period of the war for the Union, and was also incidentally brought near Mr. Lincoln, gives whatever he may relate concerning the events of that period somewhat the air of a revelation from the inside. Accordingly, we naturally expect to find things narrated in his *Recollections of the Civil War*[51] that could not be told as well by any one else. The account given in the book relates to events in which the author was personally concerned. Mr. Dana had been associated with Horace Greeley in the editorial management of the New York Tribune for fifteen years, when, in April, 1862, Mr. Greeley invited him to resign. No reason was given or asked for the separation, and no explicit statement of a reason was needed. Mr. Greeley, having expressed in the beginning his willingness to let the secessionist "wayward-sister" States go in peace, was in favor of peace; Mr. Dana was for vigorous war. A correspondence was opened between him and Mr. Stanton in reference to public matters shortly after Mr. Stanton went into the War Department. Then Mr. Dana was intrusted with special commissions that carried him to the front and brought him in contact with the leaders of the army; and finally, in 1863, was appointed Assistant Secretary of War, an office he filled till the end of the contest. His narrative deals as the story of one having knowledge with questions of policy, with the critical phases of the hard conflict, with the perplexities and anxieties of the men charged with responsibilities, with stirring scenes in the councils at the Capitol and in battle at the front, and with personal incidents of the men whose names the nation loves and delights to honor. All is related in the straightforward, fluent style, touching only the facts, of a writer who has a story to tell and makes it his business to tell it. The result of the reading of the book is to arouse a new appreciation of the abilities and virtues of those great men in their various walks of civil, political, and military life, who took our country through its supreme trial.

[Pg 854]

Mrs. *Arabella B. Buckley's Fairy-Land of Science* has stood the test of about thirty years' publication as one of the simplest, clearest, and best popular introductions to physical science. Originating in a course of lectures delivered to children and their friends, the thought of publishing the book was suggested by the interest taken in the lectures by all the hearers. It was a happy thought, and the carrying of it out is fully justified by the result. But thirty years is a long time in so rapidly advancing a pursuit as the study of science, and makes changes necessary in all books treating of it. The publishers of this work,[52] therefore, with the assistance of the author, have considerably extended the original volume, adding to it notices of the latest scientific discoveries in the departments treated, and amplifying with fuller detail such parts as have grown in importance and interest. A few changes have been made in the interest of American readers, such as the substitution, where it seemed proper, of words familiar here for terms almost exclusively used in England, and the introduction of American instead of English examples to illustrate great scientific truths. The book has also been largely reillustrated.

Some of the essays in Miss *Badenoch's True Tales of the Insects*[53] have already appeared in serials—two of them in the Popular Science Monthly. The essays are not intended to present a view of entomology or of any department of it, but to describe, in an attractive and at the same time an accurate manner, a few special features of insect life and some of what we might call its remarkable curiosities. The author is well qualified for her undertaking, for, while being an entomologist of recognized position, she has those qualities of enthusiasm in her pursuit and literary training that enable her to present her subject in its most attractive aspect. From the great variety of insect forms she has selected only a few for this special presentation, including some of eccentric shape and some of genuine universal interest. She begins with the strange-looking creatures of the family of the *Mantidæ*, or praying insects, or, as the Brazilians call the *Mantis*, more fitly, the author thinks, the devil's riding horse, which is characterized as "the tiger, not the saint, of the insect world." The walking-stick and walking-leaf insects, of equally strange appearance, but peaceful, naturally follow these. Then come the locusts, and grasshoppers, which are more familiar, and the butterflies and moths, which attract the most attention and present such remarkable forms as the case-moths and the hawk and death's-head moths. The insects made subjects of treatment are described with fullness of detail, and the record of their life histories. The book is published in an attractive outer style, on thick paper, with thirty-four illustrations by Margaret J. D. Badenoch.

Prof. *Charles C. James*, now Deputy Minister of Agriculture for Ontario, defines the purpose of his book, *Practical Agriculture*[54] to be to aid the reader and student in acquiring a knowledge of the science as distinguished from the art of agriculture—"that is, a knowledge of the 'why,' rather than a knowledge of the 'how.'" The author believes, from his experience of several years' teaching at the Ontario Agricultural College, that the rational teaching of agriculture in public and high schools is possible and would be exceedingly profitable, and that an intelligent knowledge of the science underlying the art would add much interest to the work and greatly increase the pleasure in it. The science of agriculture is understood by him to consist of a mingling of chemistry, geology, botany, entomology, physiology, bacteriology, and other sciences in so far as they have any bearing upon agriculture. He has aimed in this book to include only the first principles of these various sciences, and to show their application to the art of agriculture. The subject is treated as it relates, consecutively, to the plant, the soil, the crops of the field; the garden, orchard, and vineyard; live stock and dairying; and, under the heading of "other subjects," bees and birds, forestry, roads, and the rural home. The appendix contains lists of trees and of weeds, and an article on spraying mixtures. Questions to be answered by the reader are attached to most of the chapters. The illustrations are well chosen and good.

[Pg 855]

Considerable information about the Philippine Islands and their inhabitants is given by Dr. *D. G. Brinton* in a pamphlet entitled *The Peoples of the Philippines*. Dr. Brinton's point of view is the

anthropologist's, and accordingly, after a few paragraphs about the geography, geology, and history of the islands, he takes up their ethnology and describes their various peoples as they have been studied by the masters of the science and by travelers. Much valuable as well as interesting information is given respecting their manners and customs, languages, and literature, for the Tagals have had a written language from the earliest known times, and though their old literature does not amount to much they are to-day exceedingly facile versifiers.

