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*** START OF THE PROJECT GUTENBERG EBOOK APPLETONS' POPULAR SCIENCE MONTHLY, JUNE 1899 ***

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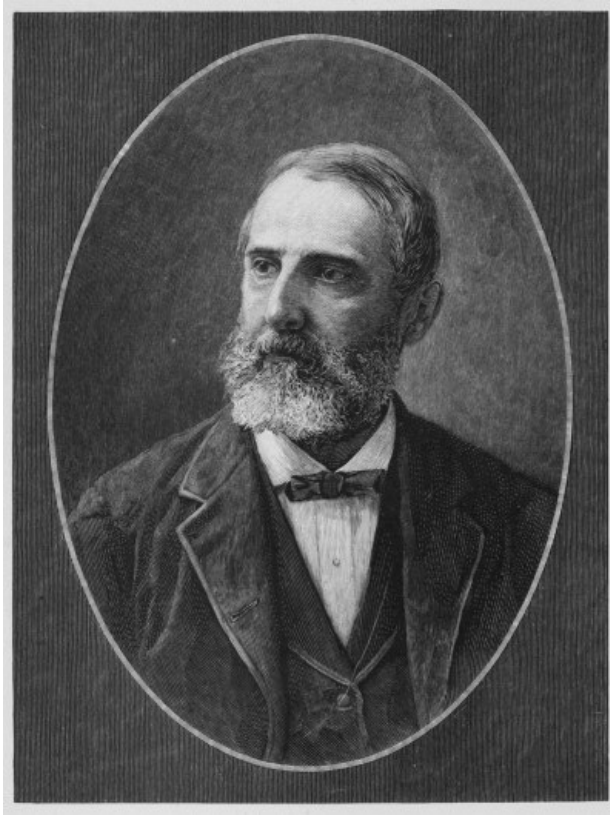
**APPLETONS'
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WILLIAM JAY YOUMANS

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THOMAS EGLESTON.

APPLETONS' POPULAR SCIENCE MONTHLY.

JUNE, 1899.

NEW METHOD OF ESTIMATING THE AGE OF NIAGARA FALLS.

By G. FREDERICK WRIGHT.

Both the interest and the importance of the subject make it worth while to follow out every clew that may lead to the approximate determination of the age of Niagara Falls. During this past season, in connection with some work done for the New York Central Railroad upon their branch line which runs along the eastern face of the gorge from Bloody Run to Lewiston, I fortunately came into possession of data from which an estimate of the age of the falls can be made entirely independent of those which have heretofore been current. The bearing and importance of the new data can best be seen after a brief *résumé* of the efforts heretofore made to solve this important problem.

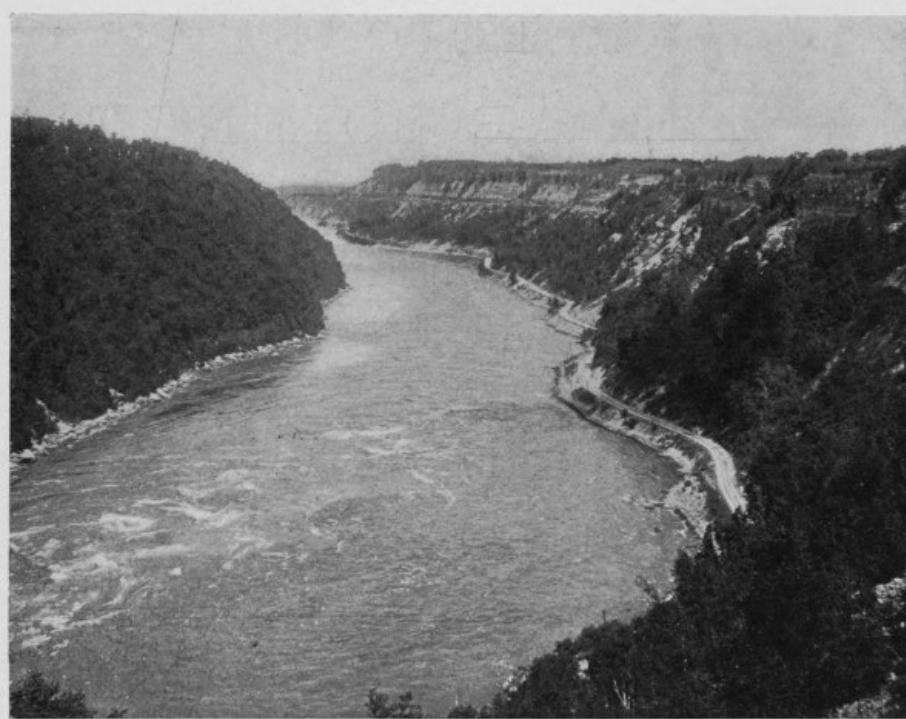


FIG. 1.—Looking north from below the Whirlpool, showing the electric road at the bottom of the east side of the gorge, and the steam road descending the face about halfway to the top.

In 1841 Sir Charles Lyell and the late Prof. James Hall visited the falls together; but, having no means of determining the rate of recession, except from the indefinite reports of residents and guides, they could place no great confidence in the "guess," made by Sir Charles Lyell, that it could not be more than one foot a year. As the length of the gorge from Lewiston up is about seven miles, the time required for its erosion at this rate would be thirty-five thousand years. The great authority and popularity of Lyell led the general public to put more confidence in this estimate than the distinguished authors themselves did. Mr. Bakewell, another eminent English geologist, at about the same time estimated the rate of the recession as threefold greater than Lyell and Hall had done, which would reduce the time to about eleven thousand years.

But, to prepare the way for a more definite settlement of the question, the New York Geological Survey, under Professor Hall's direction, had a careful trigonometric survey of the Horseshoe Fall made in 1842, erecting monuments at the points at which their angles were taken, so that, after a sufficient lapse of time, the actual rate of recession could be more accurately determined. In 1886 Mr. Woodward, of the United States Geological Survey, made a new survey, and found that the actual amount of recession in the center of the Horseshoe Fall had proceeded at an average rate of about five feet per annum. The subject was thoroughly discussed by Drs. Pohlman and Gilbert, at the Buffalo meeting of the American Association in 1886, when it was proved, to the satisfaction of every one, that, if the supply of water had been constant throughout its history, the whole work of eroding the gorge from Lewiston to the Falls would have been accomplished, at the present rate of recession, in about seven thousand years.

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But the question was immediately raised, Has the supply of water in Niagara River been constant? It was my privilege, in the autumn of 1892 (see Bulletin of the Geological Society of America, vol. iv, pp. 421-427), to bring forth the first positive evidence that the water pouring over Niagara had for a time been diverted, having been turned through Lake Nipissing down the valley of the Mattawa into the Ottawa River, following nearly the line of Champlain's old trail and of the present Canadian Pacific Railroad. The correctness of this inference has been abundantly confirmed by subsequent investigations of Mr. F. B. Taylor and Dr. Robert Bell.^[A] The occasion of this diversion of the drainage of the Great Lakes from the Niagara through the Ottawa Valley was the well-known northerly subsidence of the land in Canada at the close of the Glacial period. When the ice melted off from the lower part of the Ottawa Valley the land stood five hundred feet lower than it does now, but the extent of this subsidence diminished both to the south and the west, making it difficult to estimate just how great it was at the Nipissing outlet. A subsidence of one hundred feet at that point, however, would now divert the waters into the Ottawa River. That it actually was so diverted is shown both by converging high-level shore lines at the head of the Mattawa Valley and by the immense delta deposits at its junction with the Ottawa, to which attention was first called in my paper referred to above.

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The indeterminate question which remained was, At what rate did this postglacial elevation of land which has brought it up to its present level proceed? Dr. Gilbert, Professor Spencer, and Mr. Taylor have brought forth a variety of facts which, according to their interpretation, show that this rate of elevation was so slow that from twenty thousand to thirty thousand years was required to restore to the Niagara River its present volume of water. Their arguments are based upon the varying width and depth of the Niagara gorge, proving, as they think, the presence of a smaller amount of water during the erosion of some portions. Dr. Gilbert has also brought forward some facts concerning the extent of supposed erosion produced by the diverted waters of

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Niagara when passing over an intermediate outlet between Lake Simcoe and Lake Nipissing. But the difficulty of obtaining any safe basis for calculation upon these speculative considerations has increased the desire to find a means of calculation which should be independent of the indeterminate problems involved. That I think I have found, and so have made a beginning in obtaining desired results. *The new evidence lies in the extent of the enlargement of the mouth of the Niagara gorge at Lewiston since the recession of the falls began.*

It is evident that the oldest part of the Niagara gorge is at its mouth, at Lewiston, where the escarpment suddenly breaks down to the level of Lake Ontario. The walls of the gorge rise here to a height of three hundred and forty feet above the level of the river. It is clear that from the moment the recession of the falls began at Lewiston the walls of the gorge on either side have been subject to the action of constant disintegrating agencies, tending to enlarge the mouth and make it V-shaped. What I did last summer was to measure the exact amount of this enlargement, and to obtain an approximate estimate of the rate at which it is going on.^[B] As this enlargement proceeds wholly through the action of atmospheric agencies, the conditions are constant, and it is hoped that sufficiently definite results have been obtained to set some limits to the speculations which have been made upon more indefinite grounds.

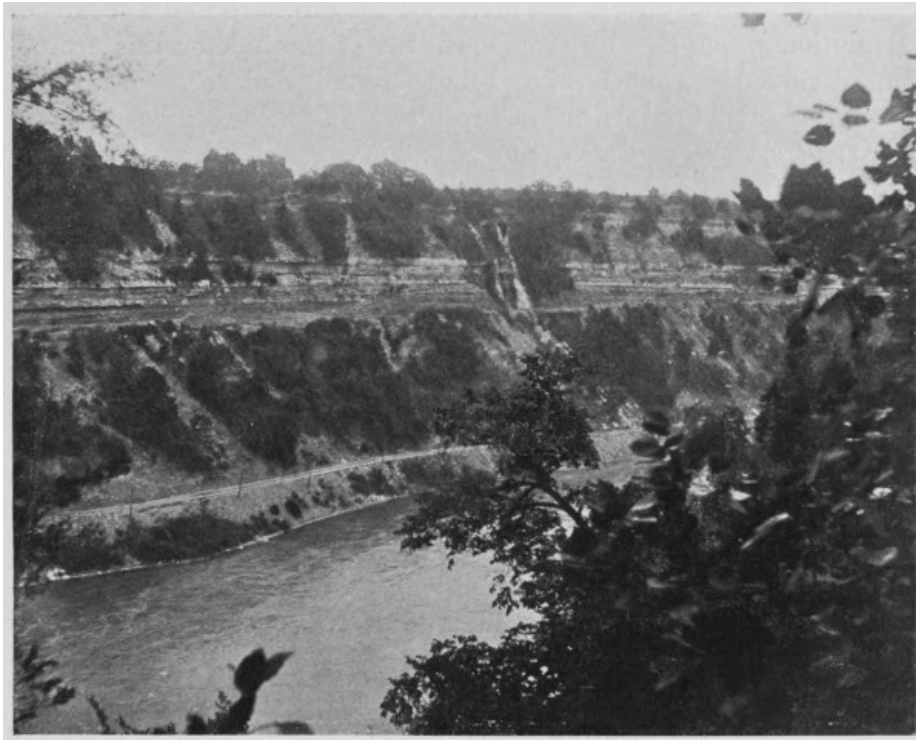


FIG. 2.—View looking east across the gorge near the mouth, showing the railroads and the outcrops of Clinton and Niagara limestones above the steam road.

The face on the east side of the gorge presents a series of alternate layers of hard and soft rocks, of which certain portions are very susceptible to the disintegrating agencies of the atmosphere. The summit consists of from twenty to thirty feet of compact Niagara limestone, which is underlaid by about seventy feet of Niagara shale; which in turn rests upon a compact stratum of Clinton limestone about twenty feet thick, which again is underlaid by a shaly deposit of seventy feet, resting upon a compact stratum of Medina sandstone twenty feet thick, below which a softer sandstone, that crumbles somewhat readily, extends to the level of the river.

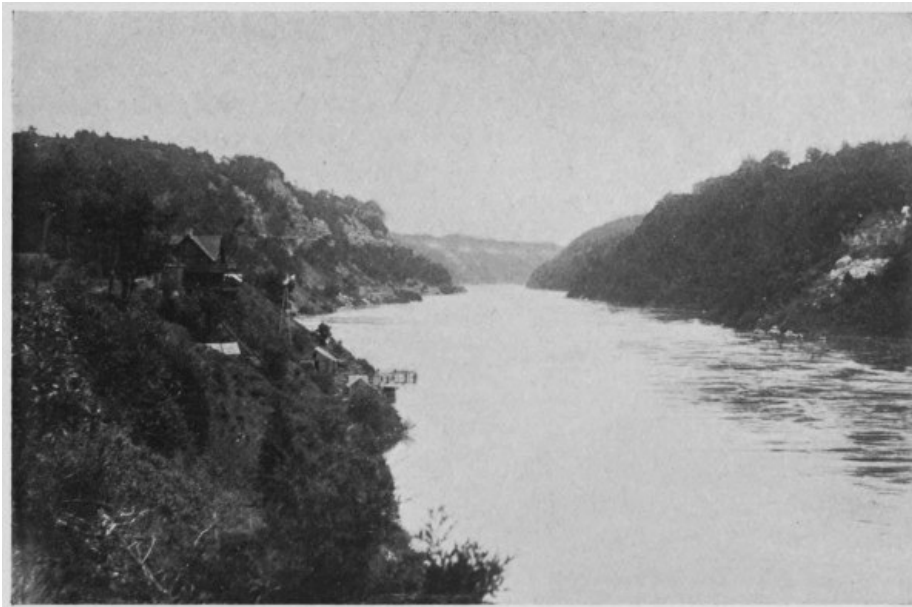


FIG. 3.—Looking up the gorge from near Lewiston, showing on the left the exposed situation of the eastern face of the gorge at the extreme angle, where the measurements were made.

The present width of the river at the mouth of the gorge is seven hundred and seventy feet. It is scarcely possible that the original width of the gorge was here any less than this, for in the narrowest places above, even where the Niagara limestone is much thicker than at Lewiston, it is nowhere much less than six hundred feet in width. Nor is it probable that the river has to any considerable extent enlarged its channel at the mouth of the gorge at the water level. On the contrary, it is more probable that the mouth has been somewhat contracted, for the large masses of Niagara and Clinton limestone and Medina sandstone which have fallen down as the shales were undermined have accumulated at the base as a talus, which the present current of the river is too feeble to remove. This talus of great blocks of hard stone has effectually ripped the banks, and really encroached to some extent upon the original channel.

We may therefore assume with confidence that the enlargement, under subaërial agencies, of the mouth of the gorge at the top of the escarpment has been no greater than the distance from the present water's edge to the present line of the escarpment at the summit of the Niagara limestone. This we found to be three hundred and eighty-eight feet—that is, the upper stratum of hard rock on the east side of the gorge had retreated that distance, through the action of atmospheric agencies, since the formation of the gorge first began. The accompanying photogravures and diagram will present the facts at a glance. The total work of enlargement on the east side of the gorge has been the removal of an inverted triangular section of the rock strata three hundred and forty feet high and three hundred and eighty-eight feet base, which would be the same as a rectangular section of one hundred and ninety-four feet base. From this one can readily see that if the average erosion has been at the rate of one quarter of an inch per annum, the whole amount would have fallen down in less than ten thousand years; while if the time is lengthened, as some would have it, to forty thousand years, the rate would be reduced to one sixteenth of an inch per year.

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Fortunately, the construction of the railroad along the face of the eastern wall of the gorge affords opportunity to study the rate of erosion during a definite period of time. The accompanying photogravures will illustrate to the eye facts which it is hard to make impressive by words alone. The course of the road is diagonally down the face of the gorge from its summit for a distance of about two miles, descending in that space about two hundred feet to the outcrop of hard quartzose Medina sandstone. The lower mile of this exposure presents the typical situation for making an estimate of the rate at which the face is crumbling away.



FIG. 4.—Nearer view of the upper portion of the face near the mouth, showing the exposure of the situation at that point.

Beginning at what used to be known as the "Hermit's Cave," near the Catholic College grounds, where the Niagara shale is well exposed, and extending to the outer limit of the gorge, the height of the face above the railroad averages one hundred and fifty feet. Now, the crumbling away of the superincumbent cliffs gives continual trouble to the road. Three watchmen are constantly employed along this distance to remove the *débris* which falls down, and to give warning if more comes down than they can remove before trains are due. The seventy feet of Niagara shale, and the equal thickness of shaly Medina rock which underlies the Clinton limestone, are constantly falling off, even in fair weather, as any one can experience by walking along the bank; while after storms, and especially in the spring, when the frost is coming out, the disintegration proceeds at a much more rapid rate. Sometimes two or three days are required by the whole force of section hands to throw over the bank the result of a single fall of material.

At a rate of one quarter of an inch of waste each year the amount of *débris* accumulating for removal on the track along this distance would be only six hundred and ten cubic yards per annum—that is, if six hundred and ten cubic yards of material falls down from one mile of the face of the wall where it is a hundred and fifty feet high, the whole amount of enlargement of the mouth of the gorge would be accomplished in less than ten thousand years. Exact accounts have not been kept by the railroad; but even a hasty examination of the face of the wall makes it sure that the actual amount removed has been greatly in excess of six hundred yards annually. This estimate is based partly on the impression of the railroad officials as to the cost of removal, and partly on the impressions of the watchmen who spend their time in keeping guard and in the work of removing it.



FIG. 5.—Showing extent of erosion at base of the Niagara shale since 1854. (See description in the text.)

But that is not all. The accompanying photogravures indicate an actual amount of removal over a part of the area enormously in excess of the rate supposed. Fig. 5 shows a portion of the precipice, a hundred feet high, where the road first comes down to the level of the Clinton limestone, and where, consequently, the whole thickness of the Niagara shale is accessible to examination. Fortunately, Patrick MacNamara, the watchman at this station, was a workman on the road at the time of its construction in 1854, and has been connected with the road ever since, having been at his present post for twelve years. We have therefore his distinct remembrance, as well as the appearance of the bank, to inform us where the face of the original excavation then was. In the picture he is standing at the original face, while the other figure is nearly at the back of the space which has been left empty by the crumbling away of the shale. The horizontal distance is fully twenty feet, and the rocks overhang to that amount for the whole distance exposed in the photograph. All this amount of shale has fallen down in forty-four years, making a rate many times larger than the highest we have taken as the basis of our estimate. Of course, this rate for the crumbling away of the Niagara shale on its fresh exposure is much in excess of the average rate for a long period of time; but it is clear that the rate of erosion at the base of the Niagara limestone at the mouth of the gorge can never have been sufficiently slow to reduce the total average much below the assumed rate of a quarter of an inch a year.

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To impress the truth of this statement it is only necessary to follow the progress, in imagination, of the crumbling process which has brought the side of the gorge to its present condition. At first the face of the gorge was perpendicular, the plunging water making the gorge as wide at the bottom as at the top. At successive stages the strata of shale on the side would crumble away, as is shown in our photograph, and undermine the strata of hard rock. The large fragments would fall to the bottom, and, being too large to be carried away by the current, would form the talus to which we have already referred, which would grow in height with every successive century. The actual progress of the enlargement would thus be periodic, and not capable of measurement by decades; but after centuries the progress would be clearly marked, and especially whenever there was a falling away of the lower stratum of compact Medina sandstone, which is about two hundred feet below the top, would a new cycle of rapid disintegrations in the superincumbent strata follow.

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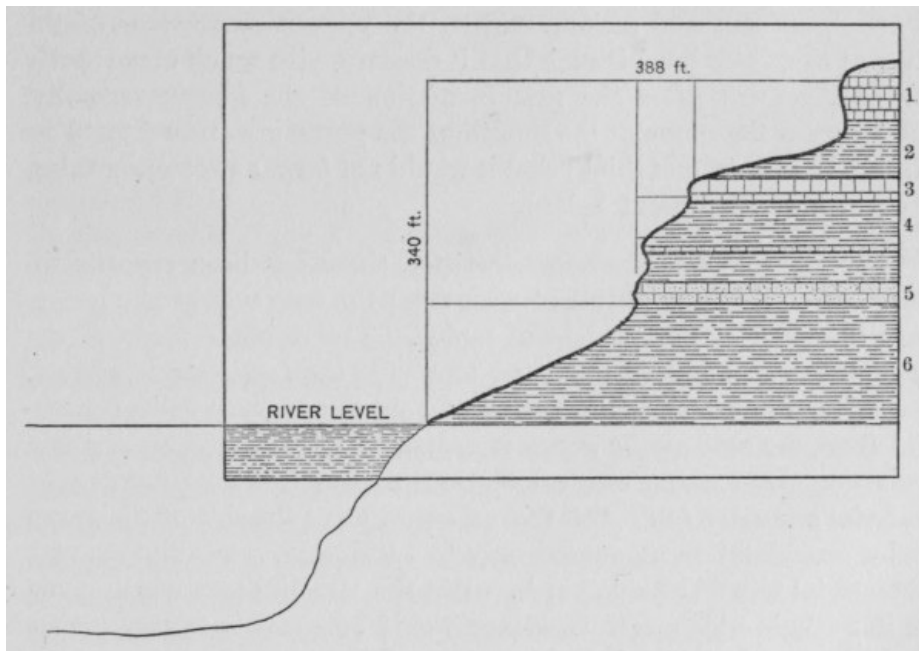


FIG. 6.—Section, drawn to equal vertical and horizontal scale, showing enlargement of Niagara gorge on the east side at its mouth at Lewiston: 1, Niagara limestone, 20 to 30 feet; 2, Niagara shale, 70 feet; 3, Clinton limestone, 20 to 30 feet; 4, Clinton and Medina shale, 70 feet; 5, Quartzose Medina sandstone, 20 to 30 feet; 6, softer Medina sandstone, 120 feet above water level.

An important point to be noticed, and which is evident from two of the reproduced photographs (Figs. 3 and 4), is that the talus has never reached up so high as to check the disintegration at the mouth of the gorge of the Niagara shale and limestone which form the upper one hundred feet of the face, and which exhibit the maximum amount of enlargement which has taken place. The thickness of the Niagara limestone is here so small that it has not been so important an element in forming the talus as it has been farther up the stream, where it is two or three times as thick. Now, while our original supposition was that one quarter of an inch annually was eroded from the upper two hundred feet, this would involve the erosion of a half inch per annum over the top of the gorge to bring the calculation within the limit of ten thousand years. It certainly is difficult for one who examines the facts upon the ground to believe that the crumbling away of this exposed Niagara shale could have been at any less rate than that; so that the estimate of about ten thousand years for the date of that stage of the Glacial period in which Niagara River first began its work of erosion at Lewiston (an estimate which is supported by a great variety of facts independent of those relating to the Niagara gorge) is strongly confirmed by this new line of evidence.

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So far as I can see, the only question of serious doubt that can be raised respecting this calculation will arise from the possible supposition that, when the eastern drainage over the Niagara channel began, the land stood at such a relatively lower level as would reduce the height of the fall to about half that of the present escarpment at that point; when it might be supposed that a protecting talus had accumulated which would interrupt the lateral erosion for the indefinite period when the drainage was being drawn around by way of the recently opened Lake Nipissing and Mattawa outlet. Then, upon the resumption of the present line of drainage, with the land standing at nearly its present level, the talus may have been undercut, and so fallen down to leave the upper strata exposed as at present. But there does not seem to be sufficient warrant for such a supposition to make it necessary seriously to entertain it, while the objections to it are significant and serious. First, the present narrowness of the river at the water level is such that it does not give much opportunity for enlargement after the first formation of the gorge; secondly, the Niagara limestone at the mouth of the gorge is so thin (stated by Hall to be twenty feet thick) that it would not form a protecting talus, even at half its present height.

P. S.—Since the above was written there has been reported in the papers an immense fall of rock from the east side of the gorge, near the head of the Whirlpool rapids. The estimate made of the amount is one hundred thousand tons. If that estimate is correct, it is a very impressive illustration of how the average fall of material from the side of the gorge is occasionally increased by a single instance. In making our calculations above, the total amount of material annually falling off from the portion of the side of the gorge under consideration amounted only to 1,237 tons, while the amount of material was 611 cubic yards. But the 100,000 tons which came off in a single slide a few weeks ago would be equal to twenty inches in thickness from the whole face of the cliff, where our estimate was only a quarter of an inch.

N. B.—In the diagram (Fig. 6) extend the Niagara shale (2) up to occupy lower two layers of (1), thus making Niagara limestone (1) half as thick as now.

A piece of skin which the authors maintained to be of great antiquity and to have belonged to the extinct mylodon or ground sloth, found in a cave in Patagonia, was recently exhibited to the London Zoölogical Society by Mr. A. Smith Woodward and Dr. F. P. Moreno.

ABUSE OF PUBLIC CHARITY.

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By BIRD S. COLER,

COMPTROLLER OF THE CITY OF NEW YORK.

Ten per cent of all the human beings who die in New York city are buried in Potter's Field at public expense; but the records of organized charity, official and semiofficial, show that less than one per cent of the living are paupers or dependent persons. There are two explanations of the difference between the number of living poor and penniless dead. The chief one is that abuse of public charity has grown to such proportions that the city has become the Mecca of the chronic idlers and tramps of the entire country. 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. No magic wand of ancient fable was ever more potent to unlock the gates of castle or prison than the name of charity is to open a way to the public treasury. The liberal and well-nigh indiscriminate giving of the money of the taxpayers for the relief of sickness and poverty has been commanded by law, sanctioned by custom, and approved by public opinion until the possibility of checking or reforming the abuse grows more and more remote as the burden increases and the evil results multiply.

The city of New York gives annually to public charity more than \$5,000,000, and contributes indirectly \$2,000,000 more. Of the money raised by taxation for city purposes proper (State taxes, interest, and county expenses eliminated), almost twelve per cent is properly chargeable to relief of poverty and sickness. Of this expenditure more than \$3,000,000 is paid to private institutions and societies over which the city authorities have no control or supervision. The payments are made in compliance with the provisions of acts of the State Legislature. The only provision in these laws that enables the city officers to protect the treasury from fraud is a clause under which the comptroller is permitted to verify the bills of the institutions for the care of committed persons. There is a constitutional safeguard against outright swindling of the city, in the requirement that charitable institutions shall be inspected and their bills approved by the State Board of Charities, but the system is open to many abuses where the public officers are powerless.

The present comptroller of the city has found that a number of alleged charitable institutions and societies receiving money from the city apply nearly all their funds to the payment of salaries of officers and employees, while their relief work is very limited and of doubtful character. Other societies, he found upon investigation, really encourage professional beggars without in any case relieving deserving poor. A few cases were so flagrant in their abuse of public charity that the further payment of city money to the societies was refused. In one case he found that a society which claimed a board of directors and numerous officers was really managed by one person, who in one year had received \$1,500 from the city and \$70 from all other sources, and had expended \$1,300 of the amount for salaries and \$40 for the relief of the destitute.

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The Department of Public Charities, for the maintenance of which the sum of \$1,941,215 is appropriated for the year 1899, is controlled entirely by the city. The balance of the \$5,000,000 appropriated annually for the same general purpose is divided among more than two hundred societies and institutions managed by corporations or private individuals. In theory none of these private institutions is supported by the city, the municipality merely paying to them a fixed sum, which is supposed to be supplemented by private donations. In reality nine tenths of them could not exist six months without the money they receive from the public treasury. Very few of these semipublic charities have an income from all other sources equal to the appropriation from the city.

The city pays for the support of a child in a private institution the sum of \$110 a year, and the average allowance for the maintenance of an adult is \$150. The percentage of children among the dependent persons is almost three to one, so the \$5,000,000 public charity fund would feed and clothe more than forty thousand persons each year if applied directly to that purpose. In the distribution of this great sum of public money, however, fully \$2,000,000 of the amount is absorbed in the payment of salaries and expenses, and therein exists an abuse of public charity so great that the present comptroller of the city some months ago appealed to the Legislature for relief in the form of legislation which would enable the local authorities to stop payments to many societies. There are numerous small institutions, some of them having the indorsement and moral support of leading citizens, that spend from sixty to eighty per cent of all the money they receive in the payment of salaries, and in one case discovered by the comptroller the expenses absorbed ninety-four per cent of the total income of the society!

There is no evidence that any of these societies are deliberately dishonest in their dealings with

the city and the public. They are as a rule conducted by men and women whose motives are good, but who have no experience or practical knowledge to fit them for the management of a charitable institution. They are easily imposed upon by professional beggars, and in most cases fail in their well-meant efforts to reach and relieve the deserving who are in actual need. Most of the small organizations that waste public money in misdirected charity are controlled by women of eminent respectability, but with no knowledge whatever of the details of the work they have undertaken. The result in many cases has been that they employ enough help to absorb the bulk of the money received without realizing that they are doing more harm than good.

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The city does not spend its own money cheaply. Of the appropriation of \$1,941,215 for the support of the Department of Charities for the current year the sum of \$529,626 is allowed for the payment of salaries of commissioners and employees. No private business could long endure if conducted on such a basis. Some of the institutions where hundreds of homeless waifs from the streets are cared for—institutions semipublic in character, managed by men of more than local reputation as experts in such work, societies founded by men and women whose lives have been devoted to doing good—show by their annual reports that more than half their income is paid out in salaries. One institution that received \$30,000 from the city in 1898 and \$20,000 from all other sources, reported a salary account of \$31,000. Another, receiving \$100,000 from the city and \$120,000 in donations, had a salary account of \$115,000. For every five persons supported by public charity there are three persons employed on salary in the work of relief. Of every five dollars paid out by the city treasury to relieve the sick and destitute, two dollars is absorbed by the salary and expense accounts.

The theory of the law under which city money is paid to private charitable institutions is that they relieve the municipal authorities of the care of a certain number of persons who would otherwise become public charges to be maintained in the hospitals, asylums, or homes owned by the city. It is also a popular theory that young children who have become a public charge will receive better care and training in a home controlled by a private society than they would in a public institution. Appropriations and legislation are also obtained by private organizations on the representation that for every dollar paid to them by the city or State an equal amount will be contributed by founders and subscribers. This representation is not always true, and in many cases it happens that when a society begins to receive money from the city private contributions fall off. When the city authorities first took up the question of caring for homeless and destitute persons and found that they had to deal with a grave problem, some of the private charitable institutions were already in existence and came forward with offers to share the burden. At that time it was considered a good business arrangement for the city to use private societies in the work of relief. This plan, it was expected, would save the city considerable money, because the officers of the societies would contribute their services, and the cost of applying public charity to necessary relief would in that way be reduced to a minimum. That expectation has not been realized. With the rapid increase of necessity and demand for public relief the expenses of administration of the societies have increased out of all proportion to the work accomplished. In the beginning the city authorities shirked a public duty, and by giving city money to private persons who were willing to relieve them of a burden they invited the creation of new societies and a steadily increasing demand for more funds.

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Of the two hundred and twenty charitable societies that receive money from the city more than one hundred have been organized during the past ten years. The records of the finance department and the annual reports of these new organizations show that many of them have received from the city sixty to ninety per cent of all the funds they have handled, and that almost the same percentage of their total income was charged to expenses, the chief item of expense in every case being the payment of salaries to officers. Year after year the promoters and officers of these small organizations appear before the city authorities when the annual budget is to be passed, and, attempting to excuse the poor showing they make, say, in pleading for a larger appropriation, "We hope to do better next year." The most liberal-minded defender of indiscriminate public charity would find it difficult to excuse the existence of some of these societies.

There are scores of small organizations helping to spend public money that are unknown to the general public. In fact, some of them are never heard of except when their officers appear before the Board of Estimate once a year to ask for more money. There is a society, organized for the purpose of supplying clothing to shipwrecked sailors, which for several years obtained a small appropriation from the city. When the officers requested an increase of the amount allowed, the city authorities asked for some particulars of the work done. The report submitted in reply showed that the society had received, in addition to the money obtained from the city, several donations of second-hand clothing and one box of wristlets (knit bands to be worn on the wrists); had sent to a sailor shipwrecked on the coast of Oregon a suit of underwear, a pair of hose, and a rubber coat; to a crew wrecked on the reefs of Florida some shoes and oilskin caps. There was no report of relief or clothing supplied to a sailor or any other person in the city or State of New York, but there was a charge for salaries that almost balanced the amount received from the city treasury.

Another of the minor institutions is a society that is engaged in an original method of charitable work. The agents of this society, or the members themselves, go out into the slums of the city on Sunday mornings and gather in a number of tramps. The homeless wanderers are assembled in a room hired for the purpose and supplied with a warm breakfast, after which they are compelled to listen to a sermon and a lecture. They are then allowed to depart and live as best they can until

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the following Sunday. For a number of years this society has received a small appropriation from the city on the ground that it is a useful public charity. To all of these small societies, no matter what may be their alleged field of charitable work, city money is appropriated without specific knowledge of the exact purpose to which it is applied. By legislation or petition, backed by the influence of prominent citizens, scores of these petty organizations, some of them merely a fad or whim of an idle man or woman, have been placed on the list of semipublic charities to be aided at the expense of the taxpayers, and there they remain year after year without so much as a serious inquiry as to their merits or the work they accomplish. The city authorities who grant the appropriations do not and can not know how the money they give to such societies is to be expended, because they have no legal authority to investigate the conduct of such institutions. The city officers, therefore, are not to blame. The fault seems to rest primarily upon that condition of public opinion that is cheerfully tolerant of any fraud committed in the name of charity, and secondly upon the members of the Legislature who vote without question or investigation for all legislation asked for by any benevolent person or society.

To the large charitable and correctional institutions of established reputation, to which children or pauper adults are committed by the local authorities, city money is appropriated on a business basis. A fixed sum is paid for the support of each committed person, and the taxpayers may know what they are getting for their money. While the city authorities can not regulate the expenses or salaries in these institutions, they know that the city is paying for a specific service and that the work is performed. That it might be done better or more cheaply need not concern them. But to the institutions and societies that do not undertake to support dependent persons, but engage in indiscriminate charitable work, the giving of city money is as doubtful a method of relieving the deserving poor as throwing coin in the streets.

The appropriation of city money made for 1899 direct to two hundred and fifteen charitable and correctional institutions and societies amounts to \$1,784,846. The appropriations from the excise funds to institutions that support pauper children and adults will slightly exceed \$1,000,000. The county of New York pays to State and private charitable institutions for the same period the sum of \$118,682; Kings County, \$82,669; and Richmond County, \$4,845; all of which comes out of the general treasury. The money received for licenses for theaters, concert and music halls, amounting to \$50,000 a year, is divided among eighty-two private societies and institutions. This makes an aggregate of \$3,000,000 paid out of the city treasury annually and expended under the direction of private organizations. With the exception of less than \$100,000 it is all appropriated under the provisions of special acts of the Legislature, or sections of the city charter, and the city officers have no control whatever over the methods of expenditure or the work undertaken by the societies that receive the money. Under such a system the possibilities for abuse of public charity are well-nigh unlimited.

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These direct appropriations of money do not represent all of the city's contribution to the cause of charity. The property of all the charitable institutions and societies is exempt from taxation and from assessments for public improvements. The tax commissioners report that the assessed value of the property of such organizations is \$70,781,990. At the present rate of taxation this means a loss to the city of more than \$1,400,000 a year. The assessments upon the same property for public improvements exceed \$100,000 a year, which is paid by the city. These exemptions materially affect the tax rate as well as the bonded indebtedness and annual interest charges of the city, so that the yearly contribution of the taxpayers of New York to charity is nearly if not quite \$7,000,000, or about fifteen per cent of the direct expenses of the city government.

Some figures from the budget for 1899 will show the relative cost of caring for the poor. The city will pay for public education \$13,040,052; for police, \$11,797,596; for the fire department, \$4,443,664; for the health department, \$1,110,538; for lighting, \$2,000,000; for water, \$1,450,817; for cleaning the streets, \$4,575,800; for parks, \$1,729,235; for paving and repaving streets, \$2,520,099; and for charity direct and indirect, \$7,000,000.

The chief abuses of the present system of public charity are the extravagant expenditures for salaries and the steady and rapid increase of pauperism due to the misdirected efforts of the inexperienced persons who control so many of the smaller societies that receive city money.

One of the oldest and most important charitable organizations in the city is the Children's Aid Society. The report of the treasurer for 1898 shows the following expenditures:

Industrial schools—		
Salaries of superintendent and teachers	\$106,265.71	
Rent of schoolrooms	5,119.26	
Books and school supplies	5,178.54	
Provisions	8,509.70	
Clothing and special relief	5,512.56	
Fuel, gas, repairs, etc.	20,497.88	

Sick Children's Mission		\$655.48
Children's Summer Home		9,405.37
Health Home		8,307.45
Farm for Boys—Summer Charities		2,719.59
Brace Memorial Lodging House		12,914.13

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Elizabeth Home for Girls	10,366.33
Tompkins Square Lodging House	7,546.38
West Side Lodging House	9,079.26
East Side Lodging House	1,848.06
Forty fourth Street Lodging House	7,948.56
Fogg Lodging House	1,942.26
Brace Farm School	12,150.64
Reading rooms	402.96
Medical examinations	312.00
Salaries, executive officers	8,659.92
Immigration, fares, food, clothing, etc.	30,162.69
Reinvestment, bonds sold	29,902.50
Amount due treasurer, November 1, 1898	435.71
Printing, stationery, car fares, and incidental expenses	3,551.85

	\$309,394.79

This shows a total salary account of \$114,925.63, or about thirty-seven per cent of the expenditure. The society received from the city \$100,764, and from general subscriptions and donations \$119,768. The balance of the income was derived from legacies, endowments, special trust funds, and sale of bonds.

One of the private institutions in the city for the instruction of deaf-mutes receives city, State, and county pupils under the provisions of special acts of the Legislature. The report of the treasurer for the fiscal year ending September 30, 1898, shows the following receipts:

Balance on hand, October 1, 1897	\$2,885.03
New York State	44,216.74
New York County	27,179.54
Kings County	12,697.05
Queens County	1,217.19
Westchester County	1,060.94
Various other counties	2,727.02
Paying pupils	791.75
Donations	11,754.46
All other sources	613.89

	\$105,143.61

The expenditures for the same period were \$102,570.64, of which \$33,613.56 was for salaries and wages. This is a private institution exempt from city or State control, subject to no governmental supervision except examination by the State Board of Charities, yet ninety per cent of its income is public money, and almost one third of the cost of maintenance is charged to salaries and wages. These two cases are mentioned not in criticism of the work or methods of the institutions, but as representing a fair average of the salary account of all the larger private charitable societies. They also fairly represent the two extremes in the source of their income, one receiving ninety per cent of public money, the other a little more than thirty per cent.

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Recent investigations conducted by the city comptroller and supplemented by the agents of the State Board of Charities disclose abuses in the expenditure of public money by certain small societies so flagrant that the appropriations for the current year have been withheld. In these cases the salary account was always the chief expenditure, but it was also discovered that whatever relief got beyond the headquarters of the societies went to professional beggars, who had no difficulty in deceiving the persons in charge. It was found that persons in good health had lived comfortably for months, perhaps for years, on public charity dispensed through private organizations. These professional beggars would obtain food at one place, clothing at another, coal at a third, small sums of money from all three perhaps, then reverse the order of application or appeal to newer organizations if detection threatened. Relief was extended in many instances with little or no effort on the part of the societies to ascertain the merits of a case or the honesty of an applicant.

One small society was found to have expended practically all of the money received from the city in the payment of the living expenses of the person who had the entire management of the organization. The charitable work of a year consisted in the distribution of a small quantity of cast-off clothing and a few bushels of potatoes. The reports of the society contained the names of directors who had never served and knew nothing of the true condition of the organization. They had merely consented that their names might be used as a guarantee of reliability and to aid in the work of soliciting contributions.

One case has been found where a mother and daughter lived comfortably by selling coal given to them by charitable societies. One private institution, now abolished, boarded committed children and received two dollars a week from the city for each child. The children were fed on fish and potatoes at a cost of forty-four cents each per week. After these facts were discovered the city authorities could not remove the children until the Board of Health condemned and closed the

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building under the provisions of the sanitary code. The minor abuses in the way of aiding undeserving persons extend to nearly all the private societies that receive city money. Those that exercise care and have been long established are often deceived by professional beggars.

