SCIENCE

NEW YORK, SEPTEMBER 2, 1892.

THE IMMEDIATE WORK IN CHEMICAL SCIENCE.[1]

BY ALBERT B. PRESCOTT.

A DIVISION of science has a work of its own to do, a work that well might be done for its own sake, and still more must be done in payment of what is due to the other divisions. Each section of our association has its just task, and fidelity to this is an obligation to all the sections. Those engaged in any labor of science owe a debt to the world at large, and can be called to give an account of what they are doing, and what they have to do, that the truth may be shown on all sides.

If it be in my power to make the annual address of this meeting of any service at all to you who hear it — in your loyalty to the association — I would bring before you some account of the work that is wanted in the science of chemistry. Of what the chemists have done in the past the arts of industry speak more plainly than the words of any address. Of what chemists may do in the future it would be quite in vain that I should venture to predict. But of the nature of the work that is waiting in the chemical world at the present time I desire to say what I can, and I desire to speak in the interests of science in general. The interests of science, I am well assured, cannot be held indifferent to the interests of the public at large.

The Hidden Composition of Matter.

It is not a small task to find out how the matter of the universe is made. The task is hard, not because of the great quantity in which matter exists, nor by reason of the multiplicity of the kinds and compounds of matter, but rather from the obscurity under which the actual composition of matter is hidden from man. The physicists reach a conclusion that matter is an array of molecules, little things, not so large as a millionth of a millimeter in size, and the formation of these they leave to the work of the chemists. The smallest objects dealt with in science, their most distinct activities become known only by the widest exercise of inductive reason.

The New World of Discovery.

The realm of chemical action, the world within the molecules of matter, the abode of the chemical atoms, is indeed a new world and but little known. The speculative atoms of the ancients, mere mechanical divisions, prefiguring the molecules of modern science, yet gave no sign of the chemical atoms of this century, nor any account of what happens in a chemical change. A new field of knowledge was opened in 1774 by the discovery of oxygen, and entered upon in 1804 by the publications of Dalton, a region more remote and more difficult of access than was the unknown continent toward which Christopher Columbus set his sails three centuries earlier. The world within molecules has been open for only a hundred years. The sixteenth century was not long enough for an exploration of the continent of America, and the nineteenth has not been long enough for the undertaking of the chemists. When four centuries of search shall have been made in the world of chemical formation, then science should be ready to meet a congress of nations, to rejoice with the chemist upon the issue of his task.

It is well known that chemical labor has not been barren of returns. The products of chemical action, numbering thousands of thousands, have been sifted and measured and weighed. If you ask what happens in a common chemical change you can obtain direct answers. When coal burns in the air, how much oxygen is used up can be stated with a degree of exactness true to the first decimal of mass, perhaps to the second, yet questionable in the third. How much carbonic acid is made can be told in weight and in volume with approaching exactness. How much heat this chemical action is worth, how much light, how much electromotive force, what train-load of cars it can carry, how long it can make certain wheels go round,— for these questions chemists and physicists are ready. With how many metals carbonic acid will unite, how many ethers it can make into carbonates, into what classes of molecules a certain larger fragment of carbonic acid can be formed,—the incomplete records of these things already run through a great many volumes. These carboxylic bodies are open to productive studies, stimulated by various sorts of inquiry and demands of life. Such have been the gatherings of research. They have been slowly drawn into order, more slowly interpreted in meaning. The advance has been constant, deliberate, sometimes in doubt, always persisting and gradually gaining firmer ground. So chemistry has reached the period of definition. Its guiding theory has come to be realized.

The Central Truth of this Science.

"The atomic theory" has more and more plainly appeared to be the central and vital truth of chemical science. As a working hypothesis it has directed abstruse research through difficult ways to open accomplishment in vivid reality. As a system of knowledge, it has more than kept pace with the rate of invention. As a pholosophy, it is in touch with profound truth in physics, in the mineral kingdom, and in the functions of living bodies. As a language, it has been a necessity of man in dealing with chemical events. Something might have been done, no doubt, without it, had it been possible to keep it out of the chemical mind. But with a knowledge of the primary elements of matter, as held at the beginning of this century, some theory of chemical atoms was inevitable. And whatever theory might have been adopted, its use in investigation would have drawn it with a certainty into the essential features of the theory now established. It states the constitution of matter in terms that stand for things as they are made. The mathematician may choose the ratio of numerical notation, whether the ratio of ten or some other. But the chemist must find existing ratios of atomic and molecular mass, with such degree of exactness as he can attain. Chemical notation, the index of the atomic system, is imperfect, as science is incomplete. However defective, it is the resultant of a multitude of facts. The atomic theory has come to be more than facile language, more than lucid classification, more than working hypothesis, it is the definition of the known truth in the existence of matter.

The chemical atom is known, however, for what it does, rather than for what it is. It is known as a centre of action, a factor of influence, an agent of power. It is identified by its responses, and measured by its energies. Concealed as it is, each atom has given proof of its own part in the structure of a molecule. Proofs of position, not in space but in action, as related to other atoms, have been obtained by a multitude of workers with the greatest advantage. The arrangement of the atoms in space, however, is another and later question, not involved in the general studies of structure. But even this question has arisen upon its own chemical evidences for certain bodies, so that "the configuration" of the molecule has become an object of active research.

Known for what it does, the atom is not clearly known for what it is. Chemists, at any rate, are concerned mainly with what can be made out of atoms, not with what atoms can be made of. Whatever they are, and by whatever force of motion it is that they unite with each other, we define them by their effects. Through their effects they are classified in the rank and file of the periodic

[1] Address of the retiring president of the American Association at Rochester, August, 1892.

system. The physicists, however, do not stop short of the philosophical study of the atom itself. As a vibratory body its movements have been under mathematical calculations; as a vortex ring its pulsations have been assumed to agree with its combining power. As an operating magnet its interaction with other like magnets has been predicated as the method of valence. There are, as I am directly assured, physicists of penetration and prudence now looking with confidence to studies of the magnetic relations of atoms to each other.[1] Moreover, another company of workers, the chemists of geometric isomerism, assume a configuration of the atoms, in accord with that of the molecule.

Hypotheses to be Held Apart.

The stimulating truth of the atomic constitution of the molecule, a great truth in elastic touch with all science, excites numerous hypotheses, which, however profitable they may be, are to be stoutly held at a distance from the truth itself. Such are the hypotheses of molecular aggregation into crystals and other mineral forms. Such are the biological theories of molecules polymerizing into cells, and of vitality as a chemical property of the molecule. Such are the questions of the nature of atoms, and the genesis of the elements as they are now known,— questions on the border of metaphysics. Let all these be held distinct from the primary law of the atomic constitution of simple molecules in gaseous bodies, an essential principle in an exact science. The chemist should have the comfortable assurance, every day, as he plies his balance of precision, that the atom-made molecules are there, in their several ratios of quantity, however many unsettled questions may lie around about them. Knowledge of molecular structure makes chemistry a science, nourishing to the reason, giving dominion over matter, for beneficence to life.

Men Who Make Science.

Every chemical pursuit receives strength from every advance in the knowledge of the molecule. And to this knowledge, none the less, every chemical pursuit contributes. The analysis of a mineral, whether done for economic ends or not, may furnish a distinct contribution toward atomic valence. The further examination of steel in the cables of a suspension bridge is liable to lead to unexpected evidence upon polymeric unions. Rothamsted Farm, where ten years is not a long time for the holding of an experiment, yields to us a classic history of the behavior of nitrogen, a history from which we correct our theories. The analysis of butter for its substitutes has done something to set us right upon the structure of the glycerides. Clinical inspection of the functions of the living body fain finds a record of molecular transformations too difficult for the laboratory. The efforts of pharmaceutical manufacture stimulate new orders of chemical combination. The revision of the pharmacopœia every ten years points out a humiliating number of scattered errors in the published constants on which science depends. The duty of the engineer, in his scrutiny of the quality of lubricating oils, brings a more critical inquiry into the laws of molecular movement. There is not time to mention the many professions and pursuits of men who contribute toward the principles of chemistry and hold a share therein. If it be the part of pure science to find the law of action in nature, it is the part of applied science both to contribute facts and to put theory to the larger proof. In the words of one who has placed industry in the greatest of its debts to philosophic research, W. H. Perkin, "There is no chasm between pure and applied science, they do not even stand side by side, but are linked together." So in all branches of chemistry, whether it be termed applied or not, the best workers are the most strongly bound as one, in their dependance upon what is known of the structure of the molecule.

Waiting for Workers.

Studies of structure were never before so inviting. In this direction, and in that, especial opportunities appear. Moreover, the actual worker here and there breaks into unexpected paths of promise. Certainly the sugar group is presenting to the chemist an open way from simple alcohols on through to the cell substances of the vegetable world. And nothing anywhere could be more suggestive than the extremely simple unions of nitrogen lately discovered. They are likely to elucidate linkings of this element in great classes of carbon compounds, all significant in general chemistry. Then certain comparative studies have new attractions. As halogens have been upon trial side by side with each other, so, for instance, silicon must be put through its paces with carbon, and phosphorus with nitrogen. Presently, also, the limits of molecular mass, in polymers and in unions with water, are to be nearer approached from the chemical side, as well as from the side of physics, in that attractive but perplexing borderground between affinity and the states of aggregation.

And all for Mankind.

Such is the extent and such the diversity of chemical labor at present that every man must put limits to the range of his study. The members of a society or section of chemistry, coming together to hear each other's researches, are better able, for the most part, to listen for instruction than for criticism. Still less prepared for hasty judgment are those who do not come together in societies at all. Even men of eminent learning must omit large parts of the subject, if it be permitted to speak of chemistry as a single subject. These considerations admonish us to be liberal. When metallurgical chemistry cultivates skepticism as to the work upon atomic closed chains, it is a culture not the most liberal. When a devotee of organic synthesis puts a low value upon analytic work, he takes a very narrow view of chemical studies. When the chemist who is in educational service disparages investigations done in industrial service, he exercises a pitiful brevity of wisdom.

The pride of pure science is justified in this, that its truth is for the nurture of man. And the ambition of industrial art is honored in this, its skill gives strength to man. It is the obligation of science to bring the resources of the earth, its vegetation and its animal life, into the full service of man, making the knowledge of creation a rich portion of his inheritance, in mind and estate, in reason and in conduct, for life present and life to come. To know creation is to be taught of God.

The Means of Unification.

I have spoken of the century of beginning chemical labor, and have referred to the divisions and specialties of chemical study. What can I say of the means of uniting the earlier and later years of the past, as well as the separated pursuits of the present, in one mobile working force? Societies of science are among these means, and it becomes us to magnify their office. For them, however, all that we can do is worth more than all we can say. And there are other means, even more effective than associations. Most necessary of all the means of unification in science is the use of its literature.