The Open Court Publishing Company (Chicago) publishes *The Lectures on Elementary Mathematics* (*Leçons élémentaires sur les mathématiques*) of *Joseph Louis Lagrange*, "the greatest of modern analysts," in a translation from the new edition of the author's collected works by Thomas J. McCormack. These lectures, which were delivered in 1765 at the École Normale, have never before been published in separate form, except in the first printing in the Journal of the Polytechnic School and in the German. "The originality, elegance, and symmetrical character of these lectures have been pointed out by De Morgan, and notably by Dühring, who places them in the front rank of elementary expositions as an example of their kind. They possess, we might say, a unique character as a reading book in mathematics, and are interwoven with helpful historical and philosophical remarks." They present with great clearness the subjects of arithmetic and its operations, algebra, equations of the third and fourth degrees, the evolution of numerical equations, and the employment of curves in the solution of problems. The translator has prefixed a short biographical sketch of Lapouge, and an excellent portrait is given.

A book of *Observation Blanks for Beginners in Mineralogy* has been prepared by *Herbert E. Austin*, as an aid to the laboratory course, and is published by D. C. Heath & Co. (Boston, 30 cents). The laboratory course is intended to make the pupil familiar with the characteristics of minerals and the terms used in describing them by directing him to observe typical specimens and describe what he sees, and to develop his faculties of observation, conception, reasoning, judgment, comparison, and memory. A description is given of apparatus that may be home-made. The blanks follow, containing spaces for the insertion of notes under the heads of Experiment, Observation, Statement, and Conclusion.

In Volume No. XXX of the International Education Series—Pedagogics of the Kindergarten—a number of Froebel's essays relating more especially to the plays and games were printed from the collection made by Wichard Lange. A new volume of the series, *Friedrich Froebel's Education by Development*, includes another selection from Lange's publication, in which the gifts are more thoroughly discussed. "Again and again, in the various essays," the editor of the series says, "Froebel goes over his theory of the meaning of the ball, the sphere, the cube, and its various subdivisions. The student of Froebel has great advantage, therefore, in reading this volume, inasmuch as Froebel has cast new light on his thought in each separate exposition that he has made.... The essays on the training school for kindergartners and the method of introducing children's gardens into the kindergarten are very suggestive and useful. In fact, there is no other kindergarten literature that is quite equal in value to the contents of this volume." The few essays [Pg 856] in Lange's volume that still remain untranslated are characterized as being mostly of an ephemeral character. With the publication of the present volume, of which, as of the Pedagogics, Miss Josephine Jarvis is the translator, a complete list of the original works of Froebel in English translations has been provided in the International Education Series of Messrs. D. Appleton and Company.

A useful manual for students in chemistry is the *Chemical Experiments* of Prof. *John F. Woodhull* and *M. B. Van Arsdale* (Henry Holt & Co., New York). It embraces directions for making seventy-five experiments with different substances and chemical properties, including oxygen and the air, hydrogen and water, chlorine and the chlorine family, acids, bases, salts, sulphur, nitrogen, carbon, carbon dioxide and the carbonates, fermentation, potash, and problems to illustrate the law of definite proportions. A title is given to each experiment, suggesting what is to be proved by it; the details of the process are given, and the pupil is left to do the rest, entering his particular observations and conclusions on the blank page opposite the text. Questions are appended, of a nature further to develop the thinking powers of the pupils, and tables or lists are added of the elements concerned in the experiments, weights and measures, apparatus, and chemicals.

The book *Defective Eyesight: the Principles of its Relief by Glasses*, of Dr. *D. B. St. John Roosa*, is the result of an attempt to revise The Determination of the Necessity for Wearing Glasses, published by the same author in 1888. It was found, on undertaking the work of revision, that the advance in our knowledge of the proper prescription of glasses, especially in the matter of simplicity in method, had been so great as to require a complete rewriting. In doing this the book has been very much enlarged, and illustrations have been introduced. The author hopes his manual may prove a reliable guide to the student and practitioner in ophthalmology, and may also be of interest to persons who wish to know the principles on which the prescription of glasses is based. The special subjects treated of are the measurement of visual power, presbyopia, myopia or short-sightedness, hypermetropia, corneal astigmatism, asthenopia, and the qualities of lenses. (Published by the Macmillan Company. Price, $1.)

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Fragments of Science.

Officers of the American Association for 1900.—The American Association, at Columbus, Ohio, elected as president for the next meeting, which is to be held in New York city, June 25 to 30, 1900, Prof. R. S. Woodward, of Columbia University. The vice-presidents-elect are: Section A (Mathematics and Astronomy), Asaph Hall, Jr., of Ann Arbor, Mich.; Section B (Physics), Ernest Merritt, of Ithaca, N. Y.; Section C (Chemistry), James Lewis Howe, of Lexington, Va.; Section D (Mechanical Science and Engineering), J. A. Brashear, of Pittsburg, Pa.; Section E (Geology and Geography), J. F. Kemp, of New York city; Section F (Zoölogy), C. B. Davenport, of Cambridge, Mass.; Section G (Botany), William Trelease, of St. Louis, Mo.; Section H (Anthropology), A. W. Butler, of Indianapolis, Ind.; Section I (Economic Science and Statistics), C. M. Woodward, of St. Louis. The permanent secretary is L. O. Howard, United States Entomologist, Washington, D. C.; General Secretary, Charles Baskerville, of Chapel Hill, N. C.; Secretary of the Council, William H. Hallock, of New York city. The sectional secretaries are: Section A, W. M. Strong, of New Haven, Conn.; Section B, R. A. Fessenden, of Allegheny, Pa.; Section C, A. A. Noyes, of Boston, Mass.; Section D, W. T. Magruder, of Columbus, Ohio; Section E, J. A. Holmes, of Chapel Hill, N. C.; Section F, C. H. Eigenmann, of Bloomington, Ind.; Section G, D. T. McDougal, of New York Botanical Garden; Section H, Frank Russell, of Cambridge, Mass.; Section I, H. T. Newcombe, of Washington, D. C. Treasurer, R. S. Woodward, of New York city.