After his investigation of the subject the city comptroller established in his office a bureau of examination for the purpose of placing a check on the many small societies that indulge in indiscriminate charity at the expense of the city, but he soon found that he was powerless to correct all abuses. The present condition can not be corrected and public charity placed upon a practical basis and limited to the real necessities of the deserving poor until the city government begins to deal with each society and institution upon its merits. Changes and reforms to the present system will come in time, but progress will be slow because charity is a valid excuse at the bar of public opinion for the reckless expenditure of city money, and for that reason it appeals strongly to the average politician and lawmaker. Charity will cover with a mantle of commendation a multitude of abuses and crave pardon for gross frauds. It is the pastime of the rich and their gratuity to the poor. The magic of the word seems to move a Legislature and open the treasure vaults of city and State.

ALASKA AND THE KLONDIKE.

A JOURNEY TO THE NEW ELDORADO.

By ANGELO HEILPRIN,

PROFESSOR OF GEOLOGY AT THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, FELLOW OF THE ROYAL GEOGRAPHICAL SOCIETY OF LONDON.

II.—SAN FRANCISCO OF THE NORTH.



DAWSON AND KLONDIKE CITY (SOUTH DAWSON) IN SEPTEMBER, 1898.

A first impression of Dawson, in August, 1898, could not be other than one calculated to bring up comparisons with strange and foreign lands. As we saw it, approaching from the water side, it persistently suggested the banks of the Yang-tse-kiang, or of some other Chinese river, on which a densely apportioned population had settled. Hundreds—one is almost tempted to say thousands—of boats were lined up against the river front, and so packed in rows back of one another that exit from the inner line was made possible only by a passive accommodation from the outside. There were steam craft, house-boats, scows, and a variety of minor bottoms, ranging from the hay-packed raft to the graceful Peterboro canoe. Many had canvas spread over them, giving house quarter to those who preferred the economy of an owned estate to the high-priced cabins of log huts and hotels, and the purity of the open air to what was at least considered to be the polluted atmosphere of the stable city. It would be far from the truth to assume that this floating population was composed exclusively of men, women, and children; there were dogs galore, abundant by both presence and voice, horses and mules, and an occasional goat betrayed itself munching among hay-packs and the usual combination of simple and hard things which make up goat food. One canvas bore the tempting inscription "Hot and Cold River Baths," several carried legends of variously designated laundries, and a few even invited to "Board and Lodging, Cheap." Of course, the word cheap had here a special etymologic significance, and bore little relation to the same form of word which is current in lexicons.

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SOME MUD IN THE MAIN STREET—FIRST AVENUE.

The first favorable impression of dry land in Dawson was tempered by a knowledge that even here were many moist spots. The mud lay in great pools along the main street—First Avenue or Front Street—but hardly in sufficient depth to make walking dangerous. Dogs and goats could alone drown in it. It is true that an occasional wading burro or even a mule would find a dangerously low level, but I am not aware that any in this condition had added to a list of serious casualties. No mention is made in this connection of cats, for, in truth, only two specimens of the feline family had up to this time reached Dawson—one, a blue-ribboned kitten, which was endearingly received as the mascot of the Yukon Mining Exchange.



THE MAIN STREET IN A SPRING FRESHET.

The Dawsonites are not entirely oblivious to the discomforts of mud, for an effort is being made to block it out with sawdust, of which the three or four sawmills in the town furnish a goodly supply. In some parts a rough corduroy has been attempted, but the price of lumber, two hundred dollars per thousand linear feet, renders this form of construction too expensive for general use, especially in a community all of whose members, female as well as male, are prepared to stem the tide with high-top boots. About one half the street length shows the pretense of wooden sidewalks, but no one has yet recognized a special responsibility for repairs, or seemingly considered that a continuous walk requires a continuous support. Walking is a succession of ups and downs; boards are missing here, other are smashed elsewhere, and the whole walk gives the impression of having been in existence for centuries rather than for the period of a short twelvemonth.

It was not difficult to determine what, perhaps, the majority of the sixteen thousand inhabitants of Dawson were doing at the time of our arrival. They were simply loitering, and the streets were packed with humanity. This was not strange, either, for it must have been difficult to resist the enjoyment of that open sunshine, that soft, warm atmosphere which is the delight of the summer climate of the far North. Never had I experienced anything comparable, and others who had traveled much agreed with my experience. On my way to the hotel, the "Fair View," which had been strongly recommended for its *cuisine* and the circumstance that it was "brand" new in its appointments—having only come into existence a few days before—I caught a good general glimpse of the town, the dominant features of which were registered in the two sides of the main thoroughfare along the river front. A nearly continuous row of one-story, or at the utmost two-story, frame shacks or booths, many of them still in canvas form, and most of them supported

over the river's bank by pile proppings, built up the river side of this First Avenue. All manner of articles, both serviceable and unserviceable, for the Klondike business were displayed, mostly in cramped quarters. The variety of things that had in so brief a period found their way to this region was truly astonishing, and one marveled at the mental ingenuity which spirited some of these articles to a *champ de vente*. Surely nothing but "manifest destiny" could have placed a mammoth's molar on sale for a hundred dollars, when it was thought that a period of starvation was reigning in the town. And yet almost alongside of it were posters announcing that four loaves of bread could be purchased for one dollar—in another place "six loaves" for the same price—and that "half an ounce" of gold dust, the equivalent of eight dollars, would gain admission to the best seat witnessing a boxing and wrestling contest.

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In addition to the booths doing a regular merchandise business, there were those whose masters ministered to a specialty—druggists and doctors, photographers, auctioneers, and brokers of one kind or another. "Bartlett Bros., Packers" served the inner core of the gold regions by means of long trains of pack-mules, but they were not the only ones to whom the *cargador* was an officer militant. Dog teams there were as well as mule teams, and the majesty of the law was hardly considered invaded when the former effected a junction with man in the capacity of common carriers. One of the most interesting sights was to me the large number of letters awaiting ownership which were tacked up to the fronts and sides of different buildings, in the most public way petitioning for rapid delivery. My first letter in Dawson was obtained by stripping it from a door-jamb, but it was three weeks before my attention had been directed to it by a friendly discoverer. To obtain anything from the post office was a most exhaustive process, and usually required a long wait, sometimes of a day, or even of two days, before entry could be obtained into the small room where the sorting, distribution, and dispensation of mail matter were being effected. Even when finally issued, this matter was usually of several weeks' antiquity of arrival, the sorting of tons of substance being much beyond the capacity of the few official hands that were engaged in the work.



DOG-TEAM EXPRESS—DAWSON.

By far the most imposing side of the street was that which faced the river. Here, at least, were real buildings. The stately depots of the Alaska Commercial and North America Trading and Transportation Companies, with their outer casing of corrugated iron, would have done credit to a town of larger capacity than Dawson, and in regions much more accessible to civilization than the Northwest Territory. Farther on, the signs of a number of well-built saloons—"The Dominion," "The Pioneer," etc.—attract attention, not by the supposition that they are alone in the business, since they are supported by probably not less than two or three score others of their kind, but by their specially distinctive interiors; one of these is embellished inside by a series of four mural decorations in oil or distemper, representing a range of subject from Morro Castle, Havana, to a "Moonlight on the Yukon," for which a resident artist "of promise," whose work was done in an open lot, received the handsome compensation of eight hundred dollars. They were befitting the place which they graced.

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JUNCTION OF THE KLONDIKE WITH THE YUKON.

A more intimate acquaintance with these saloons made it plain that they were patronized both for the drinks which were sold over the bar for fifty cents or more and for the gaming tables which in open evidence betrayed a surpassingly strong interest in faro, *rouge et noir*, and roulette. Crowds were watching the fortunes of the play at every turn. From the front entrance quite to the rear some of the more favored halls were packed, but with an element that seemed little disposed to disturbance of any kind. While the drinking of spirituous liquors is very largely indulged in, I believe that during all my stay in Dawson only three cases of obtrusive drunkenness were brought to my attention; and of riotism my experience was wholly negative. Life and property are considered safe even in the most doubtful establishments, and it is not uncommon for a man to pass hours in a crowded dance hall with virtually all his possessions, possibly a few hundred dollars, or it may be thousands, carried in the form of gold dust in his trousers pockets. Two main factors are involved in this condition of security or in the feeling that it exists. The first of these is, perhaps, a wholesome dread of the Canadian Mounted Police, whose efficiency in the direction of controlling order is conceded by every one; and the second, the circumstance that the inhabitants of Dawson and of the adjoining Klondike region are not, as is so largely supposed, a mere assortment of rough prospectors, intent upon doing anything for the sake of acquiring gold, but a fair representation of good and indifferent elements borrowed from all professions and stations of life, and not from one country alone, but from nearly all parts of the civilized globe. During my brief stay I stumbled upon "counts," "sirs," military and naval officers, scientists, lawyers, newspaper men, promoters, and others of broad and liberal standing; and if some of these were undistinguishable in external garb from their brethren in mustard-colored mackinaws whose sole resource was digging for gold, their polished and intellectual method was evidence enough that civilization was present in good quantity along the upper Yukon. The fact that there are three weekly newspapers published in Dawson—the Nugget, Midnight Sun, and Dawson Miner, the first two selling for fifty cents a copy and the last for twenty-five cents—can hardly be considered to prove this condition, although favoring it; for, though the substance and especially the typography of the journals are quite good, the demand for reading matter is such that almost anything could realize a subscription list. The long-belated New York journals seem to command a steady sale on the news stands, where one also sees displayed the small and (in our country) gratuitously distributed scenic book of the transcontinental railways put up for fifty cents. The Argosy, Strand, Munsey's, and Cosmopolitan were the ruling magazines during my visit, and each of these could be had for seventy-five cents a number.

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Regretfully must it be said that the female portion of the population does not sustain the male either in character or diversity. I tried in various ways to ascertain the number of women who represented the community, but failed to obtain a satisfactory accounting. A large proportion of those who are in evidence, and perhaps even by far the greater number, belong to the "red" aristocracy, or at least to that side where steady principles are treated with little consideration and respect. I use the word aristocracy advisedly, for it is a notorious fact that an amount of deference is paid to these creatures of shame which is not given to the virtuous or self-respecting woman; and that they themselves, recognizing their standing, are apt to look down upon the rest of their kin, and to even question their proper privileges. A large part of the broadly capacious Second Avenue, together with equally conspicuous sections of the town elsewhere, is given up to the public display of the inmates of neatly constructed log cabins bearing such devices as "Saratoga," "Bon-Ton," "The Lucky Cigar Store," "Green Tree," etc. The number of open houses is probably less than in most mining camps, and far below what it is in some places. In deference to a demand tax of fifty dollars, levied on each member of the profession to pay part costs of two fire engines which had been brought to the town, there was a response of only sixty-nine, and this was considered a sufficiently close representation not to press the matter any further.

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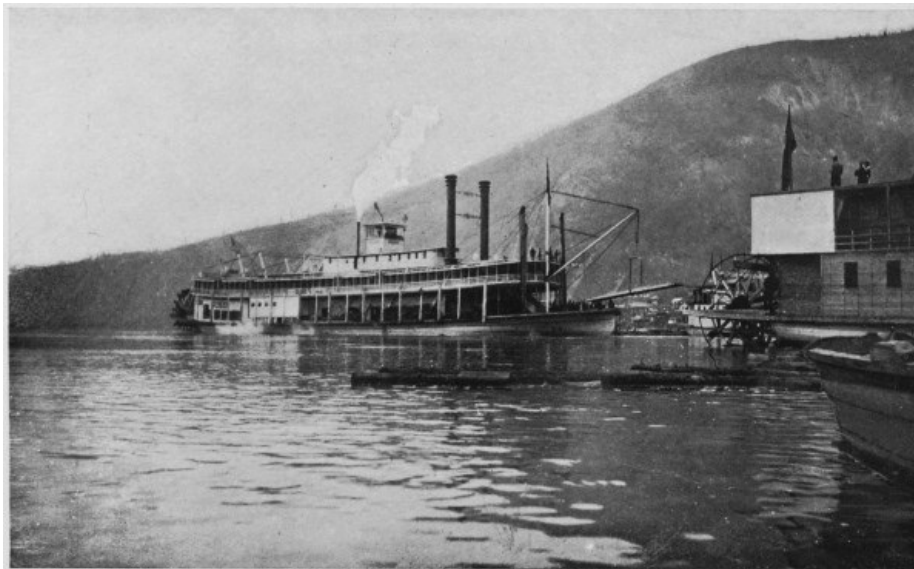
A community of this kind must necessarily have its dance halls and places of amusement. The latter consisted at the time of my arrival of four "theatres" or "opera houses"—the "Combination," "Monte Carlo," "Mascot," and "Pavilion," two of which suspended or closed up before the "season" had fairly opened. Ordinarily, the price of a drink at the bar of entrance paid for admission to the performance with seat, and many will agree with me in believing that the admission was fully paid. The acting need not be worse at any theater, and the singing could

hardly be surpassed in its eccentricities; yet the performances appeared to satisfy a general demand, as ordinarily the houses were packed to their full capacity evening after evening. Needless is it to say that the performances are not intended for women in good standing, and few such are ever present, unless heavily screened behind the curtains of the "boxes." The plays are all of a low order, but the worst is not much worse than some of the plays that are tolerated in all their nastiness in some of our own legitimate theaters. It is singular and interesting as showing the influence of necessity that a sacred Sunday concert in aid of the fire department was successfully carried through in the capacious halls of one of the most notorious dancing resorts.

There are now two banks in Dawson—the Bank of British North America and the Canadian Bank of Commerce. In the early days of August the first of these was still housed in a tent, and before the end of the month a stately wooden structure with flagstaff, and with commodious quarters for the representing officers and accountants, gave dignity to the institution, while it lent style to the corner upon which it was erected. Adjoining it now is the architecturally most imposing but by no means largest building in Dawson—the three-storied, bow-windowed log cabin of Alexander McDonald, the recognized "King of the Klondike"—intended primarily as an office building. It is a truly fine expression of the art of log-cabin building. In many ways one of the most interesting buildings, if such it can be called, was the air space, with canvas top, which adjoined one of the theaters and was used by Signor Gandolfo for a fruit store. There was no architectural quality to commend this space; nor, indeed, was there anything else in its favor, except that it was in the right place and brought both lessor and lessee fortunes. For the privileges of this space of five feet width the occupant paid the handsome rental of one hundred and twenty dollars a month, or twenty-four dollars per single foot of frontage; his profits were, however, such as to justify this payment, and before leaving he confided to me his plan of renting one half of the establishment. Conceive of the character of a store five feet wide, the opposite sides of which are devoted to quite distinct interests! Other sites rent for very little less, and the singular part of it is that much of the rental goes to the pockets of certain assumed owners, whose actual rights are largely in the nature of a "grab" or of squatter sovereignty alone.

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ARRIVAL OF THE "SUSIE" FROM "DOWN THE RIVER."

Dawson extends up the river for about two miles, virtually coalescing with and taking in what has been euphoniously called Lousetown and also Klondike City. These more southerly parts carry with them certain characteristics which are either wanting in the main city or are there but feebly represented. The closely packed tents remind one of an army gathering or of the furniture of some religious camp meeting; walking between them might almost be considered to be a branch of navigation. Inscriptions on the canvas tell us of certain "brothers from St. Louis" being occupants here, and of "the Jolly Four from—" occupants elsewhere. Representatives of the press, physicians, and attorneys all have their inscriptions. But the most interesting constructions, picturesque as much as they are instructive, are the elevated platform *caches*, diminutive log cabins, which on high stilts store a multitude of articles in safe keeping and beyond reach of the army of hungry dogs which are everywhere prowling about and carousing upon all manner of odds and ends. Their appearance, especially where they are placed among trees and bushes, is such that the observer can hardly resist the feeling that he is traveling in a region of primitive pile-dwellings—it may be the interior of New Guinea or the forest tract of one of the Guianas.

Dawson, which now owns the right to celebrate its third anniversary, is destined before long to assume a modern garb. It already has its electric plant, and before many months have passed electric illumination will lift the burden of the dark winter night. It is believed, too, that an electric railroad for freight and passenger service will be constructed in the course of the present year into the heart of the adjoining gold region. The tiresome accounts of bad trails will then be a thing of the past. In its business aspects Dawson does not materially differ from the majority of the boom towns of the United States, though of course it has its peculiarities. In the period of little more than a year it has gathered to itself, besides the usual class of merchants, representatives of a number of professions, such as doctors, lawyers, chemists, and assayers,

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most of whom, especially of the first two classes, appeared to be doing at least fairly well. Mine brokers, or simply venders of claims, are numerous, but their service does not in most cases sustain confidence; the display of posters announcing "bonanzas" in mining properties may be effective at times, but ordinarily the investor turns either to the Mining Exchange, a reasonably well-conducted private enterprise, or to claim-holders on the ground. The auction of claims at the Exchange was always largely attended at the times of my visits, and the bidding was frequently very spirited. The allowance of a time limit of ten days in which to make an examination of properties purchased and of the titles thereto before payment, beyond a forfeit of ten per cent, was exacted, naturally inspired confidence in the method of the transaction, and there is no question that a considerable number of good properties were parted over the boards here, and with eminent satisfaction to the purchasers.

The practice of medicine is necessarily governed by the laws which are in effect in the Dominion of Canada, and it requires the possession on the part of the practitioner of a diploma properly accredited from some recognized college of medicine in Canada. Graduation with diploma from the best medical schools in the United States is not considered to meet the requirement—nor, for that matter, is the diploma of any but a British school. This restriction also applies in the case of professional trained nurses. A number of cases closely bordering on litigation, and at one time even threatening to bring about international complications, have arisen in connection with practice violating this law; but despite the overwhelmingly large number of foreigners who are resident in the region, and who, it was thought by some, had the right to consult practitioners of their own nationality or choice, there is now a peaceful submission to the reading of the statute. The exaction is in no way intended to legislate against foreigners, but is simply a provision of the Dominion laws, similar to that which requires a "Dominion surveyor" who intends doing official survey work in British Columbia to be properly accredited with a special paper of that section of Canada (as distinguished from the Northwest Territory, etc.). Like the physicians, all surveyors giving out work under their names must be officially licensed from the Dominion, although those not thus certificated are permitted to do office or field work for others who are.

A field of labor that has already been entered upon by women is stenography and typewriting. There has been considerable demand for this kind of work, and there will continue to be much more, but it may be doubted if profits arising from it will ever equal what has been attained in millinery and the sale of fancy dress goods. One of the earliest milliners to come out of Dawson told me at Bennett that she had disposed of a hat which brought her two hundred and eighty dollars (in April, 1898), and its only ornamentation was two black ostrich feathers! Such prices are to-day a thing away in the past, but fur capes or circulars are still marketable for three hundred dollars and upward.

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Toward a more intimate acquaintance with the methods and lines of business now followed in Dawson we subjoin a facsimile of portions of the advertising page of the Yukon Midnight Sun, bearing date of September 3, 1898.

<p>ATTORNEYS AT LAW. C. M. WOODWORTH, M.A. LL.B. Advocate, Solicitor, Commissioner, Notary, etc. Five years' practice in Northwestern Territory Office opposite the New England</p>	<p>Klondike Hotel NELSON & SMITH, Props —o— Finest Brands Wines, Liquors and Cigars Front street north</p>	<p>French Royal Restaurant Renovated and New Go there for a square meal! Nothing but the very best served and cooked by a chef! P. E. De Ville, (French) Prop.</p>
<p>WADE, CLARK & WILSON Members of the Canadian Bar. Advocates, Attorneys, Solicitors, Notaries, Conveyancers Office, Rutledge Block. First Street, Dawson F. C. Wade O. H. Clark H. G. Wilson</p>	<p>Yukon Sawmill Co. Lumber Best grade Lowest price House Logs Sawed to Order or Sold from Stock —o— Office on Front street and second avenue</p>	<p>ARCTIC MEAT CO. G. G. BERG, Mgr. Fresh and Salt Meats All the Market Affords Wholesale and Retail Front street Dawson</p>
<p>C. W. C. TABOR Barrister and Solicitor Advocate Notary Public Conveyancer</p>	<p>Gold Dust Bought for Cash ALBERT HANSEN, Jeweler 706 First Ave., Seattle, Wn</p>	<p>HART & CATES Furniture and Upholstering All kinds of Seating, Mattresses, etc. Second avenue, Opposite Bank of British N. A.</p>
<p>BURRITT & McKAY Advocates, Solicitors, Notaries, Commissioners, etc. Counselors for Ontario, Quebec and British Columbia. PHYSICIANS AND SURGEONS.</p>	<p>Seattle-Yukon Transportation Company (Four Leaf Clover Route) W. D. Wood, President, A. L. Bradley, Vice President, Charles H. Smith, Traffic Manager 90 or Columbia St., Seattle Seattle No. 1 and barges will leave Dawson for St. Michael and return over route on or about Aug 25th, and make connection with our A. & S. Alliance for Seattle.</p>	<p>The Pioneer Blacksmith Shop GED. McCORM, Prop. General Blacksmithing and Machine Work Jobs performed to meet General and Mining work Steel Drills and Picks Made Especially for Frozen Ground 40* Four Years of Alaska Experience *c Second avenue, Bet. Second and Third streets</p>
<p>DR. W. T. BARRETT Late Superintendent St. Andrew Hospital, Wis- consin. Physician and Surgeon to St. Mary's Hospital, Office Rutledge Block, Front street, Office hours—From 10 a. m. to 12 p. m.; at Hospital from 8 p. m. to 10 p. m. and 1 to 2 p. m.</p>	<p>Pacific Alaska Express Co. Operates over our line and handles express matter for all points. Orders for freight coming to will be handled promptly. Goods forwarded and stored in Dawson and down-river points on days free of charge. This includes storage or transport with a light outfit and call for their goods when permanent camp is located. We are the only established company carrying freight for shippers to the remote points on the Yukon. For rates and other information, call on H. Te Roller Library Building Dawson</p>	<p>HART & CATES Undertakers and Embalmers Special attention given to shipping remains to their former homes. Second avenue, Opposite Bank of British N. A.</p>
<p>J. A. SUTHERLAND, M. D., C. M. L. C. P. & S. Ontario Physician and Surgeon, Late of Toronto, Ontario Office, Flower Drug Store, 17 Main.</p>	<p>DR. J. W. REED Dentist Special attention given to all kinds of fine gold work, including crowns and bridge work No. 141 First avenue</p>	<p>Louis Seckels ASSAYER, General Assay-</p>

FACSIMILE OF PART OF YUKON MIDNIGHT SUN,
 SEPTEMBER 3, 1898.

THE NEGRO QUESTION.

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The negro question is not of recent origin. The Iliad of our woes began in 1620, when negroes were first brought to the colony of Virginia and sold as slaves. Slavery antedates history. The traffic of Europeans in negroes existed a half century before the discovery of America. The very year in which Charles V sailed with a powerful expedition against Tunis to check the piracies of the Barbary states, and to emancipate enslaved Christians in Africa, he gave an open legal sanction to the African slave trade. When independence was declared in 1776 all the colonies held slaves. Slavery, said the late Senator Ingalls, disappeared from the Northern States "by the operation of social, economic, and natural laws," and "the North did not finally determine to destroy this system until convinced that its continuance threatened not only their industrial independence but their political importance." In course of years "the peculiar institution" assumed a sectional character. The war between the States precipitated a crisis. President Lincoln began then the work of emancipation. "As commander-in-chief of the army and navy in time of war, I suppose I have the right to take any measure which may best subdue the enemy.... I view the measure [the Proclamation] as a practical war measure according to the advantages or disadvantages it will offer to the suppression of the rebellion." Senator Ingalls's testimony is as follows: "It may be admitted that the emancipation of the slaves was not contemplated by any considerable portion of the American people when the war for the Union began, and it was not brought to pass until the fortunes of war became desperate, and was then justified and defended upon the plea of military necessity." The Southern States ratified the amendments to the Constitution under penalty of otherwise remaining out of the Union and in political and military vassalage. The abolition of slavery has the assent of all sane men. Apart from ethical considerations, the subjection of the will, thought, or labor of a mature human being to the whim, caprice, or legal right of another is a gross political and economical blunder, unwise and indefensible. After emancipation came citizenship and enfranchisement of the freedmen, and the punitive measures of reconstruction, which were the outcome of hatred, revenge, desire for party ascendancy, and which no good man can now approve. No conquering nation ever inflicted on a conquered people more cruel injustice than the disfranchisement of the most capable citizens and the enfranchisement of liberated slaves. Certain great civil rights are the necessary and proper consequences of freedom. Suffrage is not a natural right, nor a legal, political, or general result of freedom or citizenship. The large majority of citizens do not and can not vote.

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The liberation of millions of slaves was the most gigantic and, in itself, one of the most beneficent acts of this century. Nothing is comparable to it as a triumph of the inalienable rights of man. Humanity and justice demanded emancipation. Re-enslavement no one proposes or desires. All would rejoice in the prosperity and progress of the Afro-American, but with freedom came citizenship and suffrage, and these revolutionized our Government. Elements undreamed of were introduced as constituents. When the Constitution and the resulting Union were formed, such a citizenship with franchise was not proposed, and if proposed would not have been listened to for a moment. The most infatuated negrophilist would not stultify himself by asserting that the Union of States would or could have been consummated with the present incongruous, heterogeneous citizenship.

From these and other facts has been evolved what has been called the negro problem. In the discussion, it is best to eliminate all extraneous considerations, all issues which, as the lawyers say, are "*dehors* the record." Government is a very practical business. The end is the securing and preserving the peace, safety, and well-being of the State. Civil government has no mission of general philanthropy. This problem, while of terrific importance in the South, where the black population is persistently congestive, is not, in its ramifications or direct effects, local or sectional. It affects every community and every section. It is of paramount national importance, complex, and involving social, moral, and political considerations. Its gravity can not be exaggerated. It compels the attention and demands all the resources of patriots, philanthropists, statesmen. It thrusts itself, uninvited and unwelcomed, into religious and social assemblies and legislative councils. It is pervasive, continuing, vital. It is better to look it full in the face and give it dispassionate thought.

It need scarcely be said that in this discussion no hostile reference is made to individuals. Some negroes are men of intelligence, integrity, patriotism, and stand on a plane with our best citizens in virtues and mental qualifications.^[C] The gist of this contention is not based on special exceptions, but on the race in the aggregate.

We find in the South the presence of two distinct peoples, with irreconcilable racial characteristics and diverse historical antecedents. The Caucasian and the negro are not simply unlike, but they are contrasted, and are as far apart as any other two races of human beings. They are unassimilable and immiscible without rapid degeneracy. Ethnologically they are nearly polar opposites. With the Caucasian progress has been upward. Whatever is great in art, invention, literature, science, civilization, religion, has characterized him. In his native land the negro has made little or no advancement for nearly four thousand years. Surrounded by and in contact with a higher civilization, he has not invented a machine, nor painted a picture, nor written a book, nor organized a stable government, nor constructed a code of laws. He has not suppressed the slave trade, which, according to recent testimony, was never more flourishing. He has no monuments nor recorded history. For thousands of years there lies behind the race one dreary, unrelieved, monotonous chapter of ignorance, nakedness, superstition, savagery. All

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efforts to reclaim, civilize, Christianize, have been disastrous failures, except what has been accomplished in this direction in the United States.

It need not be disguised, for it is the ever-present, indisputable fact, that while there are alleviations of the unpleasantness, the relations between the negroes and their co-citizens of the Caucasian race are strained and unsatisfactory. The friction, the prejudice, the cleavage, is not between Teutonic and Latin on the one side and Semitic on the other, nor between Saxon and Celt; it lies deeper, yields less readily to palliatives and remedies, and seems a matter of adjustment for the remotest future. It may help to understand the situation if we analyze its causes.

The great revolution suddenly transformed the customs, traditions, and conditions of the two races. Ownership gave way to freedom; compulsory and wage-unrewarded labor to absolute control of person; inequality, inferiority, subjection, to equality in the eye of the law; restrained locomotion to license of movement; kindness, interest in life, wealth, and physical welfare, to suspicion, distress, alienation. With property in man, regulated and enforced by laws in the interest of the master, labor was organized, directed by intelligent control to the development of agricultural resources and to the building up of a society which for refinement of manners, hospitality, and administrative capacity, has elicited praise from disinterested travelers and investigators. The negro, whatever he may have attained from the discipline of slavery, was not cultivated in intelligence, in manual skill, in forethought, power of initiative, in thrift, and the comforts and graces of home life. When freed, many were deluded by deceptive promises. They construed freedom to mean a division of property. Release from bondage led to intemperance and extravagance. Accustomed to control, unaccustomed to self-reliance, having others to think, plan, buy, and sell for them, to supply wants, to watch over them from the cradle to the coffin, many, when left to themselves, reverted to primitive habits, and became idle and worthless. Slavery had cursed the South with ignorant, unskilled, uninventive labor. Freedom did not change its character. The war, liberation of slaves, the sudden extinguishment of millions of property, bankrupted the South. Subsistence, recovery of means of living, rehabilitation, reorganization of those agencies, which are, with intelligent work, the chief means of the wealth of civilized peoples, became the first duty after hostilities ceased. This demanded steady, persistent industry, the change of former methods of agriculture, subdivision of farms, diversification of pursuits, opening of academies and colleges, and establishment of public schools for free and universal education. The contrast between the wealth and prosperity of the North and South presents an appalling picture. Naturally, the Southern people were in despair, and too often they vented their dissatisfaction, their rage, upon the irresponsible and unoffending negro.

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Slavery *per se* is not conducive to self-restraint of the enslaved, to high ethical standards, and the best types of human life. When the interest and authority of owners were removed and former religious instruction was crippled or withdrawn, the negroes fell rapidly from what had been attained in slavery to a state of immorality, and, in some cases, to original fetichism. Some remained immovable in their former faith, but many, especially of the younger generation, of both sexes, gave proof of what degeneracy can accomplish in a quarter of a century. It is very common for them to divorce religion and piety. Artificial excitement, passionate emotion, was substituted for a faith which should be the product of a knowledge of and deep reverence for the Word of God. The danger of doing harm, or injustice, restrains my pen from disclosing a mass of disgusting material which could only shock sensibilities and stagger credulity. It is, besides, very easy to magnify our own virtues and others' vices. It is a prevalent mode of religiousness to repent of other people's sins, and to get superfluous merit by showing how others fall short of our attainments. Lowell said, "Everybody has a mission (with a capital M) to attend to everybody else's business," and "to make his own whim the law, and his own range the horizon of the universe." We have all read of the philanthropic Mrs. Jelliby neglecting home and children to sweeten the lot of the unregenerate natives of Borrioboola Gha. Still, testimony, to satisfy the most skeptical, could be adduced *ad nauseam*, from men and women doing educational and missionary work among the colored people, to show the deplorable depths into which multitudes have sunk.

Under the Reconstruction Acts there was a deliberate, predetermined attempt and purpose to put the freedmen in control of the Southern States. The late slaves were enfranchised; the best class of white men were disfranchised. The law presumes that a man or a State intends the logical consequence of acts done. In South Carolina, Mississippi, and Louisiana a majority of the voters, under the coerced policy, were negroes. In other States they were so numerous that a combination with a small fraction of white voters would give the ascendancy. In Virginia, a coalition between non-taxpaying white people and negroes, under skilled and bold leadership, accomplished partial repudiation of the State debt. Superadd to this undisguised Federal intent the hungry adventurers who, as governors, judges, marshals, district attorneys, etc., flocked like vultures around the carcass, the horde of persons whose object was to pilfer and plunder, who played upon the ignorance, the superstitions, and gratitude of the negro and made the credulous victims believe that their former masters were not to be trusted in elections, and you have a picture which imagination fails to realize. The negroes, neither by apprenticeship, nor political education, not intellectual culture, were prepared for the boon, and their unscrupulous friends organized them into secret societies and inflamed hopes and expectations of wealth and dominancy. Casper Hauser transferred from a dungeon to a throne would be a fit illustration of this defiance of all the teachings of the past. Suffrage was a wrong to the nation, to the States, to the white and black races, and especially to the negro. Negro suffrage is a farce, a burlesque on

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elections, and only evil. The negroes generally vote as puppets, as machines, and have not the remotest conception of the character or effect of the act they are ignorantly performing, or of the issues involved in the contest, or of the functions or duties of the officers voted for. Huxley says, "Voting power as a means of giving effect to opinion is more likely to prove a curse than a blessing to the voter, unless that opinion is the result of a sound judgment operating upon sound knowledge." This premature investiture of the negro with suffrage reciprocally provoked alienation, bitterness, strife, and a resolute purpose on the part of the white people not to submit to the misrule and tyranny of ignorance and pauperism, but to resort to all necessary methods to defeat such a result.

It is needless to recapitulate the facts of many thousand years in order to raise the inference of racial difference between the Caucasian and the negro. The immigration to our country is the proof of antagonism of races. The foreigner stays away from the South; so in a large degree does the Northern man. Notwithstanding the unsurpassed climate, the rivers and gulf and mountains, the fertile soil, the varied products, the hospitable welcome, the territory occupied by the negro is persistently avoided. By the census of 1880 the proportion of foreign-born in all the former slave States was 3.5 per cent; in the Northern States about twenty per cent; in eight Southern States, where the negroes abound, there was in 1880 only one and a third per cent who were of foreign birth. Mr. Lincoln, in 1858, in accounting for the repulsion, said: "There is a physical difference between the two races which will probably forbid their living together upon the footing of perfect equality.... I am not, or ever have been, in favor of making voters or jurors of negroes, nor of qualifying them to hold office, nor of intermarrying with white people." Absorption, assimilation, is not to be dreamed of. The negro is no nearer common fellowship, equality of association, than he was in 1865. Reconstruction measures, constitutional amendments, sword and bayonet, ecclesiastical anathemas, fulminations of press and pulpit, all power of church and state and public opinion, have not altered, can not alter, what seems ineradicable. Race antagonism reaches deeper than political affiliation. If every negro at the South were to vote the Democratic ticket in every subsequent election, the race division would remain the same.

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Can these differences be effaced, alienations be healed, and overshadowing perils be averted? What concerns the patriot is to find a solution for this gigantic and appalling problem. The statesman has not yet arisen, disposed to grapple with the problem, or capable of suggesting a feasible and efficacious remedy. With the least hardship to the negro, proper recognition of his rights as a man, due regard to the just ends of our Government, and the purposes of its founders, some scheme, if possible, wise, adequate, and comprehensive, should be devised. Whatever hitherto has been suggested has been met with opposition and is justly liable to criticism. The most obvious remedy, and which has been tried with some success, is to uplift the race by means of public schools and proper religious instruction. All honor to the schools that train the youth into self-respecting manhood and womanhood! All honor for the efforts that are making to correct the debasement of slavery, to unite faith and practice, to infuse religious life with an ethical Christianity, and to form a moral basis for life and character! The crimes of both races in the South, pushed within the last few years to most brutal atrocities, show that there can be no safety for free institutions, no guarding against savage degradation, if either race be kept in crass ignorance. Both must suffer. It would be some relief from ballot-box evils and perils if the examples of New England and of Louisiana, Mississippi, and South Carolina were followed by all the States. As "universal suffrage has no anchorage except in the people's intelligence," Massachusetts requires of voters a prepayment of taxes, and voting and office-holding are limited to those who can read the Constitution in the English language and write their names. What has been done by States, denominations, and individuals through schools is not discouraging to larger and better efforts, but is a stimulus to and an assurance of excellent results. The plantation system of the South, when land was in the hands of a few territorial magnates, was of very doubtful utility. A bold peasantry is a country's pride, and a small farmer should take the place of the large landed proprietor. If the negroes should acquire and hold more real estate, they would be of more value as citizens, and would have increased interest in the stability of laws, enforcing of contracts, and the preservation of State honor. An enlargement of the number of those who have a solid stake in the well-being of the country would be adding to the ranks of natural supporters of law and honor, and strengthening the true foundations on which the stability of a republican government must rest.

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The congestion of the negroes aggravates the difficulties and dangers of the problem. The area of the States holding slaves in 1860 was 901,740 square miles, and of the Northern States, excluding Alaska, 2,123,860 square miles. By the census of 1890, the total population of Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, Virginia, and West Virginia, was 37.3 per cent of negroes and 62.7 per cent of whites; or, including Delaware, Maryland, Kentucky, and Missouri, 30.7 per cent of negroes and 69.3 per cent of whites. The African citizens are localized within a narrow area. A French statesman said, "Cross the Pyrenees and Africa begins." Cross Mason and Dixon's line, or the Ohio and Potomac Rivers, and in a truer sense Africa begins, for south of that line the negroes are massed. It has been nearly forty years since slavery existed, for no one born since 1860 was ever practically a slave, and yet freedom has not diffused the seven million and a half of Africans. Despite all the traditions of bondage, all the misrepresentations of modern literature, all the exaggerated accounts of intimidation and cruelty, the South remains the home of the negro. When he is told that equality, friendship, political sympathy, and good wages may be secured by passing an invisible geographical line, he persistently refuses to be seduced across. Senator Windom, of Minnesota, advocated a plan for distributing by assisted emigration, but nothing came of it. Senator Edmunds, in discussing the Chinese question, said: "The people of

Massachusetts would not be hungry for an eruption of a million of the inhabitants of Africa, ... because they believe, either by instinct or education, that it is not good for the two races to be brought into that kind of contact in that place.... The fundamental idea of a prosperous republic must be a homogeneity of its people."

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Colonization as a remedy has had many strong advocates. As early as 1800 the Assembly of Virginia, in secret session, instructed the Governor to correspond with the President with the object of procuring a colony to which the negroes could be sent. Jefferson began the correspondence. The Legislature resumed the question, and expressed its preference for "Africa or any of the Spanish or Portuguese settlements in South America" as the place "to which free negroes or mulattoes, and such negroes or mulattoes as may be emancipated," might be sent or choose to remove. In 1805 the members of Congress were instructed to endeavor to procure suitable territory in Louisiana. In 1811, being asked his opinion as to a settlement on the coast of Africa, Jefferson replied that "nothing is more to be wished than that the United States would themselves undertake to make such an establishment on the coast of Africa." In 1813 the Legislature openly and almost unanimously adopted, for the third time, resolutions similar to those of 1800. The same year the Colonization Society was formed, out of which grew the Republic of Liberia. President Lincoln, in his first annual message, December, 1861, referring to the two classes of liberated persons that might be thrown upon Congress for their disposal, recommended "that in any event steps be taken for colonizing both classes at some place or places in a climate congenial to them. It might be well to consider, too, whether the free colored people already in the United States could not be included in such colonization." Congress responded by voting one hundred thousand dollars for the voluntary emigration of freedmen from the District of Columbia to Haiti or Liberia, and later, in July, 1862, gave five hundred thousand dollars for the colonization of negroes in some tropical country beyond the limits of the United States. Mr. Lincoln continued to favor the policy of removal to another country, and five days after signing the above act he read to his Cabinet a proposed order for "the colonization of negroes in some tropical country." Burdened with this great question, amid the exigencies of the mighty war, he continued to push the matter, and had Secretary Seward send a circular letter to England, France, the Netherlands, and Denmark, with regard to colonizing the negroes in some of their tropical possessions. Offers came from the Danish West Indies, Dutch Surinam, British Guiana, Honduras, Haiti, New Granada, and Ecuador. Mr. Lincoln considered the offers from New Granada and an island off Haiti, and even sent a colony to the latter. Again, in his annual message in 1862, he argued for colonization, and asked for an appropriation, but, under the passions of the terrible conflict then raging, the Congress, instead of heeding the request, repealed the former act appropriating five hundred thousand dollars.

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The Indians, against their will, were transported, by coercive measures, to allotted lands beyond the Mississippi, but that was before the modern discovery that the United States should grant "fraternity and assistance to all people" under other than republican governments, and that universal suffrage was the infallible expedient for civilizing semibarbarous peoples. President Harrison, in his letter of acceptance, writing on another subject, says, "We are already under a duty to defend our civilization by excluding alien races whose ultimate assimilation with our people is neither possible nor desirable."

Remedies, strong and adequate and feasible, may not be found readily, but there are gentler and quieter agencies which may be used by both races to mutual advantage. The white people, in accepting the legitimate consequences of defeat, in vigorous efforts to restore antebellum prosperity, in establishing schools, in reconstructing shattered society, have done nobly, but they are not without sin. Laws, general and wise and impartial, on the statute-book need for their enforcement a sustaining public opinion, but this has not always been forthcoming. Lawless and violent proceedings, always unnecessary and demoralizing, sometimes as brutal as the crimes which excited horror; harsh and unjust contracts; interferences in elections; false registration and counting of votes, and other acts which the plea of self-preservation did not justify, have evinced the harshness and injustice of dominant power, and have not tended to soften prejudices or make the situation more tolerable. Each race is fortunately improving in intercourse and in dealings with the other, and time and sober judgment are, in a sensible degree, removing causes of alienation which are not inherent and incurable.