It is by published communications that the worker is enabled to begin, not where the first investigation began, but where the last one left off. The enthusiast who lacks the patience to consult books, presuming to start anew all by himself in science, has need to get on faster than Antoine L. Lavoisier did when he began, an associate of the French Academy in 1768. He of immortal memory, after fifteen eventful years of momentous labor, reached only such a combustion of hydrogen as makes a very simple class-experiment at present. But, however early in chemical discovery, Lavoisier availed himself of contemporaries. They found oxygen, he learned oxidation: one great man was not enough, in 1774, both to reveal this element and show what part it takes in the formation of matter. The honor of Lavoisier is by no means the less that he used the results of others, it might have been the more had he given their results a more explicit mention. Men of the largest original power make the most of the results of other men. Discoverers do not neglect previous achievement, however it may appear in biography. The masters of science are under the limitations of their age. Had Joseph Priestley lived in the seventeenth century he had not discovered oxygen. Had August Kekulé worked in the period of Berzelius, some other

[1] "The results of molecular physics point unmistakably to the atom as a magnet, in its chemical activities."—A. E. Dolbear, in a personal communication.

man would have set forth the closed chain of carbon combination, and Kekulé, we may be sure, would have done something else to clarify chemistry. Such being the limitations of the masters, what contributions can be expected in this age from a worker who is without the literature of his subject?

The Cure for the Crank.

In many a town some solitary thinker is toiling intensely over some self-imposed problem, devoting to it such sincerity and strength as should be of real service, while still he obtains no recognition. Working without books, unaware of memoirs on the theme he loves, he tries the task of many with the strength of one. Such as he sometimes send communications to this association. An earnest worker, his utter isolation is quite enough to convert him into a crank. To every solitary investigator I should desire to say, get to a library of your subject, learn how to use its literature, and possess yourself of what there is on the theme of your choice, or else determine to give it up altogether. You may get on very well without college laboratories, you can survive it if unable to reach the meetings of men of learning, you can do without the counsel of an authority, but you can hardly be a contributor in science except you gain the use of its literature.

The Want of Original Memoirs.

First in importance to the investigator are the original memoirs of previous investigators. The chemical determinations of the century have been reported by their authors in the periodicals. The serials of the years, the continuous living repositories of all chemistry, at once the oldest and the latest of its publications, these must be accessible to the worker who would add to this science. A library for research is voluminous, and portions of it are said to be scarce, nevertheless it ought to be largely supplied. The laboratory itself is not more important than the library of science. In the public libraries of our cities, in all colleges now being established, the original literature of science ought to be planted. It is a wholesome literature, at once a stimulant and a corrective of that impulse to discovery that is frequent among the people of this country. That a good deal of it is in foreign languages is hardly a disadvantage; there ought to be some exercise for the modern tongues that even the public high schools are teaching. That the sets of standard journals are getting out of print is a somewhat infirm objection. They have no right to be out of print in these days when they give us twenty pages of blanket newspaper at breakfast, and offer us Scott's novels in full for less than the cost of a day's entertainment. As for the limited editions of the old sets, until reproduced by new types, they may be multiplied through photographic methods. When there is a due demand for the original literature of chemistry, a demand in accord with the prospective need for its use, the supply will come, let us believe, more nearly within the means of those who require it than it now does.

The Indexing of the Literature.

What I have said of the literature of one science can be said, in the main, of the literature of other sciences. And other things ought to be said of what is wanted to make the literature of science more accessible to consulting readers. A great deal of indexing is wanted. Systematic bibliography, both of previous and of current literature, would add a third to the productive power of a large number of workers. It would promote common acquaintance with the original communications of research, and a general demand for the serial sets. Topical bibliographies are of great service. In this regard I desire to ask attention to the annual reports, in this association for nine years past, of the committee on Indexing Chemical Literature, as well as to recent systematic undertakings in geology, and like movements in zoology and other sciences, also to the Index Medicus, as a continuous bibliography of current professional literature.

Societies and institutions of science may well act as patrons to the bibliography of research, the importance of which has been recognized by the fathers of this association. In 1855, Joseph Henry, then a past-president of this body, memorialized the British association for co-operation in bibliography, offering that aid of the Smithsonian Institution which has so often been afforded to publications of special service. The British association appointed a committee, who reported in 1857, after which the undertaking was proposed to the Royal Society. The Royal Society made an appeal to her Majesty's government, and obtained the necessary stipend. Such was the inception of the Royal Society Catalogue of scientific papers of this century, in eight quarto volumes, as issued in 1867 and 1877. Seriously curtailed from the generous plan of the committee who proposed it, limited to the single feature of an index of authors, it is nevertheless of great help in literary search. Before any list of papers, however, we must place a list of the serials that contain them, as registered by an active member of this association, an instance of industry and critical judgment. I refer to the well-known catalogue of scientific and technical periodicals, of about five thousand numbers, in publication from 1665 to 1882, together with the catalogue of chemical periodicals by the same author.[1]

Compilations of Science.

Allied to the much-needed service in bibliography, is the service in compilation of the Constants of Nature. In the preface of his dictionary of solubilities, in 1856, Professor Storer said, "that chemical science itself might gain many advantages if all known facts regarding solubility were gathered from their widely-scattered original sources into one special comprehensive work." That the time for the philosophical study of solution was near at hand has been verified by recent extended monographs on this subject. In like manner, Thomas Carnelley in England, and early and repeatedly our own Professor Clarke in the United States,[2] bringing multitudes of scattered results into co-ordination, have augmented the powers of chemical service.

What bibliography does for research, the Handwörterbuch does for education, and for technology. It makes science wieldy to the student, the teacher, and the artisan. The chief dictionaries of science, those of encyclopedic scope, ought to be provided generally in public libraries, as well as in the libraries of all high schools.[3] The science classes in preparatory schools should make acquaintance with scientific literature in this form. If scholars be assigned exercises which compel reference reading, they will gain a beginning of that accomplishment too often neglected, even in college, how to use books.

The Laboratory Method.

The library is a necessity of the laboratory. Indeed, there is much in common between what is called the laboratory method, and what might be called the library method, in college training. The educational laboratory was instituted by chemistry, first taking form under Liebig at Giessen only about fifty years ago. Experimental study has been adopted in one subject after another, until now the "laboratory method" is advocated in language and literature, in philosophy and law. It is to be hoped that chemistry will not fall behind in the later applications of "the new education" in which she took so early a part.

Urgency of the Chemical Task.

The advancement of chemical science is not confined to discovery, nor to education, nor to economic use. All of those interests it should embrace. To disparage one of them is injurious to the others. Indeed, they ought to have equal support. It

[1] Bolton's Catalogue of Scientific and Technical Periodicals (1885: Smithsonian) omits the serials of the societies, as these are the subject of Scudder's Catalogue of Scientific Serials (1879: Harvard Univ.). On the contrary, Bolton's Catalogue of Chemical Periodicals (1885: N. Y. Acad. Sci.) includes the publications of societies as well as other serials. Chemical technology is also represented in the last-named work.

[2] The service of compilation of this character is again indicated by this extract from Clarke's introduction to the first edition of his "Constants" (1873): "While engaged upon the study of some interesting points in theoretical chemistry, the compiler of the following tables had occasion to make frequent reference to the then existing lists of specific gravities. None of these, however, were complete enough. . . ."

[3] The statistics of school libraries in the United States are very meagre, the expenditures for them being included with that for apparatus. For libraries and apparatus of all common schools, both primary and secondary, the annual expenditure is set at $987,048, which is about seven-tenths of one per cent of the total expenditure for these schools.

would be idle to inquire into their respective advantages. This much, however, is evident enough, chemical work is extensive, and there is immediate want of it.

Various other branches of science are held back by the delay of chemistry. Many of the material resources of the world wait upon its progress. In the century just before us the demands upon the chemist are to be much greater than they have been. All the interests of life are calling for better chemical information. Men are wanting the truth. The biologist on the one hand, and the geologist on the other, are shaming us with interrogatories that ought to be answered. Philosophy lingers for the results of molecular inquiry. Moreover the people are asking direct questions about the food they are to eat, or not to eat, asking more in a day than the analyst is able to answer in a month. The nutritive sources of bodily power are not safe, in the midst of the reckless activity of commerce, unless a chemical safeguard be kept, a guard who must the better prepare himself for his duty.

The Subsistence of Science.

Now if the people at large can but gain a more true estimation of the bearing of chemical knowledge, and of the extent of the chemical undertaking, they will more liberally supply the sinews of thorough-going toil. It must be more widely understood that achievements of science, such as have already multiplied the hands of industry, do not come by chances of invention, nor by surprises of genius. It must be learned of these things that they come by breadth of study, by patience in experiment, and by the slow accumulations of numberless workers. And it must be made to appear that the downright labor of science actually depends upon means of daily subsistence. It must be brought home to men of affairs, that laboratories of seclusion with delicate apparatus, that libraries such as bring all workers together in effect, that these really cost something in the same dollars by which the products of industrial science are measured. Statistics of chemical industry are often used to give point to the claims of science. For instance, it can be said that this country, not making enough chemical wood-pulp, has paid over a million dollars a year for its importation; that Great Britain pays twelve million dollars a year for artificial fertilizers from without; that coal tar is no longer counted a by-product, having risen in its value to a par with coal gas. But these instances, as striking as numerous others, still tend to divert attention from the more general service of chemistry as it should be known in all the economies of civilization.

It is not for me to say what supplies are wanted for the work of chemists. These wants are stated, in quite definite terms, by a sufficient number of those who can speak for themselves. But if my voice could reach those who hold the supplies, I would plead a most considerate hearing of all chemical requisitions, and that a strong and generous policy may in all cases prevail in their behalf.

The Lesson of a Life.

If any event of the year is able to compel the attention of the world to the interests of research, it must be the notable close of that life of fifty years of enlarged chemical labor, announced from Berlin a few months ago. When thirty years of age, August Wilhelm von Hofmann, a native of Giessen and a pupil of Liebig, was called to work in London. Taking hold of the organic derivatives of ammonia, and presently adopting the new discoveries of Wurtz, he began those masterly contributions that appear to have been so many distinct steps toward a chemistry of nitrogen, such as manufacture and agriculture and medicine have thriven upon. In 1850 he opened a memoir in the Philosophical Transactions with these words, "the light now begins to dawn upon the chaos of collected facts." Since that time the coal-tar industry has risen and matured, medicine has learned to measure the treatment of disease, and agriculture to estimate the fertility of the earth. It seems impossible that so late as March of the present year, he was still sending his papers to the journals. If we could say something of what he has done, words would fail to say what he has caused others to do. And yet, let it be heard in these United States, without such a generous policy of expenditure for science as gave to Dr. Hofmann his training in Giessen, or brought him to London in 1848, or built for him laboratories in Bonn and Berlin, without such provision by the State, the fruits of his service would have been lost to the world. Aye, and for want of a like broad and prudent provision for research with higher education, in this country, other men of great love for science and great power of investigation every year fail of their rightful career for the service of mankind.