Graphite.—An interesting account of the history and manufacture of graphite is given by E. G. Acheson in the June issue of the Journal of the Franklin Institute. In the year 1779 Karl Wilhelm Scheele, a young apothecary in the town of Köping, Sweden, discovered that graphite was an individual compound. It had up to this time been confounded with molybdenum sulphide. In 1800 Mackenzie definitely added graphite to the carbon group by showing that, on burning, it yielded the same amount of carbon dioxide as an equal amount of charcoal and diamond. Graphite in a more or less pure state is quite freely distributed over the earth, but only in a few places is it found under conditions of purity, quantity, ease of mining, refining, and transportation to market that permit of a profitable business being made of it. Statistics for the last six years (1890-'95) show an average yearly production of 56,994 short tons. The countries contributing to the supply were Austria, Ceylon, Germany, Italy, United States, Canada, Japan, India, Russia, Great Britain, and Spain. Great differences exist in the structure and purity of the graphites furnished from the various mines. There are two general forms—the crystalline and the amorphous. The product of the Ceylon mines is crystalline of great purity, analyzing in some cases over ninety-nine per cent carbon, while that of the Barrowdale mines is amorphous and also very pure. The chief impurity in graphite is iron. It is probable that the first use made of graphite was as a writing substance. The first account we have of its employment for this purpose is contained in the writings of Conrad Gessner on Fossils, published in 1565. Its present uses include the manufacture of pencils, crucibles, stove-polish, foundry-facing, paint, motor and dynamo brushes, anti-friction compounds, electrodes for electro-metallurgical work, conducting surfaces in electrotyping, and covering the surfaces of powder grains. For most of these purposes it is used in the natural impure state. The mining and manufacture of graphite into articles of commerce give employment to thousands of people. The mines of Ceylon alone, when working to their full capacity, employ about twenty-four thousand men, women, and children. The rapid increase in the use of graphite has led to considerable discussion in recent years regarding the possibility of its commercial manufacture. It has been made in a number of different ways in the laboratory, all, however, depending on the same fundamental principle—viz., the liberation of the carbon from some one of its chemical compounds, under conditions which prevent its reassociation with the same or other elements. Mr. Acheson, who has been working for several years in an endeavor to devise a commercially successful process of manufacture, found, somewhere back in 1893, that graphite was formed in the carborundum (electric) furnaces of the Carborundum Company of Niagara Falls. Since then he has been following up this clew, and now believes that "the only commercial way to make graphite is by breaking up a carbide by the action of heat." A building for its manufacture in this way, by the use of the electric furnace, is now in course of erection at Niagara Falls. [Pg 858]

Commercial Education in England.[55]—It is only of comparatively late years that the Government has had anything to do with the education of the people. For some centuries back all English education was practically controlled by our two ancient universities—Oxford and Cambridge. They decided what subjects were to be taught, and how they were to be taught. The control they exercised over our English schools was an indirect one, but it was none the less effectual. The schools themselves were, like the universities, independent of Government, or, indeed, of any control. The principal of these are known as "public schools," though the term "public" has of late years also been applied to the public elementary schools. These are nearly all developments of ancient foundations. Winchester, founded in the fourteenth century, and Westminster, in the sixteenth, grew up under the shadows of great religious houses; Eton was established in the fifteenth century by the monarch, close to his own palace at Windsor; Harrow,

which dates from the sixteenth century, is the most important example of the most numerous class of all privately founded local schools—grammar schools, as they were generally entitled— [Pg 859] which have developed beyond their original founders' intention, and have eventually come to attract boys from all parts of the kingdom. The best boys from all of them went to the universities, and the course of study which was most successful at the university was naturally the course of study which was preferred at the school. The *literæ humaniores*, which were the sum total of university education, included only Greek and Latin language and literature, mathematics, and logic. Science—I have now in my mind the education of but a single generation back—was ignored. The teaching of modern languages was perfunctory in the extreme; the same may be said of history and geography, while even English language and literature were almost entirely neglected. Now an education modeled on these lines was not ill suited for professional men—men who went from the university into law, the Church, or medicine. But it was by no means suited, especially when cut short in its early stages, for boys whose future destination was the counting-house or the shop. We are not met to consider the training of scholars, but the sort of education best adapted to the requirements of the ordinary man of business, and given under the limitations inevitable in the conditions of the case—that is to say, in a very limited period and during the early years of life—intended also not only to train the mind but to provide a means of earning a living. Commercial education must in fact be a compromise between real education and business training. The more it inclines to the former the better. With the growth of modern industry and commerce the necessity for a training better suited for the requirements of modern life became more and more evident, and the place was supplied, or partially supplied, by private-adventure schools, which undertook to provide the essentials of a commercial education. Of late years also some important middle-class schools have been founded by institutions like the Boys' Public Day Schools Company, and the Girls' Public Day Schools Company, the teaching in which is of a modern if not of a commercial character. The growth also of science had its natural and obvious effects on educational methods. Scientific teaching was introduced at the universities—it had been practically ignored at Oxford, and recognized at Cambridge only as a department of mathematics. The more important of our public schools introduced what was known as a "modern side," that is to say, an alternative course which a boy might take, and in which science, modern languages, and mathematics took the place, to a greater or less extent, of the classical languages. Other schools modified their whole curriculum in a like direction; others again almost abandoned the ancient knowledge in favor of the modern. Such, in briefest and baldest summary, is the condition at which our system of secondary education has now arrived. In the meantime, elementary education in England had been organized and systematized. At the beginning of the century elementary education was imparted to the children of the peasants and agricultural laborers in village schools, most of which were sadly inefficient. In the towns there were various charitable institutions for educating the children of those who were unable to provide education for themselves, and there were also what were known as ragged and parochial schools, which were more or less of the same character as the elementary schools of to-day. Early in the century several important societies were established—they were mostly of a religious character—for the improvement of elementary education. By their assistance schools were founded throughout the country. These were maintained by voluntary effort, and so gained their name of voluntary schools, though they received aid from the Government, an annual grant being allotted for the purpose. In 1839 a committee of the Privy Council was created to regulate the administration of Government grants for education, and this committee still remains the governing body of our education department. The Elementary Education Act of 1870, with later acts of 1876 and 1880, laid down the principle that sufficient elementary education should be provided for all children of school age, and established a system of school boards, which boards were to be and were formed in all districts where such sufficient provision for education did not exist. By a later act of 1891 education was made gratuitous as well as compulsory. We have, therefore, now two great classes [Pg 860] of elementary schools—school-board schools, in which education is free, and voluntary schools, in which a fee may be charged. Both alike receive Government aid under certain conditions. As a rule the voluntary schools are connected with the Church of England or with one or other of the nonconformist bodies. The boards which control the board schools are elected bodies, and the teaching is undenominational.