"What a blessing," said President Sir John Lubbock, at the late meeting of the International Congress of Zoölogists, "it would be for mankind if we could stop the enormous expenditure on engines for the destruction of life and property, and spend the tenth, the hundredth, even the thousandth part on scientific progress! Few people seem to realize how much science has done for man, and still fewer how much more it would still do if permitted. More students would doubtless have devoted themselves to science if it were not so systematically neglected in our schools; if men and boys were not given the impression that the field of discovery is well-nigh exhausted. We, gentlemen, know how far that is from being the case. Much of the land surface of the globe is still unexplored; the ocean is almost unknown; our collections contain thousands of species waiting to be described; the life-histories of many of our commonest species remain to be investigated, or have only recently been discovered."

By J. RUSSELL SMITH.

That the Philippine Islands are of value as a place for investment is an unexplained generalization that is now being used to tempt business men. The object of this article is to discuss this generalization. The idea that the Philippine Islands are of importance to us, as a new field for our industrial developments, depends upon two assumptions: First, that we need to go beyond the bounds of the United States; second, that the Philippines offer the best available field for the satisfaction of that need.

As to the first assumption, the occasion and origin of the demand for the retention of the Philippines furnish presumptive evidence that it represents no real economic want of the American people. No one ever thought of it until we heard the boom of Dewey's guns at Manila. The demands that then arose for Eastern territory were the natural result of a just pride in the amazing triumph of our navy. Before the battle of Manila a suggestion that we should take the Philippines and receive \$20,000,000 as a bonus we would have deemed preposterous. Before that battle, one idea was uppermost in the minds of the American people—namely, the development of the American continent. And yet, along with the enthusiasm over the accomplishments of our army and navy, the idea has crept into some minds that we are in need of more land to develop, and that we must find it in the Eastern Hemisphere.

Examination of the internal condition of the United States does not seem to indicate such need. Our exports are an index to our condition. In 1872 we exported merchandise to the value of \$522,000,000; in 1898 the amount had swelled to \$1,230,000,000, an increase of two hundred and thirty-five per cent. No European nation has shown such progress. Despite their colonial empires, their armies and navies, their chartered companies, their spheres of influence, and all their elaborate paraphernalia, we are competing with them in their own markets. We have pursued a policy the opposite of theirs and are outstripping them in the race for a share of the world's trade. It is not compatible with industrial wisdom to change and adopt the policy of our less successful rivals just as the success of our own policy is being fully demonstrated.

A nation's commercial supremacy rests upon the same principles as a business man's leadership in his trade—namely, superiority of production. It does not require a citation of evidence to say that the producers of Europe are staggering under the burden of their armies and navies. While they are thus handicapped, we have nothing to fear unless we inflict upon ourselves a similar burden. We have succeeded by attending to our own industries, by developing our natural resources, by producing things that the people of other nations must have. That development is but begun. Even England, the ruler of the greatest colonial empire the world has ever known, the greatest manufacturing nation, the mistress of the seas, stands with almost stationary exports. The United States, the nation with a small navy, the nation that never really had a colony, the so-called isolated nation, has come by rapid strides to the point where she is the leading exporter of the world.

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There is no reason why the progress of the United States should be checked. England has demonstrated the fact that the nation that has the iron and coal is the commercial mistress of the world. The United States is continuing, and will continue the demonstration. England has but 900 square miles of much-used coal lands, and she gets her iron ore from Spain. We have over 200,000 square miles^[D] of untouched coal lands; an almost continuous bed of iron ore, reaching from Lake Ontario to Alabama.^[E] Beside this great ore bed is the Appalachian coal field, with coal mines in every State between New York and Alabama. There are mountains of iron ore in Missouri and Michigan. By the special lines of lake steamers the iron ore of Lake Superior is taken to Chicago and Cleveland, and thence carried by rail to Pittsburg. There the eastern coal completes the conditions for the most economical production of iron and steel. That gives the United States the basis for our export trade in iron, steel, and machinery. We are capturing the iron markets of the world, and, judging by our supplies, can hold them for ages. As our iron and coal are the basis of all manufacturing industry, continued attention to them will give us the control of the world's trade.

There are many other lines of our internal development that are yet barely begun. Irrigation is an example of this. The report of John W. Noble, Secretary of the Interior for 1891, said, "One hundred and twenty million acres that are now desert may be redeemed by irrigation so as to produce the cereals, fruits, and garden products possible in the climate where the lands are located." That is an area nearly twice as large as the Philippine Islands, and it is open to the American settler, while there is an indication that the Philippines may be inaccessible on account of their climate. Moreover, they are four times as densely populated as is the United States; and while we deem the Chinese so undesirable that we exclude him from our shores, all authorities agree that his race is superior to that of the Malays, Tagals, and Negritos who inhabit the Philippines.

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The irrigable area is much larger than the States of New York, Pennsylvania, Illinois, and Massachusetts combined. Those States at the present time are supporting a population of over seventeen millions, and many authorities claim that they will in the future support at least fifty millions. The regions of scanty rainfall that can be irrigated are fairly crusted with potash and other soluble mineral ingredients that nourish plant life, and give to the valleys already irrigated their astonishing fertility. This enables the farmers to support themselves on such small areas

that the life is almost a communal one. The irrigated West can sustain a population as great as that sustained on an equal area in the East, or even greater.^[F] For years that dry climate has been a health restorer to the sojourner there. This is not claimed for the Philippine Islands. The building up of this Western empire with its canals and irrigating ditches, its railroads and cities, will absorb a vast amount of capital, and it is a natural and easy line of development for us. Mr. Irwin has said, "To capital seeking investment in a large way, irrigation enterprises in the West offer a most solid, lucrative, and tempting field."^[G] Secretary Noble has said, "No one can now compute the money value that will concentrate in these reservoirs and canals and ditches, carrying water to the fields of the husbandman, and upon which the people must depend for their prosperity."^[H]

Five centuries ago large parts of eastern and western England were impenetrable morasses. These have entirely disappeared before the skill of the engineer.

N. S. Shaler says, "The total area of the inundated lands of the United States probably exceeds 115,000 square miles, counting only those flooded areas which are at present unsuited by their excessive humidity for agricultural use, but which may be won to the service by engineering devices such as have been applied in the regions occupied by older civilizations."^[I] This is more than 73,000,000 acres of drainable swamps and marshes. Lands more easy of access have, in the past, so occupied our attention that these lowlands have thus far been almost entirely neglected. They are located along our northern, eastern, and southern borders in close proximity to water transportation and to the large cities of the seaboard. They can be drained, as were the swamps of England. Their fertility will make this profitable, and they will support a large population.

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The public highways of the United States are, on the whole, in anything but a desirable condition, and their improvement is a good investment for the commonwealth. We have railroads to build, harbors to deepen, and canals to dig. The United States is young yet, and tremendous tasks await her labor and capital.

In this country, so full of promise for the future, we are still using borrowed foreign capital. In The Forum for February, 1895, Mr. Alfred S. Lauterbach said, "That the people of the United States require European capital for the full development of the great resources of our country there can be no doubt." The same author made a "very conservative estimate," and said that we owed to Europe annually:

"For dividends and interest upon American securities still held abroad, minimum	\$75,000,000
"For profits of foreign corporations doing business here, and of non-residents, derived from real estate, investments, partnership profits, etc., about	75,000,000

	\$150,000,000"

That is to say, we were paying a five-per-cent interest on \$3,000,000,000 of foreign money.

As to the second assumption: It is claimed by some that we should have the Philippines because they will furnish us the tropical products that we are using in ever-increasing quantities. Two things are revealed in the examination of our needs of tropic products and a comparison of the Philippines with the American tropics: 1. That the Philippines are at a great disadvantage in location. 2. That America is of sufficient area and natural wealth to meet all our needs, and more.

As to location: It is a first principle of commerce to get supplies where they are most accessible. It is about ten thousand miles from New York to Manila, twelve hundred to Havana, and eighteen hundred to the continent of South America. Under these conditions the freight rates must always discriminate in favor of tropic America. The disadvantage of the Philippines is increased by the fact that the ships going from San Francisco or Panama to Manila are compelled to carry their coal three thousand four hundred miles at one stretch—from Honolulu to Yokohama, the most available route. Then, again, a large part of our tropic trade, and one that shows promise of the most growth, is in the green fruits, such as cocoanuts, pineapples, lemons, oranges, and bananas. Of the last article our imports have doubled every five years since 1865. On account of distance it is not practicable to bring any of these fruits from the Philippines, but there is no limit to the amount of trade that can grow up on the lines that are now beginning to form between us and our southern neighbors.

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As to the fitness of tropic America to supply our needs: There are Central America, South America, and the West Indies. An examination of their area and productiveness shows that there is little to induce American industry to control any part of the Eastern Hemisphere. Of the 17,000,000 square miles that make up the Western Continent, the tropics make up 5,000,000 square miles—an area sufficient to make more than one hundred States as large as Pennsylvania; an area nearly fifty times as great as the Philippines. The variety of its productions is scarcely excelled even by the East Indies. There are only two important tropic products imported into the United States that are not already largely produced on this continent. They are Manila hemp and tea, and it would appear that the reason they come from the East is because of present labor conditions there. Manila hemp is a sort of half-wild product that may yet have an introduction to our rich tropics just as the potato was introduced into Europe, and many of our crops have been introduced from Europe. Even the tea plant thrives in the warm regions of America as far north

as Tennessee. Small quantities of tea are now grown in various parts of America,^[J] but the cheap labor of the East has made it unprofitable here. We are at the present time getting nine tenths of our tea from India, where Anglo-Saxon care has developed the industry and is fast driving China out of the tea market of the world.

There is a difference when it comes to the two great tropic staples of coffee and sugar. Our imports of these two articles in 1897 were valued at \$180,000,000, while the imports of tea were less than one twelfth as much. At the present time nearly all the coffee used in the United States comes from Central and South America, whence also comes the greater part of the world's supply. The declining price of coffee indicates that we shall get it under more favorable terms in the future.

We import about \$100,000,000 worth of sugar per annum.^[K] Approximately two fifths of it is beet sugar and comes from the continent of Europe, and the rest is cane sugar from scattered sources in the tropics. Only one sixth comes from the Eastern Hemisphere. We are getting sugar from Europe, not because it is the natural development of the industry, but because those countries are willing to give an export bounty on all that is exported. This makes exportation possible. Meanwhile the American sugar industry is left to unprogressive and slovenly methods, but it needs only a reasonable addition of capital and labor to enable it to supply the markets of the world. An Englishman of much experience in the sugar-growing colonies of Great Britain says that by the introduction of improved methods all the sugar that we use in this country could be grown on one half of the little island of Porto Rico.^[L] This would cause heavy complaint from the sugar-cane region of Louisiana, and from those sections of our country that are beginning to hope for a future in the beet-sugar industry. Certainly America can supply herself in this particular.

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India rubber is another of our tropic imports that promises to increase in importance with improvements in our ability to use it. Nearly the whole supply comes from the American tropics. There it thrives everywhere. We are importing it from almost all of our sister republics, and although it responds readily to cultivation and yields a profitable crop,^[M] the main supply is yet taken from the wild trees of the forests. Like the other products it waits for the capital which it will well repay.

By a comparison of the average yields per acre of the leading tropic imports with the amounts of those imports, we shall find the area of the territories that are in cultivation to meet our present needs.^[N] In 1897 we imported into this country from all sources the crops that would be yielded by 1,400 square miles of coffee, 30 of bananas, 40 of cocoa beans, 60 of India rubber, 10 of oranges; a total of 1,540 square miles. Add to that the area that will be needed for our sugar, and the result does not equal the whole of Porto Rico. The area of Porto Rico is less than 4,000 square miles. Multiply these crop areas by ten, to make allowance for crop rotation and for the time taken for new plantations to come into bearing. The result will be less than 40,000 square miles, a territory not half as great as the area of the West India islands. They in their turn do not comprise the fiftieth part of the area of tropic America.

When the time comes that American industry needs to develop more lands, there they lie. They are our opportunity. They have an almost virgin soil, because we have been too busy with our own internal development to give them needed attention. They need capital, and we have been borrowing money abroad to meet our needs at home. Their inhabitants are idle for lack of employment; they will respond to our capital. The United States is the natural market for the West Indies; they lie close to our shores, and when the Nicaragua Canal comes they will be but islands in an American lake—parts of the industrial unit of Greater America. They can give us the things that are needed to round out our consumption, and we can do the same for them.

[Pg 192]

It is illogical and unlike American shrewdness to go seven thousand miles for tropic lands when an equally valuable, a more valuable, area is within seven hundred miles of us. The comparison becomes even more striking when it is remembered that the control of the Philippines brings to us a burden of problems from which industrial development in this country is free.

The Government at Washington may spend our millions and establish government in the Philippines, but will American capital go there? Will our citizens invest their money seven thousand miles away while tropic America is so much nearer, and is, moreover, an equally rich and far more extended field? This does not assume the conquest of American regions. It is not necessary to have governmental control in order to profit by the industries of a country. The conditions of modern industry prove this most conclusively. But for this fact the progress of the world would have been much less rapid. We have an example of this in American railroads: they have been largely built by English capital; the same is also true to a greater or less degree of many of our other industries. What England has done in North America without governmental control, we can do in Central and South America when our industrial condition demands new areas to work over. By the modernized Monroe doctrine our supremacy in this hemisphere is assured, and we have the guarantee of a clear field. Our interests are also furthered by our friendly relations with the American peoples and by our nearness to them.

The American policy of our forefathers is the one for us, even from the industrial point of view. America is an industrial unit, an economic unit, full of undeveloped possibilities that await the hand of American enterprise. Our resources can abundantly provide for our material needs. The continent is controlled by the most ingenious of all the races, and is dominated by the highest political ideals known to man. What need have we to reach out across seven thousand miles of

THE PHYSICAL GEOGRAPHY OF THE WEST INDIES.

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By F. L. OSWALD.

III.—REPTILES AND FISHES.

The present fauna of our planet includes many varieties of mammals and reptiles, and a few kinds of birds, that are found only on certain islands—a fact which seemed rather to justify the once universal belief in the origin of species by separate acts of creation.

A different theory of explanation has, however, been suggested by the discovery of fossil remains, proving the former existence of closely allied forms on continents where their battle for existence had to be fought against beasts of prey and competitors for a limited food supply.

The supposed products of an island genesis by the fiat of supernatural agencies, demanding recognition in mental penance and the payment of tithes, may thus be simply animal Crusoes, favored by the positive or negative advantages of their surroundings.

The dodo, in its struggle for survival, would have had no chance against South American tiger-cats. Not one of the twenty-odd species of Madagascar lemurs could have held its own against the competition of the African daylight monkeys.

Yet there was a time when night apes and large ground birds seem to have had things all their own way, the world over, and Central America may have afforded a chance for existence to several species of reptiles which at present are found only on the West Indian islands.

The Cuban bush tortoise (*Emys nigra*) is found only in the forests of Santiago and Puerto Principe, and there only on the south coasts. It is the most sluggish creature of its genus, and does not seem to have had enterprise enough to crawl around the sand belt of Cape Maysi and colonize the jungles of the north side provinces. It is as helpless as a hedgehog, *minus* its bristles. The darkeys of the Cuban planters crack its armor with home-made hammers, and the *tortuga prieta*, or prieta, as they call it for short, forms a factor of holiday *menus* as frequently as 'possum pie in southern Georgia.

Swift-flowing rivers bear it away as they would a floating log, and it is wholly incredible that its ancestors should have crossed the Caribbean Sea in quest of a more congenial home; but it is possible enough that its eggs may have been ferried across on one of the driftwood islands which the Sumasinta River often tears from the coast swamps of southern Mexico and carries into the current of the Gulf Stream. The evolution of the South American giant cats was probably the death warrant of its continental relatives, but in Cuba it had no four-footed enemies except the *hutia*, or jungle rat, that now and then destroys its eggs.

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An equally favored islander is the grayish-yellow rock lizard, abounding in the uplands of Cuba and Hayti. The lizard-killing cranes of Honduras have not found their way to the Antilles, and the *lagartilla* still basks in the sun that once smiled upon the indolence of the naked Lucayans.

The *toco*, or Cuban hornbill, however, devours small reptiles of all sorts, and the West Indian tree lizards have become almost as nimble as squirrels. They dodge behind branches and wait to ascertain the origin of every flitting shadow, but from imminent danger save themselves by a swift descent, followed by a bold leap into the thickets of the underbrush. Their courtship is quite as grotesque as that of the strutting bush pheasants. The males will swing their heads up and down and puff up their throat-bags till their skin seems on the point of disruption, while the objects of their rivalry sit blinking, reluctant to risk an open manifestation of preference. Some gorgeously beautiful varieties are found in Jamaica: greenish-blue, with a metallic luster, and rows of bright crimson spots, as if the design of protective colors had been patterned after the flower shrubs of the tropics.



IGUANA.

The word *iguana* is of Mexican origin, and rarely used in the Spanish West Indies, but the animal itself is—for culinary purposes, though the Haytian negroes do not go quite as far as the mongrels of Yucatan, where iguana farmers fatten the defenseless reptiles with cornmeal, in wickerwork baskets, that are brought to market as a New England poultry fancier would fetch in a crateful of spring chickens. But, prejudice aside, there is no harm in an iguana fricassee; the meat is white and insipid, but takes the flavor of every spice, and is far more digestible than such hyperborean delicacies as fried eels and pork fritters. There are two species—one in eastern Cuba, with spines all the way down to its tail-tip, and in Hayti a smaller one, with a smoother tail, but with an exaggerated throat-bag and wattles like a turkey gobbler.

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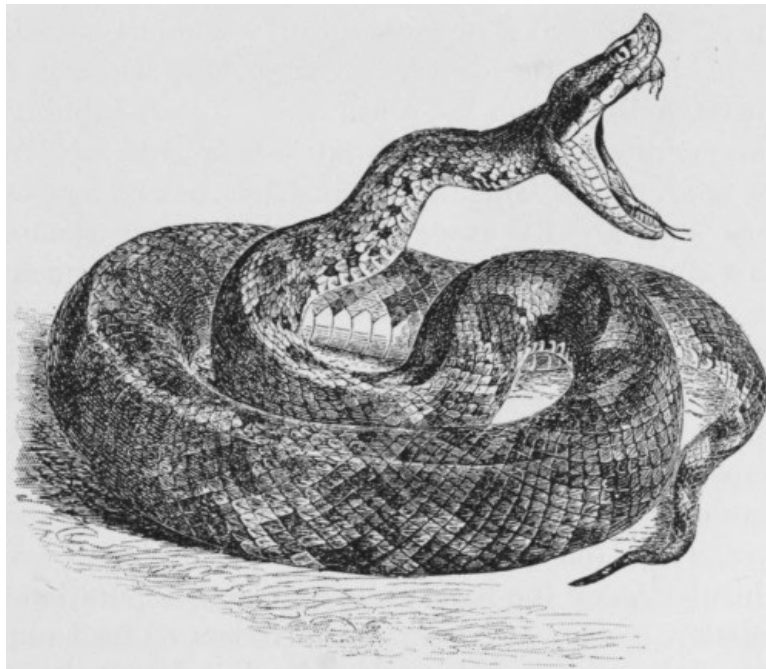
Lagartos vastecos, or "tree alligators," the Cuban creoles call the scampering forest dwellers, that attain a length of four feet, and can stampede foreigners by leaping to terra firma with an *aplomb* that scatters the dry leaves in all directions. If chased, they will take to water like frogs. They are first-class swimmers, their throat-bag serving the purpose of a float, and once in the ripple of the stream are hard to keep in sight, as they have a trick of keeping their legs close to the body and navigating by means of their submerged tails. Like the rainbow hues of the coryphene (miscalled dolphin), the bright colors of the iguana soon fade after death, and the shriveled greenish-brown specimens of our taxidermists give no idea of the appearance of the living animal in the sunlight of its native land. The *Iguana tuberculata* (eastern Cuba) is velvet-green above, with saffron flanks, ringed with blue, black, and brown stripes, and the pet specimens, basking on the porch of a coffee planter, can challenge comparison with the paroquets that flutter about the eaves of the outbuildings like swifts around a martin box.

Cuba has also acclimatized a horned frog, and one species of those curious half-lizards whose shapes may have suggested the dragon fables of antiquity. The "basilisk" (*Cyclura carinata*) is only half a yard long, but can erect its crest and raise its pronged tail in a manner that will make a dog leap back in affright. It has no goiter-bag, but the skin of its throat is elastic, and can be made to swell out like that of the East Indian cobra, while its multiplex spines vibrate ominously. The little monster is, nevertheless, one of the most harmless reptiles of the tropics, and subsists on succulent leaves, with occasional *entremets* of small grubs and insects. In that case, however, Nature has rather overdone its efforts at protective ugliness, and the creoles kill the poor simulator of terrors as the Mexican rustics would a horned toad.

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A plurality of the zoölogical immigrants of the West Indies seem to have come from Mexico, and it is a suggestive fact that the number of reptiles steadily decreases from west to east. Cuba, with its western headland approaching the east coast of Yucatan, thus came in for a lion's share of lizards, tortoises, and ophidians.

Hayti, though only one fourth smaller, experienced a seventy-five-per-cent discount, and all natives and travelers agree on the *curiosum* that there is *not a single species of serpent* on the island of Porto Rico. Trinidad, with an area of only fifteen hundred square miles, but laved by the giant current of the Orinoco, boasts twenty-eight species of land serpents, besides several pythons and swamp vipers. The Trinidad museum of venomous ophidians does not, however, include the dreaded fer-de-lance, which infests the woods near Samana Bay on the south coast of San Domingo. The *Bothrops lanceolatus* is larger than a rattlesnake, and its bite, though not always fatal, causes fearful inflammation, but its aggressive disposition has been greatly exaggerated. Like most venomous serpents, it is a sluggish brute, relying on its ability to crouch motionless till its prey comes in range, then get in a snap bite and shrink back to wait till the virus begins to take effect, and the victim, in its fever spasms, betrays its helplessness by those eccentricities of conduct which are apt to be misinterpreted by the dupes of the "serpent-charm" superstition.



FER-DE-LANCE.

The fer-de-lance is found also on the islands of Martinique and Santa Lucia, where the natives counteract its virus with a decoction of jungle hemlock, and the basis of its grewsome reputation seems to be the fact that it does not warn the intruders of its haunts, after the manner of the cobra or the rattlesnake, but flattens its coils and, with slightly vibrating tail, awaits events. If the unsuspecting traveler should show no sign of hostile intent he may be allowed to pass unharmed within two yards of the coiled matador, but a closer approach is apt to be construed as a challenge, and the *vivoron*, suddenly rearing its ugly head, may scare the trespasser into some motion of self-defense—he may lift his foot or brandish his stick in a menacing manner. If he does he is lost. The lower coils will expand, bringing the business end, neck and all, a few feet nearer; the head "points," like a leveled rifle, then darts forward with electric swiftness, guided by an unerring instinct for the selection of the least-protected parts of the body.

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And the vindictive brute is ready to repeat its bite. For a moment it rears back, trembling with excitement, and, if felled by a blow of its victim's stick, will snap away savagely at stumps and stones, or even, like a wounded panther, at its own body.

A very curious adaptation of means to ends in the modification of the virus is its swiftly fatal effect on birds. A stricken child, though half crazed with fear, may run a distance of three miles before paralysis begins to impede its motions; a squirrel will escape to its nest in the top of the tree, only to come forth again and topple down in its delirium; but a bird drops as if he had swallowed a dose of prussic acid. Serpent virus is specifically a bird poison; in other words, it acts instantaneously in cases where a few moments' delay would defeat the purpose of the snap bite. Wounded rodents will not run very far and can be relied upon to come out of their holes; but a bitten bird, unless promptly paralyzed, would fly out of sight and drop in distant thickets, beyond the ken of its destroyer. And of all bird-killing reptiles the fer-de-lance is the most destructive. The Spaniards have varied its bill of fare by importing the wherewithal of an occasional rabbit stew, but during the preceding ages it had to subsist on poultry, like a popular circuit preacher—the *hutia* rat having developed a talent for avoiding its haunts.

The alleged *horror naturalis* of serpents is perhaps not more deep-rooted than the aversion to cats; at all events, the West Indians have overcome it sufficiently to prefer rat-killing snakes to tabbies. In thousands of rancho cabins a pet serpent of the genus *coluber* may be seen gliding noiselessly along the rafters, or slip through the crack of a floor plank to reach the penetralia of the basement, where the death shriek of rodents soon after announces the result of its activity. Aristocratic Creoles relegate it to their stables, but the tenants of numerous backwood *casuchas* furnish it a cotton-stuffed bed box, and reward its services with a weekly dish of milk. There are several species of large river serpents, and one true boa, the Cuban *matapollos*, or chicken-killer, that attains a length of eighteen feet, and has been known to use its supernumerary coils for the purpose of cracking the ribs of a hound flying to the assistance of the barnyard rooster.

[Pg 198]

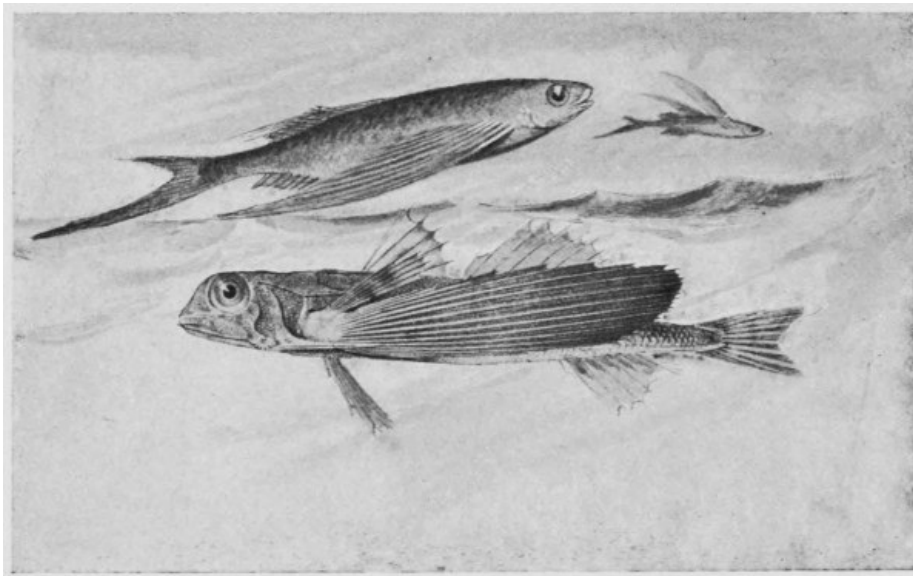
In addition to the above-mentioned jungle tortoise there are several land turtles of the genus *chlemmys*, and thousands of chelidonianians are annually caught on Samana Bay, southern Porto Rico, St. Vincent, the Isle of Pines, and the north coast of Matanzas, Cuba. Those of Santiago Bay have gradually been exterminated, but a large number of West Indian fishing waters are practically inexhaustible. A specialist like Agassiz might haul nondescripts from scores of Haytian coast rivers, and the angle fishers of the Cuban sierra brooks can hook an equally interesting reproduction of an Appalachian species.

"Some of our companions had to eke out a haul with crawfish," says the traveler Esterman, "but our own string of sundries included a puzzle for naturalists. We had caught some twenty brook trout, absolutely indistinguishable from the species found in the head waters of the Tennessee River. Where did they come from? Had they crossed the Gulf of Mexico and ascended the rapids

of half a hundred rivers, or had Nature copied her own handiwork in such details as the small dark dots below each red spot, and the occasional breaks in the lines of the silver-white keel streaks?"

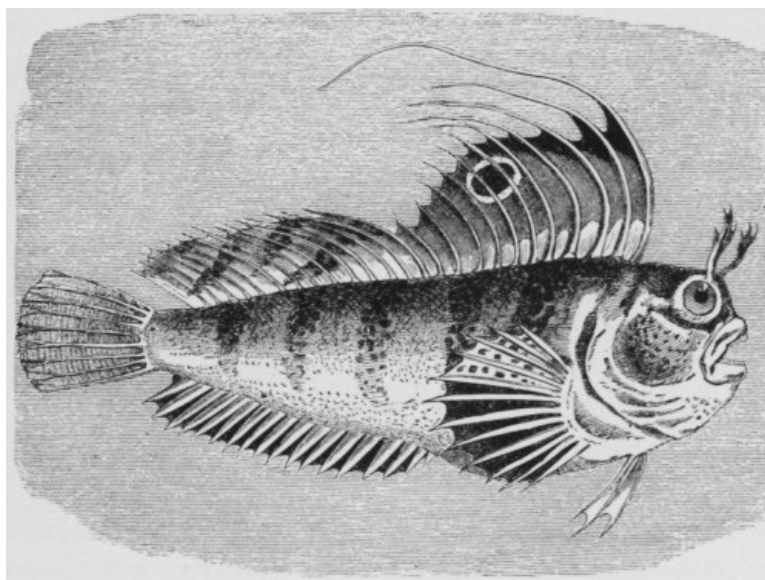
The perch of the forest rivers include several nest-building varieties, and the sportsmen of Kingston, Jamaica, often amuse themselves with target practice at a species of rock fish that come clear out of the water and bask, like coots, on the harbor cliffs.

With every mile farther south the number and variety of the finned aborigines become more infinite, and the fishermen of the estuary of San Juan de Porto Rico alone catch pompanos, mullets, cavalli, red snappers, chiquillos (a kind of sardelles), sea bass, dorados, skip-jack, angelfish, skate, ray, sheepshead, garfish, torpedo-fish, devilfish or giant ray, cobia, hogfish, croakers, shark, and coryphenes.



FLYING FISH (*Exocoëtus volitans*); FLYING GURNARD OR FLYING ROBIN (*Cephalacanthus volitans*). (From Baskett's Story of the Fishes.)

The tiger of the sea, the great white shark, occasionally visits the harbor waters of Cuba, and has been known to seize barefooted peons, surf-bathing horses in the next neighborhood of Morro Castle, and drag them under so suddenly that their companions were unable to account for their disappearance till the foam of the breakers became flecked with blood.



BUTTERFLY FISH.

That champion of marine man-eaters is as smooth as a hypocrite, and hides its double row of horrible fangs under a slippery nose, while the little butterfly fish tries its best to disguise its helplessness with a crest of spiny fins. Its length rarely exceeds four inches, and it can be handled with impunity, but its spines are just rigid enough to entangle it in tufts of gulf weed, and in company of equally tiny sea horses and goldfish, it can often be seen in the aquariums of the Jamaica seaport towns.

[To be continued.]

EMPRESS OF AUSTRIA).

By CESARE LOMBROSO.



FIG. 1.—LUIGI LUCCHENI.

There is not an enlightened person in the world who does not deplore the anarchist crime committed last summer by Luccheni in Geneva upon the unfortunate Empress of Austria. With grief is associated the duty of inquiring what could have been the origin of a misdeed which besides being cruel had the vice of being absurd, falling as it did upon a poor woman near the tomb, who was ready to welcome death, and who had no political influence, by an assassin who had not suffered any offense from her or from her government, and who further had the impudence to boast of his crime as if it had been a heroic act.

We begin our inquiry by seeking for an explanation of the act by means of a study of the person of the murderer in conformity with the rules of the anthropological school. [Pg 200]

Luigi Luccheni is the illegitimate son of a Parmesan servant now living in America, and her master, who lived in the Parmesan territory, a priest, unbalanced and intemperate, who sent her when she was pregnant to Paris to be confined. There she abandoned her newborn babe to a foundling asylum. The child was sent thence to his native country and placed, till he was nine years old, with a Parmesan family named Monici, of whom the father was a shoemaker, very poor and intemperate, and the mother immoral.

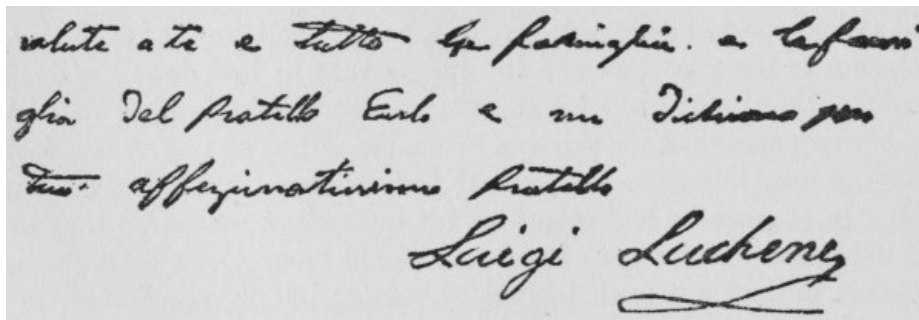
After he was nine years old he was put with a family named Nicasi, good people, but very poor—peasants, or rather mendicants, so that he too became a mendicant, wandering with his comrades through the streets and pilfering till he was thirteen years old. It appears from what Dr. Guerini, of Parma, writes me that during this time he had epileptic fits. When twelve years old he went to school, where he appeared bright but impulsive, and on one occasion in his anger destroyed the portrait of the king.

From the age of fourteen to that of nineteen he was a servant, and had two masters, and wandered in Liguria, Switzerland, and Austria, where he was arrested, sent back to his country, and prohibited from showing himself in the east. He then entered the military service, where he conducted himself very well, incurring only light punishments for assaulting a comrade and for helping a sergeant get out of the barracks at night. He was so liked by his superiors and comrades that when, three years afterward, in 1897, he left the army, Captain the Prince de Vera engaged him as his servant. In this service he exhibited great affection for children, and, what is strange, he was so good a monarchist that he was scandalized that at the commemoration of the deceased Cavolotti, in Naples, the orator was permitted to praise him as a political man without interruption from the delegate. [Pg 201]

One day, irritated because he had been denied some permission, he abruptly took his leave, declaring that he was not born to be a servant, and returned to Switzerland to work as a marble polisher. But even from Switzerland he kept continually imploring his old employer to take him back, declaring in a letter which revealed symptoms of a persistent delirium that "he probably would not receive him again because he did not go to mass"; which indicates substantially that he had not that repugnance for the anti-anarchical life of a servant which he manifested previously

and afterward.^[O]

Whether all at once or not he became an extreme anarchist. He signed and composed anarchist hymns. Suspected by his comrades of not being zealous enough, and also perhaps of being a spy, he decided to strike a blow against some prince; he chose the empress as his victim possibly because he had suffered his first annoyance in Austria. He, who had never killed a fly, had a rude instrument prepared—a file; practiced for a considerable time, perhaps a month, at striking with it, and having committed the crime, tried to escape. When stopped by two citizens he did not resist, and behaved in a very different way from common criminals, therein exhibiting a tinge of insanity. He, for example, although he knew French very well, denied it and demanded an interpreter in the interrogations. He sang and laughed continually, and was glad that he had dealt his victim a good blow, and that he had struck deep with the instrument, boasting that he had used a file instead of a dagger. He was, besides, solicitous of publicity, declaring to the reporters and the judges that he had done the deed all alone, that he had left his captain to accomplish his idea, that he had been an anarchist for thirteen years, etc. In two ungrammatical and very long letters to the journal *Don Marzio*, in Naples, chosen evidently because he had seen it at his master's, he declared that he was not a criminal born, as Lombroso would have it, nor a madman, and that he had not been incited by misery but by conviction, because, if all would do as he had done, middle-class society would soon disappear. He knew that this single assassination would be of no avail, but he had, nevertheless, committed it for an example.



salute a te e tutto la famiglia. a lafam
gia Del fratello Eraldo e mio Dittionario per
Duo. affezionatoissimo fratello
Luigi Luccheni

FIG. 2.—EXTRACT FROM A LETTER BY LUCCHENI.

He wrote to the President of the Swiss Confederation that he would rather be tried at Lucerne, because the death penalty was in force there, and repeated the statement to the judges; he wrote to his master that he was more worthy of him than ever; he replied to the reporters and the judges who reproached him with having killed a helpless woman, that as for that, if she had been a child, but a prince, he would have killed her all the same. At another time he said, in a wild way: "I killed her because she did not work; whoever does not work should not eat, and I was not going to work for her"—a reason which would be as good for the slaughter of several million persons.

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Curious and important is the remark of Luccheni that "Crispi would not have killed her because he was a thief"; an evident proof of the complete lack of moral sense in anarchists,^[P] who like primitive men confound the crime with the deed, and regard criminality as a sort of merit, a seal of fraternity; which demonstrates that the anarchistic practice, if not its theory, is an equivalence of crimes.

When asked if he had never committed blood-crimes, he replied that he had never had anything to do with courts, not even as a witness—which was found to be true—but "I entertained the idea this time, and acted upon it."

Luccheni is a man of medium stature, about 1.63 metre, with very thick, light chestnut hair, stout, with dark-gray, half-closed eyes, roundish ears, heavy eyebrows, voluminous cheek bones and jaw prognatic, low forehead, very brachycephalic (cephalic index 88). He has, therefore, a number of characteristics of degeneration common to epileptics and insane criminals. On the other hand, his handwriting, with its minute characters, especially in the writing of past years, indicates a mild feminine disposition, with little energy of character. This is especially seen in an autograph of 1896, which was procured for me by Dr. Guerini, who got it from his patient (see Fig. 2). This characteristic, which was extremely conspicuous in Caserio when he was near his crime, was also apparent in the assailant of General Rocha. I have likewise observed it to be very conspicuous in epileptics and hysterical persons; and it corresponds, according as they are in their psychical spasm or out of it, with a real double personality provoked by their disease. In one, as I have shown in *L'Uomo Delinquente*, they write signatures that cover a whole page in their larger diameter, while the signature in the normal state is often smaller than the average (see Fig. 3).

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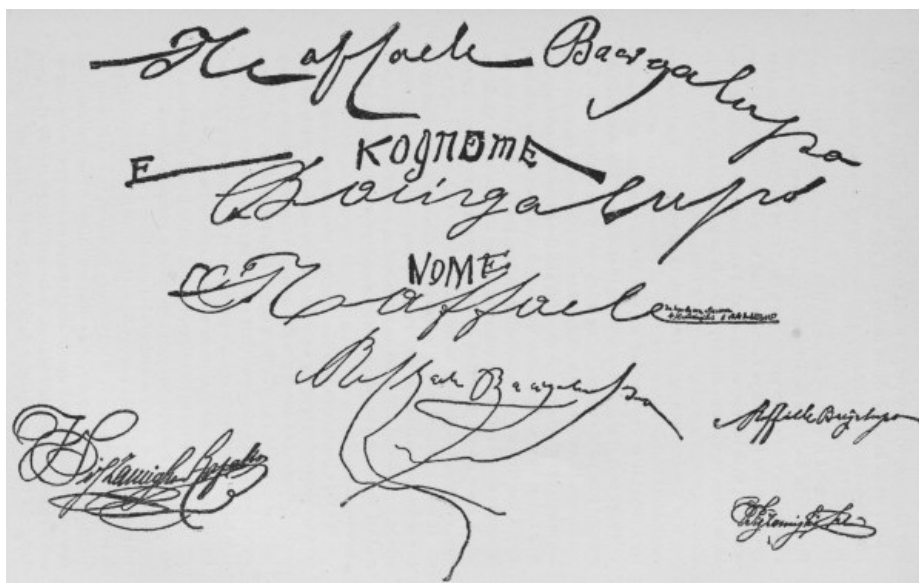


FIG. 3.—MACROGRAPHIC AND MICROGRAPHIC WRITING BY THE SAME EPILEPTIC.

The same double personality that is apparent in the writing is attested in the psychology. We have seen that Luccheni was kind to children, that he was a good servant, characteristics quite opposed to the anarchistic nature, and a genial companion; a man who in Africa was enthusiastically fond of military life; who, a little while before, when he was in the service of the captain, had expressed extreme monarchical sentiments; and finally, when he had become an anarchist, again asked his master to be restored to his service. This double personality is another of the essential characteristics of hysteria and epilepsy.

I have recently studied an epileptoid degenerate who has a sound mind, and, at least in his normal state, is quiet and gentle. But as soon as he has taken hardly more than ninety grammes of alcohol (96° proof) he becomes a wild anarchist, with fierce impulses and hallucinations, of which he has no recollection two hours afterward, or even charges them to his comrades. In this case a double personality is revealed, the demonstration of which is completed by alterations of the visual field and of the touch.