Endowments for Research.

For the prosecution of research, in the larger questions now before us, no training within the limitations of human life can be too broad or too deep. No provision of revenue, so far as of real use to science, can be too liberal. The truest investigation is the most prudent expenditure that can be made.

In respect to the support that is wanted for work in science, I have reason for speaking with confidence. If I go beyond the subject with which I began I do not go beyond the warrant of the association. This body has lately defined what its members may say, by creating a committee to receive endowments for the support of research.

There are men and women who have been so far rewarded, that great means of progress are in their hands, to be vigorously held for the best advantage. Strength is required to use large means, as well as to accumulate them. It is inevitable to wealth, that it shall be put to some sort of use, for without investment it dies. By scattered investment wealth loses personal force. The American association, in the conservative interests of learning, proposes certain effective investments in science. If it be not given to every plodding worker to be a promoter of discovery, such at all events is the privilege of wealth, under the authority of this association. If it be not the good fortune of every investigator to reach knowledge that is new, there are, every year, in every section of this body, workers of whom it is clear that they would reach some discovery of merit, if only the means of work could be granted them. Whosoever supplies the means fairly deserves and will receive a share in the results. It is quite with justice that the name of Elizabeth Thompson, the first of the patrons, has been associated with some twenty-one modest determinations of merit recognized by this association.

The Association as a Trustee.

"To procure for the labors of scientific men increased facilities" is one of the constitutional objects of this body. It is time for effectiveness towards this object. The association has established its character for sound judgment, for good working organization, and for representative public interest. It has earned its responsibility as the American trustee of undertakings in science.

"To give a stronger . . . impulse . . . to scientific research" is another declaration of what we ought to do. To this end larger endowments are necessary. And it will be strange if some clear-seeing man or woman does not put ten thousand dollars, or some multiple of it, into the charge of this body for some searching experimental inquiry now waiting for the material aid. The committee upon endowment is ready for consultation upon all required details.

"To give . . . more systematic direction to scientific research" is likewise stated as one of our objects. To this intent the organization of sections affords opportunities not surpassed. The discussions upon scientific papers give rise to a concord of competent opinions as to the direction of immediate work. And arrangements providing in advance for the discussion of vital questions, as formally moved at the last meeting, will in one way or another point out to suitable persons such lines of labor as will indeed give systematic direction to research.

In Fellowship.

In conclusion I may mention another, the most happy of the duties of the American association. It is to give the hand of hospitable fellowship to the several societies which year by year gather with us upon the same ground. Comrades in labor and in refreshment, their efforts reinforce us, their faces brighten our way. May they join us more and more in the companionship that sweetens the severity of art. A meeting of good workers is a remembrance of pleasure, giving its zest to the aims of the year.

AMERICAN ASSOCIATION OF STATE WEATHER SERVICES.

A CONVENTION of representatives of State weather services was held in Rochester, N.Y., on Aug. 15 and 16, 1892, in conjunction with the forty-third meeting of the American Association for the Advancement of Science. The convention was called to order by Professor Mark W. Harrington, chief of the Weather Bureau, who made an address of welcome to the representatives present. He suggested certain important subjects for discussion, and appointed committees on permanent organization, programme, etc.

A permanent organization was effected, and the following officers were elected: President, Major H. H. C. Dunwoody; first vice-president, B. S. Pague of Oregon; second vice-president, G. M. Chappel of Iowa; secretary, R. E. Kerkam, chief of State Weather Service Division, Weather Bureau; and treasurer, W. L. Moore of Wisconson.

The title, American Association of State Weather Services, was adopted by the convention, and it was decided to hold annual conventions in future at the same time and place as those of the American Association for the Advancement of Science.

The following representatives were in attendance: The U. S. Department of Agriculture, Weather Bureau, being represented by Professor Mark W. Harrington, chief; Major H. H. C. Dunwoody, forecast official; Mr. R. E. Kerkam, chief of State Weather Service Division; Mr. N. B. Conger, inspector; and Mr. F. J. Randolph, stenographer; F. H. Clarke, Arkansas; J. A. Barwick, California; John Craig, Illinois; C. F. R. Wappenhans, Indiana; G. M. Chappel, Iowa; Frank Burke, Kentucky; E. A. Evans, Michigan; G. A. Lovelend, Nebraska; J. Warren Smith, New England; E. W. McGann, New Jersey; R. M. Hardinge and W. O. Kerr, New York; C. M. Strong, Ohio; B. S. Pague, Oregon; H. L. Ball, Pennsylvania; S. W. Glenn, South Dakota; G. N. Salisbury, Utah; J. N. Ryker, Virginia; and W. L. Moore, Wisconsin.

Many of the representatives who were unable to be present at the convention forwarded papers giving their views on various subjects of interest to be discussed.

The subject of instrument-shelters and a uniform manner of their exposure was debated, and it was the concensus of opinion that a uniform pattern of shelter should be adopted for use throughout the entire country. The subject was referred to a committee consisting of Messrs Smith, Moore, and Pague, with instructions to report as to the most suitable shelter and manner of exposure to be generally adopted by State weather services.

On the subject of whether the voluntary observers should be supplied with self-registering maximum and minimum thermometers, the prevailing opinion was that such instruments should be issued and used in determining temperature means and averages, wherever and whenever practicable. The old method of making readings at 7 A.M., 2 P.M., and 9 P.M. of the dry thermometer shall be continued whenever desired, but the means should be deduced from the self-registering thermometers where such instruments are in use.

As to the adoption of a form to cover the needs of a great majority of the voluntary observers who are supplied with dry or maximum and minimum thermometers and rain-gauges, it was decided to adopt a form which was suggested by the secretary, so arranged as to admit of making three or four copies, at one writing, by means of the indelible carbon process, thus saving the observers the copying of the form at the end of the month; the object of this arrangement being to give a copy of the monthly report to the office of the chief of the Weather Bureau, one to the office of the director of the State service, and one to be retained by the observer, and also to make such additional copies as he may desire to furnish to the local press, etc.

The forecasting of thunder-storms was the fourth subject discussed, and an interesting paper on this topic was read by the Wisconsin representative.

The proposition to print the weekly, monthly, and annual reports of the State weather services in a uniform manner was freely discussed. The desirability of uniform reports was generally admitted, but it was thought impracticable at this time to take any action in the matter, as a number of States have appropriated funds for printing reports according to definite size and style.

The discussion of the question of the best methods of signaling weather forecasts by display-men covered a wide range. The flag, the whistle, the semaphore, and the sphere, bomb, and flash-light systems were freely discussed, and an interesting paper was presented by the New England representative on the system of spherical bodies hoisted on a staff. This subject was referred to a committee composed of Messrs. Conger, Glenn, and Kerkam, for report at the earliest practicable date.

On the subject of inspection of voluntary observers' stations the decision was that each voluntary station should be inspected at least once each year, to keep up the interest of the voluntary observers and to enable the directors of State services to become thoroughly familiar with each station and its surroundings. It was recommended by the association that sufficient leave of absence be granted the Weather Bureau representative at each State service centre to enable him to make a tour of inspection.

Relative to the subject — the relations of State weather services to agricultural colleges and experiment stations — it was decided that, owing to the lack of telegraphic facilities and other means of disseminating weather information, it would not be practicable generally to have the central stations of the State weather services at such colleges or stations, but that a very close co-operation would be desirable.

The subject of an exhibit at the World's Fair was the last general subject discussed. It was decided that each State service should have its exhibit in the building set apart for the use of the State, and not to have the exhibits collected in the building for the use of the United States Weather Bureau.

Mr. E. T. Turner of New York and Mr. E. H. Nimmo of Michigan were elected to active membership in the association, and the following honorary members were also elected: E. F. Smith, California; Professor R. Ellsworth Call, Iowa; Charles C. Nauck, Arkansas; Professor William H. Niles, Massachusetts; G. H. Whitcher, New England; H. G. Reynolds, Michigan; H. F. Alciatore, Oregon; Major Richard V. Gaines, Virginia; Professor A. L. McRae, Missouri; C. F. Schneider, Michigan; Professor Louis McLouth, South Dakota; and all active voluntary observers of the United States Weather Bureau.

NOTES AND NEWS.

MR. THEODOR GRAF of Vienna has in his possession a remarkable treasure in the shape of fragments of the Bible recently found in Egypt. They consist of a portion of Zechariah, chapters iv.–xiv., in the shape of a papyrus book in a fair state of preservation. The fragment is that of a Greek translation, and from the shape of the letters the MS. would appear to belong to the fourth century, making it the oldest Bible MS. thus far discovered. The same papyrus also contains fragments of Malachi.

— The current number of the *Zeitschrift der Deutschen Morgenländischen Gesellschaft* contains an article of the highest importance by the distinguished Egyptologist, Dr. Adolf Erman. He discusses in a most cautious way the supposed relationship of the Egyptian with the Semitic languages. A careful examination of the consonants and vowels, the accent, the pronominal suffixes, the pronouns, and the demonstratives, the nouns, adjectives, numerals, and verbs, as well as of the syntax, leads to the conclusion that on the grammatical side there is sufficient evidence to warrant the assertion of a relationship between Egyptian and Semitic. An examination of the vocabularies shows only a comparatively small number of words which are identical, but this number will probably be increased when the laws of phonetic change come to be better understood. The conclusions of Professor Erman, if accepted, will be epoch-making, since they will establish the identity of the culture of the Nile and Mesopotamian valleys.

SCIENCE:

A WEEKLY NEWSPAPER OF ALL THE ARTS AND SCIENCES.

PUBLISHED BY

N. D. C. HODGES,

874 BROADWAY, NEW YORK.

SUBSCRIPTIONS.—United States and Canada.................$3.50 a year.

Great Britain and Europe................. 4.50 a year.

Communications will be welcomed from any quarter. Abstracts of scientific papers are solicited, and one hundred copies of the issue containing such will be mailed the author on request in advance. Rejected manuscripts will be returned to the authors only when the requisite amount of postage accompanies the manuscript. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a guaranty of good faith. We do not hold ourselves responsible for any view or opinions expressed in the communications of our correspondents.

Attention is called to the "Wants" column. It is invaluable to those who use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

For Advertising Rates apply to HENRY F. TAYLOR, 13 Astor Place, New York.