Genius and Habit.—W. L. Bryan and N. Harter are the authors of an interesting monograph in the Psychological Review for July, from which the following paragraphs are taken: "There is scarcely any difference between one man and another of greater practical importance than that of effective speed. In war, business, scientific work, manual labor, and what not, we have at the one extreme the man who defeats all ordinary calculations by the vast quantity of work he gets done, and at the other extreme the man who no less defeats ordinary calculations by the little all his busyness achieves. The former is always arriving with an unexpected victory, the latter with an unanswerable excuse for failure. It has seemed to many psychologists strongly probable that the swift man should be distinguishable from the slow by reaction time tests. For (*a*), granting that the performances demanded in practical affairs are far more complicated than those required in the laboratory tests, it seems likely that one who is tuned for a rapid rate in the latter will be tuned for a rapid rate in the former, when he has mastered them. Moreover (*b*), a rapid rate in elementary processes is favorable to their fusion into higher unitary processes, each including several of the lower. Finally (*c*), a rapid rate in elementary processes is favorable to prompt voluntary combinations in presence of new emergencies. In face of these *a priori* probabilities, eleven years' experience in this laboratory (the first three being spent mainly on reaction times) has brought the conviction that no reaction time test will surely show whether a given individual has or has not effective speed in his work. Very slow rates, especially in complicated reactions, are strongly indicative of a mind slow and ineffective at all things. But

experience proves that rapid rates by no means show that the subject has effective speed in the ordinary, let alone extraordinary, tasks of life. How is this to be explained? The following answer is proposed: The rate at which one makes practical headway depends partly upon the rate of the mental and nervous processes involved; but far more upon how much is included in each process. If A, B, and C add the same columns of figures, one using readily the method of the lightning adder, another the ordinary addition table, while the third makes each addition by counting on his fingers, the three are presently out of sight of one another, whatever the rates at which the processes involved are performed. The lightning adder may proceed more leisurely than either of the others. He steps a league while they are bustling over furlongs or inches. Now, the ability to take league steps in receiving telegraphic messages, in reading, in addition, in mathematical reasoning, and in many other fields, plainly depends upon the acquisition of league-stepping habits. No possible proficiency and rapidity in elementary processes will serve. The learner must come to do with one stroke of attention what now requires half a dozen, and presently, in one still more inclusive stroke, what now requires thirty-six. He must systematize the work to be done, and must acquire a system of automatic habits corresponding to the system of tasks. When he has done this he is master of the situation in his field. He can, if he chooses, deal accurately with minute details. He can swiftly overlook great areas with an accurate sense of what the details involved amount to—indeed, with far greater justice to details than is possible for one who knows nothing else. Finally, his whole array of habits is swiftly obedient to serve in the solution of new problems. Automatism is not genius, but it is the hands and feet of genius."

"**A vague Impression of Beauty.**"—The following sentences occur in an article on The Real purpose of Universities in a recent issue of the London Spectator. They give so strange a picture [Pg 861] of the ideals of the two leading English universities as to seem worthy of reproduction: "However, Dr. Hill made one statement for which we owe him a sincere gratitude. 'The excellence of the classics,' said he, 'lay chiefly in their complete uselessness.' ... In this simple statement is expressed the true value of our old universities. They should be practically useless. They should not teach you to be a good carpenter or a skillful diplomatist. You can not march out of Oxford or Cambridge into any career which will return you an immediate and efficient income.... The other universities of Europe are prepared to cut you to a certain measure, or to render you technically competent. But our English universities have hitherto declined to discharge this humble function, save in rare lapses, from a noble ideal. They at least profess to accomplish a far greater task. There is a strange period dividing the man from the boy, which clamors aloud for intelligent discipline, and this discipline Oxford and Cambridge are anxious to supply. The undergraduate is too young to specialize, and not too old to receive instruction. When his period of training is finished he is asked to assume the heavy burdens of life, to discharge tasks which may be dull, and which are rarely concerned with what were once called the humanities. As he passes through the university he may not have the time nor the wit to become a sound scholar nor a profound mathematician. But he may, if he understand his privilege aright, linger for a while in the groves of 'practically useless' knowledge. He may learn what literature meant in an age when it was concerned only with the essentials of simplicity; he may read the lessons of history when history was still separate from political intrigue. And though he forgets his Greek grammar, though in middle life he can not construe a page of Virgil, yet he carries away from this irrational interlude a vague impression of beauty which no other course of education will ever give him." Even for the schoolmen "a vague impression of beauty," whatever that may mean, seems rather unpractical as an educational *ultima Thule*.