We have, then, in Luccheni a degenerate and probably epileptic person descended from an alcoholic father. Although he affirms that he is not insane or a criminal born, he is a little of both, for he is epileptic and hysterical, so that his denial is already a beginning of a proof of disease. Luccheni also confirms what I have tried to demonstrate in my *Delitto politico*—that the most frequent organic cause of similar morbid impulses of a political character is hystero-epilepsy; for not only do the declarations of some of his countrymen point to epilepsy, and the characteristics of degeneration in the skull confirm it, but his inheritance from an alcoholic father and that impulsiveness and that double personality, which make him pass from the gentlest of men to the cruelest, and which is reflected in the macrography alternating with the micrography of the intervals between the spasms, are accumulative evidence of it.

I have demonstrated the hysterical and epileptic basis in the anarchists and regicides Felicot, Monges, and Caserio, and particularly in a vagabond anarchist, full of cranial anomalies, who told me, when I questioned him concerning political reforms, "Do not speak to me of them, for as soon as I begin to think about them I am taken with a vertigo and fall down"; so that it seems to me possible to establish a psycho-epileptic equivalent in extreme political innovators, an equivalent which is further manifest in their vanity, rising sometimes to megalomania, in their intermittent geniality, and especially in their great impulsiveness. There was also latent in Luccheni an indirect disposition to suicide, which I have found in other political criminals, like Oliva, Nobiling, and Passananti,^[Q] who, having conceived a dislike for the king, made an attempt on his life; and especially in Henry, who rejected the defense of his advocate and his mother based on the insanity of his father, remarking that it was the advocate's business to defend, his to die; and in that Roumanian who was photographed in a portrait that I have reproduced, in the act of committing suicide.^[R] Luccheni, too, believed he would be condemned to death, and was much disappointed when he learned that there was no such penalty in the canton where he committed the crime.

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It may have been morbid vanity that prompted the exclamation he was heard to make, "I wanted to kill some great person, so as to get my name in the papers" (Gautier).

But while an organic, individual cause was good for a third in Luccheni's crime, he was much more influenced by the atmosphere in which he lived. An illegitimate child, left in one of those nurseries which are real nests of crime and graver disorders, then consigned to a very poor and not always moral family of mendicant habits, having learned nothing except to beg and wander, he found such modes of subsistence as he could (notice the uncertainty and plurality of his occupations, indicating lack of assiduity—servant, soldier, marble polisher, and in the beginning peasant); he found, we might say, as the most constant condition the infelicity which radiated around him from every quarter, and, reflecting the worst, urged him to this way of suicide. We should recollect, too, what Frattini said: "Was it hunger brought me to this?" and the anarchist

whom Hamon speaks of: "When I began to question the unfortunates of the hospital, it had a frightful effect on me; I comprehended the need of solidarity and became an anarchist"; and as another one said to the same Hamon: "I became an anarchist when I saw my comrades begging for work with their faces bathed in tears, and was indignant over it." Caserio wept when he thought of the lot of his Lombard companions in misery. These criminals by passion, by altruism, are, as Burdeau wrote, veritable philanthropic assassins. They kill recklessly for the love of men.

Epilepsy and hysteria in Luccheni are explained by his abrupt passage from one condition to the other, and by the conversion of factional passion in him into a criminal act. But there are epileptics and criminals everywhere; yet persons thus disordered in Norway and Sweden are not transformed into anarchists; nor in Switzerland and England, whither people resort from all parts of the world, and where, when anarchy shows itself, it is like a meteor falling to the earth from the extra-planetary regions—wholly isolated and opposed to the world around it.

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The most important cause of this transformation is the misery that weighs upon our unfortunate country, evidence of which comes in from every side even upon those who are not miserable themselves. If even in the latest days Luccheni had been living comfortably, he could not, with the excessively morbid altruism that dominated him, have failed to feel this misery, which is so profound and general in Italy.

Not much erudition is required to demonstrate the immense economical embarrassment of Italy as contrasted with other countries when it is known that we pay about five hundred times its value for salt, that bread is growing dearer every day, and that the amount consumed diminishes one tenth every year in these lands.

It was, therefore, with justice that Scarfoglio said in explaining the origin of anarchism, "A good fifth of the population of Italy are still living in a savage state, dwelling in cabins that the Papuans would not live in, accommodating themselves to a food which the Shillooks would refuse, having a vision and an idea of the world not much more ample than that of the Kaffirs, and running over the land desiring and seeking servitude."

It may be added that it is because of this condition—that is, of the defective civilization that results from it—that there is everywhere a weakened revulsion and diminished horror at blood-crimes, so that there are now sixty homicides for every one hundred thousand inhabitants.

We may learn from this what the true remedies should be. The idea of conquering anarchy by killing anarchists is not valid, because every epileptic has another ready to take his place, because anarchistic crimes are to a great extent simply indirect suicides, and because anarchists think as little of their own lives as of the life of another. It is rather necessary to change the direction of the disease by changing the miserable conditions in which it originates.

Not for humanity, therefore, not for exalted social theories, but in our direct interest, we ought to make a complete change. The suppression of a dozen anarchists is like killing a thousand microbes without disinfecting the surroundings that contain milliards of them; it is that we should look, if we want to be better, to breaking up the large estates, and ameliorating the conditions of agriculture and operative industry, and this in the interest of the governing classes.

Typhus, cholera, and plague, it is true, attack chiefly the poor, but from these the contagion extends also to the rich; and from the unhealthy habitations in which the rich man permits beggars to crowd and suffer, the miasm, as if in revenge, is propagated to marble palaces.

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That imbecile idea of some European nations, who, instead of disinfecting the medium, find it better to put down the doctors who propose remedies, can not make itself at home except among peoples who are destined to perish.^[S]—*Translated for the Popular Science Monthly from the Archives di Psichiatria.*

TENDENCIES IN FRENCH LITERATURE. [T] SUGGESTED BY PROFESSOR DOWDEN'S RECENT BOOK.

BY PELHAM EDGAR, PH. D.

"To present Victor Hugo in a few pages is to carve a colossus on a cherry stone." Thus Professor Dowden prefaces his ten admirable pages on the great French poet; and with equal appropriateness we might assign the phrase as a motto for the whole undertaking. The subject is too vast to cope with adequately in the limits of a slender volume, the tendencies too complex; and the appeal from human interest, which since the days of Sainte-Beuve and Taine has formed such an important element in scientific criticism, had to be abandoned in favor of generalized views of literary conditions and tendencies necessarily abstract or impersonal in character. Yet, despite these evident restrictions which the requirements of his task imposed upon him, Professor Dowden has produced a work of extraordinary merit, a masterpiece indeed in its kind. If we were not assured that everything which the eminent critic writes is its own sufficient justification, we might be inclined to question the necessity of the present volume, in view of the painstaking and conscientious treatise that Mr. Saintsbury gave to the public some sixteen years ago, and which has deservedly remained until the present time the most reliable English text-

book upon the subject of French literature. With no desire to disparage Mr. Saintsbury's scholarly contribution, the present work does in truth supply a need which the earlier book, in spite of its abundant merit, failed to satisfy. It is not harsh criticism to state that Mr. Saintsbury's volume, crammed as it is with a plethora of dates and titles, is at best a compendium for convenient reference, and consequently quite unreadable as a book. Professor Dowden, on the other hand, has conquered the dry-as-dust problem with admirable skill, and the charm of his diction and the easy sequence of his ideas lead the reader insensibly on to the close of a delightful volume. Nor is the book lacking in instructive value of a highly reliable kind, for, in addition to an intimate knowledge of French criticism, Professor Dowden is evidently familiar at first hand with all the more important works of which he treats, and not infrequently proffers fertile suggestions upon debated questions.

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Having avowed, therefore, a genuine admiration of Professor Dowden's book, will it be thought a graceless task if, with the proverbial perversity of critics, I endeavor to point out here and there questions of importance that may seem to have merited more attention than the author was perhaps able to afford to them within his restricted space?

The mediæval portion of Professor Dowden's book is valuable not for its originality, but rather as the reflection of advanced modern criticism in France. Therefore, in this brief review the mediæval period may be neglected, and turning to the second book, which deals with the sixteenth century, the first writer of capital importance whom we encounter is Clément Marot. The author has justly indicated the decrepit conditions of poetry in Marot's youth in the degenerate hands of the Rhétoriciens, and also the powerful attraction which the allegorizing mania exercised on the poet's early work. His later manner is justly emphasized, and his prowess in the lighter familiar forms of verse; but it is only by inference that we apprehend the comparative neglect of his work until the later classical reaction restored him to favor. Professor Dowden, indeed, throughout his book has hardly conveyed a proper idea of the reactionary shocks by which French literature has invariably advanced. Thus the Pléiade, in the enthusiasm of their rupture with middle-age traditions, were blind to the Renaissance elements in Marot's work, and seeking as they did to elevate poetry to nobler themes and a nobler manner, his easy familiar grace was distasteful to them.

Rabelais, of course, is another "colossus on a cherry stone," and the purport of his message is epitomized in a few luminous sentences. The elements of contrast in the man, and his full-blooded joy in living, which was the sign-manual of the Renaissance upon him, are indicated as follows: "Below his laughter lay wisdom; below his orgy of grossness lay a noble ideality; below the extravagances of his imagination lay the equilibrium of a spirit sane and strong. The life that was in him was so abounding and exultant that it broke all dikes and dams; and laughter for him needed no justification, it was a part of this abounding life. After the mediæval asceticism and the intellectual bondage of scholasticism, life in Rabelais has its vast outbreak and explosion; he would be no fragment of humanity, but a complete man."

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Proceeding to the Pléiade, we find its doctrine admirably enunciated, and one point of literary history is well brought out—namely, that to the Pléiade, and not to Malherbe alone, belongs the honor of establishing the bases of classicism in France, the difference chiefly residing in the fact that the programme of the Pléiade was one of expansion in matters of language and prosody, whereas it is precisely in these points that Malherbe and Boileau are concerned with restrictive refinements. Again Professor Dowden, following perhaps in the wake of M. Brunetière, characterizes the conditions of the time as being unfavorable to lyrical expansiveness. "Ronsard's genius was lyrical and elegiac, but the tendencies of a time when the great affair was the organization of social life, and as a consequence the limitation of individual and personal passions, were not favorable to the development of lyrical poetry." These words are ripe with suggestiveness, and duly weighed, they afford the true solution of the oratorical and impersonal character of French literature for two long centuries, when the social *genres* in prose and poetry usurped dominion over the national mind. With our eye then upon the social conditions in France, the often-quoted words "Malherbe a tué le lyrisme" mean nothing more than that he struck a prostrate body.

Before turning from the sixteenth century it should perhaps be observed that in discussing the comedy of that period the author might have amplified his statement of Italian influences by at least a reference to the *Commedia dell' Arte* which we find established in France in 1576, with its traditional repertory of stock characters, whose antiquity ascends to the venerable times of the early Latin farces, and whose survival the work of Molière, nay, even of Beaumarchais, will adequately attest. The last great figure that greets us in the sixteenth century is Montaigne, and we feel a sense of disappointed curiosity when he is relentlessly dismissed at the end of the five pages to which he is entitled here. This singularly modern doubter still smiles inscrutably at us through the misty centuries that flow between us, and we would prefer to loiter with him by the way rather than pass him with a curt nod of recognition. But Montaigne is more important in the history of thought than in the history of literature, so, crossing the threshold of the sixteenth century, we meet the great lawgiver Malherbe, a Moses who really entered the promised land. Professor Dowden is eminently just and appreciative in his judgment of this pedantic and unsympathetic figure, estimating his merits and impartially noting his defects without presuming in his character as literary historian to stamp them as such. Malherbe undeniably eliminated personality from poetry. Shall we regard this as a defect? A century's masterpieces of objective art survive to say us nay, and if the critic's personal sympathies sway him to the side of lyric eloquence, the historian of literature observing without prejudice judges without rancor. "The

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processes of Malherbe's art were essentially oratorical; the lyrical cry is seldom audible in his verse; it is the poetry of eloquence thrown into studied stanzas. But the greater poetry of the seventeenth century in France, its odes, its satires, its epistles, its noble dramatic scenes, and much of its prose literature, are of the nature of oratory; and for the progress of such poetry, and even of such prose, Malherbe prepared a highway."

And now in the wake of Malherbe so thick do the great names throng that I must perforce touch swiftly only on what seems to demand amplification rather than dwell at length, as it would be much less difficult to do, on the many admirable views the book contains. And first as regards the literary significance of René Descartes. Professor Dowden places himself in accord with the customary views of criticism in assigning to Descartes a preponderating influence on the literary art of his century. "The spirit of Descartes's work was in harmony with that of his time, and reacted upon literature. He sought for general truths by the light of reason; he made clearness a criterion of truth; he proclaimed man a spirit; he asserted the freedom of the will. The art of the classical period sought also for general truths, and subordinated imagination to reason. It turned away from ingenuities, obscurities, mysteries; it was essentially spiritualist; it represented the crises and heroic victories of the will." This sounds reasonable, and is indeed in large measure in accordance with the actual conditions observable in the seventeenth century. Yet there is no doubt that the literature of Louis XIV is more intimately penetrated by the ascetic spirit of Jansenism as conveyed in the famous doctrines of Port-Royal, and it is to Jansenism, and emphatically not to Cartesianism, that the literature of the seventeenth century owes that aspect of grandeur and moral serenity which characterizes it. To quote Brunetière: "Pendant plus de cinquante ans, la conscience française, si l'on peut ainsi dire, incarnée dans le jansénisme, et rendue par lui à elle-même, a fait contre la frivolité naturelle de la race le plus grand effort qu'elle eut fait depuis les premiers temps de la réforme ou du calvinisme." Indeed, the tenaciously religious Jansenist spirit of the "grand siècle" would have been universal were it not that Molière and La Fontaine were apathetically indifferent, nay, sometimes actively hostile, to the general enthusiasm.

Let us, however, examine in all brevity the fundamental doctrines of Cartesianism. The terms are familiar enough. The identity of being and of thought. The objectivity of science. The all-powerfulness of reason. Progress to infinity. Optimism at all times. We can not fail to observe the significance of these categories, and how they contain the germs of almost every great subject debated by the leviathians of the eighteenth century. Yet the nation struggled long before it had strength to shake the incubus of Jansenism from its back, and the stimulating work of Bayle had to be supported by events of actual political significance before the stringent and constraining dogmas of catholicism relaxed their grasp on thought and conduct. The revocation of the Edict of Nantes, the Quietistic movement with its unseemly attendant episcopal quarrels, and finally the actual persecution of the Jansenists, all pointed inevitably in one direction, and stimulating the anti-religious sentiment and opening the flood gates to immorality, induced a potent reaction of Cartesianism in the fundamental theories of the eighteenth century.

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In his treatment of Corneille, Professor Dowden "opens his hands only sufficiently to let out a portion of the truth he holds," but what he says is admirable to a degree. Of his diction he writes: "His mastery in verse of a masculine eloquence is unsurpassed; his dialogue of rapid statement and swift reply is like a combat with Roman short swords; in memorable single lines he explodes, as it were, a vast charge of latent energy, and effects a clearance for the progress of his action." This is well said, but hardly indicates how Corneille soared so often in the region of Spanish bombast, or crept among the insipid flowers of Italian preciousness; defects from which Racine's severer Greek taste held him free.

It is refreshing when we come to Boileau to find an English mind impartial enough to do justice to the much-abused "lawgiver of Parnassus." Criticism has for so long deplored his narrowness that we relish an encomium on his good sense. But beyond this there is an opinion which the general reader would be reluctant to admit, but which Professor Dowden has had the courage and the discernment to enforce, when he writes as follows: "But for Paris itself, its various aspects, its life, its types, its manners, he had the eye and the precise rendering of a realist in art; his faithful objective touch is like that of a Dutch painter." Let the incredulous merely turn to the satires to appreciate the scope and truth of the remark. It is difficult to imagine that a more brilliant and effective account of Boileau's work and influence could be presented within so limited a space; yet might not the author have added that whereas Malherbe is the representative of the aristocratic element in literature, Boileau is the first great incarnation in modern times of the bourgeois spirit?

With regard to La Fontaine it need only be observed that Professor Dowden recognizes what French critics with repeated insistence emphasize, the cunning harmonies of his verse.

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Much space is of right devoted to Molière, who with La Fontaine has ever been a stumbling-block to English criticism. Professor Dowden voices our national feeling in refusing to consider him as a poet, preferring to emphasize his profound and healthy philosophy of life. *Tartufe* he considers to be an attack on religious hypocrisy merely. Is not the interpretation perhaps correct which regards it as an attack on the intolerance and Puritanism of all religion, even the most sincere?

Once again, in dealing with Racine, the author shows that subtle discernment in which his criticism abounds. He penetrates to the heart of the secret reason for the cabals that harassed Racine in the later years of his dramatic activity, and which doubtless had their influence in enforcing his retirement. Have we ever sufficiently realized that Boileau, Molière, and Racine

were waging constant war against a rebirth of the *précieux* spirit which threatened not only society with ridiculousness but literature with ruin? Such, indeed, was the case, and in the eyes of the super-refined coterie that grouped itself round the Duchesse de Bouillon, Boileau and his fellow-workers were innovators of a dangerous and revolutionary order. Does not this idea carry us far from our preconceived notions of the narrow conservatism that dominated the leaders of classical thought? Referring to the disastrous check of Racine's *Phèdre*, the author writes: "It is commonly said that Racine wrote in the conventional and courtly taste of his own day. In reality his presentation of tragic passions in their terror and their truth shocked the aristocratic proprieties which were the mode. He was an innovator, and his audacity at once conquered and repelled." The point of view may seem extreme to us, and this vaunted realism may show pale and weakly when contrasted with the grossness of much of the realism that prevails at the present day, or with the graphic directness of the best examples of the type. But the words ring true if we are willing to accept the refined psychological realism of Racine as equally worthy to the title with the physiological naturalism of our more scientific age. Our whole conception of Racine's art falls into line with this view, and his constant solicitude for an easy and natural intrigue in the structure of his tragedies may be brought home to the same healthy impulse of his mind. Was it not Faguet who maintained that so natural indeed were the processes of his plots that a happy ending would have alone been needed to make any of his tragedies, with some added modicum of wit, in all essential features a comedy that Molière might have penned? Mr. Saintsbury, on the other hand, in dealing with Racine is seemingly swayed by some innate prejudice, or he could hardly have denied the poet a high moral character, merely granting him the possession of great shrewdness and discernment. True passion, he remarks, was not popular with the crowd, but "love-making, on the contrary, would draw, and love-making accordingly is the staple of all his plays." It is against this view, and against Mr. Saintsbury's further opinion that the tragedy of Racine is at the furthest remove from an imitation of Nature, that Professor Dowden makes a strong and timely protest.

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While applauding, however, the value of such novel opinions in English criticism at least, we may suspect that in his desire to clinch his arguments the author may have driven the nail too ruthlessly home. And so it would appear when we seek in vain for any statement which contains the shadow of a justification for the existence of that powerful *précieux* spirit against which the greater classicists rebelled. We are too inclined to take Molière's word for it that they were solely ridiculous, forgetting the explicit reserve of his preface—"aussi les véritables précieuses auraient tort de se piquer lorsqu'on joue les ridicules qui les imitent mal." So let us then give the *Précieuses* credit for what they did confer to the advantage of letters amid so much folly, and, weighing the matter carefully, their gift to literature amounts to this: First, amid much linguistic and metaphorical pedantry they were free from the equally damaging and ridiculous pedantry of a labored erudition which pervaded the literature of the day. In the second place, whether we regard it as an advantage or the contrary, their influence made directly *against* the licentiousness of the *esprit gaulois*, and *for* politeness and decency in expression; and as a third count in their favor can we doubt that straining as they did to express the *nuances* of sentiment and gallantry, they were instrumental in stimulating that ardor of mental analysis which is of all things the distinguishing mark of the century? A word finally might have been said with a view to elucidating the inherent divergence of the *précieux* spirit from our own Euphuism, from the Marinism of Italy, or the Gongorism of Spain; a divergence due certainly to the fact that the *précieuses* allied themselves to, and accordingly strengthened, that spirit of social coherence so characteristic of the life and letters of the time in France, whereas the influences of similar movements abroad were more transitory, inasmuch as in some degree more isolated and tentative.

The chapter devoted to the seventeenth century closes with a critical review of the series of great preachers and theologians who have left their mark more or less upon the development of thought, while their literary significance can be comparatively slighted in a history of this kind; and the chapter which discusses the transition to the eighteenth century broaches questions of such large issue that an exhaustive treatment of them was not to be expected. Such are the memorable quarrel of the Ancients and the Moderns, and the *philosophe* idea of perfectibility and human progress. The chapter closes with an account of the great protagonist and pioneer in the warfare against Christianity, the patient, plodding, dangerous Pierre Bayle. So effectually was his teaching absorbed by Voltaire and the encyclopedists that he is read no longer; but low as his flame has sunk, he remains one of the beacons lighting us over the lurid threshold of the century of strife.

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We are in safe hands when it is Professor Dowden who guides us on the highways and bypaths of the eighteenth century, but by very reason of his accurate knowledge of the ground whereon he treads we are disappointed when he fails to point out to us some special feature of the landscape. Beauties we could hardly hope to meet with on our journey. There was not sap enough in that arid soil to nourish flowers, or send a flush of living green over hill and valley. The most serious omission is to have left entirely out of account the exceedingly interesting reactionary influences that leaped back and forth across the Channel when Marivaux's romances were devoured in England, and Richardson's *Pamela* was in every French pocket large enough to hold it. It is in itself still an open question which of these two authors exerted the initial influence on the other, although eighteenth-century criticism invariably held that in *Marianne* Richardson found his inspiration.

A great deal of interest attaches to an explanation of the causes of Le Sage's decline in popularity, and this question likewise Professor Dowden has not adequately presented. Le Sage

saw the imperative need of mediating between the stilted heroic romances *à la Scudéry* and the grotesque travesties of Scarron and Furetière. Inspired by the picaresque romances of Spain, he produced, amid much inferior work, *Gil Blas*, a masterpiece in its kind. The plot is loose-jointed, the composition *nil*, but the book teems with such verve and vigor that it still pulses with an abounding life when Marivaux and Richardson slumber on our shelves. Yet we must admit that the characters are vagabonds, and the sentiment not without coarseness. Love when not slighted is ridiculed, and metaphysical analysis and moral disquisitions are both refreshingly absent from the book. Hence Le Sage's claims on our consideration as the progenitor of naturalism in romance, but on this account also the reactionary wave against which he had to buffet in his declining years. Marivaux, on the other hand, saw the need of mediating between the stilted heroics of Scudéry and what he deemed the ignoble realism of Le Sage. In this resolve he elevated the characters to *bourgeois* rank, and abandoning the empty love rhetoric of the old romances, he brought the acuteness of an analytic mind to bear on the exploitation of the tender passion; and a conscientious though desultory effort is made to study subtle phases of character in the light of surrounding circumstances. Despite the artificial *précieuse* qualities of his style, and the unfinished condition of his novels, Marivaux enjoyed an extraordinary popularity in his day. The same problem repeats itself on a larger scale when we transfer our attention to Richardson, whose works, translated and popularized by Prévost, were read with the greatest avidity in France. Were not these such influences as Professor Dowden's profound knowledge of English literature would have qualified him to illustrate with more precision than has yet been brought to bear upon them; and was it not in point of fact almost imperative for him to deal seriously with such an important theme in the international literary history of nations?

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The pages which Professor Dowden devotes to Voltaire, although brilliant, are not sufficiently suggestive of the extraordinary influence which that most celebrated of writers exercised. It was in no uncritical spirit that Mr. Morley wrote: "The existence, character, and career of this extraordinary person constituted in themselves a new and prodigious era. The peculiarities of his individual genius changed the mind and spiritual conformation of France, and in a less degree of the whole of the West, with as far-spreading and invincible an effect as if the work had been wholly done, as it was actually aided, by the sweep of deep-lying collective forces. A new type of belief, and of its shadow, disbelief, was stamped by the impression of his character and work into the intelligence and feeling of his own and modern times." Nor will Villemain be accused of rapt enthusiasm when he writes, "C'est le plus puissant renovateur des esprits depuis Luther, et l'homme qui a mis le plus en commun les idées de l'Europe par sa gloire, sa longue vie, son merveilleux esprit et son universelle clarté." The strangest fact to contemplate with regard to this unrivaled popularity, this astonishing range of influence, is that it truly constitutes an apotheosis of superficiality. And this in no disparaging spirit of Carlylese disdain for clear ideas around which hang no mists of oracular obscurity, but rather by way of tribute to a heart that beat responsively to human suffering, to a mind keenly sensible of human wrongs. Voltaire rejected the subtleties of metaphysical thought, was indeed incapable of attaining to the heights of speculative contemplation; he was only preternaturally sensitive to the moral defects of this imperfect world, and determined to bend all his efforts to the alleviation of injustice and of crime. As a further concession to his superficiality as a thinker we may frankly admit his incapacity to originate new ideas. His mind indeed was extraordinarily receptive, his intellectual curiosity unlimited, and hostile critics have availed themselves of this very receptivity as a medium of attack upon his originality. They are free to pursue him on that score, but it does not appreciably detract from his greatness in the eyes of posterity to recognize that Bayle before him had preached the doctrine of toleration; that Montesquieu had advocated the abolition of torture and of slavery, and the sanctity of social institutions, or that Boileau forsooth had upheld the dignity of classical formulas in matters literary. It is rather in the mobility of his mind and in the impressionability of his temperament that we should seek for an explanation of a philosophical disturbance in his ideas. It is not an actual mental confusion that I refer to, for his diction is never more limpid than in the expression of his easy personal beliefs; but a certain intellectual inconsistency in his habits of thought makes it impossible for us to hold him down to any definite set of opinions which we can regard as a genuine confession of faith. And this is a vital characteristic of skeptical minds of his stamp, swiftly receptive, and as open as the day to each new intellectual impulse as it arises. Thus we must attribute to his capacity for mental development, as well as to the narrowness of his philosophical range, the many contradictions which his writings exhibit in such matters of intellectual belief as are wont to give a permanent bias of thought to minds less volatile and alert. Are we to regard him as an optimist or a pessimist? a believer in immortality or devotee of annihilation? a fatalist or spiritualist in history? an advocate of free will or determinism? We can not say, and M. Faguet has amused himself with supporting each of these opinions in turn upon its appropriate text, whose clearness is beyond dispute.

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If there was one set of opinions to which Voltaire may be said to have somewhat consistently adhered I may instance his vague and insipid deism, which relegated to God the rôle of an absentee landlord in this poor world which he created and governs by absolute law, but in whose affairs he only intervenes when the death rent is to be collected. He infers a creative God from the argument of the clockmaker and the clock, but takes extreme pleasure in showing how sadly the poor machine is out of order. His idea of the social utility of an avenging and rewarding God must of course be regarded as a freak of intellectual caprice, and yet his timid political instincts made him regard the terrorizing influence of the doctrine of hell with some complacency as a restraining force upon the unthinking masses. The story is well known of the atheistic conversation between D'Alembert and Condorcet at Voltaire's table, who summarily dismissed

the servants from the room with the remark: "Maintenant, messieurs, vous pouvez continuer. Je craignais seulement d'être égorgé cette nuit." The *Dictionnaire philosophique* confirms the flippant utilitarian point of view, which we must beware of regarding as a personal conviction. "I insist particularly on the immortality of the soul, because there is nothing to which I hold more than the idea of hell. We have to do with a host of rogues who have never thought; a crowd of petty people, brutes and drunkards and thieves. Preach to them if you will that there is no hell and that the soul is mortal. As for me I will cry in their ears that they are damned if they rob me." It is needless to add that convictions of this eminently practical nature did not seriously hamper Voltaire in his anti-religious crusade.

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To every branch of letters Voltaire brought the same splendid qualities of mind, and need I add the same defective qualities of conscience and carelessness of the truth when his personal glory or his material advancement were concerned? The sordid pages of his life would weary us in the turning, yet his native generosity and sympathy incline us to charity; and it is wonderful how his never-failing wit can temper his vindictiveness for us, now that the sting has lost its living poison.

I have referred to Professor Dowden's unsatisfactory treatment of the international reactions which characterize the literary history of the eighteenth century. There is another omission which I have remarked in the book on a reperusal of the pages devoted to Rousseau and the encyclopedists. It might have been easily within the scope of a literary story of even moderate dimensions to have more explicitly accounted for the crumbling of the old classical ideal, to have shown that the once impregnable citadel of classical art was rotten at the base, and that those who still defended the imaginary stronghold were themselves the unconscious agents of its destruction. With reference to the irreligious influences of Cartesianism and the philosophical system of Bayle I shall say no more, save that the evident loss in prestige of the traditional religious faith, combined as it was with the rapid decentralization of the sovereign power in the state, must perforce make impossible the survival of literature on the old national basis. Again, in point of pure art a decline was inevitable in connection with the revival of Cartesianism among writers of the stamp of Fontenelle; for their prestige was synchronous with the triumph of the modern party in the famous quarrel; and no student of the *Art Poétique* will fail to appreciate the æsthetical significance of an abandonment of classical standards of taste as an unimpeachable canon of art. Defending as Boileau did the supreme value of reason and good sense, what justification could he have found for poetry unless he had proved to the satisfaction of his generation that poetry better than any other mode of expression could render permanent the promptings of the diviner reason, as witness the eternal monuments of ancient art in the domain of poetry? The triumph of the moderns then turned men's faces in other directions, and whether literary art should henceforward advance or decline, it must at least strike root in a newer soil.

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The inroads of sensibility into French literature, as exemplified in Marivaux and Prévost in the thirties, followed swiftly by the rank and file, also wrought havoc in the old classical method, though this fact may not without further reflection be conceded. But in the broad realm of psychological observation, where classic art had reigned supreme, the influx of a certain morbid sensibility strangely warped the mental vision of the observer. Diderot, a veritable sinner himself in this respect, admits as much in an unguarded moment: "L'homme sensible est trop abandonné à la merci de son diaphragme ... pour être un profond observateur et conséquemment un sublime imitateur de la nature." Every one knows Voltaire's naïve statement which bears condemnatory evidence to the bluntness of his psychology. "La nature est partout la même." And is it not, we ask, this enigmatical typical man, out of space and out of time, for whom the chimerical theories of universal perfectibility were soon to be woven?

It is incontestably true, then, that the character of human observation undergoes a sensible alteration in the course of the century, and that whereas the individual man had been heretofore studied inasmuch as he was in himself of typical value, henceforward not man the individual will be the object of study, but the observation of human relations will usurp the field, and psychological analysis will yield to social investigation.

I would add a word or two by way of conclusion to illustrate how the encyclopedists in their propaganda, aided in part by the coincident influence of Rousseau, established ideals of thought and conduct which were in the most violent contrast to the ideals cherished in the preceding century. Of course, we readily understand that the encyclopedists threw to the four corners of heaven the outworn respect of religious and political tradition. Furthermore, we may ask ourselves what it is which in a sense makes Molière and La Fontaine isolated in their century; and the answer will not be far to seek when we realize that these two alone of all their fellows urged the suspected authority of instinct as a sufficient guide for conduct. Yet how far were not even these bolder spirits from the natural man of Rousseau or of Diderot?

The views of the two centuries concerning the authority of reason seem at first sight to coincide, yet, while bearing Boileau in mind, we can confidently assert that the doctrine of the sovereignty of reason was not established as a principle of thought until the culminating years of the eighteenth century. Pascal's "taisez-vous raison imbécile" indicates how attempered and attenuated by spiritual faith were the dictates of pure reason in his day, and the reason of Boileau, as I have already observed, was strongly tinged with æstheticism. I need not, with reference to eighteenth-century reason worship, go further than to refer the curious of enlightenment on the subject to the masterly works of Morley on the period in question, in which it is precisely this unflinching devotion to reason or unreason (if the sage of Chelsea will have it thus) which stimulates his calm and logical temperament to positive enthusiasm.

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A last element of contrast between the centuries is of interest in connection with the habitual mode of thought which Godwin and his political disciple Shelley borrowed from eighteenth-century French sources with reference to the true relations subsisting between laws and morals. The seventeenth-century mind held tenaciously enough to the theory that it is the *moeurs* of a nation that inspire the laws, but the encyclopedists were inspired in their undying hope of amelioration and human progress to perfectibility by the contrary theory that men, after all, are only bad because the laws have made them so.

It may be conceded, then, that these broad relations of literary movements one with the other, the conflict of converging tendencies, and the more evident causes of the growth and decay of powerful manifestations of a nation's thought, are of quite sufficient moment to have merited fuller treatment at the hands of the eminent critic who has in all other respects fulfilled his task so admirably, that having regard to the necessary conditions of the subject, it would be above criticism if anything could be.

THE BOTANY OF SHAKESPEARE.

By THOMAS H. MACBRIDE.

The universality of Shakespeare is the common remark of critics. Other great men have been versatile; Shakespeare alone is universal. He alone of all great men seems to have been able to follow his own advice, "to hold as it were the mirror up to Nature." On the clear surface of his thought, as on a deep Alpine lake, the whole shore lies reflected—not alone the clouds, the sky, the woods, the castles, the rocks, the mountain path by which the shepherd strolls; not alone the broad highway by which may march the king in splendor the peasant with his wain; but even the humbler objects by the still water's edge, the trodden grass, the fluttering sedge, the broken reed, the tiniest flower, all things, all Nature in action or repose finds counterpart within the glassy depths.

Hence it is that no man, at least no English-speaking man, reads Shakespeare wrong. Everybody understands him. Here is a sort of Anglo-Saxon Bible in which, so far as the world goes, every soul finds himself, with all his hopes, his doubts, his whims, depicted. We are therefore not surprised that everybody claims a share in Shakespeare; rather claims the poet as his own. The Protestant is sure that Shakespeare despised the hierarchy; the Romanist is quite as certain that he loved the Church. There exists an essay to prove him a Presbyterian; another to show that the great dramatist was a Universalist. A volume has been written to prove the man a soldier; another that he was a lawyer, a printer, a fisherman, a freemason; and here are five or six articles to show that Shakespeare was a gardener.^[U]

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All this simply means that the poet had a marvelous faculty for close observing; that his vision was accurate, his instinct wonderfully true. It may be therefore worth our while to study for a little this remarkable man from the standpoint of a naturalist, to see how he who so vividly paints a passion can paint a flower; how the man who limns a character, till beyond the photograph it starts to actuality, will catch the essential feature of some natural truth.

We shall nowhere lack for material. The plays are full of references to plants and flowers of every sort. England in Shakespeare's day, as now, was a land of bloom, and the poet but reflects the loveliness of beauty and color spread about him. But he does something more. He is not content with flashes of color and breathings of odor, he goes into detail and gives us the individual plant unmistakably. In his description he shows an exactitude, a discriminating perception that, had it been turned to Nature's problems seriously at all, must at once have transformed the science of his age. But Shakespeare was not a man of science; he was a poet. In his views of Nature he resembles the great poets of the world, notably Goethe; and, like Goethe, he not infrequently outruns the science of his time, uses his imagination, divining things invisible. Moreover, Shakespeare's plants are living things; they form a garden, not a herbarium. They stand before us in multitudes, so that it is difficult for the present purpose to know what to select. We must be content with a few specimen forms brought out in quotations no more extensive than seems necessary to the argument. Of course, there are many plants to-day discussed of which Shakespeare never heard. He does not speak of many sorts of fungi, of slime molds, microbes; he knew nothing about these. The microscope had hardly been invented, and the unseen world was as yet largely personified. And yet Shakespeare has not failed to note the visible signs of some of our microscopic forms. Critics have wasted their time and the patience of mankind in an effort to identify Hebona, the "leperous distilment" poured into the porches of the royal ear. Almost profitless are such discussions. Yet we may note that we have here to do with an effect; the means of producing it need not be too closely questioned. Before the rush of action, the weird setting, the voice of an apparition, the excited audience cares not what the mysterious vial may contain—ebony, henbane, yew, or whether it were entirely empty. What is called for is a speedy and mysterious taking off. Had the scene been laid in Italy, the effect had been reached by the fateful prick of a jeweled pin, some ring upon a Borgian finger whose pressure was the paralysis of death. But the king died of no such curari. Note the symptoms (Hamlet, i, 5, 64-73):

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"The leperous distilment; whose effect
Holds such an enmity with blood of man

That swift as quicksilver it courses through
The natural gates and alleys of the body,
And with a sudden vigour it doth posset
And curd, like eager droppings into milk,
The thin and wholesome blood; so did it mine;
And a most instant tetter barked about,
Most lazar-like, with vile and loathsome crust,
All my smooth body."

These are the symptoms of blood-poisoning, vividly portrayed; of some contagion, communicable by infection. In foul old London Shakespeare had doubtless seen endemic, zymotic diseases of every description, and drew his picture from the life. Royal blood is notoriously unsound, royal habit leaves the porches of royal ears especially exposed. On our supposition the vial need not have contained very much, not even ebony. The dramatist had plenty of mystery ready to his hand, and the Hebona is perhaps intentionally ambiguous. Bacterial diseases were of old called plagues; they fell from heaven. Listen to King Lear:

"Now, all the plagues that in the pendulous air
Hang fated o'er men's faults, light on my daughters!"

Or Caliban:

"All the infections that the sun sucks up
From bogs, fens, flats, on Prosper fall and make him
By inch-meal a disease!"

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Or they were attributed, as already intimated, to unseen personal agencies:

"This is the foul fiend Flibbertigibbet: he begins at curfew, and walks till the first cock;
he gives the web and the pin, squints the eye, and makes the hare-lip; mildews the
white wheat, and hurts the poor creature of earth."

I quote this latter rather also to show the accuracy and compass of Shakespeare's vision. How many people, not farmers, have seen wheat whitened by the blight! And that is exactly the description, white not "to the harvest," but whiter still to sterility and death.

But leaving aside all microscopic forms which may or may not be incidentally touched upon everywhere, we may turn our attention next to cryptogamic plants which are positively defined. The sudden springing of mushrooms, for instance, especially at night, so unreal and yet realities withal, made their creation a suitable trick for Prospero:

"You demi-puppets that
By moonshine do the green sour ringlets make,
Whereof the ewe not bites, and you whose pastime
Is to make midnight mushrooms, that rejoice
To hear the solemn curfew."

The "green sour ringlets on the fields whereof the ewe not bites" are "fairy rings." The same thing appears in the speech of Dame Quickly:

"And nightly, meadow-fairies, look you sing,
Like to the Garter's compass, in a ring;
The expressure that it bears, green let it be,
More fertile-fresh than all the field to see."

Fungi, toadstools, mushrooms, and so forth, are fructifications only; the vegetative part of the plants permeates the soil, feeds on its organic matter, and spreads almost equally, we may assume, in all directions from the point of starting. When now this vegetative growth has accumulated energy to form fruit, the sporocarps or mushrooms rise all around at the limits of activity; hence, in a circle.

The fungi cut a small figure in Shakespeare—i. e., considering their numbers and almost omnipresence. But we must remember that they were at that time studied by few, their significance and interest little suspected. They formed part of the realm of the world unseen; they came and went at the instance of powers unknown, mostly personified, imaginary, a misty population, the thought of which kept for long ages the childhood of our race in terror. Shakespeare saw the forms of unstudied plants, everything visible to the naked eye, and really omitted very little. He speaks of mosses—the lichens were included with them—chiefly as indicative of age in the object in which they rest:

"Under an oak, whose boughs were mossed with age
And high top bald with dry antiquity."

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Then again he simply touches them, but in such a way as to reveal his full appreciation of their beauty, as in *Cymbeline*, iv, 2. For the decoration of Imogen's grave the ruddock would bring flowers—

"... bring thee all this;

Yea, and furr'd moss besides, when flowers are none,
To winter-ground thy corse."

The "furred moss" to "winter-ground thy corse" is exquisite.

Ferns, though so much larger, so handsome, and in our day so all-attractive, failed generally to impress our fathers.

Butler, writing in 1670, has this to say:

"They spring like fern, that infant weed,
Equivocally without a seed,
And have no possible foundation
But merely in th' imagination."

Now, as far as Shakespeare was concerned, ferns answered his purpose without seed just as well as with such visible means of perpetuity. His only reference is I Henry, iv, where Gadshill says:

"We have the receipt of fern-seed, we walk invisible";

and Chamberlain replies:

"Nay, by my faith, I think you are more belonging to the
Night than to fern-seed for your walking invisible."