CREMATION OF CHOLERA CORPSES.

BY ALBERT S. ASHMEAD, M.D., LATE FOREIGN MEDICAL DIRECTOR OF TOKIO HOSPITAL, TOKIO, JAPAN.

JAPAN has almost everything, or believes that it has almost everything, to learn from us; but there are a few things which it would be wise for us to consent to learn from Japan. The Japanese, a prey from time to time, like all Oriental countries, to cholera epidemics, and, having the cholera always with them endemically, have early found out that the cholera corpses should be burned.

There are in the city of Tokio six crematories. They are not only destined to the incineration of cholera corpses; for cremation is imposed as a religious duty by a number of Buddhist sects. In the oldest cemetery in Japan, that of Koya-san, near the great water-falls in Wakayama-Ken, 700 English miles south of Tokio, cremation has been practised, as is generally believed, as a religious rite these 1200 years.

Naturally, the rite of incineration had no difficulty in that country in passing from the religious conception to a sanitary application. The first sanitary cremation edict was issued by the government in 1718, during an epidemic which seems to have been very destructive. Japanese documents speak of that period with trembling awe; 80,000 a month died in the city of Yedo; undertakers could not make coffins fast enough; grave-yards were all filled up. The Japanese are singularly struck by the idea that the men who worked at the cremation furnaces after sunset were themselves changed into smoke before sunrise, and that the tomb stone cutters of a day found (*horribile visu!*) their own names carved on the morrow's tombstones! Finally the priests of all the sects united in asking for a general application of the cremation rite; ashes alone, they said, should be buried; at every burial-ground mountains of casks discouraged the diligence of the grave-digger; a multitude of corpses (the Japanese documents have the simplicity to add that they were mostly poor persons) remained unburied for weeks. The Japanese have long believed that this was a cholera epidemic, the first that ravaged the *fertile sweet-flag plain;* but that is a delusion. Cholera paid them its first visit more than a hundred years later. It was then that the religious character departed once for all from the cremation rite; for the government, seeing that the fire was too slow, ordered the bodies, wrapt in mats and quick-lime, to be sunk into the sea; cremation ever after was only a sanitary operation.

In the past thirteen years there have been 456,080 reported cholera patients in the empire; of these 303,466 died, that is, 66½ per cent. Every one of these corpses has been burned. Under police regulations, in the city of Tokio, there may be eight public crematories (of course, this has nothing to do with the private establishment of each Buddhist burial-place), placed outside of the city-limits. The law requires that they shall be constructed of brick and large enough to burn at least twenty-five corpses at a time. Each furnace must have a chimney over thirty feet high. Each crematory is expected to have a separate furnace for burning discharges, and a separate disinfecting room. This furnace is to be of brick and capable of incinerating at least twenty-five casks (bushels) at a time; its chimney must be thirty feet high. The law requires further that the disinfecting compartment shall be divided into two spaces, one a bath-room, not for the corpses, of course, but for persons suspected of harboring the disease; the other a fumigating place. Cremation can only be performed from sunset to sunrise; the corpses are not stripped of their clothing, and are one and all accompanied by their burial certificate.

In the Buddhist cemeteries cremation is thus performed. The corpse is brought in a square wooden box or barrel (the regular Japanese coffin) in a sitting position, according to the national custom. A hole in the ground with sloping sides awaits it, at the bottom of which are two stones, upright and parallel; across the top of these stones fire-wood and charcoal are piled. Around the corpse, placed upon the pile, a circular wall is built up, formed of rice-straw and chaff, perhaps to a height of five or six feet, and the wall itself is wrapped in wet matting, which during the whole operation is continually moistened. The fire is kept up during twelve hours, after which the ashes and bones are picked up with chop-sticks by the oldest representative of the family, enclosed in a funeral urn, and buried after seven days of various religious observances.

It is most regrettable that cremation has not with us that religious origin which recommended it first to the Japanese. Reason and good sense have never proved such strong foundations; otherwise the advisability of the cremation of cholera corpses would have occurred to us long ago. It is useless to object that these precautions do not preserve Japan from cholera epidemics. The disease is kept up there by causes which cannot be reached by cremation. The houses are built in unhealthy places, they are squalid and in every way insalubrious; the water is wretched, infected by impurities dropping from ill-kept closets. There would be no end, if we tried to enumerate all the causes of disease, which render the wisest precautions useless. None of these causes exists in our western countries, and the cremation of cholera corpses would have yielded its whole sanitary benefit. If we burned our corpses, the bacillus would be destroyed effectively; in Japan, the dejections of the living, contaminating the well-water, the system of promiscuous public bathing, etc., keep it alive in spite of the cremation.

When the cholera, some years back, made its appearance, not in New York, indeed, but in its harbor,—that is, in the quarantine station,—having been brought by an Italian immigrant ship, the dead were buried on Staten Island at the quarantine burying-grounds. If we were as ready to profit by past observation as we ought to be, cremation would have been introduced then and there. For in 1866, when some cholera immigrants had been buried on Ward's Island, an epidemic started almost immediately in the part of the city nearest to that burial-ground; there, in 93d Street and 3d Avenue, the first case occurred. This was certainly a fact to be taken into serious consideration. No man interested in the health of his fellows will be content to say that this was only chance. And if it is more than chance, why then has it never been proposed to prevent the propagation of the disease by fire, as other peoples have long been accustomed to do?

There are four rules, by observing which we can absolutely prevent cholera from setting foot on this continent: —

1. Let the drinking-water be perfectly isolated; that is, keep the cholera germs from the drinking-water.

2. Let the fœces and other discharges be disinfected with quick-lime or common white-wash. This is, by the way, what Professor Koch recommended to the Central Sanitary Board of Japan.

3. Let the clothing be disinfected with dry heat, 100° C., and afterwards with steam.

4. Finally, let the cholera corpse be cremated instead of buried.

4 King Street, New York.

ACORN-EATING BIRDS.

BY MORRIS GIBBS, M.D.

IN Michigan there are, to my knowledge, six species of birds which feed on acorns. Of these, the passenger-pigeon and mourning-dove swallow the acorn entire, with its shell intact, only removing the cup or rough outside covering. The white-bellied nut-hatch occasionally hoards the acorns away, and only draws on its store after some months, and when the firm shelly covering readily gives away to its sharp, prying bill. The other three are the well-known blue-jay, common crow-blackbird, and red-headed woodpecker. The methods employed by these birds in opening an acorn are so entirely different, that a description may not be uninteresting to your readers.

Kalamazoo City is nestled in a valley which was once nearly filled with oak trees, and large numbers of the burr-oak, *Quercus macrocarpa*, are still standing. The acorns of these trees, sometimes called over-cup or mossy-cup, are nearly ripe and are now falling, and the birds which feed on them gather to satisfy their love for the nutritious kernels. So far as I am able to learn, the birds, except in rare instances, do not pick the acorns from the tree, but have to content themselves with the fallen fruit. Occasionally one sees a bird attempting to pick an acorn, but it is rarely a success, as the twigs are small and do not accommodate the swaying bird well, and, moreover, at this season of the year, many acorns are still strongly attached.

The red-head, deigning to descend to the ground, seizes an acorn, and flying with it in its bill to a spot where there is a small cavity in the dead portion of a trunk, or to a crevice in the bark, immediately begins to hammer it with its sharp-pointed bill. In a couple of strokes it has removed the outer shell or cup, and at once attacks the still green-colored shell which directly surrounds the meat. The inside, or shell proper, quickly gives way, usually nearly in halves, and the woodpecker enjoys the kernel. The red-head rarely comes into the city, and is never here continuously, but at this season he is quite often seen and heard, and I have thought that the acorns brought him. The woodpeckers are as nearly strict insect-feeders as any birds we have, unless an exception is made of the swifts and swallows, yet here is an instance of a varied diet. However, the red-head is quickly satisfied in the acorn line, and soon begins circling the trunk, or more often limbs, for his legitimate food.

The blackbird confines himself to the ground in his efforts for acorn meats, and I have yet to see him in a tree with one. Walking up sedately to an acorn, and making no effort to seize or confine it, it strikes savagely and almost aimlessly. Its bill frequently glances, and the splintered shell dances about, until at last a huge piece of the kernel is dragged out, after which the bird leaves for other quarters or begins on another acorn.

The jay swoops down with flaunting blue wings, and, seizing the largest acorn on the ground, flies to the nearest convenient limb or onto the decayed ridge-board of an adjacent building. There, firmly pressing the nut between his big, black feet, he hammers away with a vengeance, and quickly tears off nearly half of the shell, after which it proceeds to pick out the meat in small bits. The cup is often left nearly perfect, the jay never making an effort to secure the nut entire, which he could easily do.

Walking under the oaks, one can readily tell whether the woodpeckers, blackbirds, or jays have been at work among the acorns, by the appearance of the mutilated shell-remains lying about.

Kalamazoo, Michigan.

LETTERS TO THE EDITOR.

**** *Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

The Intelligence of a Horse.

CAN a horse reason, or does he act solely from instinct? Many believe that he has reason and intelligence; others attribute all his acts to instinct. As a help to elucidate this question, I wish to present the readers of *Science* the following statement of facts based on long and close observation.

I have a horse, now nineteen years old, that I have owned thirteen years. I have used him all this time almost every day, harnessed to a buggy, in going back and forth to my office. He is very gentle, good-natured, and kind, and has never shown any vices. Soon after I commenced using him, I noticed that on Sundays, whenever I drove him down-town, he strongly insisted, by pulling on the lines, on going to the church where I had been in the habit of attending. I watched this disposition constantly after that, and on every Sunday since, when driven out, he has continued to do the same thing, and, if left to his own will, invariably goes to the church and stops. I thought it possible that he was guided by the ringing of the church bells, and tested him by driving him down-town at all hours of the day, before and after the ringing of the bells; but the result was the same. He invariably insisted on going to church on that day, no matter how often I drove him down-town. My office is one block west and one north of the church, and a half-mile west of my residence. In going to church I usually turn south one block east of the office, but sometimes go around by the office, where I usually drive him every morning and afternoon. In going to my office he never offers to go to the church except on Sunday, but on that day he invariably begins to turn south to the street leading to the church, from fifty to a hundred feet before reaching the crossing, and, if not checked, turns into the street and hurries to the church. He has kept this up for at least twelve years. He never does this on any other day than Sunday. In bad weather or in good weather it is the same, although at the office much of the time he has had stable protection from bad weather. On week-days he often insists on going to the stable in bad weather; but on Sunday, even when I compel him to go by the way of the stable, he pulls over to the opposite side of the street, and hurries on to the church, if permitted, though he may have to stand out in the cold, rain, or snow.