The Purple of Cassius.—There are few substances in the field of inorganic chemistry on which so much speculation and actual work has been expended as the so-called purple of Cassius. A recent article by Mr. C. L. Reese, in the Chemical News, contains some interesting information regarding this curious compound. Up to the present time there have, it seems, been two views held as to its chemical nature—one that it is a mixture of stannic acid and metallic gold; the other, that of Berzelius, that it is substantially a chemical compound of purple gold oxide with the oxides of tin possibly mixed with an excess of stannic acid. It has seemed very likely that the substance is a chemical compound of acid character, and that the solubility in ammonia is due to the formation of a salt, but it has been found that by oxidation of stannous chloride and by allowing very dilute solutions of stannic chloride to stand, the "hydrogel" of stannic acid separated out, which, on the addition of a few drops of ammonia, liquefied and so became soluble in water, just as the purple of Cassius does. There can therefore be no salt formation here. Some comparatively recent work by Richard Zsigmondy, however, seems to have finally cleared up the chemical nature of this curious substance. Its formation is explained by assuming that when stannous chloride is added to a sufficiently dilute solution of gold chloride the latter is immediately reduced to metallic gold while stannic chloride is formed. Generally after a few seconds the liquid becomes red, but the purple is not precipitated for several days, unless it is heated. The gold is not precipitated as a black powder because the stannic chloride formed is immediately hydrolized into hydrochloric acid and the hydrate of stannic acid. The latter prevents the aggregation of the gold particles, and the stannic acid remains in solution as a colloid, which on standing gradually changes under the influence of the dilute hydrochloric acid to an insoluble form, the "hydrogel" of stannic acid. By heating, this change takes place immediately. The properties of the purple of Cassius depend on the properties and character of the stannic acid present, and the great variety in the properties of the stannic acids, the ortho, the meta, and the colloidal mixtures of the two explain the many contradictions in the literature with reference to the properties of the purple of Cassius. Zsigmondy says, "I look upon the knowledge that a [Pg 862] mixture of colloid bodies can behave, under some conditions, as a chemical compound, and that the properties of one body in such mixtures can be hidden by those in another as the most

important conclusion to be drawn from this work."

The Abuse of Unskilled Labor.—The number of diseases directly or indirectly due to continued long standing is especially numerous among women. The London Lancet, which nearly twenty years ago attempted to improve matters in this respect in the case of shopgirls, has again taken up the subject, and recently published an editorial urging customers of the shops to boycott those establishments where no sitting accommodations are provided for the clerks. It says: "We, as medical men, maintain that sitting accommodations are absolutely necessary for shopgirls. The only argument having even the semblance of legitimacy which we have heard put forward in defense of the nonprovision of seats is that sitting is conducive to idleness, but in this connection such a premise can not be permitted, for an employee would be bound to come forward when an intending purchaser entered the shop.... The very fact that in many shops she is not allowed to sit down is conducive to idleness—idleness of the worst kind, the idleness of pretending to do something while in reality nothing is being done. Can nothing be done to stop this—as we once called it without the least exaggeration or sensationalism—'cruelty to women'? To the true woman—the woman with feelings for her sisters, the woman of love and sympathy, the true woman in every sense of the word—we appeal for help in this matter. If such women would abstain from purchasing at shops where they see that the employees are compelled to work from morning till night without permission to rest from their labors even when opportunity occurs, we should soon see the end of a practice which ruins the health and shortens the lives of many of our shopgirls." That there is a certain amount of danger for women from long-continued standing, to the point of exhaustion, there is no doubt, and much can be done toward improving the present conditions in this respect and in other hygienic ways in the shops. The large influx of women during recent years into the counting-room and the salesroom gives such questions an increasing importance, especially in the less skilled positions where labor combinations for mutual protection are not possible. There has already been considerable agitation of the question in this country, and there still remains much to be done. But, as Lord Salisbury pointed out in causing the rejection of a bill for remedying present shop conditions in England, it is a question not suitable for legislation, and can only be settled through the indirect action of public opinion on the shopkeeper himself.

The Occurrence of Gold Ores.—The following paragraphs are from an article by H. M. Chance in the Engineering Magazine for July, entitled The Increasing Production of Gold: "Another reason for anticipating further increase in the production of gold is found in our better knowledge of gold ores, and of the conditions under which gold occurs in Nature. Until the discovery of the Cripple Creek district the occurrence of gold as tellurid in deposits of large extent and value was practically unknown. Gold was, of course, known to occur, sparingly in some ores, partially as a tellurid associated with other minerals; but such a mineralized belt as that at Cripple Creek was entirely unknown, and such deposits were not looked for by the prospector. Similarly, we now know of another class of gold ores in which the gold occurs apparently in some form chemically combined in a siliceous matrix, often approaching a true jasper or hornstone, and showing by analysis possibly ninety-five per cent of silica. Such ores show no trace of 'free' or metallic gold, and the presence of gold can be determined only by assay or analysis. A few such discoveries have recently been made, accidentally, by inexperienced persons, who had rock assayed from curiosity. Similarly again, in the last few years gold has been found in most unpromising-looking porphyry dikes—the very rocks prospectors the world over have regarded as necessarily barren because they almost invariably fail to show any 'free' or metallic gold by the miner's quick 'horn' or 'pan' test. But mining engineers and prospectors are [Pg 863] learning that in a mineralized region gold may occur in any rock, and hundreds of prospectors are assaying all sorts of most unpromising-looking rock, satisfied that by assay alone can they determine whether a certain rock is gold-bearing or not. This persistent and more or less systematic work now going on in every mining district must result in the discovery of many valuable deposits in unexpected localities, and ultimately promises to add largely to the annual output of gold."