In this connection Ellacombe suggests the doctrine of signatures. The God of Nature had written for us his human children prescriptions all over the leafy world. The remedy indicated by its form its own application. Thus a heart-shaped leaf was good medicine for cardiac troubles, a lung-like leaf was good for consumption, a lungwort in fact, and so a liverwort, a spleenwort, and the like. Gerarde, and, in fact, all the old medical writers throughout the centuries, are full of this. Now, what more natural than that a plant which could thus perpetuate itself age after age by means invisible should be able to confer the much-sought gift of invisibility, the power to disappear and reappear at pleasure? Many people so believed. Shakespeare appears to have been skeptical.

Turn we now to the flowering plants: the amount of material at our disposal, as already indicated, is immense. Shakespeare was evidently a great lover of flowers simply as such. His pages from first to last are ornate with color, almost redolent of roses, lilies, eglantine, with every conceivable metaphor and trope—"the bud of love," the "nettle of danger," the "flower of safety." Their lovely shapes are ever before him; he is spellbound with their beauty. "England itself is a sea-walled garden." Grammatical forms may vanish, if only the flower may live. Compare Cymbeline, ii, 3:

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"Hark, hark! the lark at heaven's gate sings,
And Phœbus 'gins arise,
His steeds to water at those springs
On chaliced flowers that *lies*."

The image of the morning flowers, the fiery steeds that drink them dry, shall fascinate us so that we forget the grammar. It will not do to say lie; the word must rhyme with "arise," and further on with "eyes":

"And winking Mary-buds begin
To ope their golden eyes:
With everything that pretty is,
My lady sweet arise."

For the Queen of the Fairies he spreads this sort of a couch:

"I know a bank where the wild thyme blows,
Where oxlips and the nodding violet grows,
Quite over-canopied with luscious woodbine,
With sweet musk-roses and with eglantine:
There sleeps Titania sometime of the night,
Lulled in these flowers with dances and delight," etc.

Such cases reveal the impress, the healthy, happy impress which Nature could exercise on this the foremost man of all the world, the harmony between Nature and Nature's child. All the plants in the last quotation are wild flowers, except the musk-roses, and these are so common in England as to be almost wild. The eglantine was the sweetbrier, said to be wild in all the southern part of the island and popular in the literature of all recorded centuries. Gerarde describes as follows: "The leaves are glittering, of beautiful green color, of smell most pleasant.... The fruit when it is ripe maketh most pleasant meats, and banqueting dishes, as tarts and such like, the making whereof I commit to the cunning cook, and teeth to eat them in the rich man's mouth."

The sweetness of the leaf of the eglantine is referred to by Shakespeare in another passage which I venture to quote now for another purpose, to show the accuracy of his description as applied to simple flowers. The lines are from the scene quoted before. Arviragus and Guiderius would bury

the swooning Imogen. They think her dead (*Cymbeline*, iv, 2):

"I'll sweeten thy sad grave: thou shalt not lack
The flower that's like thy face, pale primrose; nor
The azured harebell, like thy veins; no, nor
The leaf of eglantine, whom not to slander,
Out-sweetened not thy breath."

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Primroses when pale are the palest of all withering plants. The flowers change color with maturity, especially after fertilization. The paleness of the primrose is the pallor of decay. But the azure harebell—behold it waving on its slender stipe beneath the shade of some great rock—who can look into its delicate cerulean cup again and not bethink him of the blue-veined eyelid sleep that falls upon our human flowers!

The same accuracy of detail is evinced in many other places. Take, for instance, Shakespeare's description of the violet all the way through. It moves him chiefly by its odor (*King John*, iv, 2):

"To gild refined gold, to paint the lily,
To throw a perfume on the violet,
To smooth the ice, to add another hue
Unto the rainbow, or with taper-light
To seek the beauteous eye of heaven to garnish,
Is wasteful and ridiculous excess."

Nevertheless, we have violets dim, and violets blue, and purple violets, and more particularly "blue-veined" violets, as if the poet looked with a lens into the very throat of the flower which Frenchmen call a thought. "And there is pansies—that's for thoughts." His description of the elm is equally exact (*Midsummer-Night's Dream*, iv, 1, 47-49):

"So doth the woodbine the sweet honeysuckle
Gently entwist; the female ivy so
Enrings the barky fingers of the elm."

There is nothing better than that, as you may prove by examining the twigs of even some of our American species; the cork elm, for instance. The hawthorn, the cedar, and the pine and the oak especially, are most naturally treated. These are Shakespeare's familiar trees. The cedar of Shakespeare is the cedar of Lebanon, commonly planted throughout Europe since the time of the Crusades. Shakespeare had probably seen specimens in England. He uses it as the type of all that is great and fine. One author thinks he copies Ezekiel, chapter xxxi. The pine was beside him all the while. He knew the secret of the pine knot, and well describes it (*Troilus and Cressida*, i, 3):

"... checks and disasters
Grow in the veins of actions highest reared,
As knots, by the conflux of meeting sap,
Deflect the sound pine and divert his grain
Tortive and errant from his course of growth."

Any one who has ever examined the case, or even one who has handled knotty lumber, has seen the wood fiber run around the persistent base of some dead limb, and can appreciate these lines.

All these quotations show that Shakespeare used his own eyes and used them well. He saw the real distinctions of things, the hoariness on the willow leaf. He found character in the oak as in the king, and beauty in both. In many of his notices of natural objects, however, the poet is not the original observer. He often uses current opinions, fancies, dreams, for these also were the realities in his day, quite as much sometimes as oaks and forests. There is concerning plants a sort of orthodox mythology, and thousands of years have sometimes contributed to the reputation born by a single species. A curious illustration is found in what Shakespeare has to say about the mandrake (*Antony and Cleopatra*, i, 5):

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"Give me to drink mandragora.
Why, madam?
That I might sleep out this great gap of time."

Othello, iii, 3:

"Not poppy, nor mandragora,
Nor all the drowsy syrups of the world,
Shall ever medicine thee to that sweet sleep
Which thou owedst yesterday."

Juliet, reflecting on her proposed entombment in the dark grave of the Capulets, exclaims (*Romeo and Juliet*, iv, 3):

"Alack, alack! is it not like that I,
So early waking, what with loathsome smells,
And shrieks like mandrake's torn out of the earth,
That living mortals, hearing them, run mad:

Or, if I wake, shall I not be distraught,
Environèd with all these hideous fears?"

The mandrake *Atropa officinalis* belongs to the *Solanaceæ*, and, like others of the family, has narcotic properties. This was doubtless known to Shakespeare, as in the passage cited he compares the mandrake with the poppy. The groaning and shrieking are, of course, the purest superstition. The root of the mandrake was supposed to resemble the human form. The favorite habitat assigned to the plant was the foot of the gallows, and men believed that in some way the bodies of criminals were reproduced in the growing plant; their very pains and cries renewed, especially for him who profanely dared to pull the mandrake from the earth. The curious may consult Gerarde.

These ideas, it is needless to say, are very old; Pliny refers to them, and, if I recollect well, Vergil has his hero pull up some plant amid the strangest of sights and sounds. With these old myths are tied up, perchance, the mandrakes of King James's version. Nay, the superstition still survives; look at the woodcut in Webster's Unabridged, and you will discover that the artist who set out to illustrate the word mandrake for that somewhat venerable authority was by no means able to free himself from the ancient spell. Credulity is evermore a factor in the compound called human nature. Men love to be fooled, or to find some support for belief in manifest absurdity. There is nothing so silly but has its advocates among men who ought to know better.

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A year or two since, a man brought from Ohio to the University of Iowa an innocent five-parted, digitate, black fungus. It was treasured in alcohol. Why? Because of its origin. An honest mechanic meeting with accident lost his fingers under the surgeon's knife. The amputated members were neglected, but presently discovered and duly buried in the garden. The following spring from the "identical spot" uprose a swarthy hand, black without, white within. The hand was a perfect *main-de-gloire* for that sensation-loving community. The matter was discussed in newspapers. A long and careful account of the wonder was prepared, put in print and circulated among the friends of the deceased—fingers! "What fools we mortals be!" For sheer superstition and crass stupidity who may say that the nineteenth century may not yet discount the days of the virgin Queen?

But I said at the outset that Shakespeare had in some instances anticipated modern scientific teaching. To illustrate this in its most striking instance, I am compelled to offer a somewhat long quotation (Winter's Tale, iv, 4, 76-106):

POLIXENES. Shepherdess,
A fair one are you, well you fit our ages
With flowers of winter.

PERDITA. Sir, the year growing ancient,
Not yet on summer's death, nor on the birth
Of trembling winter, the fairest flowers o' the season
Are our carnation and streaked gillyvors,
Which some call nature's bastards: of that kind
Our rustic garden's barren; and I care not
To get slips of them.

POLIXENES. Wherefore, gentle maiden,
Do you neglect them?

PERDITA. For I have heard it said
There is an art which in their piedness shares
With great creating nature.

POLIXENES. Say there be;
Yet nature is made better by no mean,
But nature makes that mean: so, over that art
Which you say adds to nature, is an art
That nature makes. You see, sweet maid, we marry
A gentler scion to the wildest stock,
And make conceive a bark of baser kind
By bud of nobler race: this is an art
Which does mend nature, change it rather, but
The art itself is nature.

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PERDITA. So it is.

POLIXENES. Then make your garden rich in gillyvors,
And do not call them bastards."

Here we have brought out very distinctly the effect of cross-fertilization in flowers, the result of grafting and the development of varieties. Better than that, we have here the recognition of that tendency in organisms to vary that lies at the very root of the development of species. Natural selection, survival of the fittest, were impossible were it not true that "Nature is made better by no mean but Nature makes that mean"; or, as it is more broadly stated a few lines further on, "This is an art which does mend Nature, change it rather, but the art itself is Nature." I consider

these very remarkable statements when we reflect on the time in which they were written. Darwin, in 1860, does but unfold the thought. The selection which Shakespeare notes as practiced by gardeners, and a similar selection seen in the world of domestic animals, gave Darwin his cue of natural selection. The beauty of Darwin's thesis lies in the fact that the process is natural, and such is Shakespeare's dictum. Later on, lines 112-128, Perdita brings out another remarkable observation that has only lately been confirmed by the conclusions of science:

"... Now my fairest friend,
I would I had some flowers o' the spring that might
Become your time of day; and yours; and yours;
That wear upon your virgin branches yet
Your maidenheads growing: O Proserpina,
For the flowers now, that frighted thou let'st fall
From Dis's wagon! daffodils,
That come before the swallow dares, and take
The winds of March with beauty; violets dim,
But sweeter than the lids of Juno's eyes
Or Cytherea's breath; pale primroses,
That die unmarried, ere they can behold
Bright Phœbus in his strength—a malady
Most incident to maids; bold oxlips and
The crown imperial; lilies of all kinds;
The flower-de-luce being one!"

Primroses are dimorphic—i. e., on the same species we find flowers of different sorts. These are complete, but in any particular flower the essential organs fail of adaptation to each other—the style in one too long, in another too short, to receive pollen from the stamens of its own flower. For fertilization such flowers are absolutely dependent upon the assistance brought by insect visitors. Perdita's primrose is *Primula veris*, the early primrose, "that takes the winds of March with beauty," and dies ere it beholds "bright Phœbus in his strength," and it is precisely this species that forms the basis of one of Darwin's earliest and most fruitful studies in the cross-fertilization of flowers. The styles in one form of the early primrose are three times as long as in the other, the stigmas differ, and the coadaptation of the parts of the different flowers extends even to the grains of pollen. Such flowers in the absence of insects are entirely unproductive. Insects are rare so early in the year, and accordingly many of the primroses die, as Perdita says, "unmarried."

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Of course, it is not pretended that Shakespeare knew anything of this; but that he should have discovered the fact that the early primrose bears little or no seed, and that he should have been impressed by the truth that this is due to lack of fertilization, is wonderful. This circumstance might well lead to the suspicion that the poet was a gardener.

We must not forget to notice, too, in this connection, that carnations—i. e., pinks—are remarkable for the great number of their varieties. We have, if I may so say, pinks of every color, from crimson to white, even brown it is said. This was true in Shakespeare's time, if one may trust Gerarde again; he says, "A great and large volume would not suffice to write of every one at large considering how infinite they are, and how every year the climate and country bringeth forth new sorts and such as have not heretofore been written of."

Another passage in which the poet has instinctively hit upon a scientific truth is found in Sonnet IV, the last ten lines. The beauty of the passage as a whole is so remarkable that the delicate touches in particular lines are apt to be overlooked:

"For never-resting time leads summer on
To hideous winter and confounds him there;
Sap checked with frost and lusty leaves quite gone,
Beauty o'ersnowed and bareness everywhere:
Then, were not summer's distillation left,
A liquid prisoner pent in walls of glass.
Beauty's effect with beauty were bereft,
Nor it nor remembrance what it was:
But flowers distilled though they with winter meet,
Lose but their show; their substance still lives sweet."

No botanist can read the line "A liquid prisoner pent in walls of glass" and not recognize the exact portrayal of the living vegetable cell. The living protoplasm is a liquid prisoner sure enough, hemmed in by walls transparent. There could be no more striking image. And when in herb and tree, in every living plant, the summer's work is ended and hideous winter falls, the new cells, summer's distillation left, do in all perennials actually survive, lest of the effect of beauty, beauty be bereft. There is no more marvelous picture in all the vegetal world than that of a great tree with all its myriad cells, in summer so filled with the rush of life's activity and change that we might hear its music, in autumn sinking to quiescence, and the winter's silent chill where liquid prisoners sleep 'neath walls of glass. The poet did not understand it; he simply prophesied better than he knew. He makes us think of Goethe, of Lucretius. These men made happy guesses. Lucretius especially surprises us by his views of the constitution of matter—unverified, so far as we can know. Goethe lived in the age of science and went on laboriously to verify his surmises.

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The only natural science which Shakespeare knew was gardening—if that may be called a science. His Sonnets are supposed to have been written about 1590, and the first scientific glimpse of the "prisoner pent in walls of glass" came about 1670, through the lenses of Nehemiah Grew, a Puritan physicist and botanist.

I am aware that it is said by some that in a critique like this we are apt to read much into the writings of our author. The quotations I have submitted show, it seems to me, that this is unnecessary in the present case at least. The words are generally unequivocal. Of course, the language is poetical, metaphoric, but the metaphor has reference to something else; the description is not the metaphor. But, in fact, ought we to expect in Shakespeare very exact or complete description? His whole art lies in the power of suggestion. The deep impressions a man of genius makes upon our minds lie often, if not always, in what he does not say. A word or two and the vision rises, whether in Nature or in life, a passion or a landscape. Take the broken phrases of Ophelia depicting her broken heart, her "no more but so"; or the picture of the winter woods in Sonnet LXXIII:

"That time of year thou mayst in me behold
When yellow leaves or none or few do hang
Upon those boughs which shake against the cold,
Bare ruined choirs where late the sweet birds sang."

Does any one pretend that we are reading into the lines when we appreciate the marvelous sorrow of the one picture or the exquisite truthfulness and splendor of the other?

Shakespeare's natural eye was clear indeed, but none the less he seems to have seen everything with the eye of his mind. Faraday so saw the world of force, Newton of mathematical law, and Tyndall's scientific use of the imagination lies in the same direction.

And so the man of science and the poet have much in common. Both use the natural world, and the imagination is for each an instrument of effort. The poet's generalization is a splendid vision in a world ideal, suggested, no doubt, by what is actual and liable here and there to coincide with truth; the generalization of the scientific man is likewise a vision, but it rests upon the actual, upon the ascertained fact at the greatest number of points possible, and disappoints us only that it is not everywhere coincident. The poet dreams of Atlantis, the lost continents, the islands of the blest, and builds us pictures that vanish with his song; the man of science too beholds the continents rise; scene after scene he likewise makes to pass across our startled vision; but his are history, his tapestries are wrought in the loom of time.

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The poet writes the book of Genesis, with the herbs bringing forth fruit after their kind; the man of science figures fossil leaves and cones and fruit. Only at the last do poetry and science possibly again agree:

"The cloud-capped towers, the gorgeous palaces,
The solemn temples, the great globe itself—
Yea, all which it inherit shall dissolve,
And like this insubstantial pageant faded, leave not a rack behind!"

And when the man of science gathers all his data, and collates fact with fact, and builds the superstructure of his vision, with him, too, all things fade and vanish in the infinity of the future.

AMERICAN INDUSTRIAL EXPOSITIONS—THEIR PURPOSES AND BENEFITS.

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Industrial expositions are a natural development of the fairs of the middle ages. The latter are believed to have originated in the religious gatherings which afforded an opportunity for the sale of wares to large numbers of people. Such fairs still persist in northern Europe, and the best known of them is probably that held three times a year in Leipsic, to which, it is said, "some twenty-five or thirty thousand foreign merchants" are still attracted each year.

In course of time international exhibitions at which specimens of the arts and industries of the great nations of the world were contrasted came into vogue. These began with the International Exhibition held in London in 1851, and of them three have been held in the United States, as follows: The first in New York, in 1853; the second in Philadelphia, in 1876; and the third in Chicago, in 1893. The great magnitude of such expositions has led in recent years to their specialization or subdivision into expositions at which only a specialty was presented. Notable among such have been the following, which were for the most part international: Of articles connected with the leather industry, held in Berlin, in 1877; of all kinds of paper and pasteboard, held in Berlin, in 1878; of fisheries, held in Berlin, in 1880; of electricity, held in Paris, in 1881; of geography, held in Venice, in 1881; of cotton, held in Atlanta, Georgia, in 1881; of early data in American history, held in Madrid, in 1881; of fisheries, held in London, in 1883; of historical matters pertaining to Columbus and the discovery of America, held in Madrid, in 1892; and of hygiene, including chemical, pharmaceutical, and sanitary objects, held in Naples, in 1894.

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Similarly there has been a development in the United States from local fairs, such as those of the various mechanics' institutes, typical of which is the one held annually since 1828 in New York city under the auspices of the American Institute, into interstate expositions. Of these, since 1880, the following have been held: Cincinnati Industrial Exposition, Cincinnati, Ohio, September 30 to October 4, 1883; Southern Exposition, Louisville, Kentucky, August 16 to October 25, 1883; World's Industrial and Cotton Centennial Exposition, New Orleans, Louisiana, December 16, 1883, to June 30, 1884; Central Exposition of the Ohio Valley and Central States, Cincinnati, Ohio, July 4 to October 7, 1888; California Midwinter Fair, San Francisco, California, January 1 to July 4, 1894; Cotton States and Industrial Exposition, Atlanta, Georgia, September 18 to December 31, 1895; Tennessee Centennial Exposition, Nashville, Tennessee, May 1 to October 31, 1897; and Trans-Mississippi International Exposition, Omaha, Nebraska, June 1 to November 1, 1898.

Of the foregoing, the more important were those held in New Orleans, in 1884; in San Francisco, in 1894; in Atlanta, in 1895; in Nashville, in 1897, and in Omaha, in 1898; especially so from the fact that all of these received recognition by the Government; and, with the exception of that held in San Francisco, liberal appropriations were made for their support by Congress. Moreover, at each of them, excepting again that held in San Francisco, a special Government building was erected in which the national Government made exhibits of the workings of the several executive departments, together with the Smithsonian Institution and its dependencies and the Fish Commission.

The first named, that of New Orleans, was held as a celebration of the centenary of the cotton industry in the United States. The first record of cotton as a factor in the foreign trade of this country appeared in the shipment in 1784 of six bags, amounting to about one bale, from Charleston, South Carolina. Audubon Park was the site on which the buildings were erected.

The exposition held in San Francisco, in 1894, had for its purpose the affording of an opportunity to foreign exhibitors at the World's Fair to further display their goods in the United States, and in consequence a great number of exhibits were shipped direct from Chicago to the Pacific coast. The exposition was located in Golden Gate Park.

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The Atlanta Exposition had its inception in a belief that the agricultural, mineral, and manufacturing resources of the South were not adequately represented in Chicago in 1893. It was believed that a better exhibit of the products of the Southland would tend to foster greater trade relations between that section of our country and other parts of the United States, as well as with foreign countries, especially those to the south, such as Mexico. The Cotton States Exposition was held in Piedmont Park.

The exposition in Nashville was designed primarily to celebrate the one hundredth anniversary of the admission of Tennessee into the Federal Union. Recognizing the commercial and educational advantages to be derived from such a demonstration, it was deemed wise to characterize the celebration as an exhibit of "the matchless resources of Tennessee, and at the same time to lead to their greater development." The old West Side Park was chosen as the site of the "Centennial City."

The exposition held last year in Omaha had for its purposes to do for the Trans-Mississippi States what the more local exhibitions had done for Atlanta and Nashville. It was claimed that it would for the "first time fully illustrate the wealth-producing power and the extent of productive industries of the Greater West," and it did. The exposition grounds were included within what was called the Kountze tract and the old fair grounds.

Each of these expositions has been projected for distinct commercial reasons. They have had for their immediate purposes the presentation of the products of the region in which they were located to their neighbors, to the nation, and to the world. In this sense they have been simply the offspring of the fairs of the middle ages, differing from them only in that the feature of sale has been largely eliminated. That they have been successful in accomplishing the results desired is beyond doubt; indeed, the expositions in Nashville and Omaha were even financial successes. But they have done more than this; they have accomplished a world of good in the way of education.

Let us consider some of these benefits. Beginning with the grounds, these have been given over to the charge of some competent landscape architect under whose skillful supervision the desert has been made to blossom like a rose. The sand hills of San Francisco became the beautiful "Palm City," which since the close of the exposition has become one of the most attractive spots in the Golden Gate Park. At Nashville the landscape effects were claimed by many to excel in beauty those of the World's Fair in Chicago. "Evergreens, vines, and shrubs are everywhere, and three lakes break this vista of green," was the opinion of one visitor. Besides the general architectural effect of the buildings, which can not but impress those who are so fortunate as to visit these expositions, there is a special value in the reproductions of historical buildings. At Atlanta the Massachusetts Building was a representation of the Craigie House, the headquarters of Washington when in Cambridge at the beginning of the Revolution, and later the home of the poet Longfellow. It was a fortunate inspiration of the late Dr. G. Brown Goode that led to its presentation by the State of Massachusetts to the local Society of the Daughters of the American Revolution. The architectural feature of the Nashville Exposition was the replica of the Athenian Parthenon in all its artistic beauty. Every detail was true to the original in design and coloring. It was the chief glory of the centennial, and as it was a permanent structure it will long remain to the "Athens of the South" a memorial of its exposition. Of less conspicuous interest were the

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reproductions of the Rialto of Venice and the Alamo of San Antonio.

The only architectural feature of historic character announced for Omaha was that "the Arkansas Building will be a reproduction of the mansion of General Albert Pike in 1843." The long oval waterway around which the buildings were grouped afforded, however, excellent opportunity for studying the architecture of the buildings, which, it was claimed with much justice, approached those of the never-to-be-forgotten "White City" in their beauty of design.

From the exterior to the interior is a natural method of progression. Let us therefore pass to a brief consideration of the educational features that are to be derived from an examination, no matter how cursory, of the displays that are to be seen within the buildings. First of all, and indeed frequently the most important, is the exhibit made by the national Government. In the special building devoted to that purpose are shown the exhibits of the several executive departments, including also that of the Smithsonian Institution and its dependencies, and the Fish Commission. As a result of the years of accumulated experience there has been in each of the expositions previously mentioned, except that in San Francisco, a distinct improvement in the installation of the exhibits in the Government Building, until it was recognized in Atlanta that the display was superior to that in Chicago, and in Nashville "the best exhibit ever made" was the verdict of those who had seen the successive expositions previous to that in Omaha. Therefore the telling of a story by means of objects in the best manner possible is the result sought for and attained most perfectly by those who installed the Government exhibits.

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It is, of course, understood that the purpose of the Government exhibit is to familiarize the public with the methods of carrying on the functions of the different departments. Thus, in the post-office exhibit there is shown the entire sequence of postage stamps, both of the United States and foreign countries, the various kinds of mail bags, figures of the mail carriers in their different uniforms, and finally models or pictures of the methods of transportation. The Treasury Department shows the working of the mint by the striking of commemorative medals, while a full series of the existing medals and coins of the country are displayed in cases on the wall. The functions of the Department of the Interior are shown by exhibits of a series of models of some important invention, as, for instance, a sequence showing the development of the sewing machine. In this way—for of course the blanks and other documents are shown—the working of the Patent Office is demonstrated; while the Geological Survey, also of the Department of the Interior, presents a series of minerals, showing the economical wealth of the country, together with its maps and reports, results of work accomplished. Everything can not be shown, but a most excellent idea of what each department does can be had from a study of the exhibits of the Government.

Next in importance to the Government Building is the one devoted to commerce, and here are usually to be found the weak points of our American expositions. In lieu of a series of exhibits showing the progress in a given industry or trade, we find too frequently a collection of nondescript articles without much if any relationship to each other. This is due primarily to a lack of proper organization in soliciting exhibits, and also because the awards or medals of the jurors are so often of no relative value. The second condition is an outcome of the first. To be more specific, in Nashville there were no exhibits from any one of the larger and well-known silver firms, and yet American silverware has a recognized status as one of the most successful of our American art industries. Cut glassware is another branch in which our artisans or art workmen have achieved splendid results, and still there were no exhibits from art glassmakers in Nashville. Certain varieties of art pottery and art glassware, such as the Rookwood pottery and the Tiffany glass, are seldom seen at these smaller expositions. In consequence the juror makes an award to the best article of its kind on exhibition, which may be but a third-rate article compared with others; still it is the best shown in the exposition, and therefore worthy of recognition. Another unfortunate feature must be mentioned at this point. It is the decorative feature. At the last World's Fair held in Paris there was a colossal figure of George Washington in chocolate exhibited by an American manufacturer of that article. While it might be considered as a laudable attempt to make known to the French nation the features of the "Father of his Country," and from that point of view worthy of recognition, still it was no evidence of the superiority of the chocolate, and therefore could not be considered in connection with the giving of an award. This condition of affairs prevails at every exposition, and too frequently an exhibit of a meritorious article is made in such a modest manner that its claims are overshadowed by the pretentious display of something quite inferior.

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Two conditions thus present themselves—namely, the lack of proper exhibits and the improper presentation of certain exhibits. The first condition may be overcome by a more perfect canvass of the industries of the country. In nearly every one of these there is a national organization, and it should be the duty of that body to consider the matter. By the appointment of committees and working among the representatives of the industry, either a good exhibit from the leading firms could be secured, or else a collective exhibit of the best from many firms could be obtained. Typical of the last named was the exhibit made by the potters of the country at the World's Fair in Chicago. By the adoption of such a method of displaying the products of manufacturers the possibility of the second condition would be entirely eliminated.

After all, the value of these expositions is chiefly educational, and surely no more perfect way of educating the visitor or sightseer could be found than by placing before him a historical series of products, beginning with the one made first in point of time, continuing with better specimens, showing the improvements that have resulted from increased experience and knowledge, and culminating with the finest product now made. The contrast between the first and the last would

be indeed most striking.

It must not be thought from the foregoing remarks that these interstate expositions have been lacking in the presentation of the products of their own home industries. Far from it. In San Francisco, in Atlanta, in Nashville, and in Omaha the local manufacturers did themselves great credit by the admirable way in which their goods were shown, but it was just in this particular feature that the weak point indicated previously made itself most conspicuous. A local silversmith could hardly be expected to compete with the more famous manufacturers in the same line in larger cities, and yet in the absence of an exhibit by the better known firm an award would naturally be given to the smaller manufacturer, thus creating a false impression to the world at large.

It must not be assumed that the educational value of the exhibits in the Commerce Building is without commendation. Next to making a thing, the seeing of it is most important, and surely no one can pass along the aisles of any exposition without noticing much that is new or unusual, no matter what his previous experience may have been. It is in this connection that the foreign section is frequently most instructive. Warm furs from Russia and the north, rich fabrics and strange metal ware from the Orient, rare porcelains from Copenhagen, and brilliant glassware from Bohemia and Hungary, tell the story with striking vividness of the special products of the Old-World nations.

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As has been shown, the finished products of manufacturers are those that are housed in the building devoted to commerce and manufacturing, but the raw materials require a building or two for themselves. That in which the products of the earth are exhibited is usually designated the "Minerals and Forestry Building." This requires but brief mention, and has its chief interest for the expert. Geological specimens, including paleontological and lithological exhibits, show the age and character of the soil, while the rocks further indicate the possibilities of the territory, for they show the geological horizon. In natural order are shown the minerals of the country. At Atlanta and Nashville the richness of the mineral wealth of the Southern States was fully demonstrated. Not only ores such as those of iron and manganese, but the combustible minerals, as coal, lignite, and petroleum, were exhibited. More striking, perhaps, are the great numbers of economic minerals that these expositions show. The materials—phosphate rock, sulphur, and nitrates—used in making artificial fertilizers; the marbles; the pigment-yielding minerals, including ochres, umber, and barite; the clays, with their products of earthenware and pottery, bricks, and tiles; and even mineral waters are among the different minerals to be seen. It is from such exhibits that something of an idea is obtained of the enormous wealth that is contained in the earth, waiting only to be excavated and fashioned into articles of beauty and utility. While such exhibits are frequently to be seen in museums, still the average mind is more impressed by the casual examination of these things in expositions, and one's pride of home increased by the rich stores of mineral wealth attractively installed. It is customary also to show models of the machinery used in mining, and even books, maps, and drawings are not uncommonly seen.

A similar arrangement is followed in regard to the forest products. Logs and sections of trees, as well as samples of wood and timber of all kinds, are shown. Then come the finished products—boards, shingle, and moldings—and finally the manufactured articles, such as pails, tubs, and then furniture. Barks, as for tanning or dyeing, seeds and gums, and the wood pulp for paper are on exhibition. Among the miscellaneous products deserving mention are fibers, as used in basket-making or cane work.

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Forestry as a science is made the basis of a series of exhibits. These include timber culture, tools used, and methods employed in planting and caring for trees. And finally lumbering as a science finds a place in the scheme followed in this department. This includes the tools used in lumbering and the methods employed, as well as exhibits illustrating the tan-bark industry, the turpentine industry, and the charcoal industry. So it happens that there is much that can be learned by the student who will devote a little time to the analysis of the exhibits in the building devoted to the products of the mines and the forest.

A visit to the Agricultural Building reveals to the interested observer those products of the soil that are for the most part the result of cultivation, and so we find exhibits of cereals—wheat, oats, barley, and the like—and then their immediate products: bread, pastes such as macaroni, and starches. The sugar-yielding plants, together with honey and the manufactured product, as candy and other confections, come next in order. The root crops, such as potatoes or beets, and the vegetables, are of much importance. Preserved meats and food preparations, dairy products, spices, tea, and tobacco are among the articles on exhibition. Then come the plants yielding fibers, as cotton and the like; but we hasten on to make mention of the exhibits of implements used in agriculture and its special subdivisions, such as horticulture, viticulture, floriculture, and arboriculture. Who will gainsay the fact that the farmer can not do otherwise than learn much from a visit to the home of the products of the soil? It is also customary to include a live-stock exhibition during some period of the exposition.

Mention has been made of the building devoted to the finished products of manufactures and of the buildings in which the crude materials are displayed. Besides these there are usually several buildings devoted to the exhibition of the means by which the original substances, whether from the mine, forest, or farm, are made up into the commercial product for the merchant. One of these is called the "Transportation Building," and in it we find the various means by which the raw materials are conveyed to the factory. From the lower forms of transportation of which man is the motive power, such as the wheelbarrow, upward through the various forms of vehicles of

which the power comes from horses and other animals, until as the topmost member of the series is shown the magnificently equipped train of railway cars, provided with all the conveniences that modern luxury can devise. If the visitor is not content with land locomotion, more than likely he can find an exhibit in which transportation on water is possible, as by means of a naphtha or steam launch.

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Machinery is the active means by which the immediate transposition of the crude material into the finished article is accomplished. And in a building where the ceaseless belt moves with the rapidly revolving pulley may be seen the many forms of machinery which the active brain of the ingenious mechanic has devised to cheapen labor and increase production. The change of the cotton fiber into cloth, or the passage of the silken thread into the finished handkerchief; the revolving cylinder on which the virgin sheet of white paper becomes the printed purveyor of news; or the many and varied appliances by which the piece of leather is fashioned into a covering for the foot; or again the means by which the strip of steel is made into a pin or needle, are among the interesting things that may be seen in Machinery Hall.

Conspicuous among the many interesting wonders of science that were shown at the Centennial, in 1876, were the few, insignificant, blue, flickering, and unstable lights that ushered into existence a new era in the history of electricity. In Atlanta, in Nashville, and in Omaha a building was necessary to hold the appliances and products of the latest of our sciences. Telephones no longer impress us by their newness, and the appliances of electricity to heating and lighting are now household necessities. To those who treasured the memory of the beauty of the lighted Court of Honor at the White City in Chicago there was given a greater joy when the entire grounds of the beautiful Centennial City in Nashville were illuminated with more than seventeen thousand incandescent lamps. Daylight had faded into darkness only to emerge into an electric day of brilliancy unsurpassed. Thus was told the story of the progress of the science which as a result of the studies of Franklin, Henry, Morse, and Graham Bell may well be regarded as the American science.

A parting word must be given to the amusement features. How the Streets of Cairo, now so hackneyed, linger in one's memory! The Enchanted Swing was one of the novel features of the Midwinter Fair in San Francisco, and of weird interest was the Night and Morning in Nashville. The Mexican and Japanese villages were excellent features in Atlanta, and so was the Chinese village in Nashville, although the "Old Plantation" was more popular. Panoramas such as that of the Battle of Gettysburg, or pyrotechnic spectacular shows such as The Storming of Wei-Hai-Wei, are of value. The musical features must not be forgotten, even if popular fancy leans toward Dixie, for the occasional "Gems from the Operas" help to leaven the mass. At Nashville the military drills by the national and State troops were of considerable interest, and much had been hoped for in Omaha in this respect, but the war prevented.

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In this analysis, incomplete, it is true, of these American interstate expositions something has been shown of their design and more of their benefits. They have had for their purpose the exhibition of the materials, processes, and products of manufacture, but their ultimate benefit has been that of education. To the thoughtful an opportunity has been afforded of following the crude material through the processes of manufacture until the finished product has been exhibited. The variety of crude materials was shown him, the different processes were contrasted, and finally the completed article was exhibited which possessed this merit or that advantage according to the process followed. For the mere pleasure-seeker there were the delights of attractive surroundings, the beauty of the exhibits, and the delights of music or other entertainments. Indeed, all the influences are for good.

Let it then be the effort of every one, whether official, exhibitor, or visitor, to use his influence to improve and elevate these expositions so that only the most desirable localities shall be chosen in which to hold them, and let the selection of exhibits be made so as to include the most worthy; for then, and only then, will the visitor derive the greatest benefit.

And so from time to time and in various places we shall have these interstate expositions, which will show to the world the advancement made in the development of the resources of our great country.

BOOKWORMS IN FACT AND FANCY.

By WILLARD AUSTEN.

"What is a bookworm? Tell me if you can;
I merely mean the insect, not the man—
A reptile whom a wit like Hood might dub
A grub that grubs in Grub Street for its grub."

ROBERT ROCKLIFF.

So much mystery has gathered around the term bookworm, so much imagery has been employed in depicting the appearance and devastations of this mythical creature, that many have been prepared to accept almost anything, no matter how fabulous, that might be said about this unknown enemy of literature. Reaction against these weird and fantastical accounts is indicated

by the question, not infrequently asked, "Are there such things as bookworms?" Few are aware that in this creature we encounter another case of masquerading, that these "destroyers of the Muses" are common enough pests playing other rôles than those in which they are familiarly known. Some of them are met with daily in the house and elsewhere, and arouse no unusual interest, while the world goes on wondering what a bookworm is like.

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Insects injurious to books and bindings are not a new subject. The Greeks and Romans observed and wrote about them, but notwithstanding, their knowledge of zoölogy, comparatively speaking, was so meager, they do not seem to have felt any of the mystery or wonderment about these creatures which we have felt. The terms *blatta*, *tinea*, *silphe*, are frequently met with in the works of classical writers, and, while we can not be sure of the particular species they intended to allude to by these terms, we do in many instances know from the context that the creatures known to them had like characteristics with those known to us, and that they were given to literary depredations as are their descendants.

The earliest allusion to a book-destroying worm which has come down to us from classical lore was rescued from oblivion by the lad Salmasius in 1606, when he discovered the manuscripts of the anthology of Cephalas in the library of the Counts Palatine at Heidelberg. Among the fragments in this collection is one attributed to Evenus, the sophist-poet of Paros, who wrote about 450 B. C., in which the "foul destroyer" is thus berated:

"O worst enemy of the Muses, devourer of the pages of books,
Foul destroyer that lurkest in a hole, ever feeding on what thou hadst stolen
from learning,
Tell me, black-colored bookworm, why dost thou lie in ambush to injure the
sacred decrees while fashioning thy envious image?"

Aristotle, in his History of Animals, mentioned the "little scorpionlike creature found in books"; a characterization which obtains to-day for the little creature which Leunis calls the "*Bücherscorpion*." Horace addresses his finished book, to which he imputes an unbecoming haste to be displayed on the booksellers' stalls, thus: "When thumbed by the hands of the vulgar, you begin to grow dirty, then you will in silence feed the groveling bookworm." Ovid, in his exile at Tomi, likens the "external remorse of its cares" which his heart feels to the gnawing of the *tinea*.

Considering the fact that Pliny is said to have comprised in his Natural History all the knowledge of the natural sciences then known, it is a little surprising that he had not more to say regarding book insects. Here and there in his writings, however, he speaks of worms in connection with books and papers in the same casual way as other classical writers, causing you to feel that he was conversant with their destructive tendencies. The epigrammatist Martial in the first century, and Lucian in the second, both use the term bookworm; Martial, in much the same way as did Horace, warning his book of the fate awaiting it; Lucian, in his well-known dialogue, *The Dream*; or, *The Cock*, as a symbol of the condition to which miserly man may descend.

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Sufficient has been said to show the attitude of the ancients toward these little pests, that had no more regard for their precious thoughts than for the utterances of modern "statesmen," whose speeches are "read by title and ordered printed."

Crossing the cloistered period of the ages called dark, when books were so few and so constantly used by the jolly monks that these little creatures must have had a difficult time getting a living unobserved, we come down to the sixteenth century, by which time books had begun to multiply and worms to propagate. In the last quarter of this century we find Pierre Petit, who is numbered among the celebrated pleiade of Latin verse writers along with Rapin, Commire, and others, addressing these "impudent creatures" in a thirty-four-line Latin poem titled *In Blattam*.

A curious and interesting characterization of some species of book insects has come to us in the writings of Christian Mentzel, the German naturalist and philologist, who lived in the seventeenth century. When one reads that he heard the bookworm crow like a cock, and said, "I knew not whether some local fowl was clamoring or whether there was but a beating in my ears," one can not help wondering if there was not something defective in his ear drums; but further on he says, "I perceived, in the paper whereon I was writing, a little insect that ceased not to carol like very chanticleer, until taking a magnifying glass I assiduously observed him." From this one concludes that if the fault were not with his hearing, by which some well-known sounds made by book insects seemed to him like the crowing of a cock, an altogether different cock from the kind we know must have lived in his day.

The earliest observations on the subject possessing any scientific value were made by Robert Hooke in his *Micrographia*, published in London in 1665. In many respects this work was a curious medley of facts and fancy. The registers of the Royal Society, of which he was a member, testify to the eagerness with which Hooke hurried from one inquiry to another with "brilliant but inconclusive results." Among the many objects which engaged his attention was an insect which he described in a chapter entitled *Of the Small Silver-colour'd Bookworm*. His description shows it to have been the "fishtail," by naturalists called *Lepisma*, well known as one of the pests that not infrequently is found in the library as well as other parts of the house.

Many interesting instances of the discovery of bookworms are found in the literature on the subject, showing the keen interest felt in the search for specimens of the "destroyer," many of them revealing the fact that some unique and curious creature which stands alone in its taste for literary food was sought. Mr. Blades reported in 1858 that he found specimens in some black-

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letter fragments at the Bodleian Library, that were recognized by the librarian, Dr. Bandinel, who crushed them with his thumb, saying, as he wiped his thumb nail on his coat sleeve, "O yes, they have black heads sometimes." The librarian of Hereford Cathedral, the Rev. F. S. Havergal, contributes his observations, covering a period of eighteen years, during which time he reports that he found two distinct species. From his description, however, it appears that he failed to recognize that the two were the larva and imago of the same species. Many cases of the finding of bookworms reported in England and America are not accompanied with sufficient data to determine just what they were. These contribute to the general impression that many have sought but few have found what were thought to be "genuine bookworms," while on every hand are those creatures which under the right conditions become book destroyers.