Sometimes, from one cause or another, he has not been taken away from home from one to four weeks, and I supposed that he would lose the run of time, or at least show some hesitation and uncertainty; but not so. On the first Sunday after I drove him out, he insisted, as before, on going to church. He never offers to go there any other day of the week, though the church bells are rung and numerous services are held nearly every day.

If on Sunday I go to the post-office, which is on the north-west corner of the street-crossing, where we usually turn south to the church, instead of going from there direct to the office as on other days, he turns to the south and goes to the church. He never willingly goes to the post-office on Sunday, but always stops there on week-days of his own accord, if permitted. Many times I have taken other streets on Sunday and approached the church from other directions; but in all cases, when left free, he invariably takes the first street leading to the church. I have experimented with him very largely in this respect, with a view to learning how he keeps the run of time, but am unable to satisfactorily account for it. I have also observed and experimented with him in a great many other ways, and have taught him to know the meaning of many words.

When alarmed at anything, he looks back to me with a frightened look, as much as to say, "Will it harm me?" On my saying to him, "All right, go on," he moves on. If much frightened, he will repeatedly look back for assurance from me.

He knows the meaning of many words, such as office, post-office, school-house, mill, farm, cemetery, church, apple, corn, grass, water, and many others. The fact that he knows the meaning of these words, or at least attaches a meaning to them, I have tested many times in many ways, the relation of which would make this paper too long. When his corn is about used up, if I speak of it to him and say, "Deck, your corn is out; you must go to the mill," even before starting from home, he turns in at the mill as I go by, and goes up to the office door where I have been in the habit of ordering his food. Sometimes I have forgotten it by the time I come opposite the mill, and would have gone by; but he has not forgotten it, and turns in. If I say to him, "Do you want an apple?" of which he is very fond, he puts on the most wistful look and does all in his power to say that he does; and if the apple is not produced at once, he begins to explore my pockets and clothing with his nose in search of an apple suspected to be concealed about my person. If I say to him, "Do you want grass?" he at once shows that he expects to be turned out upon pasture.

He also knows a number of people by name and where they reside; and if told to stop at the residence of one of them, naming him, he will do so, without any guiding.

These are only a few of the many evidences of his intelligence. Hundreds of examples might be given showing his knowledge and intelligence, and that he gives very close attention to and understands what is said to him.

Do not these facts strongly indicate that the horse has more than mere instinct, that he reasons; that out of the store-house of his knowledge and experience he forms conclusions, thoughts, purposes, and plans? He understands certain symbols, such as words; he keeps the run of time and knows uniformly when Sunday comes, for he has not made a mistake in this respect for more than twelve years past; he uses many and diverse means for making his wants known.

Instinct is supposed to imply inherited knowledge of objects and relations in respect to which it is exercised, and will usually, if not always, operate where there is no experience to guide. But this horse's knowledge, in these respects, has not been inherited, but is acquired. He never was at this church till he was six years old. His mother was probably never there. In instinct there is no necessary knowledge of means and ends implied, though such knowledge may be present, but instinct is always manifested in like manner by all individuals of the same species, under like circumstances, which is certainly not true in this case.

Hence I infer that this horse does reason; that he has a high degree of intelligence, even much more than he is able to make us understand and appreciate.

But does the fact of his observing Sunday imply a moral sense? Why does he seek to go to the church on that day? It has been said that animals do reasonable things without having the gift of reason; that they do things involving distant foresight without having any knowledge of the future; that they work for that which is to be without seeing or feeling anything beyond what is; that they enjoy, but do not understand; that reason works upon and through them, but is not in them. The facts that I have related and observed make me greatly doubt many of these statements. I find it hard to sharply define the limits between instinct and reason. The facts that I have related indicate reason, intelligence, motives, and the formulation of plans, methods, and schemes for carrying out preconceived purposes. Some of the acts, at least, indicate pure reason based upon former and remembered sensations, perceptions, and knowledge, and the purpose to gratify merely mental desires.

What motive does this horse have for going to church every Sunday, even at a sacrifice sometimes? It is not for rest, it is not shelter, it is not feed, it is not company, it is not to gratify any merely physical want, for all these things he has elsewhere every day. Is it not purely an intellectual or moral want that he seeks to gratify? He stands near the church door, hears much of the exercises, especially the singing, and will remain, almost without motion, whether tied or not, till the services are over, and I am ready to go home. But it cannot be for the mere speaking and singing that he hears there, for he often hears speaking, singing, concerts, the Salvation Army, and music of various kinds while he stands tied at the office on the public square; but none of these take the place of his church-going.

These facts I have given as tending to illustrate and explain animal intelligence. I have given only such as I have verified many times. T. B. REDDING.

Newcastle, Ind., Aug. 22.

The English Sparrow and our Native Birds.

I AM obliged to send a different report regarding the influence of the English sparrow on the presence of native wild birds in a country village.

In 1874–5 there were not more than one or two pairs of these foreigners in the village of Fort Edward. In less than ten years they numbered hundreds, and long since seemed to have reached the limit of the winter-food capacity of the district, being distributed among the farmers' barns as well as in the village.

Before their arrival the chipping sparrow was plentiful; now it is seldom seen. The song-sparrow nested frequently; I have not seen them in the village as residents for several years. Catbirds were not infrequent; now they come in the early spring for a few days, then disappear, though thickets on the river-bank near the town are especially favorable. Summer yellow-birds built often in the low trees; I have not seen a single resident this summer. Wilson's thrush also was an occasional resident; none have been here for four or five years. The vireo used to build and sing in the elms and apple-trees; they are very rare indeed now. The wood-phœbes, though their early morning song is still heard, are few in number where they were once abundant. The robin is almost the sole bird, in so far as I have observed, that holds his own regardless. I will except also the black martin, or house martin, who manages to turn out about four-fifths of the sparrows. The other fifth so blockade the entrance to the holes with their nests that the martin is effectually shut out. Bluebirds too have left us, they are too weak, and too refined in their tastes to long live neighbors to such low-lived little beasts as the filth-loving, quarrelsome, meddlesome sparrows.

I have a box in my garden which the sparrows do not dare to occupy, for they know me. But the bluebirds, who formerly nested there, come occasionally in the spring, have a tilt or two in the trees with the sparrows, then leave in disgust. Probably no native wild bird begins to have the mental development and quick wit possessed by the English sparrow. But all his wit runs to saving his precious self from danger and from exertion; hence he will, without doubt, persist. See, for example, how little strength he uses in avoiding danger. He just gets beyond range of whip or stone, and sits and calmly looks you over. He avoids poison with as much foresight as you could, and will starve rather than eat suspected food. He rolls in mud and dirt, oblivious of all else, just for the fun of having a lively squabble with some fellow, and when it is over is pecking about in the next ten seconds as if nothing had happened.

A half-dozen, or dozen, males chase down a female, roll her in the dust or mud as the case may be, and, despite the frantic fighting back, pull her tail, peck her wings, pinch her with their claws, and when the tormenters are tired out and she panting with exhaustion, the whole party adjourn to a convenient heap of dung, and, in less time than it is spoken, the joke seems forgotten.

They drive away birds larger and more courageous than themselves, if they are perching birds, by following at their heels, and doubtless also making uncomplimentary remarks. Watch the arrival of the first robin, and see the three or four hoodlums follow him from tree to tree for the first week after his coming. Not one dares touch him, but they make his life miserable.

The song sparrow, though he will vanquish the Englishman every time, soon tires of being tagged from bush to tree, and leaves in disgust. The same is true of the catbird, and to some extent of the oriole, which is also less common by half. I have seen them pull a "chippy's" nest to pieces during the owner's absence out of pure mischief, and I presume they do the same to the nests of other birds.

It is difficult to see what there is to recommend the little villain, and the man who introduced him should be classed with the man who introduced rabbits into Australia. X.

Fort Edward, Aug. 22.

Celestial Photomicrography.

STELLAR photography has advanced enough to justify the hope that, by the next opposition of Mars, some means of scrutinizing his landscape more closely may be found. If microphotography and its associated science, photomicrography, are pushed on parallel lines with stellar photography by co-operating specialists who can appreciate the requirements in both fields, something valuable may result.

The possibility of an Atlantic cable was laughed at by good electricians, and astronomers despair of overcoming the difficulties presented by diffraction, irradiation, chromatic and atmospheric blurrings, and light absorption; but these matters have been conquered in many respects in telescopy and general photography.

Materials that will afford the densest homogeneity of surface should be sought for, upon which the photographs can be taken, to be later scrutinized with microscopic lenses. It may be possible to arrange a battery of microscopes to take enlarged camera-lucida photographs, which in turn may be enlarged by "solar prints;" and if surfaces can be invented or discovered smooth and continuous enough to admit of these successive enlargements without breaking up the details, we may possibly capture the Martial men in the act of filling Schiaparelli's canals, and otherwise observe what their estimated five million years of seniority over us affords them. S. V. CLEVENGER.

Chicago, Aug. 21.

As to the "Extinction" of the American Horse.

IN 1881, in the *Kansas City Review*, E. L. Berthoud pointed out the fact that, in maps drawn up by Sebastian Cabot (who went in 1527 to the east coast of South America) to show his discoveries, at the head of La Plata, with figures of other animals he gives that of the horse.

This fact, as thus put on such indubitable record, is accepted by scientists, including Heilprin, Wilckins, and Flower. The latter, in his manual on "The Horse" (1891), says: "The usual statement as to the complete extinction of the horse in America is thus qualified, as there is a possibility of the animals having still existed, in a wild state, in some parts of the continent remote from that which was first visited by the Spaniards, where they were certainly unknown. It has been suggested that the horses which were found by Cabot in La Plata in 1530 cannot have been introduced."

The above is surely of great interest, and is worthy of repetition. The writer has come across two statements, which, taken in connection with the above, appear to be even more important and significant, and may profitably be given wider prominence. As they are not generally known, they are given for the purpose of their receiving the attention that they seem to deserve.

In the volume of the Naturalist's Library, entitled "The Horse," by Major Hamilton-Smith, published in London in 1841, appears the following: "Several recent travellers in the northern portion of that continent [America] question the race of horses now so abundant being imported subsequent to the discovery by Columbus" (p. 147).

In "The History and Delineation of the Horse," by the noted authority, John Lawrence, published in London, 1809, the following sentence occurs: "The non-existence of the horse in America, previous to its discovery by Europeans, has, however, been disputed; but I recollect not by whom, or upon what ground" (p. 7). ROBT. C. AULD.

Some Notes on The Rochester Meeting.