MINOR PARAGRAPHS.

The investigations of F. E. L. Beal of the Food of Cuckoos and S. D. Judd of the Food of Shrikes in their relation to agriculture are published in a single bulletin by the Department of Agriculture. Mr. Beal finds that the food of cuckoos consists almost wholly of insects, of which he has found sixty-five species in their stomachs, and concludes that from an economical point of view they rank among our most useful birds; and, in view of the caterpillars they eat, it seems hardly possible to overestimate the value of their work. Mr. Judd finds, from a very extensive examination, that the food of butcher birds and loggerhead shrikes consists of invertebrates (mainly grasshoppers), birds, and mice. During the colder half of the year the butcher bird eats birds and mice to the extent of sixty per cent, and ekes out the rest of its food with insects. In the loggerhead's food, birds and mice amount to only twenty-four per cent. Its beneficial qualities "outweigh four to one its injurious ones. Instead of being persecuted, it should receive protection."

The Engineering Magazine is authority for the following: "The wrecking of the steamship Paris on the coast of Cornwall and the difficulties encountered in attempting to save her while a number of her compartments forward are filled with water, lead Mr. Richards, in the American Machinist, to suggest the applicability of compressed air. 'There is a means of expelling the water from the filled compartments so obvious, and so certainly effective, that it seems unaccountable that some

engineer has not suggested it before this. Close the hatches of the flooded compartments and drive the water out by forcing air in. It would not make the slightest difference how big the holes might be in the bottom, as the water would be expelled and kept out on the same principle as in the old-fashioned diving bell.' This suggestion carries with it a much larger and more important one—namely, the use of air pumps instead of water pumps to save a leaking ship while afloat. As Mr. Richards well remarks, the work of trying to pump out a leaky ship is not only enormously wasted while it is going on, but it is never finished. If, however, the water leaking into a compartment of a ship be expelled by pumping air into the space, the work is done so soon as the compartment is filled with air down to the level of the leak. After that point is reached the ship is safe, no matter how large the hole, and no further pumping is necessary."

Chlorate of potash has always been regarded by manufacturers and chemists as a nonexplosive, and hence there has been little care taken in handling and storing it. A recent explosion, however, at a large chemical works at St. Helens, in England, seems to disprove this view. A storehouse containing about one hundred and fifty tons of chlorate in the form of both powder and crystals took fire, and almost immediately after the falling in of the roof an explosion of terrible violence occurred, the shock being felt over a distance of twenty miles. The chlorate works were entirely demolished. A large gas holder of the city gas works, containing two hundred and fifty thousand cubic feet of gas, was burst and the gas ignited. Eight hundred tons of vitriol was poured into the streets of the town by the wrecking of ten vitriol chambers in a neighboring alkali works. Houses were unroofed, and in the main streets of the town, a quarter of a mile away, nearly every plate-glass window was demolished. A theory accounting for the explosion, advanced by Mr. J. B. C. Kershaw, in the Engineering and Mining Journal, is that it was due to the sudden and practically simultaneous liberation of all the oxygen from such a mass of chlorate, [Pg 864] combined with the restraining influence of the kegs (the chlorate was packed in kegs of one hundredweight each), and possibly also helped by the presence of much charred wood and the dense volume of smoke. Whatever is the true theory, however, it is evident that our belief in the nonexplosiveness of potassium chlorate must be modified.

NOTES.

A piece of experimental glass pavement was laid in Lyons, in the Rue de la République, last fall, and it is reported to have worn very well thus far. The silicate of which the pavement is composed is called by the manufacturers ceramo-crystal or devitrified glass. It may be finished in various colors and with a rough or smooth surface. The blocks are made by heating broken glass to a temperature of 1,250° C. and then compressing it by hydraulic power. The resulting compound is said to have all the qualities of glass except its transparency.

The New York Agricultural Experiment Station reports of its analyses of sugar beets in 1898 that the average percentage of sugar in the samples analyzed is 14.2, with a coefficient of purity of 85. In general the yield of beets was between nine tons and twenty tons per acre.

An altitude of 12,440 feet, or 366 feet greater than any attained before, was reached in the kite-flying experiments at Blue Hill Observatory, Massachusetts, on February 21st. The flight was begun at twenty minutes to four in the afternoon, with a temperature of 40° and a wind velocity of seventeen miles an hour at the surface. At the highest point reached by the kite the temperature was 12° and the wind velocity fifty miles an hour. Four improved Hargreave kites with curved surfaces, like soaring birds' wings, were used tandem, and the flying line was a steel wire.

The first to be unveiled of a series of tablets to be fixed by the Municipal Council of Bath, England, to mark historical houses is on the house where William Herschel lived in 1780, and was officially unveiled by Sir Robert Ball, April 22d. In a little workshop at the end of the back garden of this house Herschel made his Newtonian reflector, and here he discovered Uranus.

Attention is called by Dr. Martin Ficker to the fact, brought out in his experiments, that cultures of microbes are affected by the glass of the tubes in which they are made. By virtue of differences in composition, different sorts of glass give varying degrees of alkalinity to water in contact with them, and the activity of the bacteria they contain is correspondingly affected.