Research among the literature concerning library pests reveals the fact that no less than eleven different groups have members that are directly or indirectly accused of injuring books and bindings. The number of species in each group ranges from one to eleven, making a total of over thirty different species. In addition to these there are others against which the evidence is at best only circumstantial. It is not necessary to say that none of these bear any resemblance in any period of their existence to worms, and that the term bookworms is a misnomer. The word has become so firmly fixed in literature, both in its figurative and literal sense, that its misuse will no doubt continue.

The larger number of these are included in the class *Hexapoda*, or insects. Two species belong to the class *Arachnida*, which embraces the scorpions, spiders, mites, etc. One of these, *Chelifer cancrivorus*, known as the "book scorpion," although not a true scorpion, belongs to the order *Pseudoscorpiones*, and is probably what Aristotle had in mind when speaking of the "little scorpionlike insects found in books." The other species is known as *Cheyletus eruditus*, of the order *Acarina*, or "cheese mites." These two are known to be carnivorous in their habits, and there is some question as to whether they haunt books for the purpose of feeding on them or on other creatures to be found there.

Of those in the class *Hexapoda*, which comprises all the other known book pests, there can be no question as regards their destructiveness. Many are known about the house by the name of the article they are most frequently found in, and unless driven by a lack of those things more to their liking, they do not invade the literary sanctum. Some are so cosmopolitan in their tastes that they seem to take whatever is most convenient, whether it be books or boots, pepper or poison.

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As has been said, the earliest observation of value was made by Hooke on *Lepisma*, commonly known as "fish moth" or "silver fish," from its resemblance, in shape and coating, to a fish; also as "bristle tail," from its caudal appendages. They are found in closets, cupboards, and clothes baskets. Opinions have differed as to its destructiveness to books, but the weight of evidence is against the insect. It seeks the paste and sizing used about books, and this leads it to attack bindings and labels. There is a theory that paste made from pure starch is not to their liking, but this is not substantiated by observation.

Termites or "white ants," another misnomer, since they are not true ants, are also well-known ravagers whose deeds of destruction assume a serious aspect, especially in the tropics. "Humboldt," according to Shimer, "informs us that in all equinoctial America, where the white ants abound, it is infinitely rare to find papers or books that go back fifty or sixty years." Their destruction to timber has been the cause of serious accidents, at one time so weakening the supports of a dwelling that a whole dinner party was precipitated from the third floor to the basement. These pests belong to the order *Isoptera*. The American species is known as *Termes flavipes*, and several well-authenticated cases of their having done serious injury to books and bindings in this country are recorded. As the chief sustenance of these insects seems to be dead wood, it may be that the increased use of wood in paper will make modern books, which bookworms are said to scorn, more tempting than ever to them.

By opening quickly some old book which has lain long unused, one may see tiny pale creatures with knowing black eyes scurrying across the pages. These insects are known as "book lice," or by the Germans as "*Staublaus*" (dust louse). Entomologists have given them the high-sounding name *Atropos divinatoria*. They belong to the family *Psocidæ*, of the order *Corrodentia*. Some writers, beginning with William Derham, in 1701, are of the opinion that this delicate little creature makes a noise like unto that of the coleopterous insect called "death-watch." These little fellows are said to have stout jaws with which they do damage to books, dried plants, etc., "nibbling away the leaves and covers of the former."

Of all the insects that injure books perhaps the best known are the cockroaches, scientifically called *Blattidæ*, of which there are five species whose bookish habits are unquestioned. Many instances of serious damage done by them to the bindings of books are on record, the most important, perhaps, being that of the Natural History Museum Reports, at Albany, where Mr. J. A. Lintner found a hundred volumes or more so badly damaged by roaches that they could not be moved without coming to pieces. The United States Senate Reports, bound in cloth and leather, some fresh and new, have been badly damaged at Washington, in the efforts of these pests to get at the paste with which the covers were fastened to the volumes. The species known to commit these depredations are the "Croton bug" (*Blatta germanica*), smaller than the others, but considered by some writers as the worst pests of the family; a little larger species, called *Periplaneta orientalis*; and a large species, known as *Periplaneta americana*, or *Kakerlac*. Against two other species, *Blatta australasiæ* and *Blatta gigantea*, there is not so much evidence.

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Among the moths, or millers, order *Lepidoptera*, are found several species which injure books, the best known being the *Aglossa pinguinalis*, commonly called "grease moth." The larva of this species is at first a pale, flesh-colored grub, but as it matures it becomes quite black. It injures bindings by constructing long "silken tubes," in which it remains until full fed. Sometimes they spin a web between the volumes, "gnawing small portions of the paper with which to form their cocoons." This species belongs to the family *Pyralididæ*. Of the family *Æcophoridæ* two species are known to injure books: *Acompsia pseudospretella*, and an undetermined species of *Depressaria*. Under the name *Æcophora*, William Blades describes the ravages of the former on two leaves of a "Caxton," and accompanies his remarks with a photographic illustration of the damaged leaves, from which it is at once seen how irregular is the gnawing of this species. The newspaper account of the finding of bookworms in the Lenox Library not long ago classed the larvæ found with this species.

The largest number of book-destroying insects are found among the beetles, of the order *Coleoptera*. To this group belong the "book borers." The species thus far considered have been more or less dilettantes in literature. The beetles, however, seem possessed with a true spirit of investigation, and when they undertake a piece of work in a serious fashion they go to the bottom of it, sticking close to the line laid down. This characteristic distinguishes these insects from all others, and makes it comparatively easy to determine when they have been at work in a worm-eaten volume. No less than sixteen different species of this order have been either detected in this work, or such strong circumstantial evidence has been found against them, that there is little doubt as to their guilt. Some insects seem to destroy books for the sheer want of something better to do; some do so in seeking the paste and sizing used in and about the books; others because the leather bindings are desirable material in which to undergo transformation; and, again, others haunt book shelves and books in search of prey in the form of living creatures. But among the beetles are found tiny little grubs that seem to have a genuine intent to destroy; that set out deliberately to wreak vengeance on man's record of his thoughts, deeds, and discoveries, and, as if knowing the means which man uses to destroy, have sought to imitate him in the effects produced. As a result we find books filled with small, round, shotlike holes strongly suggesting the results which might follow from the use of the family Bible by the restless boy as a target for his first shotgun.

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The book-destroying beetles are all grouped under three families: *Dermestidæ*, *Scolytidæ*, and *Ptinidæ*. The *Dermestidæ* include the "flower beetles" and the well-known "carpet bug." The species of which there can be no doubt as to its disposition to pierce book bindings is *Anthrenus varius*, which Glover says "is a very pretty insect when examined under a magnifying glass, being beautifully marbled or variegated with black and gray." Another member of this family, against which there is less evidence, is *Dermestes chinensis*, so named by Dr. L'Herminier, of Guadeloupe, who reported a loss of nearly four hundred volumes from its ravages. Erichson believes this to have been the well-known *Anobium paniceum*. *Dermestes lardarius* and *Attagenus pellio* are others of this family mentioned in the same category.

The family *Ptinidæ* includes two groups, *Anobium* and *Ptinus*, the first being generally known as the "death-watch," from the peculiar sound, like the tick of a watch, which is produced by striking against a hard substance with their tiny jaws. Superstitious persons have long considered this noise an omen of death, hence the name. Instead of an ill omen, this noise proves itself to be a love-call between the sexes, and may be imitated accurately enough to elicit a response. One of the best known of these beetles is called *Sitodrepa panicea*, generally known in Europe as *Anobium paniceum*. It is a cosmopolitan feeder, having a reputation in several different fields of activity, commercial and scientific as well as literary. To druggists it is known as "the worm," and their stock of ginger, rhubarb, Cayenne pepper, nux vomica, and belladonna root all appear to be equally to its liking, tin foil being no formidable barrier to its persistent search. Leather dealers have suffered from the destruction wrought by this little fellow to such an extent that whole cases of boots and shoes, carriage trimmings, etc., have been ruined. To this species belongs the insect found a few years ago at work in a volume of Dante's Divine Comedy, which had been sent to Cornell University library from Florence. The larvæ are about three to four millimetres in length, of a dirty-white color, head tinged with brown, and black mouth parts, with the abdomen strongly curved. The adult is a small, cylindrical, brown beetle from two to three millimetres in length, with head bent down and wing covers marked with fine punctate striæ.

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Professor Poey made extensive observations of an insect in Cuba which had destroyed about four thousand volumes. He called it *Anobium bibliothecarum*, and Schwartz thinks the injury reported by Herminier from Guadeloupe should be attributed to the same species. *Anobium striatum* and *pertinax* have long been known to injure books by their "gnawing and burrowing," not only in and through the bindings, but also entirely through the volumes. *Nicobium hirtum*, a native of southern Europe, where its larvæ have been found doing like injury, is only locally abundant, and for this reason has never been considered a serious library pest. Schwartz says, "In one way or another the insect has found its way to North America, but has always been regarded as a great rarity with us."

The *Ptinus* group embraces *Ptinus fur*, *Ptinus mollis*, *Ptinus brunneus*, and *Ptilinus pectinicornis*, called by Leunis "*Bücherbohrer*." According to Butler, a peculiarity of this genus—that of dissimilarity of shape between the sexes—is well illustrated by the *P. fur*, the male being almost cylindrical, the female inflated or rounded at the sides; so much variation that they might be taken for two different insects. *Ptinus brunneus*, although similar to *P. fur*, is distinguished from it by being wholly of a light-brown color and destitute of whitish bands on the wing covers. Some

writers speak of this species as the "book beetle," while *Sitodrepa* is spoken of as the "spice beetle." Dr. Henry Shimer makes the following statement regarding their method of boring: "They usually operate in leather-bound or half-bound volumes by boring galleries along in the leather.... They usually bore along quite under the surface of the leather, cutting it almost through; occasionally a small round hole penetrates through the leather to the outer surface."

One of the most famous cases on record of insects boring through books is that reported by M. Peignot, in which he states that twenty-seven folio volumes were pierced through in so straight a line that a cord might be passed through them and all the volumes raised by means of it. Different writers give the credit of this feat to different members of this group, so that the most that can be said is that it was the work of some member of the *Ptinidæ*.

In the family *Scolytidæ* only one species belongs to the book ravagers. It is known as *Hypothenemus eruditus*, and was described by Westwood in 1836 as "pitchy black, the head of the same color, entirely concealed from above by the front thorax." It is very minute in size, being about one twentieth of an inch in length. So far as its depredations have been observed it confines its work to the bindings of books, making furrows in all directions much as it does in the sap wood of dead trees. The strong resemblance of its burrowing to the gouging done by an engraver's chisel has given to this family the name of "engraver beetles."

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A review of the different families of insects whose habits under favorable conditions lead them to infest books and bindings will show them to be more or less well defined according to their feeding habits. The book scorpions and mite, *Cheyletus eruditus*, which, as we have seen, do not come under the head of insects, are primarily carnivorous, and their presence in books may be due to the fact that they find there animal as well as vegetable food. This is certainly true of the book scorpion, which feeds on mites, book lice, and other small insects. The "fish moths" or "silver fish," the "book lice," and the "cockroaches" can have no other reason for infesting books than their liking for farinaceous substances such as are used in and about the bindings and labels of books. For this reason the damage done by them is largely confined to the exterior or interior of the bindings, and only so much of the book itself is injured as comes in their way in their search for food. The "white ants" feed principally on wood, and in and about books there is more or less wood fiber which would be to the liking of these voracious feeders. The moths and beetles are the burrowers and borers. They seek retired places in which to lay their eggs where the larvæ will be surrounded with food for their growth. The moths and some of the beetles are more given to burrowing in the bindings, keeping close to the outer surface for the purpose, it is thought, of making it easy for the imago to emerge after the change is completed; while others bore straight tunnels often from cover to cover.

A natural conclusion for one who has gone over the literature of book-injuring pests to reach is that the many persons that have been industriously looking for the bookworm, as well as those that have reported the finding of isolated specimens, some dead, some alive, have had in mind the one creature which bored holes in books. The frequent use of the terms "genuine bookworm," "the real bookworm," etc., reveals the fact that the users of these phrases approached the subject with a preconceived idea of the kind of creature they should find to account for the ravages only too apparent on scores of volumes which pass through the hands of booksellers and book keepers. To many the boring beetles are the only creatures which are rightfully called bookworms, and in their search other book pests have not been taken into account.

HYDROPHOBIA IN BAJA CALIFORNIA.

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By DANE COOLIDGE.

When, in 1884, Pasteur discovered the true nature and cure of hydrophobia, he dispelled the accumulated superstition of centuries regarding this mysterious and dreaded disease. But in some countries where hydrophobia exists his cure is not yet known, and the old superstitions remain. While collecting mammals near San José del Cabo, in the cape region of Lower California, two summers ago, I found the country people very fearful of wild animals, especially of skunks and coyotes. My Mexican boy, whom I had sent on an errand, remained perched half the afternoon in a thorny mesquite tree because he had seen a coyote and was afraid it was *rabioso*. But they fear the skunks most of all because of their habit of approaching men in the night while they sleep, and biting them on the toe or ear, or any exposed part. In defense, unusual precautions are taken to exclude them. The windows of the houses are barred with iron, and the doors are made in halves, horizontally, so that the lower part may be closed to keep out animals and snakes without interfering with free ventilation. The common people, who live in brush houses, blockade their doorways at night, and rely on their cur dogs to attack any animal which may come near.

Notwithstanding all this evidence, and innumerable ghastly stories, I remained a month in the country, at the rancho of Francis Pazik, a very intelligent and well-educated Bohemian, without seeing any rabid animals. Then, one evening just at sundown, a crowd of men came up the path, leading one of Pazik's mules and dragging the carcass of a skunk. They said that it had come out into the open field where the mule was picketed and bitten it on the hind foot. All of them insisted that it was rabid, and cited its extreme emaciation as a proof. The young man who dragged it showed me his great toe, half burned off with blue vitriol, and told me that a skunk had bitten

him there two months before, and the doctors had burned it. These native "doctors" are uneducated men who live on the superstition of the people. In the case of hydrophobia their methods are characteristic. There are in the cane fields little insect-eating animals called shrews which, in that country, give off a scent so like that of a skunk that Pazik has hunted them out with his dogs in the night by mistake. The "doctors" pay as much as two dollars apiece for shrews on urgent occasions, and, mixing their bodies with herbs and roots, form a concoction which they claim will ward off hydrophobia. Besides this, they also bleed the patient and cauterize the wound.

According to the Mexicans, there are two kinds of rabies: that affecting the head and that affecting the stomach. When animals have *rabia* in the head they become stupid and move about slowly, biting at everything they see or touch. They are not violent, and become very thin. But when they have rabies in the stomach it gives them great pain, and they bark and howl and race about frantically, chasing other animals and tearing them. Mr. Cipriano Fisher, of Santa Catarina, told me of his experience with a coyote which had rabies in the stomach. He was hunting deer at Cape San Lucas, and had killed two. Carrying the smaller one and his gun to camp, he returned unarmed, except for the knife which every one wears in that region, to bring in the other. As he went down a deep cañon he heard a coyote ahead, howling in the peculiar way which he knew to be characteristic of the *rabioso*. All the hunters claim they can recognize the howling of a rabid coyote, and they say that no other animal will answer it or go near it. The howling approached rapidly. Knowing that he could not escape by running back uphill, nor kill it with his knife without being bitten, he stepped quickly into the brush and cut a long green club. As he turned back into the open place he saw the coyote down the cañon, leaping up and snapping at the air. When the coyote saw him it broke into a furious run up the trail, and when, as he says, about thirty feet away, made a flying leap at his face. He jumped to one side, struck the rabid animal in the back of the head as it passed, and killed it with the one blow.

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Skunks are particularly dangerous to persons who sleep out at night. J. Ellis McLellan, a field collector of the United States Department of Agriculture, whom I met at San José del Cabo, told me of an unpleasant experience he had with a skunk while coming down from La Paz. On account of the heat he had ridden in the night as far as Agua Caliente, where he stopped near a ranch house to sleep till morning. Although the night was warm, he covered his head with a *serape* for protection from insects and wandering animals. Early in the morning he was awakened by a twitching at his blanket and, raising the *serape*, saw a skunk biting and jerking at it. Realizing the gravity of the situation, he reached for his heavy knife, and then, suddenly throwing aside the *serape*, he leaned forward and put his whole force into one blow. As he ducked under the blanket again, for protection, the dogs from the house rushed out in a body and pounced upon the dying skunk, which they worried on top of McLellan until the ranch people beat them off. When skunks bite at men's toes and ears, or at blankets in this way, it is taken as an indication that they are rabid.

Shortly after this I saw a young man at Miraflores who had just been seized with hydrophobia. Two months before he had been bitten on the great toe by a skunk as he lay asleep in his house at Agua Caliente, but had shown no symptoms of the disease until that day, when he suddenly began to bite at the door jamb in the store at Miraflores. They put him into the brick jail, where he soon became very violent. When I went down to the jail the next morning I found a group of Mexicans about the huge wooden door, which was chained fast and tied with *riatas* in addition. From the inside there came a succession of thumps and blood-curdling groans and strangles. I peered in through the barred window, and saw the unfortunate man lying on his back in a corner, spasmodically kicking out his legs from his chest and rolling his dilated eyes. Suddenly he leaped to his feet and, grasping the iron bars, shook the great door violently, chained and tied as it was. Then he seemed to leap against the walls, and at last fell down, groaning. He soon became rational again, and began to talk through a crack in the door to an old man whom I took to be his father. He asked for water, but they would not give him any, and while he was pleading for a knife or pistol another spasm seized him.

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Presently the judge came over with two policemen. They said they were going to take the *rabioso* out and tie him to a tree, because he was getting the jail too dirty, and might not die for a week. As soon as the spasm passed, and the man lay weak and moaning, the burly policemen loosed the *riatas*, and, stepping in quickly, seized him from behind. He protested pathetically against going into the hot sunshine, but they pushed him out and started toward the corral to tie him up. But when the fierce sun struck him he was racked by horrible convulsions. He kicked and struggled, bit at his shoulders, and blew spittle into the air when he threw his head back. The policemen breathed hard, and the old man, his father, hugged himself in agony as he walked behind. There was a desperate struggle, then, with a final paroxysm, the *rabioso* suddenly collapsed and hung limp in their arms. At first they thought that he was dead, but when he showed signs of life they carried him to the corral and tied him to a tree before he became conscious. Two days later he died.

Pasteur himself does not undertake to cure patients who have been seized with spasms; but the judge told me that, fifteen years before, an Italian doctor had come through their country making marvelous cures. When he arrived at Miraflores there was a *rabioso* in the jail who was so badly afflicted and so long-lived that the judge had ordered him to be shot. When the Italian doctor heard this, however, he asked permission to try an experiment on the man. This being granted, he had the patient lassoed, dragged to the river, and held under water until he was apparently drowned. After the *rabioso* was full of water, the doctor rolled him on a barrel and resuscitated

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him; then he gave him some medicine which cured him. Cipriano Fisher told me that he had cured a valuable bulldog of rabies by this same method, using the bitter juice of the *pitahaya*, a species of cactus, for medicine. This crude means of alleged cure is unique, and seems based on the theory that the antipathy of rabid animals to water, implied in the name hydrophobia, is the cause of their death, and partial drowning, therefore, a cure.

Rabies is extremely prevalent at times in certain districts of the Cape region. McLellan says it does not occur north of the tropic of Cancer—that is, of La Paz and Todos Santos—and it is hardly known in the thickly populated district about San José del Cabo, but at Cape San Lucas, and especially also along the base of the mountains near Miraflores and Agua Caliente, where it is very hot and dry, rabid animals are greatly to be feared. While collecting in these mountains I passed several good ranches which had been deserted because, as my guide said, stock could not be raised there successfully on account of the *rabia*.

This man had worked as a *ranchero* or stock herder for two years on one of these ranches, and had been obliged at one time to kill eleven cattle and seven sheep and goats in two weeks on account of their having rabies. It was part of his duty to follow up rabid coyotes, foxes, skunks, and wild cats when he saw them or heard their peculiar cry, and shoot them before they bit the stock. But he assured me very gravely that he preferred to work in the valley for less wages rather than have charge of Chollalito rancho; and when we camped there for a night he slept on top of the pack boxes, with his bare feet wrapped in blankets and a *serape* over his head, and reverently pulled out the blessed rag he wore around his neck, in order to more surely protect himself against the rabid skunks and coyotes. There is, however, very little danger in traveling through this interesting country. Cases of hydrophobia are comparatively rare, and some scientists who have collected in Baja California have even denied its existence there. But with the traveler, as with the native, there remains the vague, constant, but unrealized expectation of seeing some raging coyote come tearing through the cactus, or of having his toe bitten in the middle of the night as he sprawls in the heat and darkness.

PROFESSOR WELLDON, in the British Association, expressed his sense of the intellectual insolence of those who presume to say, notwithstanding our ignorance of animal characters, that because a characteristic seems to us minute and without importance, it is therefore without importance to the animal. Until we know the function of the animal throughout, and can picture its physiological processes thoroughly, we have no right to say, *a priori*, that this or that feature is of no use.

THE SENSE OF COLOR.

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BY M. ANDRÉ BRACCHI.

When the different rays of the solar spectrum strike the eye separately they each produce a particular characteristic and subjective impression, which is called color. Ingenious theories have been set forth by physiologists, like Young, Helmholtz, Hering, and others, to explain the perception of colors by our eye, but the problem still awaits solution, and is not likely to be explained from that side, because it is rather psychical. The laws regulating the perception of colors are not physiological; we perceive only relations. We know that the sense of color may be modified independently of that of light and of space. Two phases may be distinguished in its evolution. Every light, whether chromatic or not, produces a simple luminous impression on the retina—a simple excitation of the optic nerve, without being analyzed by it. In the second phase the brain, the psychic center of color, intervenes. There may obviously be considerable differences between persons in the interpretation of what we call colors, and we may judge that there is an education of this psychical center, and that it is an important matter.

Different as the ways of interpreting a sensation of color may be, there are still some fundamental ideas in the matter which painters, for example, do not all observe. Some, like the impressionists, exaggerate them, and others neglect them. Which of these are wrong? and which right? are questions we are not concerned with, our purpose being to show that many of the phenomena of color, shade, sources of light, etc., escape a large proportion of persons unless they are attentive observers. If we visit the exhibitions of the impressionists we shall be entertained at the criticisms we hear over the canvases of such painters as Renoir and Monet; youths who have just come out of the drawing school declaring that their master never taught them to put blue on a face, and that in Nature all shadows are gray or black, and none red or violet; and we should astonish a great many people if we should say that a white robe should never be painted in a portrait picture with white lead alone. "All skies are blue, all trees are green, all pantaloons are red," said a celebrated painter who was trying to show how the habit of seeing a colored object in a certain way prevented one from perceiving the different colors that might be applied to it. We recollect the trouble of a brave youth who, having sat for his portrait to a celebrated painter, was distracted at perceiving green in the reflections of the hair of his likeness. Yet there are in Nature shadows that are blue and reflections that are green, and if we do not see them habitually it is because we do not give sufficient attention to them.

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A common division of the spectrum is into warm and cold colors. The warm colors are red, yellow, orange, and yellow-green; the cold colors are violet, blue, green, and blue-green. This is not an arbitrary division, but answers to a fact of experience which passes from our physical to our moral impressions, and may cause in us feelings of comfort or uneasiness, joy, sadness, or moral depression. Some persons are influenced by the gray-colored sky, others are gay when the day is bright. It is a current expression that the color of the southern landscape is warm. Goethe said that blue caused him to feel cold.

The terms warm and cold are technical expressions in the arts. A color tone is cooled by putting blue in it, and warmed by adding red or yellow. "This practice is not arbitrary," says M. F. Bracquemond in his book on Design and Color; "it copies the colored aspects which natural light imposes on all imitation that seeks to realize the colored and factitious light of painting. To reach this, art observes the order according to which the natural lights distribute their various colored elements, and classes luminous aspects—a process which it has always observed—into the two categories of warm and cold. Hence, so far as examples come to us, this contrast is easy to verify; at the Louvre, for example, in works from Pompeii, and in those of all the masters." Preyer relies upon this division of colors into warm and cold for a comparison of chromatic sensations with thermic, and for supposing that the color sense is developed from the sense of temperature. Chromatic sensitiveness to this author is only a special case of thermic sensitiveness limited to the retina. Darwin's ideas were evidently the same; the whole human body was a sort of retina capable of improvement; we may, it is true, suppose with Lord Kelvin that "there is absolute continuity between the perception of heat by the retina of the eye and its perception by means of the tissues and nerves."

A very elementary experiment will easily enable us to recognize these different qualities of colors. Set a lighted candle on a table near a window; there are then two sources of light—the daylight, blue and cold, and the light of the candle, orange-red and warm. Cast a shadow on the white paper by holding a pencil straight up. The shadows cast by the candle will be blue to a degree that no one can mistake it, a greenish blue. Placing the pencil between the window and the candle and looking at the shadows, we have, first, the blue shadow of the candle, and then the shadow projected by the cold daylight. The color of the last, though perhaps less evident than the other, is an orange-yellow, of rich, warm tone.

From this little experiment we may conclude that a warm light provokes a cold shadow, a cold light a warm shadow, and that the color of the shadow is complementary to that of the light. In the experiment, daylight was the source of the cold light. Let us now take a third source of light, warmer than that of the candle, the flame produced by burning alcohol and salt—a very warm, deep orange light, which makes the light of the candle seem cold and its blue shadows appear yellow, while its own shadows are blue.

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We recently observed a very striking example of these warm and cold appearances of light; it was at the theater: a beam of red light shone brightly upon an actor, whose shadow was absolutely green. Some of the people around us were astonished at the phenomenon, which they could perceive very plainly. Phenomena of this kind are produced every instant in a nature illuminated by the sun; nearly all the shadows are colored in hues which we can distinguish with a little attention where the unpracticed eye sees nothing but gray. Thus in a mountainous country, exposed to the warm light of the sun, the mountains in the horizon appear blue through the haze; then, as evening draws on, the sun appears a deeper orange, more reddish, while the sky seems green by contrast, and the red rays of the sun falling on the mountains turn them violet, in those beautiful tints which give so much glory to those countries of large shadows and bright lights.

However intense the light of day may be, it is therefore always colored, and gives those colored shadows which painters do not always observe. The painter, in fact, should make an analysis of the complex light around him, and should repeat the result in synthesis on his canvas. Upon hardly any other condition can he represent the transparency of the atmosphere, or the luminosity of a subject or a landscape. These colored shadows are not, therefore, false colors, as often seems to be believed, or optical illusions; they are really existent, but our eyes are hardly ever practiced enough to discern them; we are deficient in education of the color sense. This education is not hard to attain. There are persons who have special aptitudes and are consequently remarkable colorists, just as some persons have an admirably organized ear for music; but, besides these, it is possible for all persons endowed with the faculty of observing and capable of attention to acquire with considerable rapidity the faculty of discerning colors, where they at present hardly see anything but confused gray masses. (The epithet gray, we may observe, is used as applied to many things the color of which is not susceptible of exact determination.) Such attentive observation of colors is, however, attended with some danger to painters. Every person prefers some one color, is influenced by a particular shade. When we examine the works of the painters we see that there are many differences in the way of seeing. Some see blue, red, green; others see clear, others obscure. In the analysis of a complex color it happens that there is sometimes an auto-suggestion. Where there is a hardly defined violet, the painter will exaggerate it on his canvas, and will be obliged, in order to keep up the right tone, to increase the intensity of the colors next to it. Hence arises a common error with painters, who start with a true principle, but are not able to apply it properly, and give their picture a tonic violet, green, or yellow, beyond all reason.—*Translated for the Popular Science Monthly from the Revue Scientifique.*

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SKETCH OF THOMAS EGGLESTON.

By PROF. DANIEL S. MARTIN.

As a general rule, the work of the scientist is not of a kind to attract conspicuous notice from the public, especially in great cities, filled and thrilled with commercial and political activity; and so it comes to pass that men of rare attainments and untiring energy, in the highest walks of life and thought, may spend their whole life-time in such an environment, and be scarcely known outside of a limited circle of kindred minds. They may confer lasting benefits on the community, render important services to the whole country, and be widely known and honored in other lands, and yet receive but little general recognition in the place of their abode.

Such a man, in such a community, is Prof. THOMAS EGGLESTON, of the city of New York. He has been too busy and too modest to seek prominence in the public eye, and his scientific work has been of a kind that does not lend itself readily to popular lectures or startling announcements; but as a mineralogist, a metallurgist, and a mining engineer, and as the planner and founder of the great School of Mines of Columbia University, he has made a deep and permanent impress on the history of science in the United States.

Professor Egleston is of New England stock, his ancestors having been among the first settlers of Dorchester, Massachusetts, in 1635. Thence they came by a toilsome and perilous journey to Connecticut, and founded Windsor, which was thenceforward their home, and whence his father came to New York. The removal to Connecticut arose from a desire for greater freedom of life and worship than they found in Massachusetts; and Professor Egleston has been deeply interested in studying the little-known records of this movement, and the influence which it exerted, as an almost unwritten chapter in American history. He proposes to publish these researches, together with much other material relating to our colonial history, in which he is an enthusiastic student. [Pg 257]

He was born in New York, on December 9, 1832. As a boy he took considerable interest in certain aspects of science, and at the age of thirteen had gathered a collection of minerals and rocks. He attended Yale College, and in the later years of his course took special elective work in chemistry. After graduating there in 1854, he was for a time an assistant to Prof. Benjamin Silliman, Jr. Subsequently he went abroad, partly for his health, and was advised to spend some time in Paris. With no special professional purpose, but from a general desire to improve his time, he began attending lectures on geology and chemistry at the Jardin des Plantes, under D'Orbigny (a brother of the eminent writer) and Hilgard, and he worked with much energy in the laboratories of those departments at the Jardin. He thus attracted the attention of some of the faculty of the École des Mines, who offered him larger facilities in that institution, which he at once accepted. After much very interesting study in the paleontological laboratory there, he decided to go regularly through the entire course, and accomplished that purpose with notable success and honor, graduating in 1860. He had worked as an assistant in every laboratory of the school, and in the summers had traveled through much of France, becoming familiar with its geology, mineral resources, mining works and processes, and gaining a mastery at first hand of all branches of those subjects. Those years were to him full of interest and enjoyment; friendships were formed that have enriched his whole life; and in it all the man was being remarkably prepared for the work of developing those forms of science and of industrial progress in our own country. Professor Egleston has always retained a strong feeling of attachment toward the École des Mines, which has likewise been warmly reciprocated. He has shown his interest by two gifts to the institution, of five thousand dollars each.

Returning hither in 1861, just as the war cloud was darkening over the land, he received almost immediately an appointment at Washington, to take charge of the mineralogical collections and laboratory of the Smithsonian Institution. After two years there he conceived the purpose that determined his whole career, and has so greatly influenced both American science and American mineral development—that of a school of mines at New York.

At that time there were, indeed, in this country schools of science, well organized and well equipped—the Sheffield School at Yale, the Lawrence Foundation at Harvard, the Rensselaer Polytechnic Institute at Troy, and others. But their scope was rather general in character, and there was no institution planned and arranged with distinct reference to mining and metallurgy as its main subjects. Mr. Egleston, as he was then known, saw and felt this lack, and planned to supply it. [Pg 258]

There is not space here to detail the circumstances under which he was led to prepare, in 1863, the Plan for a School of Mines in New York; but the modest little outline then drawn up and printed has been exceedingly rich in results. It was taken up with interest by certain leading trustees of Columbia College, as it was then called, especially by the late George T. Strong. The president, the late Dr. Charles King, and a majority of the board, favored the experiment, for so it was regarded, and arrangements were finally made to begin it in the autumn of the next year, in limited quarters in the old college building on Forty-ninth Street, and with provision for but a small number of students—not over twenty. Part of the instruction was to be given by members of the existing college faculty; and three new professors were appointed to special chairs for the school, to be compensated wholly by fees therefrom. These were, Professor Egleston, mineralogy and metallurgy; Prof. Francis Vinton, mining engineering; and Dr. C. F. Chandler, chemistry.

Meanwhile, in June, 1864, President King was succeeded by the late Dr. Barnard, whose strong

interest in science made him a warm supporter of the school. Already some prominent people were impressed with the value of such a movement, and disposed to aid it. A fine collection of minerals was purchased and presented by Mr. Strong, and another was given by Mr. Gouverneur Kemble.

On the opening day, November 15, 1864, the number of applicants was far beyond expectation and provision; the school was found to respond to a need and a demand that had not been suspected; it was a success from the first. In a year or two it had become an institution of recognized importance; ample quarters were provided for it in a large building, formerly a manufactory, on the Fourth Avenue side of the college block, and important additions were made to its corps of instructors—particularly the eminent geologist, Dr. J. S. Newberry, of Cleveland, Ohio, whose noble geological collection was deposited and used in the School of Mines, and whose breadth and power and personal magnetism so profoundly influenced scientific interest and progress in the city of New York for more than twenty years.

Such was the beginning of the school; its career has been one of unbroken growth and increasing influence. After some ten years it was found needful to take down the plain old transformed factory and erect a new building on its site, with larger space and improved facilities. Fifteen years later Columbia College was removed to its new site on the Morningside Heights, where now the School of Mines is installed in stately fireproof structures, wherein its great accumulated treasures of collections, apparatus, models, and varied appliances of instruction are safely and permanently housed.

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The influence of this school upon science in New York city has been incalculable. Only those who have lived in touch with the scientific life of the metropolis during the period since the close of the civil war can appreciate the change that has taken place in public feeling regarding science, or can recognize how largely that change is due to the existence of such an institution, and to the presence of such a body of strong and able professors, in constant and active co-operation in the interest of science. The school attracted notice from the first, abroad as well as throughout this country. In 1871, seven years from its opening, a writer in the *North American Review* characterized it as "already more scientific than Freiberg, more practical than Paris," and emphasized its influence both upon science and upon mining interests in the United States, pointing out that the literature pertaining to mines and their working had been very limited in the English language, and that the instruction in the school had to be chiefly given by lectures; but that these courses would gradually develop into a literature.

These suggestions have been fully justified by the results of the last quarter century. The vast development of our mineral resources has been largely under the direction of graduates of this school. Hundreds of them are to-day in important positions of scientific trust, not only throughout our own country but in South and Central America, Australia, China, Japan, and even Europe itself. The lectures of the professors, and the articles constantly published in the *School of Mines Quarterly*, have indeed given us a literature of the subject in English. The local influence in the city has been great, upon scientific education in secondary schools, and upon general public sentiment; while in Columbia University the experiment has become one of its finest departments and an element of its greatest strength. Rarely is it given to a man to see in his life-time so great a result from the plans and the labors of his earlier years.

Of the many forms of scientific activity which have engaged Professor Egleston during his busy life, only the briefest mention can be made. He was one of the founders of the American Institute of Mining Engineers, was thrice its vice-president, and was chosen president in 1886; and he has published over one hundred articles in its *Transactions*. He was one of the founders of the American Metrological Society, and of the societies of Mechanical Engineers and of Electrical Engineers, and a member of the society of Civil Engineers and of the Iron and Steel Institute of Great Britain. In the New York Academy of Sciences he was active for many years, and held the vice-presidency from 1869 to 1881. In 1866 Professor Egleston was associated with the Agricultural and Geological Survey of the Union Pacific Railroad; in 1868 was appointed a United States Commissioner to examine the fortifications of the coast; and in 1873 was one of the jurors for the International Exposition at Vienna. From Princeton and Trinity Colleges he received, in 1874, the degrees of Ph. D. and LL. D., respectively, and from the Government of France the rank of a Chevalier of the Legion of Honor in 1890, and the exceptional rank of "Officier" in 1895.

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His papers, published either separately or in the proceedings of the several engineering societies above mentioned, the *Annals of the New York Academy of Sciences*, the *School of Mines Quarterly*, etc., cover a wide range of subjects connected with mineralogy, metallurgy, and mining operations. In mineralogy he was especially devoted to crystallography, and his noble private collection was gathered and arranged with relation to that department. Besides his strictly metallurgical articles and treatises, he has dealt with such topics as rails, in relation to accidents; furnaces and their construction; fire-brick and refractory substances; slags and their utilization, etc.; the decay of building stones, in connection with the Obelisk; technical education, manual training, and improvement in the conditions of workmen in mining and metallurgical occupations.

His chief published works are *The Metallurgy of Gold, Silver, and Mercury in the United States*, two large volumes, 1887 and 1890, and his *Lectures on Mineralogy*, to which may be added his *Tables for the Determination of Minerals*, *Metallurgical Tables on Fuels, Iron, and Steel*, diagrams and comparisons of crystals and crystal notation, tables of production of many of the metals, report on the Union Pacific Railroad survey of 1868, and many others.

Within the past two years Professor Egleston has withdrawn from active work in the School of Mines, and bears now the title of Professor Emeritus; his health has been a good deal impaired, and his work has passed largely into the charge of younger men who have grown up under his direction as students and assistants. During the last winter he has presented to the school his entire scientific library and his private collection of minerals above referred to, some six thousand specimens. These, in addition to the great mineralogical treasures already possessed by the institution, all gathered and arranged under his supervision, will make the School of Mines collection certainly one of the finest in the country.

Although devoted to his own special branches, Professor Egleston had given a striking example of broad interest in other departments of science in his labor of love in connection with the monument to the memory of the great ornithologist Audubon. The present writer was closely associated with him in this work, and can testify to his energy, enthusiasm, and perseverance therein. The later years of Audubon's life had been spent on Manhattan Island, in a modest but beautiful suburban home on the Hudson, above Harlem, known as Audubon Park. He died in 1851, and was buried in a family vault in Trinity Cemetery, then far out of town, now lying between One hundred and Fifty-third and One Hundred and Fifty-fifth Streets, Amsterdam Avenue, and the Hudson. The spot was remote and almost unknown, and with the death and removal of most of the family, it had fallen into neglect. When One Hundred and Fifty-third Street was to be opened through to the river, the vault, which was close to the street line, was in danger of injury; and then Professor Egleston took up the matter and proposed to the trustees of the cemetery that if they would grant another plot in a better location, he would endeavor to have a handsome monument erected by national subscription. The trustees responded warmly, and Professor Egleston undertook the work. Before going abroad in 1887 he broached the subject to the writer, and suggested that he present it during the meeting of the American Association for the Advancement of Science, which was to be held during that summer in New York. The writer gladly responded to the plan, and in August of that year laid the facts before a general meeting of the association. Much interest was expressed, but no action was taken, as had been hoped. At the first regular meeting of the New York Academy of Sciences, in October, the writer again presented the subject, with better result; and a committee was appointed by the academy, consisting of Professor Egleston as chairman, Dr. N. L. Britton, and the writer. On the return of the former from Europe the work was taken up in earnest; and under the indefatigable efforts of the chairman and of the secretary, Dr. Britton, although with many delays and discouragements, it was carried to a triumphant success.

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Before the end of the year (1887) the committee had held numerous meetings, prepared and issued a circular, and engaged the co-operation of several other organizations with the Academy of Sciences, including the American Ornithologists' Union, the Agassiz Association, and the Audubon Society (for the protection of our native birds). A design was proposed by the academy's committee, and adopted by the joint committee of the several societies; this design originated with Professor Egleston, and was a striking combination of the religious, scientific, and artistic elements appropriate to the purpose. The scheme was that of a Runic cross, the only form of that Christian symbol which can properly bear ornamental devices, according to the canons of artists and architects, and this was to be covered with reliefs of the birds, quadrupeds, and flowers that Audubon so loved and studied, and that have given him his fame as the artist-naturalist of America. The general design being approved, the selection and arrangement of the animals and birds was given to a subcommittee of specialists, consisting of Dr. J. A. Allen, Mr. G. B. Sennett, and Dr. N. L. Britton, whose duty was to secure accurate representation and artistic grouping of the forms.

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In all these combined aspects this monument is doubtless unique. As it stands to-day over the grave of him whom it commemorates—graceful, dignified, and altogether peculiar—it is an honor to our city, as well as a fitting tribute to the memory of Audubon, the Nature-lover, the artist, and the Christian believer. For this beautiful thought, so nobly carried out, both American science and the city of New York are indebted to Thomas Egleston.