WHERE did the scientists come from? The first four hundred names on the register show their geographical distribution as follows, by States: New York, 119; Washington, D.C., 44; Ohio, 35; Pennsylvania, 24; Massachusetts, 22; Indiana, 19; Illinois, 18; Canada, 17; Connecticut, 13; Michigan, 11; Wisconsin, 10; Iowa, 10; New Jersey, 9; Missouri, 7; Maryland, 4; Kentucky, 4; Tennessee, 4; Alabama, 4; Maine, 3; Vermont, 3; California, 3; New Hampshire, Rhode Island, Minnesota, Georgia, and Florida, each 2; Virginia, West Virginia, North Carolina, Mississippi, Louisiana, and Texas, each 1.

More than one-fourth of the whole number came from New York State. Of the 119 from the State, 32 were from New York City and Brooklyn, 24 from Rochester, and 18 from Ithaca. Washington, D.C., furnished 44, the largest number from any one city. The whole of New England sent only 45, although it has until recently been considered the scientific headquarters of the country, and is more thickly dotted with colleges than any other section. Cornell University was more largely represented than any other University, while Princeton was not represented at all; the New Jersey delegation coming chiefly from Rutgers and Stevens. The central western States showed up handsomely, and twelve southern States sent from one to four men each; while from the States and Territories west of the Missouri River there was no representation at all, except three from California.

Geographically, therefore, the scientists who attended the meeting are not evenly distributed. New York State sent far more than its quota, even after deducting the attendance from Rochester, the place of meeting. In proportion to its population, Ohio sent twice as many as Pennsylvania, although its average distance from Rochester is greater.

The programme for the third day of the meeting (Friday) contained a list of 146 members that had been elected since the Washington meeting, with symbols expressing their affiliations with the different sections. The majority of these new members specified their intention of joining one section only, but many named two sections, and some three. Twelve members did not specify any section. The following shows the apportionment of these new members among the sections: —

Section A, Mathematics and Astronomy,	14
" B, Physics,	15
" C, Chemistry,	21
" D, Mechanical Science and Engineering,	5
" E, Geology and Geography,	21
" F, Biology,	42
" H, Anthropology,	21
" I, Economic Science and Statistics,	23
Totals, including duplications,	162

The several branches of science are therefore far from being equally represented in the new membership. The branch of mechanical and engineering science, which in the country at large is developing by leaps and bounds, sends to the association only one-fourth as many members as chemistry and one-eighth as many as biology. The latter sends more new members than the three applied sciences, chemistry, physics, and mechanical science, put together. Geology, geography, biology, and anthropology furnish more than half of all the new members.

In the reading of papers before the sections, the same want of proportion was shown. Section F, biology, held sessions on both Thursday and Friday, morning and afternoon; and 32 papers were listed for those two days. Section I, economic science and statistics, held a session on Thursday afternoon only, and none on Friday, and only 4 papers were listed, and of these the only paper that was statistical was a five minute paper on Statistics of the Salvation Army! The Section of Biology, in fact, is so overcrowded with papers and discussions that it was decided to split it into two sections, F, Zoology, and G, Botany; while a proposition was made, although not entertained, to consolidate sections D and I into one section.

At the recent meeting of the British Association, it is reported that there were 2,500 members in attendance. At the Rochester meeting there were less than 500.

From the above facts, it appears that the American Association is not a fairly representative body of American scientific men. In it the physical sciences are dwarfed by the natural sciences. The reason for this is undoubtedly because the applied scientists, and especially, those in the department of mechanical science, have so many societies of their own that they are diverted from and lose their interest in the American Association. In engineering there are four large national societies, the civil, the mechanical, the mining, and the electrical, besides numerous local societies, aggregating a membership of probably 5,000 persons, not counting duplications of those who belong to two or more societies. The small attendance at the section of economic science is probably due to the superior attractions offered by the American Social Science Association. The recent reorganization of the American Chemical Society with its branches will be very apt to diminish the interest of chemists in section C.

These facts are worthy of consideration by those interested in the future of the Association. WILLIAM KENT.

New York, Aug. 29.

BOOK-REVIEWS.

Report of the United States Board on Geographic Names. Ex. Doc. No. 16, *House of Representatives*, 52*d Congress.* Washington, Government.

THE necessity of bringing about a uniform usage and spelling of geographic names throughout the executive departments of the government has led to the creation of a board representing the Departments of State, War, Treasury, Navy, and Post Office, the Coast and Geodetic Survey, the Geological Survey, and the Smithsonian Institution, who serve without pay and can officially say in many cases what names shall be used. Names in our country have not been bestowed by any formal authority, except the more important ones of States, counties, and municipalities. The early explorers would employ aboriginal designations or others of little import; their successors often proposed others; a mountain range would receive different names from different sides of approach. Post-offices and railroad stations may not conform to the local names of the enclosing townships, or else very familiar terms have been excessively multiplied. The modes of spelling vary from time to time. To meet the various necessities, the Board adopted the following rules in case the local usage is divided: 1, Avoidance of the possessive form of names; 2, the dropping of the final "h" in the termination "burgh;" 3, the abbreviation of "borough" is "boro;" 4, the Websterian spelling of "center;" 5, the discontinuance of hyphens in connecting parts of names; 6, the omission, whenever practicable, of the letters "C. H." (court house) after the names of county seats; 7, the simplification of names consisting of more than one word by their combination into one word; 8, the avoidance of the use of diacritic characters; 9, the dropping of the words "city" and "town" as parts of names.

As to the employment of foreign words, the Board recommend that our charts for the use of the navy adopt the local names in the language of the several countries, and for home use the Anglicised forms. About 2,000 names have already been passed upon, of which a list is printed as an appendix to the report. Another appendix presents a list of all the counties in the United States.

It is easy to see that this Board is doing great service for the improvement of geographic nomenclature. Unfortunately, it cannot have power to compel the adoption of the sensible names proposed for the new States recently added to our galaxy and rejected by Congress, nor can it persuade people to use good sense after controversies have been inaugurated. The world is, however, improving, and the very objectionable names are everywhere ridiculed.

The Naturalist in La Plata. By W. H. HUDSON. London, Chapman & Hall. Ill. 396 p.

THE universal interest now taken by all classes in scientific matters has of late years given rise to a new class of books of travel. The celebrated "Voyage of a Naturalist," by Darwin, or perhaps more properly the "Wanderings in South America," by Waterton, formed the starting-point for a series which includes such books as "Travels in Peru," by von Tschudi; "Travels on the Amazon" and "Malay Archipelago," by Wallace; "Naturalist on the Amazons," by Bates; "Naturalist in Nicaragua," by Belt; "Two Years in the Jungle," by Hornaday; "Life in the East Indies," by Forbes, and many others of similar title and character. The existence and popularity of these books is evidence of the interest they have excited in the public mind; and in view of the good influence they exert there cannot be too many of them. The "Natural History of Selborne," although limited in its scope to a single parish in England, is an example of the multitude of objects which can be made interesting to all classes of readers, and it is perhaps not too much to say that there is scarcely a section of our own country about which an equally interesting book could not be written. The fact is that the objects to be studied in nature are inexhaustible. They exist in earth, in sky; in air, in water; in lane, in tree, in barren plain. Everywhere in fact that one can turn, facts of the profoundest interest are to be observed.

The ordinary globe-trotter has left few places unexplored as far as his foot alone is concerned. He has penetrated to the wilds of tropical Africa, and has left his traces amid the snow and ice of the Arctic regions; he has suffered from hunger and thirst in the deserts of Australia, and has been shipwrecked in the vast Pacific; he has explored the snowy heights of the Himalayas and the Andes, and penetrated the humid jungles of India; he has braved the sands of the desert of Gobi and the terrible glare of the Sahara. The globe-trotter used to write books describing his travels; but, alas, too frequently his eyes saw no further than his feet. He chronicled his daily aches and ills, his breakfast and supper, and mentioned the rivers he crossed or the mountains he saw. The day for such books has passed; and a man who would be listened to now must have more to tell of than how he cooked his dinner, of how many miles he sailed or walked or rode. The modern traveller must, therefore, be versed in some branch of science. He must know men, or birds, or beasts, or plants. His volume, too, must be something more than a mere itinerary; and the more closely he studies the workings of nature in her secluded haunts the wider the circle of his readers and the greater the value of his book.

Of such books as those we have mentioned above there cannot be too many. It is, therefore, with a feeling of pleasure that we welcome a late comer to the ranks, "The Naturalist in La Plata." The author is a native of the country whose phases of life he chronicles. He is an enthusiast, a lover of beasts and birds, and he makes his reader love with him. The book is filled with interesting matter, and in this notice we will mention some of the many tidbits which are offered.

One of the most interesting subjects touched upon, all too briefly be it said, is that wonderful instinct of bird migration. It seems incredible that out of twenty-five species of aquatic birds, thirteen are visitors from North America, several of them breeding in the Arctic regions and crossing the whole tropical zone to winter, or rather to summer, on the pampa. In September and even in August they begin to appear on the pampa — plover, tatler, godwit, curlew, "piping the wild notes, to which the Greenlander listened in June, now to the *gaucho* herdsman on the green plains of La Plata, then to the wild Indian in his remote village, and soon, further south, to the houseless *huanaco*-hunter in the gray wilderness of Patagonia." Of the godwit — *Limosa hudsonica* — some go north in March to breed; while later in the season (May) others come from the south to winter on the pampas. The north-flying birds travel thousands of miles to the hundreds traversed by those from the south. It is considered probable that these last have their breeding-places on the as yet undiscovered Antarctic continent, which they have left, after breeding, in time to winter on the pampas.

Another interesting chapter is that upon the Puma. Numerous facts are given to show that this animal, contrary to the habits of all the other wild *Felidæ*, is a friend of man, not only refraining from attacking him, but actually protecting him from the attacks of other animals, like the jaguar for example. One instance of this must suffice. During the course of an extended hunt one of the men fell from his horse, and in falling broke his leg. His companions did not notice his loss until evening, and the next morning he was found where he had fallen. He related that while lying there a puma had prowled about the vicinity but did not attempt to harm him. About midnight he heard the roar of a jaguar, and between that time and morning he several times saw the two animals engaged in fierce fights, the puma preventing the jaguar from attacking the prostrate and helpless man.

In discussing the question of fear in birds, Mr. Hudson discards the idea that it is only found in those which have been persecuted by man, and advances the theory that the older birds teach the young ones to fear their enemies. So strong is the habit of attending to the warning or danger note uttered by many birds, that when a nestling is hammering at its shell and seeking to reach the outer air, uttering meanwhile its feeble "peep," "if the warning note is uttered, even at a considerable distance, the strokes and complaining instantly cease, and the chick will then remain quiescent in the shell for a long time, or until the parent, by a changed note, conveys to it an intimation that the danger is over."