We have to add to our obituary list of persons in whom science is interested the names of Professor Socin, late of the University of Leipsic, Orientalist, and author of Baedeker's Palestine and Syria and many special works on the Arabic language and dialects; M. N. Rieggenbach, correspondent of the Paris Academy of Sciences, Section of Mathematics, at Olten, Switzerland; Elizabeth Thompson, donor of liberal gifts for scientific purposes, at Stamford, Conn.; she contributed toward the telescope for Vassar College, was a patron of the American Association, and endowed the Elizabeth Thompson Scientific Fund; George Averoff, who died at Alexandria, Egypt, July 27th, leaving, among other bequests, £20,000 to create an agricultural school in Thessaly, and £50,000 to the polytechnic schools at Athens; Charles J. Stillé, ex-Provost of the University of Pennsylvania, under whose administration the institution took a great stride in its development; Mrs. Arvilla J. Ellis, an assiduous student of the fungi, who assisted her husband, J. B. Ellis, in preparing and mounting the five thousand specimens for the North American Fungi and the Fungi Columbiani, and more than two hundred thousand other specimens which were distributed to the botanists of the world, at Newfield, N. J., July 18th; M. Balbiani, Professor of Embryology at the Collége de France; Prof. Pasquale Freda, Director of the Station for Agricultural Chemistry at Rome; Dr. S. T. Jakčič, Professor of Botany and Director of the Botanic Gardens, at Belgrade; Dr. Carl Kuschel, formerly Professor of Physics in the Polytechnic Institute

at Dresden; M. A. de Marbaix, Professor of Zoölogy and Anatomy in the Agricultural Institute at Louvain; Dr. N. Grote, Professor of Psychology and Philosophy in the University of Moscow and editor of a journal devoted to those subjects; Robert Wilhelm Bunsen, the eminent German chemist, of whom a fuller notice will be given; and Sir Edward Frankland, another eminent chemist (English), one of Bunsen's pupils, a member of the Royal Commissions on Water Supply and River Pollution, and author of researches on the luminosity of flame and the effect of the density of a medium on the rate of combustion, died in Norway, aged seventy-four years.

INDEX.

ARTICLES MARKED WITH AN ASTERISK ARE ILLUSTRATED.

THE END.

FOOTNOTES:

[1] Proverbs xxx, 8.

[2] I had arranged with the editor of the New York Medical News for the publication in that journal of a paper on Christian Science, and had so informed Mrs. Stetson.

[3] These medical histories are a part of my serial paper in the New York Medical News of January 28, 1899, *et seq.*

[4] New York Times, June 24, 1899.

[5] Science and Health.

[6] Ibid.

[7] Ibid.

[8] Science and Health.

[9] The Arena, May, 1898.

[10] The commissioners "have no confidence in any system of inquisition or system which requires assessors to be clairvoyants; to ascertain things impossible to be ascertained by the agencies provided in the law; to ascertain the indebtedness of the taxpayer; to ascertain or know who is the owner of property at a given time that can be and is transferred hourly from owner to owner by telegraph or lightning, and that may be transported into or out of the jurisdiction of the assessor with the rapidity of steam, or that requires assessors or taxpayers to make assessments on evidence not admissible in any court, civil or criminal, in any civilized country where witches are not tried and condemned by caprice or malice on village or neighborhood gossip."

[11] Report of the Massachusetts Commission, 1897, p. 74.

[12] The New York commission of 1870 submitted two propositions on this point:

1. Tax the house or building as real estate separately, at the same rate of valuation as the land—that is, fifty per cent—and then assuming that the value of the house or building, irrespective of its contents, be such contents furniture, machinery, or any other chattels whatsoever, is the sign or index which the owner or occupier puts out of his personal property, tax the house or building on a valuation of fifty per cent additional to its real estate valuation, as the representative value of such personal property; or, in other words, tax the land separately on fifty per cent of its fair marketable valuation, and tax the building apart from the land, as representing the owner's personal property, on a *full* valuation, as indicated by the rent actually paid for it or its estimated rental value. Or—

2. Tax buildings conjointly with land as real estate at a uniform valuation; and then as the equivalent for all taxation on personal property, tax the occupier, be he owner or tenant of any building or portion of any building used as a dwelling, or for any other purpose, on a valuation of three times the rental or rental value of the premises occupied. Tenement houses occupied by more than one family, or tenement houses having a rental value not in excess of a fixed sum, to be taxed to the owner as occupier. —*Report*, p. 107.

[13] Massachusetts Report, p. 106.

[14] California vs. Southern Pacific Railroad, 127 U. S., 40.

[15] 93 U. S. Reports, pp. 217, 224.

[16] A recent law of New York is very full on this point:

"The terms 'land,' 'real estate,' and 'real property,' as used in this chapter, include the land itself above and under the water, all buildings and other articles and structures, substructures, and superstructures, erected upon, under, or above, or affixed to the same; all wharves and piers, including the value of the right to collect wharfage, cranage, or dockage thereon; all bridges, all telegraph lines, wires, poles, and appurtenances; all supports and inclosures for electrical conductors and other appurtenances upon, above, and underground; all surface, underground, or elevated railroads, including the value of all franchises, rights or permission to construct, maintain, or operate the same in, under, above, on, or through streets, highways, or public places; all railroad structures, substructures, and superstructures, tracks, and the iron thereon, branches, switches, and other fixtures permitted or authorized to be made, laid, or placed on, upon, above, or under any public or private road, street, or grounds; all mains, pipes, and tanks laid or placed in, upon, above, or under any public or private street or place for conducting steam, heat, water, oil, electricity, or any property, substance, or product capable of transportation or conveyance therein, or that is protected thereby, including the value of all franchises, rights, authority, or permission to construct, maintain, or operate in, under, above, upon, or through any streets, highways, or public places, any mains, pipes, tanks, conduits, or wires, with their appurtenances, for conducting water, steam, heat, light, power, gas, oil, or other substance, or electricity for telegraphic, telephonic, or other purposes; all trees and underwood growing upon land, and all mines, minerals, quarries, and fossils in and under the same, except mines belonging to the State. A franchise, right, authority, or permission, specified in this subdivision, shall for the purposes of taxation be known as a 'special franchise.' A special franchise shall be deemed to include the value of the tangible property of a person, copartnership, association, or corporation, situated in, upon, under, or above any street, highway, public place, or public waters, in connection with the special franchise. The tangible property so included shall be taxed as a part of the special franchise." The reason for classing franchises as real estate was that under the existing laws of New York a franchise could not be assessed as personal property, as the bonded debt could then be deducted, leaving little or nothing to be taxed.