The progress of the effort was slow; it was not until 1891 that sufficient subscriptions were secured, and not until the spring of 1893 that all was ready for the formal ceremonies. During all this time Professor Egleston and Dr. Britton were untiring in their endeavors and unfaltering in their purpose to succeed. On April 26, 1893, the monument was dedicated with suitable exercises, of great interest, at Trinity Cemetery, and a memorial address upon the life and work of Audubon was delivered by Mr. Daniel G. Elliott, F. R. S. E., of the Ornithologists' Union, at a public meeting at the American Museum of Natural History.

Professor Egleston has also laid the citizens of New York under enduring obligation to him in another and even more important matter, the preservation of one of the most valuable of our smaller parks from the clutches of the speculator and spoiler. It is known to but few of the residents of the city that a series of determined attempts was made, some years ago, to destroy and obliterate Washington Square, in the same way in which the St. John's Park outrage was perpetrated ten years before. The method pursued in that case was by interested parties buying up property around the park and "colonizing" the houses with tenants who would either favor or consent to the vandal obliteration of that beautiful spot of rest and shade for the erection thereon of the Hudson River Railroad freight depot. St. John's Park, however, was the property partly of a corporation, partly of individuals, and the job was comparatively easy. Washington Square belonged to the city; but the same process was begun by a great real-estate magnate, and was going on toward a similar result, when the death of the arch-conspirator checked the scheme for

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a time. A little later, however, it was revived, under the notorious Tweed *régime*, and would have succeeded but for the keen insight and vigorous action of a few public-spirited citizens, led by Professor Egleston. Washington Square had been dug over and torn up, under the pretext of remodeling and "improvement," and the unsightly mounds and piles of earth were left for many months, not only to offend the eye, but to generate malaria. The ground had been originally a Potter's Field, and the opening and upturning of the soil, frequently unhealthy in its effect, was markedly so in that case. The south side of the square had been "worked" already, in the first attempt, and had largely lost its population of old residents; but the north side was still occupied by a select class of old New-Yorkers. Now, however, between the desolate aspect of the park and the malaria that began to be felt, an exodus of the owners on the north side was imminent. Then began to be hinted some schemes for which all this was preparatory. A great militia armory was to be erected on the western end, and other projects vaguely loomed up, involving the ruin of the park as such. A bill to legalize these schemes was quietly introduced at Albany, and had been brought nearly to its passage, by "influences" no less potent for their careful concealment. Professor Egleston and a few other gentlemen of the vicinity were anxious about these rumors, but could get no information. Inquiries from city officials were met with positive denial of any such intentions, and it was only within a few days of the time set for the passage of the bill that they succeeded in discovering its real meaning.

At this late juncture the "Public Parks Protective Association" was quietly and quickly organized by a small body of public-spirited men, of whom the late John Jay was president and Professor Egleston secretary. This association set itself to work most earnestly to reveal the danger, to arouse public sentiment and public protest, and to make these felt in the Capitol at Albany. Circulars and petitions were prepared and widely disseminated, at the cost of great labor, within the brief time left ere the bill should come up for passage. The New York Academy of Sciences, speaking in the interest of public health, passed strong resolutions of remonstrance; and various other bodies took similar action, including the Academy of Medicine.

The result was that legislators were aroused, some to the real character of measures that they had not fully understood, and others to the existence of a public sentiment upon which they had not counted, and the bill failed to pass. Nor was this all: a resolution was adopted, prepared by the association, guaranteeing the ground occupied by the square to be kept "forever" as a park for purposes of public health and recreation.

That Washington Square remains to-day, an oasis of beauty in the desert of brick and stone, and a breathing place in that densely built portion of the great city, is due principally to the watchfulness and energy of Professor Egleston. He it was who saved that park to the people of New York, and a debt of lasting gratitude therefore is owing him from them. This is an unwritten episode in the history of our city, and the present writer, who knew something of the facts at the time, is gratified to be able to put them on record now. But let us not fail to note the lesson that they convey. "Eternal vigilance is the price" of all that is valuable in a community like ours, where the demands of business greed and the devices of political schemers and "bosses" may at any time unite again, as in the past, for acts of profitable vandalism, and dismiss as "sentimental" all considerations of beauty, health, or historical association. The sanitary importance of our smaller parks is now better understood; and the city is buying property for such purposes at heavy cost, in localities where fifty years ago parks could have been laid out at little expense, and maintained at a vast saving of human health and life. Such articles, also, as that of Dr. Stephen Smith, in the February number of this monthly, are educating the intelligent community as to the sanitary value of vegetation in cities. But nothing is safe or sacred where the evil trinity of the boss, the speculator, and the "soulless" corporation may combine their forces; and the call is for ceaseless watchfulness.

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Professor Egleston has been all his life in active association with the religious and benevolent work of the Episcopal Church. He became president of the Bible and Common Prayer-Book Society in 1871; was vice-president of the Protestant Episcopal City Mission Society from 1870 to 1897; a trustee of the General Theological Seminary, and a member of the corporation of Trinity Church from 1878. In connection with the last-named body some of his relations have an interest wider than his own denomination, and may fittingly be mentioned in a sketch relating chiefly to his scientific career. Two points may here be noted: the schools among the poorer classes maintained by the Trinity corporation; and the unique jeweled chalice in memory of his wife, presented by him to Trinity Church.

Aided and controlled more or less by Trinity corporation, though in different parts of the city and in connection with different Episcopal churches, are now eight schools, with about one thousand pupils. In these are taught careful and scientific methods of training along modern lines, of eye and hand development, hygiene, economy, and thrift, to children and youth of the neediest classes. Already for years much interested in these schools, Professor Egleston has, since his withdrawal from professional activity, given much of his time to their advancement, and has found intense gratification in observing the results of this training among a class of children that, from their general environment, would grow up to be a burden or a menace to the city. The intelligent culture of hand and eye, the mental quickening and moral uplifting, the capacity and purpose of honorable self-support, and the protection from moral and social perils, that are imparted and secured through the agency of these schools, are to him a constant source of enthusiasm.

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The jeweled chalice above referred to is of scientific interest from the great variety and rarity of the gems with which it is set. During years of travel to and from many parts of Europe, Professor

Egleston had remarkable opportunities, in his visits to mining regions and his intercourse with mineralogists, to obtain fine and choice specimens of gems; these he had mounted in elegant forms as presents to his wife, Mrs. Augusta McVickar Egleston. Her death, in 1895, was a very great blow to her husband, as their married life had been extremely happy; and the only satisfactory use to which this beautiful treasure of jewelry could be put seemed to him to be in the services of divine worship in the church. It is not possible in brief compass, without a figure, to describe the arrangement of these jewels on the base, stem, and cup of the golden chalice; but it must suffice to say that there are one hundred and eighty stones set in, with embossed work, on a cup and pedestal nine inches high and half that width. The species and varieties number fifteen, many of them in rare shades of color; among them are the ruby-colored Siriam garnets, green "demantoid" garnets of the Ural ("Uralian emerald"), Ceylonese moonstones, colored diamonds, sapphires, both yellow and green (Oriental topaz and emerald), rubellites, red zircon, moldavite (the rare green obsidian of Moravia), green tourmaline, chrysoberyl, the rich purple amethysts of the Urals, etc. Considered either mineralogically or as a work of art, this chalice is almost unique; while the conception and designing, which are wholly of Professor Egleston's own, reveal the same union of artistic and scientific qualities that was shown in the Audubon monument above mentioned, joined with a religious and a personal sentiment almost too sacred to dwell upon in a sketch like the present.

In all these aspects of his life and work, as we said at the beginning, Professor Egleston has been little known to the general public; but among scientific and engineering circles he has been highly honored. In these pages he may become more widely known, and the people of the metropolis and of the country at large may learn something of the manner of man that has lived and labored so honorably among them, and has done so much for science and his fellow-men.

Editor's Table.

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SCIENCE AND THE IDEAL.

We have had frequent occasion in these columns to refer to the tirades against science indulged in by writers who, because they can not quite make ends meet in their philosophy of the universe, strangely allow themselves to think that *science* must be at fault. At one moment it is M. Brunetière, at another Tolstoi, at another it is a Harvard professor or a Western school superintendent; but no very long time elapses before we find somebody in very unnecessary trouble, as it seems to us, over the shortcomings of science. The last sufferer to whom our attention has been drawn is Dr. John Beattie Crozier, the author of two able works—*Civilization and Progress*, and *History of Intellectual Development*—who has lately written a history of his own intellectual development under the title of *My Inner Life*. This writer describes the effect upon his mind of a study of Mr. Spencer's *Principles of Psychology*. "Then it was," he says, "that the ideal within me, struck to the heart, shriveled and collapsed." This sad result was due to the discovery, forced on him by a study of the work in question, that all our mental experiences have equally a material basis, and that from a material point of view or, as we may say, seen from below, one thought or feeling is as much justified as any other. Previously he had considered that "such higher faculties as veneration, benevolence, conscientiousness, and the like, were quite distinct in essential nature from low ones, like revenge, lust, vanity, cowardice, and deceit"; but now "all this was changed, and all the faculties alike, the high and the low, the noble and the base, the heroic and the self-indulgent, lay on a dead level of moral and spiritual equality ... all alike being but vibrations, vibrations, vibrations, nothing more." Consequently, "the dethroned Ideal fell prone and headlong like a false and usurping spirit; and my mind, bereaved of that which had been its life, settled into a deep and what, for a year or two, threatened to be a permanent intellectual gloom."

It is a great pity that at this critical moment a very simple consideration did not occur to this troubled spirit. When we read the Sermon on the Mount we read "words, words, words"; when we read some horrible piece of profanity or indecency it is again "words, words, words"; when we read the demonstration of a proposition in Euclid it is "words, words, words"; and, again, when we take up Tennyson's *In Memoriam* we find that its whole tissue is "words, words, words." But would it tend in the least to lessen one's reverence for the Sermon on the Mount to be reminded that it was constructed out of the same verbal elements as the piece of profanity? or would it diminish our admiration for *In Memoriam* to be told that it was constructed of words just like the dullest piece of prose? If not, then why should one be so terribly disconcerted and depressed to find that all our mental life finds its basis in vibrations? Or why should the inference be drawn that, because the basis is one, all that reposes on it must also be one in character and meaning? Is our delight in the lily or the rose impaired by the reflection that it springs from the same soil that produces noisome weeds; or do we gaze on the humming bird with less admiration because it flies in the same atmosphere as the bat? Why should "vibrations" not be the condition of existence of one mental phenomenon as well as of another? Surely the very fact that Dr. Crozier classes all the feelings he mentions as mental affections should prepare him to believe that they have a common basis. But how feelings shall be classified and ranked *after they have taken form* is a question precisely similar to the question how the various combinations of words should be classified and ranked. In the latter case words are the basis of them all, but we say: "This is an epic poem; this is a moral essay; this is an immoral novel; this is a silly joke; this is a market

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report." Are these distinctions illusory because words are the basis and substance of all these various forms of composition? Does the poem lose anything of its beauty, or the essay anything of its ethical value, because each was not composed of elements altogether peculiar to itself? The solid globe itself was once a diffused nebula, but we do not on that account find a less varied beauty in flower and tree, in hillside and running brook and grandly flowing river.

In his sad condition of mental disarray our author betook himself, he says, to the counsels of Thomas Carlyle. That sage, when he heard that his visitor had been reading Spencer, made some uncomplimentary remarks about the latter which we hardly think the visitor was justified in repeating. Apart from this, Carlyle told him in effect that, as he was in the world, he had just to make the best of it, and that in time he would find work that he could do with benefit to himself and others. Finally, our author made what he calls a discovery and offers as a contribution to modern philosophy—namely, that in the mind of man there is a "scale," according to which thoughts and feelings are appraised. Some are high up on the scale and some are low down. He found that there is that *in* the mind which is not *of* the mind, and which sits in judgment on all the contents of the mind—something which smiles on every right action and frowns on every wrong one, and yet which he does not care to speak of as conscience. Here was the antidote he required to the "pure and undiluted materialism" which had so paralyzed his moral being in the Principles of Psychology; and, having obtained it, he has been living happily, as we gather, ever since.

We have tried to do justice to the originality of Dr. Crozier's conception, but really with indifferent success. That there is a scale by which we are all accustomed to measure the varying values of our thoughts, feelings, and actions hardly needs to be stated; and that there is substantial agreement between men on the same plane of civilization as to the relative values of different mental products is also unquestionably true. What our author has not shown is how this conflicts with the strict scientific position taken in the Principles of Psychology. He does not tell us that he has repudiated the teachings of that work; indeed, he gives us distinctly to understand that, so far as it affirms the dependence of thought upon physical organization, he adheres to it still. If so, he has only built upon it a superstructure which it was always open to him to build; so, why he should find fault with the foundation it is not easy to see. Science goes as far as she can see her way to go in setting forth the relations between the mind of man and the environing universe. It studies also the human mind in its historical manifestations, and tries to unfold the laws of human conduct. It confines itself to facts which are believed to admit of verification and to inferences which have been tested by experience. This is the contribution of Science to the theory of human life. But because Science stops here she does not lay any veto on thought, desire, or hope. She lays a foundation; it is for us to build thereon "gold, silver, precious stones, wood, hay, stubble," each of us according to our own impulse and upon our own responsibility. The fire of experience will "try every man's work of what sort it is." But not only may we build, we must build; no one can live upon another man's philosophy. We may adopt this creed or that, but it means nothing to us till we have worked it over in our own mind and made it our own—with modifications.

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There is nothing whatever in science that conflicts with the ideal. Strictly speaking, science brings us to the threshold of the ideal, and leaves us there. "These are the facts of life," it says; "such has been the course of human history. The human race has risen from humble origins to its present commanding position in the world; and to-day the standards of human conduct and the conditions of human happiness are very different from what they were in the distant past. Social ties have multiplied and strengthened. Domestic affections have grown in depth and tenderness, and individual happiness is now bound up to a very large extent in the happiness of other individuals. The cruel superstitions of the past have given way in many minds to a reverent regard for a power which is felt to rule in the universe. Of such a power Science can not render any exact account; but before all the ultimate questions of existence Science is dumb; nor can it attempt to reconcile the antinomies which assert themselves in all phenomena. It is for you, the individual, entering upon life, to make your choice of the course you shall hold and the principles by which you shall be governed. The senses are the guides to immediate pleasure, but the experience of the ages has settled with considerable approach to certainty the conditions on which enduring happiness is to be won.

"Choose well; your choice is
Brief and yet endless."

To the man who insists on being knocked down with a club before he will yield to persuasion there is nothing in such a mode of address that will be convincing. This is a case in which, as Pascal says, "there is enough light for those who desire to see, and enough obscurity for those who want a pretext for not seeing.... Perfect clearness might help the understanding, but it would injure the will." There is, therefore, room on the scientific foundation for the idealism of Dr. Crozier, and for many other forms of idealism. It is for each one of us to construct his own ideal, and, having constructed it, to live by it. "If any man's work abide he shall receive a reward."

RACIAL GEOGRAPHY.

The interesting papers contributed to this magazine by Prof. William Z. Ripley, which, we are glad to say, will soon be published in a more permanent form, indicate very clearly the remarkable progress that has been made of late years in the scientific study of human origins. Formerly legend and tradition were the only sources of light upon prehistoric times; and the

sagacious Thucydides dismissed all speculation respecting those ages with the curt remark that he did not think the people who lived then amounted to much, any way. No doubt he was nearer right in this opinion than were those who peopled antiquity with demigods and heroes; still there was much of interest to be gleaned respecting the prehistoric past if only right methods of research had been used. This was too much to expect in his day; and, indeed, it is only in very recent times that the study of human origins has been placed upon anything like an adequate scientific basis. A reference to Mr. Ripley's work will show how numerous are the lines of investigation now pursued. Language, which at one time was considered an all-important test of origin, has fallen from its high position; and theories which, on the strength of linguistic evidence, were very widely entertained, have lost their authority. Particularly has this been the case with the so-called "Aryan" theory. It was simple and beautiful and interesting, but as observations accumulated it became more and more untenable, until finally it had to be discarded.

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The problems which the anthropologist and ethnologist attack are indeed of the highest degree of complexity. If our predecessors went astray therein, we ourselves are only feeling our way very cautiously and somewhat uncertainly. We have not yet reached an era of victorious generalizations. Professor Ripley well indicates the difficulties of the research. Things will go well for a considerable time along certain lines of observation until the facts come to be gleaned in some special field, and then the result will perhaps be just the opposite of what theory required. In a brachycephalic region, for example, where craniological and other tests call for a population of short stature, the stature will reveal itself as much above the average. In a region where, looking at race characteristics as elsewhere established, the tendency, say, to suicide should be particularly low, it is found by statistics to be particularly high. The ethnologist finds his path strewn with endless difficulties of this nature, and yet he is not discouraged. The truth lies somewhere, and he knows that a vigorous and courageous sifting of the facts will be sure to bring it to light, if not to-day, to-morrow. We gather from Professor Ripley's pages a strong impression of the confident patience with which the true man of science attacks his problems; he is sure that his *methods* are right, and that in the end they must triumph.

The interesting points of view which the study of racial geography presents are numberless. This is particularly shown in Professor Ripley's chapter on Modern Social Problems. In this chapter the writer acknowledges, as he does elsewhere, that theories of race and of heredity have sometimes been pushed too far. He demands a due recognition of the influence of environment, and cites cases where environment will explain divergences from what are recognized as race characteristics or tendencies. An example of this is afforded by the case of Brittany, in connection with separateness of home life. The population of Brittany belongs to a race that is particularly prone to such separateness, and yet in Brittany there is an unusual intermingling of families under one roof. We can not enter into the explanation here, but Professor Ripley shows how the physical geography of the country may account for the variation from type. In the same chapter the writer shows very interestingly how the Celtic parts of France manifest almost invariably conservative tendencies: how they shun divorce, afford a very low rate of suicide, and, in the matter of crime, tend rather to deeds of violence than to acts of dishonesty. The general impression which the intelligent reader will gather from the whole work is that "racial geography" has all the interest of a rapidly growing science; but that, while much has been accomplished, much more remains to be done. The lines of research are many, and we may reasonably hope that before long the combined labors of anthropologist, ethnologist, and sociologist will give us a coherent body of knowledge and theory which shall not only illuminate the past but be of the very highest value for the comprehension of the problems of our own day.

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Scientific Literature.

SPECIAL BOOKS.

In a study of what constitutes the foundations of zoölogy we know of no one better equipped to discuss the various problems than Professor Brooks.^[V] As an original investigator in many groups of invertebrate zoölogy, as a student of animal life in temperate and tropical seas, as a special teacher of embryology and zoölogy for a quarter of a century, and, above all, as a profound student of the philosophical literature of the subject, his equipment is thorough and complete. A fair review of this work would be difficult without voluminous quotations from its pages.

The reader will find here the soundest, healthiest acceptance of the Darwinian theory of natural selection. He penetrates the mists and fogs of philosophical vagaries and follows the dictum of Tyndall, who, in presenting the essentials of a discussion, says, "Not with the vagueness belonging to the emotions, but with the definiteness belonging to the understanding" we are to study these matters. It is fact, fact, fact. The honest "I do not know" inspires the reader with a confidence that obscure points are not to be juggled with. He insists that the principles of science are physical, that a mechanical interpretation of Nature is reasonable and just. Referring to Huxley, he remarks that faith and hope are good things, no doubt, and (quoting from Huxley) "expectation is permissible when belief is not," but experience teaches that expectation or faith of a master is very apt to become belief in the mind of the student," and (again from Huxley) "Science warns us that the assertion which outstrips evidence is not only a blunder but a crime."

In the chapter of Nature and Nurture he brings many potent facts and arguments against the idea of the transmission of acquired traits. Without copious extracts it is impossible to do justice to this masterly presentation of the subject. The chapter abounds in aphorisms, as indeed do other portions of the work; and these alone, if serially collated with their contexts, would make a valuable little handbook for the student of biology. His chapter on Lamarck is equally strong, and the fallacies of Lamarckianisms have never been so clearly shown. "The contrast between what we may call the solicitude of Nature to secure the production of new beings, and the ruthlessness with which they are sacrificed after they have come into existence, is a stumbling-block to the Lamarckian, and the crowning glory of natural selection in that it solves this great enigma of Nature by showing that it is itself an adaptation and a means to an end, for the sacrifice of individuals is the means for perfecting the adjustments of living things to the world around them and for thus increasing the sum of life." "Whole books have been written on the marvelous fitness of the structure, the instincts, and the habits of the worker of the honeybee for its life of active industry—a life in which the male has no share, and from which the female is cut off by her seclusion in the depths of the hive, and by her devotion to her own peculiar duties. While the queen and the drones are well fitted for their own parts in the social organization of the hive, these duties are quite simple, and very different from the duties of the workers; and as these latter do not normally have descendants, and as they never under any circumstances have female descendants, all the workers are the descendants of queens and not of workers.

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"Their wonderful and admirable fitness for their own most necessary part in the economy of the hive must, therefore, be inherited from parents who have never been exposed to those conditions to which the workers are adapted; and this adaptation can not be due to the inheritance of the effect of these conditions, nor can we believe that they are inherited from some remote time, when the workers were perfect females or when the queens were also workers; for the sterile workers of allied species differ among themselves, thus proving that they have undergone modification since they became sterile.

"Here we have a most complicated and perfect adjustment of marvelous efficacy to external conditions which are of such a character as to prove that the inheritance of the effect of these conditions has had no part in the production of the adaptation."

His views of bird migration, based on the matter of ovulation and not on food supply, are extremely interesting. He says: "As their eggs are very large and heavy, a high birth rate is incompatible with flight, and the preservation of each species imperatively demands that every egg shall be cared for with increasing solicitude; for while in other animals increased danger to eggs or young may be met and compensated by an increase in the birth rate, the birth rate of birds can not be much increased without a corresponding restriction of the power of flight. Every one knows how quickly birds may be exterminated by the destruction of their eggs or young, and the low birth rate of all birds of powerful flight is a sufficient reason for migration, for at the same time that their fitness for flight limits the birth rate, it permits them to seek nesting places beyond the reach of their enemies."

His critical estimate of Huxley is tersely presented. He says: "His evolution is not a system of philosophy, but part of the system of science. It deals with history—with the phenomenal world—and not with the question what may or may not lie behind it.

"The cultivation of natural science in this historical field and the discovery that the present order of living things, including conscious, thinking, ethical man, has followed after an older and simpler state of Nature, is not 'philosophy' but science. It involves no more belief in the teachings of any system of philosophy than does the knowledge that we are the children of our parents and the parents of our children; but it is what Huxley means by 'evolution.'"

Dr. Brooks credits Galton with employing simple terms to express new and abstruse truths, and we trust those who are continually wrestling with the dead languages to pick out new and distracting words to express their conceptions will profit by Galton's method.

The lecture on Natural Selection and the antiquity of life is replete with original and pregnant suggestions based upon the results of his own profound investigations on pelagic life. Here again only ample quotations from his pages would convey an adequate idea of their value and importance. In his chapter on Louis Agassiz and George Berkeley he gives this just tribute to Agassiz:

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"The writer was a man of transcendent genius for scientific discovery, with intense earnestness and enthusiasm for the pursuit of truth, and rare eloquence and literary skill. If any man was devoted to the cause of truth and determined to accept it, whatever it might prove to be, that man was Agassiz; for while his impulses were notably devout and reverential, he proved, on many occasions, that he was fearless and independent in the search for truth. It is no disparagement to Buckland and Bell and Chalmers and the other authors of the Bridgewater Treatises to assert that Agassiz far surpassed them all in acquaintance with the methods which lead to success in the interpretation of Nature, and in ability to treat the problems of natural theology from the standpoint of the zoölogist."

He dedicates his book to Bishop Berkeley, and throughout the lectures his references indicate a thorough acquaintance with the writings of this eminent scholar.

Paley's old watch comes in for renewed consideration, and one wonders if the mainspring of this device will ever be broken. His apt references to classical authors indicate wide and judicious

reading. The book is overburdened with thought and clear, concise reasoning, and his final advice should be followed when he urges his readers to do double duty by reading the book again.

In the April number (1898) of this magazine we had occasion to review the first two volumes of this work.^[W] A perusal of the third volume does not permit us to modify the expressions and criticisms there made. We then said the work is "a compact storehouse of facts, a veritable ethnological museum, and this feature alone renders the book indispensable to American students." The author "shows no evidence of ever having seen the magnificent series of volumes issued by the United States Bureau of Ethnology." "The author in several instances confounds Japan and China." "His treatment of the African races is by far the most exhaustive." These extracts will apply most particularly to the present volume. The negro races of the interior of Africa and those of West Africa, as well as the cultured races of that continent, are exhaustively treated. In that portion treating of the history of the civilization of eastern Asia the Japanese and Chinese are considered together and many mistakes in generalization follow as a result of this confounding. Long before we get to this portion of the work an illustration is given of Japanese agricultural instruments, in which only one plow of the many types in Japan is presented, and this is evidently taken from a model. Not only has he confounded the Japanese with the Chinese, but the southern Malays are brought in when he speaks of the Malay and Japanese love of the cockfight—a practice which is unknown in Japan. He refers to the Japanese latrine as being built over running water, whereas the record of this custom is found only in an ancient Japanese classic of the seventh century. He is in error in stating that the stage is essentially the same in China and Japan. His description of the music of Japan applies to China only. The statements that pearls play a large part in the ornaments of the Japanese, that the fireproof buildings are of stone, that the Japanese tobacco is moistened with opium, that the Japanese street dress is full of color, are all erroneous. His description of the sash worn by men is the description of the woman's sash. He says "the Japanese currency before the change to dollars and cents was like that of the Chinese." Had he consulted Snowden's description of ancient and modern coins, etc., he would have found this correct statement in regard to Japanese coins: "In their shape, composition, and relation to each other they present some striking features which set them apart from every other system of coinage in the world."

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The illustrations are badly distributed. Through pages of description of the Japanese and Koreans, in which little is said about the Koreans, are scattered illustrations of the inhabitants of Yezo—the Ainu. The illustration of Japanese table furniture depicts only utensils for smoking and wine-drinking, and some of these are erroneously labeled, as are those of certain Chinese utensils.

We trust that the Asiatic portion of this valuable work will be written over again, and in doing it the author will realize that he is dealing with four or five hundred million people widely separated in language, modes of writing, customs, and manners; that he will consider the Ainu, Korean, Japanese, Chinese, Thibetan, and Indo-Chinese with the same thoroughness that he has given to the separate groups of the African continent; that he will draw his information from modern sources and collections properly labeled and up to date.

Even with the defects pointed out the work will prove of great value to the American student, as it brings before him the richness of the ethnological museums of Europe.

GENERAL NOTICES.

The Development of English Thought^[X] is "an attempt to present a theory of history through concrete illustrations." The book does not deal with the facts of history—a knowledge of these is assumed—it throws into relief certain salient features of each epoch which were instrumental in forwarding the social consciousness. It may, indeed, be called a philosophy of economics. It has a theory to propound: Survival is determined and progress created by a struggle for the goods for which men strive, or the means by which they may avert evil. These goods change, together with the environment dependent on them. Hence arise new activities; the race is modified, new modes of thought come forward, and finally the characteristics of the civilization are reconstructed. These changes are subject to a definite law of evolution, repeated in each new environment. England has been chosen for this economic interpretation of history; because of its insular position, its development has been more normal and indigenous, less subject to foreign influences since the Reformation, than any continental country. An explanation of the psychological theory underlying the book serves as general introduction. The antecedents of English thought are found among the early Germans, and the Early Church. The fifteenth century, with its inventions and discoveries, revolutionized men's ways of living and thinking. Then the Calvinists and Puritans imposed their standards of good and evil. These are followed by the great English thinkers: Locke, who marks the beginning of Deism in England; Mandeville, Hume, and Smith, developing the economic side; Whitefield and Wesley leading the religious revival. Later on, Malthus, Ricardo, and Mill formulated the Economic Philosophy, whereas Darwin, the first of the biologists, imposed biologic habits of thought on economic inquiry. The concluding chapter, while cautious in the discussion of current problems, attempts, assisted by the lessons of the past, to indicate the probable future movement of thought, springing out of present economic conditions.

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Mr. *Wilbur S. Jackman* has sought in preparing his manual of *Nature Study for Grammar Grades*, [Y] to propose a few of such problems arising in a thoughtful study of Nature as are within the comprehension of grammar-school pupils, and to offer suggestions designed to lead to their solution. Directions may perhaps be given by the teacher—that is, by some teachers, but very few—but even if he knows how, it is hardly possible for him to make them as systematic to so large an extent as would be required by a school of inquiring pupils; and such a plan as the author offers may be accepted as a valuable help. Take, for instance, the first lesson on the mutual relations of plants and insects—as to plants. The student is told what equipment to take, what places to visit; is reminded of seven kinds of evidence in the shape of galls, stings, eaten leaves, etc., to be considered; and is given a list of queries to be recollected in studying the phenomena, in their general aspect, as to the benefit or injury received by the plant from insects, the attractions it offers, and the defenses it possesses, with "number work" relating to the extent of the depredations, and methods of representing the results of the study in picture. The book contains forty-five such lessons on different aspects of Nature.

In the preparation of his book on *Fertilizers* [Z] it has been the aim of Mr. *Voorhees* to point out the underlying principles and to discuss, in the light of our present knowledge of the subject, some of the important problems connected with the use of fertilizing materials. While the author recognizes the lack of definite knowledge on many vital points, he considers it desirable, when the investigations of the experiment stations are becoming so important and they are so well prepared to study the fundamental principles of plant nutrition, for the practical man to have a clear understanding of what is now known. The book treats of the natural fertility of the soil and the sources of the loss of the elements of fertility, the functions of manure and fertilizers and the need of artificial ones, the different classes of fertilizers, the chemical analysis of them, and the methods of using them with their special application to various crops.

We have received, with only a short interval between them, the first volume of a third edition and the fourth or last volume of the second edition of *Alfred H. Allen's Commercial Organic Analysis*.

[AA] The former volume is first to reach us. It is a high testimony to the value of the work in itself that the publication of a rival issue of the edition of 1885 had been begun by another house, although its age, as suggested by the date, would indicate that it had much need of revision. During the thirteen years since the publication of this edition later research has thrown new light on many features of the science and processes, and has corrected many of the old conceptions, and the author's views on some points have changed in the light of the more recent results, so that the preparation of a new edition had become necessary. Mr. Allen has found it now impossible for him to undertake the continuous labor which would be imposed by such a task, and the work of revision has been undertaken by Henry Leffmann, of Philadelphia. For this new edition Mr. Allen has furnished material on the subjects of the Kjeldahl process, proteids of wheat flour, vinegar, brewing sugars, malt substitutes, hop substitutes, and secondary constituents in spirits. Information has been added by the American reviser, partly from suggestions by Mr. Allen on the subjects of specific gravity, formaldehyde, vinegar, methyl, alcohol, acetone, fusel oil, argol, starch, glucose, invert sugar, lactose, and wine, and brief notes on other topics. Processes of the American Association of Official Agricultural Chemists have been reprinted. The revision of Vol. II is well in hand, and will be much more extensive than that of Vol I.

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On the other hand, the revision of the second edition has extended over fourteen years, and is only just completed with the fourth volume, which appears a few weeks later than the volume noticed above. The earlier volumes have been long out of print, and are destined, of course, to be supplanted by those of the new revision. The present fourth volume, being newer and of the present date, will serve as the latest till the last volume of the new revision is reached; and, besides, the author hopes to publish an appendix to each volume, containing the more important of the later results. The meaning of the term Commercial Analysis has been somewhat extended, and matter has been included that in closest strictness does not belong under it, it being thought better, the author says, to include all facts possessing an analytical or practical interest to him, in the belief that what he finds useful himself will be of value to others.

In *The Porto Rico of To-day* [AB] a traveler's view of that interesting island and its people is presented by Mr. *A. G. Robinson*, who went there and remained during August, September, and October, 1898, as correspondent of the New York Evening Post. While the book can not be regarded, as it does not profess and is not intended to be, as a source of geographical or statistical information, it admirably fulfills the design of the author to present a picture of the people and of the country as he saw them; and it is a very living picture too. He looked with a sharp eye, and has recorded what he saw in graphic style. In the author's story of his early days of the island we are made acquainted with the various names it has had, of which Porto Rico, or Puerto Rico, is only the latest. The oldest of the European names appears to have been Buriquién, in some one of the dozen or more spellings it has had, one of them being Bo. It has also been called La Isla de Carib, San Juan Bautista, etc. After the account of the author's first general impressions and experiences he describes the city of Ponce, his visit to a coffee district, a number of typical towns and villages, the journey from Ponce to San Juan, the highways, railways—of which there are one hundred and forty-three miles in operation and one hundred and seventy-five miles under construction—and a fairly effective telegraph system, views of the industrial possibilities and commerce of the island, with some experiences of military campaigning.

The publication of the revision which Mr. *Herbert Spencer* is making of his *Synthetic Philosophy* in order to incorporate in it as far as may be the results of more recent advances begins with the

first volume of *The Principles of Biology*.^[AC] The advance during the last generation, Mr. Spencer thinks, has been more rapid in the direction of this science than any other, and though the hope of bringing a work on biology at large up to date could not be rationally entertained at the author's age and under the existing conditions of his physical strength, a similar service to a work on the principles of the science did not seem impossible. Numerous additions have been needful. What was originally said about vital changes of matter is supplemented by a chapter on Metabolism. A chapter is added on The Dynamic Element in Life. The insertion of some pages on Structure fills a gap in preceding editions. The revelations of the microscope on cell life and multiplication are set forth. A supplementary chapter on Genesis, Heredity, and Variation gives the results of further evidence and further thought in that line, qualifying and developing certain views enunciated in the first edition. Various modern ideas are considered under the title Recent Criticisms and Hypotheses. The chapter on The Arguments from Embryology has been largely rewritten. Smaller additions appear in the form of new sections incorporated in pre-existing chapters. The assistance needed in the work of revision has been given by Prof. W. H. Perkin in Organic Chemistry and its derived subjects; Prof. A. G. Tansley in Plant Morphology and Physiology; Prof. E. W. MacBride and Mr. J. T. Cunningham in Animal Morphology; and Mr. W. B. Hardy in Animal Physiology. In all sections not marked as new the author desires it to be understood that the essential ideas set forth are the same as they were in the original edition of 1864.

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Prof. *Silas W. Holman* attempts the presentation, in *Matter, Energy, Force, and Work*,^[AD] of some of the fundamental ideas and definitions of physics in a plain and logical manner. His purpose is not to set forth the experimental side of the subject or to describe phenomena or laws. He rather assumes a slight knowledge of these, and proceeds to develop the concept and definitions. The author regards a clearer thinking on these subjects as of special importance to engineers and members of the other technical professions, because correct views upon them have become essential in those professions through the progress of the applications of science to the industrial arts. These applications are likewise of considerable interest to the untechnical members of the community. Professor Holman has composed his book with the principle of presenting the subject of physics in logical sequence, and has divided it into two parts, the first of which contains the matter immediately proper to the subject, with discussions of substance or matter, motion; energy and its forms; force; kinetic energy, force-measurements, work, potential energy, and matter again, as distinguished from substance. The second part comprises summaries of the chief theories of the nature of matter, force, and energy, including the kinetic theory of gases, Le Sage's theory of gravitation, the vortex-atom theory, and a discussion of the nature of energy and matter, with observations on chemical energy and the ether.

The *Short Course in Music*, prepared for use in schools where a complete course is not thought necessary, by *F. H. Ripley* and *Thomas Tappen*, is embraced in two books, of which we notice the second (American Book Company). Familiar songs are made the basis of instruction, some of those which appear as melodies in Book One being repeated here in full score. All other material has been prepared especially for this book. The music and directions are adapted equally for unchanged and changed voices. Voice training and the elements of phrasing and expression are furnished in a group of *solfeggios* at the close of the book. Theory is given in condensed form, but one that, it is claimed, embraces all the essential elements of vocal music.

Mr. *J. E. Marr* has prepared his exposition of *The Principles of Stratigraphical Geology* (Cambridge University Press; The Macmillan Company, New York, \$1.60), under the belief that an idea of the subject can be obtained most satisfactorily if a large number of the details connected with the study of the stratified rocks are omitted. He has accordingly given very brief accounts of the strata of the different systems, paying more attention to the bearings of the facts than to their enumeration. The history of the earth is presented as a connected one, in which one period is linked on to the next, every event that occurs introducing a new complication into the conditions, which are consequently never quite the same—the changes showing an advance from the simple to the more complex. The study proves that an enormous period elapsed subsequent to the formation of the earth and previous to the deposition of the stratified rocks, of which we have only the slightest, if any, knowledge. The stratigraphical geologist has to establish the order of succession of the strata for the chronology, and to ascertain as far as he can the conditions existing during the deposition of the several strata or groups of strata. After an account of the growth and progress of stratigraphical geology, the nature of the stratified rocks and the law of superposition are discussed; the test of included organisms and the methods of classification are explained, the evidences of conditions under which strata were formed, and other theoretical points are considered, and the several geological systems or periods are enumerated under the English nomenclature. Finally, the various estimates of geological time and the bases on which they are made are reviewed.

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The American Book Company publishes as a part of the Eclectic System of Industrial Drawing an excellent manual of the *Elements of Perspective*, by *Christine Gordon Sullivan*, of the Cincinnati public schools. It consists of explicit directions and rules on the general principles of the art, with applications in Isometric Projection and Oblique Perspective, given in concise form and simple, clear language, amply illustrated, and supplemented by problems, in solving which the rules are made practical.

A convenient manual on *Gas and Petroleum Engines* has been prepared by *A. G. Elliott* from the French of *Henry de Graffigny* for Whittaker's Electro-Mechanical Series, in recognition of the interest that has been awakened in the application of such engines to supply the place now

occupied by horses in drawing vehicles. One chapter deals exclusively with the theory of the gas engines. Other topics treated of are the history of the gas engine, the description of existing gas engines, carbureted air engines, petroleum engines, gas-generating plants, engines for use with poor gases, and the maintenance of gas and oil engines. (The Macmillan Company, 75 cents.)

Laboratory Exercises in Anatomy and Physiology (New York: Henry Holt & Co., 60 cents) have been prepared by *James Edward Peabody* for practical application. The precept is emphasized that the pupil should be led to see that most of the materials required for observation and experiment are furnished by the organs and tissues of his own body. Directions which have been found in the author's experience necessary to guide the pupil in his observations and experiments are given at the beginning of each topic. The questions following them contemplate the student's seeking the facts from the material itself, and he is expected to be trained to distinguish observed results from the inferences that may be drawn from them. Some home study is contemplated, the results to be afterward reported in class. The book consists almost entirely of directions for experiments, and is interlined with blank sheets for recording observations.

Geographical Nature Studies (American Book Company) is intended by the author, *Frank Owen Payne*, to assist the teacher, and by pointing out the relations, often unrecognized, between familiar phenomena and home geography to guide the study of the class to definite and practical ends. The lessons are intended to fit the comprehension of the youngest pupils, to promote the cultivation of habits of accurate observation, and to stimulate a desire for more knowledge and broader views of the world. They lead directly up to the point where the more formal study of geography from a text-book begins. The lessons may be used as reading exercises and for topical recitations, and exercises are introduced which may assist the cultivation of the power of correct verbal expression in the statement of facts. The exercises concern weather, animals, physical phenomena, and objects about us, and are very various.

Impressions of Medusæ have been observed on the Jurassic lithographic limestones of Solenhofen, and some "problematic fossils" on the Lower Cambrian rocks of Sweden have been regarded as derived from Medusæ. Certain nodules, bearing what looked like flattened-out starfishes—"star-cobbles" they were called—have been found among the fossils of the Coosa Valley, Alabama. Director *Charles D. Walcott*, of the United States Geological Survey, concluded that these also represented Medusæ, and began an investigation of them which involved a comparison with the Swedish and Bavarian specimens, and was at last enlarged so as to embrace all fossil Medusæ. His work is now published as a separate memoir, *Fossil Medusæ*, as one of the Monographs of the United States Geological Survey (Vol. XXX). The Middle Cambrian Medusæ are first described, and then, in order, the Lower Cambrian of the United States and of Sweden and Bohemia and the Jurassic of Bavaria. The text is illustrated by forty-seven excellent plates.