Mr. Hudson is not content to record the observations he has made. He seeks also to explain, sometimes plausibly, sometimes perhaps not so well, many of the facts. For example, we are all familiar with the, to us, absurd cackling of a hen when she has laid her egg. She wants the whole world to know it. Obviously it would in a wild state be a serious objection, and be decidedly injurious to the species as a whole, to have all the egg-feeding snakes and mammals apprised of the fact that a new egg had been laid for them to seek. The author therefore contends that this habit is a perversion of the original instinct, and that while it now serves no purpose or a bad one, originally it was useful. He finds in a certain half-wild fowl of the pampa, a habit of making her nest sometimes 400 or 500 yards away from the feeding-grounds. After the egg is laid the hen flies directly from the nest 40 or 50 yards and then, still silently, runs along to the feeding-ground. Then only does she give vent to a low cackle. The cock, if within hearing, answers her, runs to her, and the cackling ceases. "If," says Mr. Hudson, "we may assume that these fowls, in their long, semi-independent existence in La Plata, have reverted to the original instincts of the wild *Gallus bankiva*, we can see here how advantageous the cackling instinct must be in enabling the hen in dense tropical jungles to rejoin the flock after laying an egg. If there are egg-eating animals in the jungle, intelligent enough to discover the meaning of such a short, subdued, cackling call, they would still be unable to find the nest by going back on the bird's scent, since she flies from the nest in the first place."

In a chapter on spiders mention is made of the many strange and wonderful features known in connection with them. Some spin a wonderfully complex and beautiful web; some live on or in the ground; many simulate inanimate objects or death itself. Of two species belonging to the same genus, one is green, while another is like a withered or dried-up leaf. The first, when disturbed, falls rapidly to the ground like a fresh green leaf broken from a twig; but the second falls slowly like a very light, dried, and withered leaf. Some of the spiders are very large and will chase a man from thirty to forty yards, keeping pace with a slow-trotting horse. An instance is related where one ran up the lash of the author's riding-whip to within three or four inches of his hand, and would have bitten him had he not thrown the whip away. Some rather fanciful speculations are indulged in when considering how a man-like monkey would act were he to have a cord permanently attached to his waist, as the spider may be considered to have his web-making material.

In an interesting chapter on music and dancing in nature, accounts are given of the habit as indulged in by many kinds of birds. Not the least strange of these is that of the spur-winged lapwing. These birds live in pairs, each pair jealously guarding its own chosen ground. But frequently one of a pair will fly off to visit a neighboring couple, leaving its mate to guard the ground. The visitor is graciously received, and the performance gone through with is described as follows: "Advancing to the visitor they place themselves behind it; then all three, keeping step, begin a rapid march, uttering resonant drumming notes in time with their movements; the notes of the pair behind being emitted in a stream like a drum-roll, while the leader utters long single notes at regular intervals. The march ceases; the leader elevates his wings and stands erect and motionless, still uttering loud notes; while the other two, with puffed-out plumage and standing exactly abreast, stoop forward and downward until the tips of their beaks touch the ground, and, sinking their rhythmical voices to a murmur, remain for some time in this posture. The performance is then over, and the visitor goes back to his own ground and mate to receive a visitor himself later on."

We have given here but a bare outline of some of the interesting chapters of the book. The one dealing with the dying-place of the *huanaco* attempts to explain the habit the animals have of returning to a remote place in which to die. It is traced back to a probable origin in ancient times when the animals herded together in winter for protection and warmth, and the idea is advanced that at present the habit is an aberrant and perverted instinct which has descended by inheritance. When the animal feels the pangs of approaching death, its feelings impel it to the spot where long ages ago its ancestors, with their fellows, found refuge and relief. Mr. Hudson thus regards the habit, not as going to a place to die, so much as going to a place to recover health. Other chapters deal with the odoriferous skunk, of which numerous anecdotes are told; with mimicry and warning colors in grasshoppers; the value and importance of the mosquito in the economy of nature and the question why it possesses a blood-sucking apparatus in such perfection, while scarcely one out of many hundreds of thousands ever tastes blood. The humming-birds are treated of in another chapter, while in still another is given a full account of a large family of birds known popularly as "wood-hewers." The biography of the *vizcacha*, the prairie-dog of the pampa, is given in full; while an account of certain birds and animals seen once or twice and then lost, never to be again brought to view, reminds one that disappointment sometimes waits upon the investigator into nature's secrets. The book is an interesting one, and we believe worthy of an extended circulation among lovers of natural objects.

JOSEPH F. JAMES.

Washington, D.C., Aug. 22.

Mineralogy. By FREDERICK H. HATCH. London, Whittaker & Co. 12°. $1.

DR. HATCH has brought together the most essential principles of mineralogy, and embodied them into what is really an abridgment of a larger treatise. He experiences the difficulty felt by earlier authors of making popular conceptions of geometrical figures and relations, and relieves it so far as is possible by stating the principles of their construction and by giving graphic representations of the perfect solids and diagrams illustrative of the crystallographic axes. There is a very wise selection of the more important figures described. Throughout the descriptions of crystalline form, chemical composition, and the various physical properties, including the choice of the minerals described, the author has shown that he knows what selection should be made ir order that the most essential features shall be presented. He is evidently a master of the whole science, and not an amateur content to explain the familiar portions and to overlook the difficult topics needful to make the sketch symmetrical. Wisdom is also shown in the classification and description of the minerals. The thoroughly scientific arrangement by chemical character, of use to the learned, is laid aside for the following practical scheme: First, the rock-forming minerals, such as are world-wide, and extend through the whole crust; second, the ores; third, the salts and useful minerals supplementary to the ores; and fourth, the gems and precious stones. Under the first head there is presented the important distinction of those that have been formed secondarily in contrast with those that were original. We think the author might wisely have devoted three or four pages, instead of a brief paragraph scarcely exceeding fifty words, to the hydro-carbons. No effort is made to describe the phenomena connected with refraction and polarization, nor to the microscopic structure, nor to petrography.

Notes and Examples in Mechanics. By IRVING P. CHURCH. New York, John Wiley & Sons, 1892.

THIS work, as stated in the preface, is "a companion volume to the writer's 'Mechanics of Engineering,' and contains various notes and many practical examples, both algebraic and numerical, serving to illustrate more fully the application of fundamental principles in mechanics of solids; together with a few paragraphs relating to the mechanics of materials, and an appendix on the "Graphical Statics of Mechanism." A knowledge of the elements of trigonometry and calculus is assumed.

The work is clear and practical. Many problems are first treated analytically, then by assuming numerical values for the several algebraic quantities. English units are used. Engineering data are drawn from well-known and reliable authorities.

Among the structures and machines discussed (after the necessary exposition of general principles) are the bell crank, simple and compound cranes, wedge, roof truss, pendulum, weighted piston with steam, I-beam, box-beam, fly-wheel, locomotive, jack-screw, ore-crusher, etc.

The work is abundantly illustrated with cuts.

Light. By SIR H. TRUEMAN WOOD. London, Whittaker & Co., 1891.

THIS elementary Treatise belongs to Whittaker's "Library of Popular Science." The undulatory theory is presented in clear and non-mathematical language, and the various phenomena of common observation are explained on this theory.

In a very lucid and attractive style, the author discusses such topics as reflection, refraction, color, optical instruments, the chemical action of light (as in photography), polarization, and fluorescence. The cuts are abundant and well drawn.

The appendix contains an annotated list of elementary works on light, color, spectroscope, etc.

Chemical Calculations, with Explanatory Notes, Problems, and Answers. By R. LLOYD WHITELEY. London and New York, Longmans, Green & Co. 1892.

A WIDE range of topics is included in these hundred pages; as metric system, thermometric scales, density and specific gravity, percentage composition of compounds, calculation of empirical formulæ, volume of gases, calculations depending on chemical equations, combination of gases by volume, calculation of the results of quantitative analysis, atomic weight determinations, gas analysis, absorption of gases by liquids, molecular weights, calorific power and calorific intensity.

The problems on molecular weights are not confined to vapor densities; but the more recent methods of freezing points (Raoult) and boiling points (Beckmann and Wiley) are duly explained.

The table of atomic weights is based upon $O = 16$, and agrees, for the most part, with Ostwald's "Outlines of General Chemistry;" thus $H = 1.003$, in accordance with the older determina-

Publications Received at Editor's Office.

DAY, DAVID T. Mineral Resources of the United States. Washington, Government. 8°. 678 p.

GARNER, R. L. The Speech of Monkeys. New York, Charles L. Webster & Co. 8°. 233 p.

JACKMAN, WILBUR S. Nature Study for the Common Schools. New York, Henry Holt & Co. 12°. 448 p.

MERRILL, GEORGE P. The Materials of the Earth's Crust. Washington, Government. 8°. Paper. 87 p.

SALTER, WILLIAM M. First Steps in Philosophy. Chicago, Charles H. Kerr & Co. 12°. 155 p. $1.

U. S. DEPARTMENT OF AGRICULTURE. Insect Life. Washington, Government. 8°. Paper. 90 p.

"WATERDALE." Researches on the Dynamic Action and Ponderosity of Matter. London, Chapman & Hall. 12°. 309 p.

WATKINS, J. E. The Log of the Savannah. Washington, Government. 8°. Paper. 30 p.

WELLS, CHARLES R. Manual of the Natural Movement Method in Writing. Syracuse, C. W. Bardeen. Sm. 4°. Paper. 44 p. 25 cts.

WILLIAMS, SAMUEL G. The History of Modern Education. Syracuse, C. W. Bardeen. 12°. 403 p. $1.50.

tions of the ratio O : H. For many of the problems, however, the atomic weights are rounded to whole numbers, except Cl = 35.5.

The work is recommended as a well-planned text-book of the subjects indicated.

Mechanics for Beginners. Part I. Dynamics and Statics. By J. B. LOCK. London and New York, Macmillan & Co., 1891.

THIS is a carefully-prepared elementary text-book, presenting the subject in the following order: rectilinear motion, motion in one plane, forces acting at a point, parallel forces, machines (including friction), uniform motion in a circle, energy, the pendulum. The definitions are clear and examples abundant. The demonstrations presuppose a knowledge of trigonometry.

English units are employed throughout. The following terms are convenient (in the absence of metric units), but not very familiar in this country: *velo*, the velocity of one foot per second; *celo*, the acceleration of one *velo* per second; *poundal*, a force producing one *celo* on one pound; and *foot-poundal*, the work done by one *poundal* acting one foot.

While this work shows marks of thoroughness, it seems a great pity to ignore the international system of weights and measures.

Elementary Lessons in Heat. By S. E. TILLMAN Revised Edition. New York, John Wiley & Sons, 1892.