[17] *Idola* (ειδωλα), though commonly rendered idols, would here undoubtedly be more correctly translated phantoms or specters. With this explanation, however, I shall usually employ the more familiar word.

[18] Novum Organon, edited by Thomas Fowler, introduction, p. 132.

[19] Animals and Plants under Domestication, vol. i, p. 6.

[20] Logic, ninth edition, Book V, chapter v, § 6.

[21] Leviathan, Part I, chapter xi.

[22] It is well to remember that if common sense had said the last word about the matter, the Ptolemaic theory of the universe would still stand unshaken.

[23] The metaphor is taken from the opening of the seventh book of Plato's Republic.

[24] *Cf.* Spencer's Introduction to the Study of Sociology, chapters viii-xii.

[25] The need of a language of rigid mathematical precision for the purposes of philosophic thought and discussion has long been the subject of remark. Hence Bishop Wilkins's Essay toward a real character and a philosophic language (1668), and the earlier Ars Signorum of George Dalgarno—boldly presented by its inventor as a "remedy for the confusion of tongues, as far as this evil is reparable by art." We may give these ingenious authors full credit for the excellent intentions with which they set out on impossible undertakings. A philosophic language may perhaps be attained in the millennium, but then probably it will be no longer needed. Meanwhile readers interested in the history of the mad scheme called Volapük may find some curious matter in these rare works.

[26] History of Philosophy, vol. ii, pp. 95, 96.

[27] This quotation is *not* from Bacon.

[28] Present Condition of Sociology in the United States. Ira W. Howarth. Annals of the American Academy, September, 1894.

[29] Fairbanks. Introduction to Sociology, p. 1.

[30] See for the following: H. H. Powers. Terminology and the Sociological Conference, in Annals of the American Academy, March, 1895.

[31] See Giddings. Principles of Sociology, p. 29.

[32] Lester F. Ward. Purpose of Sociology. American Journal of Sociology, November, 1896.

[33] Ward. Ibidem.

[34] See Giddings. Principles of Sociology, chap. i.

[35] In American Journal of Sociology, September, 1896.

[36] In Annals of the American Academy, July, 1896.

[37] See Giddings. Principles of Sociology, chap. i.

[38] Small and Vincent. Introduction to the Study of Society, p. 46

[39] Fairbanks. Introduction to Sociology, p. 44.

[40] Fairbanks. Ibidem.

[41] Small and Vincent. Introduction to the Study of Society, p. 218.

[42] Herbert Spencer. Study of Sociology, chaps. iv to xii.

[43] The Nation, vol. lx, p. 351. Review of Small and Vincent's Introduction to the Study of Society.

[44] Quoted by Vincent in American Journal of Sociology, January, 1896, p. 487.

[45] Higher Medical Education. The True Interest of the Public and of the Profession. By William Pepper, M. D., LL. D. Philadelphia: J. B. Lippincott Company, 1894.

[46] Report of the Provost of the University of Pennsylvania, from October, 1892, to June, 1894. Philadelphia, 1894.

[47] See the article on Science at the University of Pennsylvania, in Popular Science Monthly for August, 1896.

[48] Proceedings at the Opening of the William Pepper Laboratory of Clinical Medicine, December 4, 1895. Philadelphia, 1895.

[49] Imperial Democracy. A Study of the Relation of Government by the People, Equality before the Law, and other Tenets of Democracy, to the Demands of a Vigorous Foreign Policy, and other Demands of Imperial Dominion. By David Starr Jordan. New York: D. Appleton and Company. Pp. 293. Price, $1.50.

[50] Man Past and Present. By A. H. Keane, F. R. G. S. (Cambridge Geographical Series). Cambridge, England: At the University Press. New York: The Macmillan Company. Pp. 584. Price, $3.

[51] Recollections of the Civil War. With the Leaders at Washington and in the Field in the Sixties. By Charles A. Dana. New York: D. Appleton and Company. Pp. 296. Price, $2.

[52] The Fairy-Land of Science. New York: D. Appleton and Company. Pp. 252.

[53] True Tales of the Insects. By L. N. Badenoch. London: Chapman & Hall. Pp. 253.

[54] Practical Agriculture. By Charles C. James. American edition edited by John Craig. New York: D. Appleton and Company. Pp. 203. Price, 80 cents.

[55] From a paper read by Sir H. T. Wood, at the International Congress, on Technical Education, at Venice, May, 1899.

Transcriber's Notes:

Obvious printer's errors have been repaired, other inconsistent spellings have been kept, including inconsistent use of hyphen (e.g. "far reaching" and "far-reaching").

Some illustrations were relocated to correspond to their references in the text.

Pg. 816, word "of" added to sentence "...acceleration of social evolution."

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