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A new edition, revised and with additions, of the *Mechanics and Heat* of *Edward L. Nichols* and *W. S. Francis* is published by the Macmillan Company (\$1.50). The book is the first volume of the *Elements of Physics* of the authors, which is complete in three volumes. We find in it no explanation of the nature and extent of the revisions and additions.

The publication of such a book as *Catering for Two*—Comfort and Economy for small Households (G. P. Putnam's Sons, \$1.25)—has been suggested to *Alice L. James* by the difficulty of reducing the average rules of the cook-book to meet the wants of a family of two or three. The work embodies the results of sixteen years' experience in labor and study, and the author hopes that with it the way may be made easier for others whose bills of fare may be made for two. The directions are claimed to be throughout exact and reliable, and the dishes to be nourishing, appetizing, and inexpensive. The author's plan is to take a bill of fare with a comfortable variety of dishes, and direct explicitly how each is to be prepared.

The manual on *Testing Milk and its Products*, prepared for dairy students, creamery and cheese factory operators, food chemists, and dairy farmers, by *E. H. Farrington* and *F. W. Noll*, has reached a fourth edition, the first three editions having been exhausted in about a year. The present edition has been thoroughly revised, and such additions have been made to it as have been necessary to bring it up to date. It has been adopted as a text-book or reference-book in the dairy schools of twelve States of the Union and in a number of schools in Canada. (Published by the Mendota Book Company, Madison, Wis. \$1.)

The Silver Cross, or the Carpenter of Nazareth (International Publishing Company, New York), is a short story selected and translated from *The Mysteries of the People* of Eugène Sue, and published for the sake of the illustrations it is supposed to afford of the tyranny of the ruling class and the oppression of the working people and the poor and their suffering thereby which prevailed in the grand days of the Roman Empire, as well as always before, and is assumed to have continued down to the present. It is the story of the life and sufferings of Jesus of Nazareth, told in the thrilling style of the great French novelist.

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Agricultural Experiment Stations. Bulletins and Reports. Delaware College; No. 44. Sorghum in 1898. By Charles L. Penny. Pp. 16.—Michigan State Agricultural College. Special, No. 11. Frozen Trees and their Treatment. Pp. 4; Nos. 166 and 167. Dairy Matters. By C. D. Smith and G. H. True. Pp. 30; No. 168. Michigan Fruit List. By L. H. Taft. Pp. 16; Michigan Bulletin of Vital Statistics, February and March, 1899. Pp. 20 each.—New Hampshire College: No. 58. The Cost of raising Calves. By Fred W. Morse. Pp. 12; No. 59. Tenth Annual Report. By Charles S. Murkland.

Pp. 56; No. 60. Green Corn under Glass. By F. William Rane. Pp. 60; No. 61. The Inspection of Fertilizers in 1898. Pp. 12; No. 62. Forcing Pole Beans under Glass. By F. William Rane. Pp. 8.—New Jersey: Report of the Botanical Department for 1898. By Byron D. Halsted. Pp. 84; No. 135. The Poisonous Plants of New Jersey. By Byron D. Halsted. Pp. 28.—New York: No. 150. Two Small Fruit Pests. By F. H. Hall and V. H. Lowe. Pp. 5.—Ohio: No. 99. Sugar Beet Investigations in 1898. By A. D. Selby; United States Department of Agriculture. Some Insects Injurious to Garden and Orchard Crops. By F. H. Chittenden. Pp. 99; North Dakota Weather and Crop Service for December, 1898. By W. L. Moon and B. H. Bronson. Pp. 8.

American Economic Association. The Federal Census. Critical Essays by Members of the Association. Pp. 516. Paper. \$1.

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Fragments of Science.

The New Zealand Experiment in Woman Suffrage.—The right of suffrage was given to all the women of New Zealand in 1893 without any concerted action or aggressive demonstrations on their part by the free, almost unsolicited, vote of the men. The general election took place in November of the same year, and is described in the Saturday Review as having been a warm contest, with several questions on which public opinion was sharply divided; but "on the whole, the women took matters wonderfully coolly. They flocked in thousands to the public meetings, where, by common consent, the front seats were given up to them." Contrary to expectation, they displayed little emotion, and even had to be "coached" to make a pretense of enthusiasm. "Polling day was awaited with dread by the electioneering agents and returning officers, with doubt by veteran politicians, and with pleasurable excitement by the women." They all voted, and "what did it all lead to?" "It left things very much as they were.... Gradually but irresistibly the conviction forced itself upon the New Zealand mind that the women knowing little and caring as little about political details, had voted almost always with the men of their family and class. Sharing to the full the prejudices, hopes, and interests of their fathers, brothers, husbands, and lovers, they had cheerfully doubled the voting power of these. Where, as in the case of schoolmistresses and factory girls, they had some special bond of union other than domestic they had voted very much as schoolmasters and male trade-unionists had voted.... With one accord colonists ceased to be afraid of what the suffrage might do, and began instead to complain of it for not doing more. Only here and there careful observers note that groups of women are studying politics, and foresee that, as years go by, these will supply a new and intelligent force with distinct and logically reasoned aims of its own."

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The Metric System (a Letter to the London Times).—SIR: I see that on Wednesday next, the 22d inst., the President of the Board of Trade is to receive a deputation from the Decimal Associations and others to urge on the Government, not merely the adoption of the decimal system of notation, but the compulsory application within two years of the metric system of weights and measures in its entirety. I have been hoping to see a letter in the Times from some person of importance calling attention to this deputation. I fervently trusted I should notice one from your correspondent, Mr. Herbert Spencer, who, a year or so back, contributed a series of thoroughly well-thought-out and logical articles, exposing the fallacy of the metric system; but if any such letter has appeared I have, unfortunately, missed it. I believe this agitation to be largely due to scientific professors who have been brought up on foreign books, and have found it too much trouble to convert foreign measurements into English; further, due to the promptings of a number of foreign merchants, forming (happily, or unhappily) now so large a portion of our traders-men who, also, do not wish to take the trouble of converting foreign weights and measures into English. As regards the suggestion, made time after time, that the metric system is one giving the greatest simplicity to calculations, I say unhesitatingly, from very considerable experience, that it is one absolutely subversive of mental arithmetic, and I appeal to anybody who has ever had the misfortune to wait at the *guichet* of a French railway station while the clerk inside has been calculating the total amount to be paid for two first-class and one second-class from "A" to "B" with a piece of chalk, or pencil and paper, to compare the speed and the certainty of this process with the answer that he would get at Euston, or at any such station in Great Britain, and say which system shows by results the advantages in point of time and in accuracy. The French themselves, as has been pointed out on more than one occasion, find the metric system too irksome, and they evade it. According to the metric system, one of its great merits is that you can state every required quantity by multiples or submultiples of ten—metre, 1; decimetre, 0.1; centimetre, 0.01; millimetre, 0.001. But no Frenchman thinks of expressing himself in this way. Instead of 0.01, he says cm. 1. For a millimetre, he says mm. 1. When he comes to large weights, does he not commonly abjure the 1,000 kilos and write one tonne? When he comes to domestic weights the kilogramme is found too large; the half of this, the practical equivalent of the pound, is wanted. He ought to write 500 grammes. He does not. He abjures his decimals, and writes one half kilo. But I feel I must not take up your space by multiplying instances, so well known to many who have studied the subject, of the unbearable burden of the decimal *plus* metrical system compulsorily carried out. I well know the value of decimals, and the indispensable need of their use in many circumstances; but I object to being compelled to use them when they are not needed and are in the way. I find it easier to state seven eighths, and to deal with it mentally, than to put it into the form of .875. I do not wish to be restricted by law in the use of my tools. What would be thought of the law which compelled a shipwright on all occasions to use a chisel, and never to employ the adze. I, with, I believe, every upholder of English weights and measures, and of the use of fractions, am quite willing that the metric system should be made legal in its entirety throughout Great Britain; but we are not willing that the useful weights and measures which we can employ with so great facility and accuracy should

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5 GREAT GEORGE STREET, WESTMINSTER, S. W.,
March 18, 1899.

P. S.—Very probably the old stalking-horses will be trotted out on Wednesday, and the President of the Board of Trade will be told of the confusion created by the existence of mere local weights and measures. I believe that if those who cite these anomalies were asked to give instances at various dates it would be found that these local weights and measures were dying out. In any event they are illegal, and are not obligatory upon anybody. Every man can claim to deal according to the standards of length, of weights, and of capacity. Most certainly the introduction of the metric system would largely add to the use of illegal weights and measures, not only locally, but generally. If the inquiry were made in France, even no farther off than Boulogne, it would be found that, in the markets there, dealings are frequently carried out on a local system unconnected with the metric.—F. B.

Variations in African Religious Ideas.—Miss Kingsley observes, in her *West African Studies*, that when you are traveling from district to district you can not fail to be struck by the difference in character of the native religions you are studying, and that no wandering student of the subject in western Africa can avoid recognizing the existence of at least four distinct forms of development of the fetich idea. They have every one of them the same underlying idea, and yet they differ. "And I believe," Miss Kingsley says, "much of the confusion which is supposed to exist in African religious ideas is a confusion only existing in the minds of cabinet ethnologists from a want of recognition of the fact of the existence of these schools. For example, suppose you take a few facts from Ellis and a few from Bastian and mix, and call the mixture West African religion. You do much the same sort of thing as if you took bits from Mr. Spurgeon's works and from those of some eminent Jesuit and of a sound Greek churchman and mixed them, and labeled it European religion. The bits would be all right by themselves, but the mixture would be a quaint affair." Of the four main schools of fetich predicated by Miss Kingsley, the Tshi and Ewe school (Ellis's school) is mainly concerned with the preservation of life; the Calabar school with attempting to enable the soul successfully to pass through death; the Mpongwe school with the attainment of material prosperity; and the school of Nkissi with the worship of the mystery of the power of evil.

A Natural History Society as a School.—Among the agencies employed by the Boston Society of Natural History for making itself a vehicle of instruction to the public has been the employment of an educated man and teacher as guide to the museum, who should also give lectures there. The salary of this officer has heretofore been provided by the bounty of Miss Harriet E. Freeman, but she has been obliged to discontinue her contribution, and the curator is now seeking other means of maintaining a suitably qualified assistant. The "guide," Mr. A. W. Grabau, delivered a course of lectures in April and May, 1897, on "The Surface of the Earth: Its Rocks, Soil, and Scenery," in which special attention was given to the scenery in New England; and, whenever it was practicable, excursions were made to localities which could be used as illustrations. A similar course, delivered in 1896, resulted in the formation during the summer of the same year of a class of thirty persons, summer residents of Kennebunkport, Maine, who were under Mr. Grabau's daily instruction for two weeks. The awakening of interest in local scenery further led to his giving lectures in Belmont and Arlington, and he thereby became instrumental in a movement intended to preserve the local frontal bowlder moraine on Arlington Heights—a valuable geological movement. A course of lectures on the Animals of the Shores of New England was given by Mr. Grabau to a class of from forty to seventy-five persons, in the Teachers' School of Science, with excursions on Wednesday and Saturday afternoons. In a similar fall course attention was given specially to the study of animals in their various habitats. A course by Mr. Grabau on the use of the microscope and the preparation of specimens was followed by ten days' laboratory work in Limekilns Bay, Maine. One of the results of a winter course on zoölogy, to a class of twenty teachers, was the formation of the Hale House Natural History Club, in connection with which field meetings are held, classes for children are formed, and papers upon elementary subjects are read and discussed. Other courses of lectures are mentioned in the report of the curator of the society—the field lessons in geology, by Professor Barton, with a winter course in historical geology; the course of Dr. R. W. Greenleaf, on the elementary structure and function of the parts of flowering plants; the course of the curator (Alpheus Hyatt), on elementary zoölogy; and the lectures on geography, by Prof. W. M. Davis. [Pg 282]

Glacier Water.—An analysis of two samples of water from the Illecilliwaet Glacier, in British Columbia, was recently made by F. T. Shutt and A. T. Charron. The water was collected a few feet from the glacier's irregular face, about a mile and a half from the glacier station on the Canadian Pacific Railway. The following is abstracted from an account in the *Chemical News*:

	No. 1.	No. 2.
	Parts per million.	
Free ammonia	0.018	0.018
Albuminoid ammonia	0.027	0.037
Nitrogen as nitrates and nitrites	0.0246	0.0442
Oxygen absorbed in fifteen minutes	0.0396	0.0672
Oxygen absorbed in four hours	0.1056	0.1744

Chlorine	0.10	0.10
Total solids at 105° C.	30.8	12.0
Solids after ignition	30.8	8.0
Loss on ignition	None.	4.0
Phosphates	None.	None.

The authors go on to say: "From the above data we may unhesitatingly conclude that the glacier water is one of great organic purity. The samples are not identical, due no doubt to the fact that they were collected twelve days apart, and probably from different parts of the foot of the glacier. Both analyses, however, show that, judged by the standards used in the diagnosis of ordinary potable waters, it is a water possessing a high degree of purity, and one perfectly wholesome and eminently suited for drinking and household purposes. As received, both samples were quite murky, almost milky, in appearance. On allowing them to stand, perfect subsidence took place, leaving the supernatant water colorless and brilliant. A microscopic examination of the sediment showed it to consist of very fine rock matter, chiefly fragments of quartzite.

Protection of Plants and Birds in France and Italy.—Organized efforts for the protection of native plants and birds from further destruction are multiplying in Europe. Botanical stations for Alpine plants have been established at several places in France and Switzerland, and now Italy has come into line with the association *Pro Mortibus*, which, founded in July, 1897, has already more than five hundred adherents. Italy is probably the country where work of this kind is most needed, for nowhere else is the destruction, particularly of birds, so systematically, persistently, and industriously carried on. *Pro Mortibus* will also interest itself in the preservation and replantation of the forests. Among other efforts looking in a similar direction, M. J. Corcelli tells in *La Nature* of the establishment of shelters in connection with the schools in Saxony where birds are fed in the winter, and of lessons given to the children inculcating regard for them. A great deal has been accomplished in France without much noise in rewooding the devastated slopes of the mountains and erecting efficient safeguards against ravage by torrents—largely by restraining the torrents at their sources; and the Alpine forests of the country, M. Corcelli says, "are again rising from their ashes." Reserves of Alpine plants have been established by the Belfort section of the French Alpine Club on the *Ballon* of Alsace; the central section is creating an extensive botanical garden in the Vosges, to serve as a place of refuge and propagation and multiplication of species threatened with extinction. The city of Annecy, in Savoy, has recently voted the money required for establishing a similar garden on the verdant ridges of the Semnoz. Two local societies in Italy are engaged in a similar work, one of which has established the garden museum Chamousia on the slopes of the Saint Bernard, where plants from the Pyrenees and the Himalaya are also collected. Switzerland is not behind either of these countries in this work.

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Tortoise Shell.—The following interesting account of the tortoise-shell industry is taken from Nature: The tortoise shell of commerce is obtained from the horny superficial plates overlying the bony case of the great majority of tortoises and turtles. Turtles differ from tortoises in the heart-shaped form of the upper half of the shell, and the conversion of the limbs into paddles adapted for swimming. The upper part of the shell carries a median row of five large superficial horny plates, flanked on either side by a row of four or five still larger flat plates; these thirteen or fifteen large plates affording some of the most valuable commercial tortoise shell in the particular species whose shell is in most demand. On the front and hind edges of the upper bony shell and the portion connecting the latter with the plastron, or lower shell, are a series of smaller horny plates, generally twenty-four in number, which are sharply bent in the middle and are known in the trade as "hoof." The under surface of the shell of a turtle carries six pairs of large, more or less flat, horny plates, for which the trade term, derived from their uniform color, is "yellow belly." In value they sometimes exceed all but the very finest of the large upper plates, generally known simply as "shell." Of the host of land and fresh-water tortoises, most of which are of comparatively small size, the horny plates (which, by the way, are altogether wanting in the so-called soft tortoises of tropical rivers), on account of their thinness and opacity, are now of no commercial value, at least in England. Moreover, it is by no means all species of marine turtles which yield commercial tortoise shell. Of these marine turtles, exclusive of the great leathery turtle, there are three well-marked and perfectly distinct types, severally represented by the green or edible turtle, the hawksbill, and the loggerhead. The hawksbill furnishes the most valuable shell. The largest and best plates, which are in the middle of the back, are about a quarter of an inch thick in the center, and measure about thirteen by eight inches, their weight being from about half a pound each to as much as one pound. The length of the carapace (the upper shell) in the hawksbill is about forty-two inches. It is found in all tropical and subtropical seas. From a dead turtle the plates of tortoise shell can be readily detached by beating. The highest price realized during 1898 in the London market was about 112s. 6d. (about \$28) a pound for the very best selected shell. It is stated that 76,760 pounds of hawksbill shell were sold in London in 1898. The shell is very readily workable, being made partially plastic by immersion in hot water.

Poison in Wild Cherry Leaves.—Instances having been brought to the notice of the directory of the New Hampshire College Agricultural Experiment Station of cattle presumably fatally poisoned by prussic acid from eating wild cherry leaves, the subject has been investigated by Fred W. Morse and Charles D. Howard. Five species of wild cherry grow in New Hampshire, of which the red cherry and the horse plum are not regarded as dangerous, and the dwarf cherry has not been examined, but is strongly suspected. The wild black cherry is the most noxious

species, and the chokecherry is not far behind it. The poisonous principle in these cherries is hydrocyanic or prussic acid, which, however, does not exist in the leaves as such, but is derived from the amygdalin they contain. The popular opinion that only the wilted leaves are specially dangerous is not borne out. The authors found both wilted and fresh leaves poisonous, and the dried leaves worthy to be regarded with suspicion. Vigorous, succulent leaves from young shoots, which are the ones most likely to be eaten by cattle, are far more poisonous than the leaves from a mature tree or stunted shrub. The largest amounts of prussic acid were derived from leaves wilted in bright sunlight to about seventy-five per cent their original weight, or till they began to appear slightly limp and lose their gloss. Leaves wilted in the dark were much less dangerous.

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Dr. Brinton's Contributions to American Linguistics.—At the suggestion of the late James Constantine Pilling, Dr. D. G. Brinton has prepared an analytical survey of his contributions in the field of American linguistics, which have now extended over forty years. The list includes seventy-one titles of books and papers, of which sixteen are classed as general articles and works. The first four of these are occupied with the inquiry whether the native American languages, as a group, have peculiar morphological traits that justify their classification as one of the great divisions of human speech. Dr. Brinton finds a feature—incorporation—which, under the form polysynthesis, is present in a marked degree in nearly all of them. Another paper shows that the various alleged affiliations between American and Asiatic tongues are wholly unfounded, and another pleads for more attention to American languages. A volume of nearly four hundred pages—*The American Race*—was the first attempt at a systematic classification of all the tribes of North, Central, and South America on the basis of language. It defines seventy-nine linguistic stocks in North America and sixty-one in South America, pertaining to nearly sixteen hundred tribes. Other volumes in the list include writings, preferably on secular subjects, by natives in their own languages. One contains a list of native American authors, and notices some of their works. Another vindicates the claim of native American poetry to recognition. These works were followed by the *Library of Aboriginal American Literature*, of which eight considerable volumes were published, each containing a work wholly of native inspiration, in a native tongue, with a translation, notes, etc. Fourteen other publications relate to North American languages north of Mexico, thirty-two to Mexican and Central American languages, and ten to South American and Antillean languages. Many of these articles were collected in 1890 and published in a volume entitled *Essays of an Americanist*. It was arranged in four parts, relating respectively to Ethnology and Archæology, Mythology and Folklore, Graphic Systems and Literature, and Linguistics. The value of Dr. Brinton's labors will be realized by all persons who know how rapidly things purely native American are passing away.

Metallic Alloys of Rich Colors.—A remarkable alloy of gold seventy-eight parts and aluminum twenty-two parts, discovered by Messrs. Roberts-Austen and Hunt, has a characteristic purple color which can not be imitated; for if the designated proportions of the constituents are varied from, the base is entirely changed. The compound lacks somewhat in the qualities of resistance and malleability. The color is abnormal in that it partakes of none of the color features of its constituents, as is the case in most combinations of metals. Thus, the colors of copper alloyed with zinc or tin pass gradually from red to white, according to the proportions of the constituent metals. In the union of two metals of white or bluish-white color, like zinc, tin, silver, and aluminum, the color of the alloys is not perceptibly different from that of the components—that is, it continues white. The purple of the gold aluminum alloy is not, however, the only exception to this rule. Aluminum gives highly colored compounds with several other metals, even when the second metal is clearly white. In the experiments of Charles Marcot, of Geneva, in alloying aluminum with platinum, palladium, nickel, and cobalt, combination took place abruptly at red heat, with the development of an intense temperature and a partial combination of the aluminum; and when platinum is the second metal, an explosion is liable to occur. An alloy of seventy-two parts of platinum and twenty-eight of aluminum had a bright golden or yellow color, which varied under slight changes in the proportions of the elements to violet green or coppery red. The alloy is hard and brittle and of crystalline structure. The yellow form is stable, while the other forms decompose in a short time. An alloy of seventy-two parts palladium and twenty-eight aluminum is of fine coppery rose color, crystalline texture, hard and brittle, and suffers no change with time. An alloy of from seventy-five to eighty parts cobalt and twenty to twenty-five aluminum is straw-yellow, inclining to brown; when just formed it is externally hard and scratches glass, but is easily broken with a hammer, and falls to a powder in a few days. An alloy of eighty-two parts nickel and eighteen aluminum has a pronounced straw-yellow color, is as hard as tempered steel, and resists the blow of a hammer. The fracture, close-grained, is that of steel or bell metal. It is susceptible of a fine polish, is stable, and keeps its color. Though interesting on account of their colors, these alloys, except that of nickel, are not suitable for any use.

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The Chemistry of Sausages.—The *Lancet* is authority for the following: "The composition of the sausage is not only complex, but it is often obscure. It is supposed to be a compound of minced beef and pork. Abroad, however, the sausage is compounded of a much wider range of substances. These include brains, liver, and horseflesh. Occasionally they do not contain meat at all, but only bread tinged with red oxide of iron and mixed with a varying proportion of fat. Horseflesh is rich in glycogen, and this fact enables its presence in sausage meat to be detected with some amount of certainty. The test, which depends on a color reaction, with iodine has recently been more carefully studied and with more satisfactory results, so that the presence of five per cent of horseflesh can be detected. At present there is no legal provision for a standard in regard to the composition of sausages, but clearly there ought to be. Limitations should be laid down as to the amount of bread used, as to the actual proportion of meat substances present, and as to the coloring matters added to give an attractive appearance of fresh meat. Sausages are

extremely liable to undergo decomposition and become poisonous, owing to the elaboration of toxic substances during the putrefactive process. Bad or rancid fat is very liable to alter the character of a sausage for the worse. Thus in some instances the use of rancid lard has rendered the sausage after a time quite phosphorescent, an appearance which indicates, of course, an undesirable change. The smoked sausage is a much safer article of diet than the unsmoked, since the curing process preserves the meat substance against decomposition by reason of the empyreumatic bodies present in the wood smoke which is used for this purpose."

Photographing Papuan Children.—Many savages dislike to have their pictures taken, some being restrained by motives of superstition; but in New Guinea Professor Semon found being photographed a great joke for all the boys and girls. He had much trouble in isolating a single individual, so as not to get thirty or forty persons into his picture instead of the one he wished to immortalize. "Wishing," he says, "to portray one young girl of uncommonly good looks, I separated her from the rest, gave her a favorable position, and adjusted the lens, surrounded all the while by a crowd of people behind and beside me, the children cheering, the women most ardently attentive, the men benevolently smiling. Evidently my subject was proud of the distinction she enjoyed and the attention vouchsafed her. Quite suddenly, however, this simple savage, untaught as she was and innocent of the laws of reticence and prudishness, became convulsed with shame, covered her eyes with her hands, and valiantly resisted every attempt to make her stand forward as before. At the same time I noticed that the hue of her features changed, the brown of her face becoming darker and deeper than before, a phenomenon easily explained by the fact of the blood rising into her head. Had she been a brown girl we would have said that she blushed. At all events, the physiological process was the same as that which forces us to blush." At another time, when the author had got two little girls into position to be photographed, their mothers came up and forbade his taking them that day, but promised to present them on the morrow. On the next day "both the little angels were solemnly brought to meet us nearly smothered in ornaments, their hair decorated with feathers and combs, their ears with tortoise-shell pieces, their little throats surrounded by plates of mother-of-pearl and chains of dingo teeth, legs and arms hung with rings and shells, teeth, and all sorts of network.... Here, again, one may see that mothers are made of the same stuff all over the world, Papuan mammas being equal to any of our peasant women or fine ladies in the point of vanity as far as concerns their children."

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Meat Extracts.—An interesting account of the history and preparation of meat extracts was recently given as a lecture before the Society of Arts (English) by Charles R. Valentine. The idea of concentrating the body of an ox into a thimbleful of elixir seems to have been a very old one. Until the work of Justus von Liebig, about fifty years ago, however, little progress of practical value was made toward this end. Liebig macerated finely divided beef in cold water, or in water not above 150° F. The water dissolved from sixteen to twenty-four per cent of the weight of the dry flesh. This infusion was heated, the albumen and red coloring matter of the blood coagulated, and was separated as a flocculent precipitate. The remaining solution has the aromatic taste and all the properties of soup made by boiling the flesh. The infusion was then evaporated at a gentle heat. The residue amounted to about twelve or thirteen per cent of the original (dry) flesh. This is in rough outline the process of meat-extract making. This extract is simply an evaporated beef tea, containing the extractive matters of beef, and in virtue of these possesses medicinal and dietetic properties of value. But it is in no sense a substitute for beef, as the latter's most important food constituent—albumen—it does not contain.

MINOR PARAGRAPHS.

It appears from tables of Some Statistics of Engineering Education, compiled by President M. E. Wadsworth, of the Michigan College of Mines, that such education has been, in the United States, on the whole a thing of comparatively recent date, the oldest school, the Rensselaer Polytechnic Institute, having been established in 1824; the next, the Lawrence and Sheffield Schools, in 1846 and 1847; and the Columbia School in 1863. Civil engineering has led in this country, and has had various periods of advance, as in 1887-'88, and depression, as in 1896-'97. Mechanical engineering progressed till 1886-'87, when the number of students fell off, and the same happened with electrical engineering, "which further suffers a natural reaction from having been greatly overdone." As a rule, most of the schools in the United States seem to run to specialties, one or two of the courses being usually more conspicuous than the others.

The importance of some arrangement by which vessels may be informed of each other's approach in fog and darkness has given rise to many devices; the only one, however, which has as yet proved practical is the fog-horn or siren, and this has many disadvantages. Several fatal collisions at sea during the past year have given rise to renewed interest in the subject, and a number of new methods have been suggested. M. Branley, a French physicist, in a note presented to the French Academy suggests that each vessel be provided with a number of extremely sensitive magnetic receivers, or coherers, and a powerful magnetic transmitter. Periodical signals being made with the transmitter, corresponding impressions would be made upon the receivers of approaching vessels. The principal difficulty with this scheme lies in the fact that the receivers of a vessel will be affected by its own transmitter. There are several methods by which this difficulty may be overcome, however. Different signals may be employed, or the interval between signals may be regularly varied. M. Branley calls attention to the influence of a metallic envelope surrounding a coherer, and shows that when the coherer is thus completely surrounded it is unaffected by the influence of a transmitter. By thus inclosing the receiver on a ship at the

instant of the operation of the transmitter of the same vessel, the above difficulty might be avoided.

While we can not collect roses from our gardens in January and maple blossoms from the woods in February, yet, as Prof. W. J. Beal shows in a bulletin of the Michigan Agricultural College Experiment Station, our trees and shrubs in their winter garb furnish excellent lessons for the profitable employment of pupils during many weeks at that season in true botanical study. "Let each member of a class be provided with a branch, a foot or two long, from a sugar maple, and then spend some ten to twenty minutes or more quietly looking at the buds and the bark, with its scars and specks, and then tell what he has discovered, venturing to explain the object or meaning of some of the things he has seen. In a similar manner let each look over a branch of beech and then point out the difference between the two kinds." Opening buds of trees may be obtained at any time during the winter by placing the lower end of the stem in water for a week or two while in the schoolroom.

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Eivind Astrup, in his book *With Peary near the Pole*, gives admiring pictures of the natural innocence of the uncontaminated Eskimos of northern Greenland, where are communities in which "money is unknown, and love of one's neighbor is a fundamental rule of action; where theft is not practiced." All things are held in common, and falsehoods are told only to spare the feelings of the listener. Among the instances of the native kindness of these people is one where a dog had eaten up a reindeer coat, yet was only remonstrated with by its owner. When the author suggested that a hungry dog should be punished for stealing a piece of blubber, the owner said that it was himself who deserved the thrashing for not having obtained sufficient food for the dog.

The operations of the Illinois State Laboratory of Natural History during 1897 and 1898 were almost wholly connected with the work of the State Entomologist or with that of the Biological Station. The former work related to various insects injurious to crops. The operations of the Biological Station were carried on with more reference to completing a formal report upon the fishes of Illinois. The work is conducted with a view to the acquisition of correct ideas of the relative abundance and local distribution of species, their haunts, habits, regular migrations, and irregular movements, their building times and places, rate of growth, food, diseases, and enemies—and, in short, the whole economy of each kind represented at the station and of the whole assemblage taken together as a community group. Extensive studies of aquatic entomology were made, and a paper on ephemeroptera and dragon flies is nearly ready for the press. No part of the work of the station, however, attracts more attention among scientific men, or is likely to lead to more interesting and important results, than the plankton work, or the systematic study of the minute forms of plant and animal life suspended in the water. Water analyses have been extensively made in connection with these studies, which, combined with the continuous biological work, will, when generalized, furnish a substantial and authoritative body of knowledge of the conditions of the waters of the middle Illinois previous to the opening of the Chicago drainage canal, useful for comparison with the results of similar studies made after that event. A summer school was conducted, with fifteen pupils, in 1898, and publications were issued.

NOTES.

The Pasteur monument was dedicated at Lille, France, the city in which the subject of the memorial performed his earlier more important researches, April 9th. The ceremony was witnessed by a large assembly, which included many eminent scientific men of France and foreign countries, among whom men engaged in similar researches to Pasteur's were especially represented. The monument, the fruit of a public subscription, represents Pasteur standing on the summit of a column of Soignies stone, holding in his right hand an experimental flask. At the foot of the column a woman presents her child, which has been bitten by a mad dog, for treatment. To the left is a group representing inoculation—a woman, personifying science, injecting serum into a child she holds on her knees. Three bas-reliefs represent respectively Dr. Roux inoculating a sheep for anthrax, Pasteur studying fermentation, and the first antirabic inoculation of the young Joseph Meister, who is held by his mother, wearing the broad-flapped Alsatian bonnet. The statue is in light bronze, and with the gilded bas-reliefs harmonizes well with the gray of the stone. Addresses were made by M. Armand Gautier and M. Duclaux, who said that the improved laboratories now enjoyed by scientific institutions in Paris were largely due to Pasteur's efforts.

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The minor planet recently discovered by Witt, remarkable as having an orbit that comes within that of Mars, and provisionally known as DQ, has been named Eros. An examination by Professor Pickering and Mrs. Fleming of the Harvard photographs has revealed traces of this body on twelve plates taken in 1893 and 1894, and on four plates of 1896. By the aid of these plates it has been possible to determine its elements with greater accuracy than would otherwise be possible. Its mean distance from the sun is 1.45810, its shortest distance 1.13334, and its greatest distance 1.78286 that of the earth; the eccentricity of its orbit is 0.222729, and its period is 643.10 days. Its synodical period is such that it has three oppositions in seven years. The next opposition will be in the last months of 1900, and will be a moderately favorable one for observation.

The courses in pure science of the New York University include undergraduate, graduate, and summer courses in mathematics, physics, chemistry, geology, and biology, with laboratory privileges and provision for special students and independent work in chemistry. The university

last year was attended by 1,717 students in its three faculties and six schools, and 720 non-matriculant students and auditors. A new feature this year is the inauguration of the Charles F. Deems lectureship of philosophy, under an endowment of \$15,000 by the American Institute of Christian Philosophy, with Prof. James Iverach, D. D., of the Free Church College, Aberdeen, Scotland, as the first lecturer. A feature of the university organization is the institution of a woman's advisory committee co-operating with the council. A woman's law class is supported by the Woman's Legal Education Society, the purpose of which is to make business women and women in private life acquainted with existing law.

The new Science Building of the City Library, Springfield, Mass., recently completed, is being inaugurated by a Geographical and Geological Exhibition. It includes the best and latest maps, models, globes, charts, relief maps, and photographs, special attention being paid to the most effective modes of teaching. One of the most attractive features of the exhibition is the work from the Springfield public schools.

An ingenious method for thawing out frozen water pipes has been used by Prof. R. W. Wood, of the University of Wisconsin. It consists simply of passing a current of electricity through the pipe. In one case it is said that one hundred and fifty feet of frozen pipe was thawed out in eighteen minutes. The ordinary street current was used, the voltage being reduced to about fifty.

In a summary of inspectors' reports of the Hartford Steam Boiler Inspection and Insurance Company for 1898 it is stated that of 78,349 boilers, inspected both internally and externally, during the year, there were 11,727 dangerous defects discovered and 603 entire boilers were declared unsafe for further use.

The recent death list of men known in science includes the names of Charles Naudin, an eminent French botanist, Dean of the Botanical Section of the Academy of Sciences and author of a book on Hybrids in the Vegetable Kingdom, at Antibes, France, March 19th, aged eighty-four years; Dr. G. W. Leitner, an eminent Orientalist and linguist, Lecturer on Oriental Language at King's College, London, Principal of Lahne College, and Registrar of Punjab University, where he introduced the use of their own language and literature in teaching Indian students, founder of the Anglo-Indian Institute at Woking, England, and author of works in Education, the Races of Turkey, The Races and Languages of Dardistan, Græco-Buddhist Discoveries, and other Oriental subjects, at Bonn, March 24th, in his sixty-ninth year; Dr. Angelo Knorr, Docent in the Veterinary School of Munich, February 22d; Elizabeth Brown, astronomical observer and author of papers on solar phenomena, at Cirencester, England, March 6th; Dr. Wilhelm von Müller, Professor General Chemistry in the Institute of Technology, Munich; Dr. Friedrich von Lühmann, mathematician, at Straslund, Prussia; Dr. Charles Fortuun, mineralogist, in London; Alfred Feuilleaubeis, author of researches on Fungi, at Fontainebleau, France; Dr. Heinrich Kiefert, a geographer and cartographer whose fame was world-wide, whose maps and atlases are everywhere recognized as authorities, at Berlin, April 21st, aged seventy years; and Prof. Sophus Lie, of the University of Christiania, an eminent mathematician, February 18th, in his fifty-seventh year.

FOOTNOTES:

- [A] See article by Mr. Taylor on The Scoured Bowlders of the Mattawa Valley, in the American Journal of Science, March, 1897, pp. 208-218.
- [B] For opportunity to do this work I am indebted to the interest of President S. R. Callaway, of the New York Central Railroad. The measurements were made by Mr. George S. Tibbits, engineer of the western division. The photographs were taken by Mr. C. F. Dutton, of Cleveland.
- [C] Such an extraordinary man as Booker T. Washington is an honor to any country and worthy of unlimited confidence and regard.
- [D] The last United States census puts our coal lands at something more than 225,000 square miles.
- [E] "This deposit occurs as far north as the southern shores of Lake Ontario, and thence extends in an almost continuous manner through Pennsylvania, Virginia, Kentucky, and Tennessee to central Alabama."—*N. S. Shaler's The United States of America, vol. i, p. 432.*
- [F] If we accept the reclaimable area given above as approximately correct, and apply a system of irrigation, it can be cultivated, "and made the happy home of an industrious people more than equaling in number the inhabitants of the United Kingdom of Great Britain and Ireland."—*J. N. Irwin, in Forum, vol. i, p. 742.*
- [G] Forum, vol. xii, p. 750.
- [H] Report of the Secretary of the Interior, 1891.
- [I] The United States of America, vol. i, p. 382.
- [J] United States Report on Commerce and Navigation for 1897.
- [K] Ibid.

- [L] W. Allyn Ireland, in an address before the University of Pennsylvania.
- [M] See *Coffee and India-Rubber Culture in Mexico*. By Matias Romero, late Mexican minister to the United States.
- [N] The average yields of tropic produce were made out with the assistance of the *Cyclopædia Britannica*, *Coffee and India-Rubber Culture in Mexico* (Romero), and statistics obtained at the Philadelphia Commercial Museums. The amounts of the imports were taken from the United States Report on Commerce and Navigation for 1897.
- [O] It appears that he afterward made the strange request for an anarchist to be appointed guard of the prison, and was irritated when it was denied. (See A. Gautier, *Le procès Luccheni*. Vienna, 1899.)
- [P] See my *Delitto politico*, Part III, and *Gli Anarcici*, second edition.
- [Q] See my *Delitto politico*, 1890.
- [R] *Ibid.*
- [S] To the charges made against me by M. Gautier (*Le procès Luccheni*, 1899) of having formulated a diagnosis without seeing the patient, which was therefore inexact, and of having described characteristics of degeneration which did not exist, I answer with the pages of Forel, certainly the most eminent alienist of our time, who had him under his eyes during the whole process, and whose diagnosis differs but little from mine.
- [T] *A History of French Literature*. By Edward Dowden, D. Lit., LL. D., etc. New York: D. Appleton and Company. 1897.
- [U] In preparation of this article the author has consulted chiefly the following: John Gerarde, *The Herball or General Historie of Plants*, 1597; Shakspeare, Edward Dowden, 1872; William Shakespeare, *Works*, Globe edition, 1867; *Natural History of Shakespeare*, Bessie Mayou, 1877; *Shakespeare's England*, William Winter, 1894; *The Plant lore and Garden-craft of Shakespeare*, H. F. Ellacombe, 1896; *The Gardener's Chronicle*, sundry pamphlets, and shorter articles.
- [V] *The Foundations of Zoölogy. A Course of Lectures delivered at Columbia University on the Principles of Science as illustrated by Zoölogy*. By William Keith Brooks, Ph. D., LL. D., Professor of Zoölogy at Johns Hopkins University. Pp. 339. The Macmillan Company.
- [W] *The History of Mankind*. By Prof. Friedrich Ratzel. The Macmillan Company. Vol. III, pp. 599.
- [X] *The Development of English Thought. A Study in the Economic Interpretation of History*. By Simon N. Patten, Ph. D. New York: The Macmillan Company. 1899. \$3.
- [Y] *Nature Study for Grammar Grades. A Manual for the Guidance of Pupils below the High School in the Study of Nature*. By Wilbur S. Jackman. Danville, Ill.: The Illinois Printing Company. Pp. 407.
- [Z] *Fertilizers. The Source, Character, and Composition of Natural, Home-made, and Manufactured Fertilizers; and Suggestions as to their Use for Different Crops and Conditions*. By Edward B. Voorhees. New York: The Macmillan Company. Pp. 335. Price, \$1.
- [AA] *Commercial Organic Analysis. A Treatise on the Properties, Proximate Analytical Examination, and Mode of Assaying the Various Organic Chemicals and Products employed in the Arts, Manufactures, and Medicine*. By Alfred H. Allen. Third edition. Illustrated. With Revisions and Appendix by the author and Henry Leffmann. Vol. I. Introduction. Alcohols, Neutral Alcoholic Derivatives, Sugars, Starch and its Isomers, Vegetable Acids, etc. Philadelphia: P. Blakiston, Sons & Co. Pp. 557. Price, \$4.50.
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- [AB] *The Porto Rico of To-day. Pen Pictures of the People and the Country*. By Albert Gardner Robinson. New York: Charles Scribner's Sons. Pp. 240, with maps. Price, \$1.50.
- [AC] *The Principles of Biology*. By Herbert Spencer. In Two Volumes. Vol. I. Revised and enlarged edition. New York: D. Appleton and Company. Pp. 706. Price, \$2.
- [AD] *Matter, Energy, Force, and Work. A Plain Presentation of Fundamental Physical Concepts, and of the Vortex-Atom and other Theories*. By Silas W. Holman. New York: The Macmillan Company. Pp. 257. Price, \$2.50.

Transcriber's Notes:

Obvious printer's errors have been repaired, other inconsistent spellings have been kept, including inconsistent use of hyphen (e.g. "tortoise-shell" and "tortoise shell"), and proper names (e.g. "Shakspeare" and "Shakespeare").

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

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