THESE lessons, prepared as a short course for the U. S. Military Academy, present the most essential and practical aspects of the subject, in a clear and descriptive manner. The language of trigonometry and differential calculus are scarcely introduced, even in discussing the conduction of heat. English units are employed, for the most part. The various kinds of thermometers and other instruments required by observers are explained; and the last two chapters are devoted to meteorology.

Forty-six numerical problems are added in this edition, illustrating thermometric scales, linear and cubic expansion, properties of gases, specific heat, latent heat, relative humidity, and mechanical equivalent of heat.

AMONG THE PUBLISHERS.

THE September number of *The Mother's Nursery Guide* contains medical articles on "Natural and Artificial Feeding of Infants," "A Short Talk about Disease Germs," "Some Common Nervous Diseases," etc. Other subjects are: "A Mother's Duty in Mental Child-Training," "Kindergarten-at-Home Stories," "A Child's Vocabulary," etc.

— All teachers and those interested in the eduction of young children will wish to read the article in *The Atlantic Monthly* for September by Horace E. Scudder, entitled "The Primer and Literature." This paper proves in a very logical, clear, and interesting manner that "the time has come when the . . . statement may be made that there should be no break in the continuity of literature in the schools; that from the day when the child begins to hold a book in his hands until the day when he leaves the public school he shall steadily and uninterruptedly be presented with genuine literature; that the primer itself shall serve as an introduction to literature." The paper will well repay careful reading and discussion.

QUERY.

Can any reader of *Science* cite a case of lightning stroke in which the dissipation of a small conductor (one-sixteenth of an inch in diameter, say,) has failed to protect between two horizontal planes passing through its upper and lower ends respectively? Plenty of cases have been found which show that when the conductor is dissipated the building is not injured to the extent explained (for many of these see volumes of Philosophical Transactions at the time when lightning was attracting the attention of the Royal Society), but not an exception is yet known, although this query has been published far and wide among electricians.

First inserted June 19, 1891. No response to date.

N. D. C. HODGES,
874 BROADWAY, NEW YORK.

TO THE READERS OF SCIENCE.

PUBLISHER'S ANNOUNCEMENT.

Titles of Some Articles Published in *Science* since Jan. 1, 1892.

Aboriginal North American Tea.
Actinism.
Agriculture, Experimental, Status of.
Amenhotep, King, the tomb of.
Anatomy, The Teaching of, to Advanced Medical Students.
Anthropology, Current Notes on.
Architectural Exhibition in Brooklyn.
Arsenical Poisoning from Domestic Fabrics.
Artesian Wells in Iowa.
Astronomical Notes.
Bacteria, Some Uses of.
Botanical Laboratory, A.
Brain, A Few Characteristics of the Avian.
Bythoscopidæ and Cereopidæ.
Canada, Royal Society of.
Celts, The Question of the.
Chalicotherium, The Ancestry of.
Chemical Laboratory of the Case School of Applied Science.
Children, Growth of.
Collection of Objects Used in Worship.
Cornell, The Change at.
Deaf, Higher Education of the.
Diphtheria, Tox-Albumin.
Electrical Engineer, The Technical Education of.
Eskimo Throwing Sticks.
Etymology of two Iroquoian Compound Stems.
Eye-Habits.
Eyes, Relations of the Motor Muscles of, to Certain Facial Expressions.
Family Traits, Persistency of.
Fishes, The Distribution of.
Fossils, Notice of New Gigantic.
Four-fold Space, Possibility of a Realization of.
Gems, Artificial, Detection of.
Glacial Phenomena in Northeastern New York.
Grasses, Homoptera Injurious to.
Great Lakes, Origin of the Basins of.
"Healing, Divine."
Hemipterous Mouth, Structure of the.
Hofmann, August Wilhelm von.
Hypnotism among the Lower Animals.
Hypnotism, Traumatic.
Indian occupation of New York.
Infant's Movements.
Influenza, Latest Details Concerning the Germs of.
Insects in Popular Dread in New Mexico.
Inventions in Foreign Countries, How to Protect.
Inventors and Manufacturers, the American Association of.
Iowa Academy of Sciences.
Jargon, The Chinook.
Jassidæ; Notes on Local.
Keller, Helen.
Klamath Nation, Linguistics.
Laboratory Training, Aims of.
Lewis H. Carvill, Work on the Glacial Phenomena.
Lightning, The New Method of Protecting Buildings from.
Lissajou's Curves, Simple Apparatus for the Production of.
Maize Plant, Observations on the Growth and Chemical Composition of.
Maya Codices, a Key to the Mystery of.
Medicine, Preparation for the Study of.
Mineral Discoveries, Some Recent, in the State of Washington.
Museums, The Support of.
Palenque Tablet, a Brief Study of.
Patent Office Building, The.
Physa Heterostropha Lay, Notes on the Fertility of.
Pocket Gopher, Attempted Extermination of.
Polariscopes, Direct Reflecting.
Psychological Laboratory in the University of Toronto.
Psychological Training, The Need of.
Psylla, the Pear-Tree.
Rain-Making.
Rivers, Evolution of the Loup, in Nebraska.
Scientific Alliance, The.
Sistrurus and Crotalophorus.
Star Photography, Notes on.
Star, The New, in Auriga.
Storage of Storm-Waters on the Great Plains.
Teaching of Science.
Tiger, A New Sabre-Toothed, from Kansas.
Timber Trees of West Virginia.
Tracheæ of Insects, Structure of.
Vein-Formation, Valuable Experiments in.
Weeds as Fertilizing Material.
Will, a Recent Analysis of.
Wind-Storms and Trees.
Wines, The Sophisticated French.
Zoology in the Public Schools of Washington, D. C.

Some of the Contributors to *Science* Since Jan. 1, 1892.

Aaron, Eugene M., Philadelphia, Pa.
Allen, Harrison, Philadelphia, Pa.
Baldwin, J. Mark, University of Toronto, Canada.
Barnes, Charles Reid, Madison, Wis.
Baur, G., Clark University, Worcester, Mass.
Beal, W. J., Agricultural College, Mich.
Beals, A. H., Milledgeville, Ga.
Beauchamp, W. M., Baldwinsville, N.Y.
Boas, Franz, Clark University, Worcester, Mass.
Bolley, H. L., Fargo, No. Dak.
Bostwich, Arthur E., Montclair, N.J.
Bradley, Milton, Springfield, Mass.
Brinton, D. G., Philadelphia, Pa.
Call, E. Ellsworth, Des Moines, Ia.
Chandler, H., Buffalo, N.Y.
Comstock, Theo. B., Tucson, Arizona.
Conn, H. W., Middletown, Conn.
Cragin, F. W., Colorado Springs, Col.
Davis, W. M., Harvard College, Cambridge, Mass.
Dimmock, George, Canobie Lake, N.H.
Farrington, E. H., Agricultural Station, Champaign, Ill.
Ferree, Barr, New York City.
Flexner, Simon, Johns Hopkins University, Baltimore, Md.
Foshay, P. Max, Rochester, N.Y.
Gallaudet, E. M., Kendall Green, Washington, D.C.
Garman, S., Museum of Comp. Zool., Cambridge, Mass.
Golden, Katherine E., Agricultural College, Lafayette, Ind.
Hale, Edwin M., Chicago, Ill.
Hale, George S., Boston, Mass.
Hale, Horatio, Clinton, Ontario, Canada.
Hall, T. Proctor, Clark University, Worcester, Mass.
Halsted, Byron D., Rutgers College, New Brunswick, N.J.
Haworth, Erasmus, Oskaloosa, Iowa.
Hay, O. P., Irvington, Ind.
Haynes, Henry W., Boston Mass.
Hazen, H. A., Weather Bureau, Washington, D.C.
Hewitt, J. N. B., Bureau of Ethnology, Washington, D.C.
Hicks, L. E., Lincoln, Neb.
Hill, E. J., Chicago, Ill.
Hill, Geo. A., Naval Observatory, Washington, D.C.
Hitchcock, Romyn, Washington, D.C.
Holmes, E. L. Chicago, Ill.
Hotchkiss, Jed., Staunton, Va.
Howe, Jas. Lewis, Louisville, Ky.
Hubbard, Gardiner G., Washington, D.C.
Jackson, Dugald C., Madison, Wisconsin
James, Joseph F., Agricultural Dept., Washington, D.C.
Johnson, Roger B., Miami University, Oxford, O.
Kellerman, Mrs. W. A., Columbus, O.
Kellicott, D. S., State University, Columbus, O.
Kellogg, D. S., Plattsburgh, N. Y.
Lintner, J. A., Albany, N. Y.
Loeb, Morris, New York City.
Mabery, Charles F., Cleveland, Ohio.
Macloskie, G., Princeton, N.J.
McCarthy, Gerald, Agricultural Station, Raleigh, N.C.
MacDonald, Arthur, Washington, D.C.
Marshall, D. T., Metuchen, N.J.
Mason, O. T., Smithsonian Institution, Washington, D.C.
Millspaugh, Charles F., Morgantown, W. Va.
Nichols, C. F., Boston, Mass.
Nuttall, George H. F., Johns Hopkins University, Baltimore, Md.
Oliver, J. E., Cornell University, Ithaca, N.Y.
Osborn, Henry F., Columbia College, New York City.
Osborn, Herbert, Agricultural College, Ames, Iowa.
Pammel, L. H., Agricultural Station, Ames, Iowa.
Pillsbury, J. H., Smith College, Northampton, Mass.
Poteat, W. L., Wake Forest, N. C.
Preble, Jr., W. P., New York City.
Ruffner, W. H., Lexington, Va.
Sanford, Edmund C., Clark University, Worcester, Mass.
Schufeldt, R. W., Washington, D.C.
Scripture, E. W., Clark University, Worcester, Mass.
Slade, D. D., Museum Comp. Zool., Cambridge, Mass.
Smith, John B., Rutgers College, New Brunswick, N.J.
Southwick, Edmund B., New York City.
Stevens, George T., New York City.
Stevenson, S. Y., Philadelphia, Pa.
Stone, G. H., Colorado Springs, Col.
Thomas, Cyrus, Washington, D. C.
Thurston, R. H., Cornell University, Ithaca, N.Y.
Todd, J. E., Tabor, Iowa.
True, Frederick W., National Museum, Washington, D.C.
Turner, C. H., University of Cincinnati, Cincinnati, O.
Wake, C., Staniland, Chicago, Ill.
Ward, R. DeC., Harvard University, Cambridge, Mass.
Ward, Stanley M., Scranton, Pa.
Warder, Robert B., Howard University, Washington, D.C.
Welch, Wm. H., Johns Hopkins University, Baltimore, M.D.
West, Gerald M., Clark University, Worcester, Mass.
Whitman, C. O., Clark University, Worcester, Mass.
Williams, Edward H., Lehigh University, Bethlehem, Pa.