test of actual use with classes before being crystallized into their present form. The particular merit of the book lies in the fact that the author has carefully described small points of technique which too many others writers have left for the student to learn for himself through experience more or less bitter.

The contents of the book are as follows: Chapter I., Microscopical Examination of Bacteria, with a description of the ordinary processes of staining; II. and III., Morphology and Reproduction, with methods of straining flagella and capsules; IV., Classification of Bacteria—a synopsis of Migula's genera; V. and VI., Sterilization, and Preparation of Culture media; VII., Cultures of Bacteria—a description of the ordinary culture methods, with full tables of descriptive terms; VIII., Determination of Species, contains a list of diagnostic characters, a standard chart for full description of a species, a key for tracing the more common forms, and a synopsis of Chester's scheme of classification by groups; IX., Bacterial Analysis of Water, Milk, Air and Soil; X., Pathogenic Bacteria—directions for the study of eleven typical pathogenic organisms. The appendix contains an account of Wilson and Randolph's method of measurement by photography, a description of the common contaminating moulds and yeasts, and a very useful list of synonyms.

Not a few points and methods are described which have hitherto appeared only in monographs; some are here published for the first time. The text is fully illustrated, and many of the cuts are new.

On account of its thoroughly modern and in many respects original treatment of the ordinary technique of bacteriology this book will prove useful not only to the bacteriologist, but to the botanist who employs bacteriological methods in pathological or systematic work.

HAVEN METCALF.
THE UNIVERSITY OF NEBRASKA.

SOCIETIES AND ACADEMIES.

THE GEOLOGICAL SOCIETY OF WASHINGTON.

THE 122d meeting of the Society was held on Jan. 8. The first paper was by Mr. Charles D. Walcott on 'The Outlook of the Geologist in America.' This was the substance of the presidential address, before the Geological Society of America, at Rochester.

Mr. M. R. Campbell then presented a paper on 'Recent Geological Work in Pennsylvania.' The author summarized briefly the character and scope of the mapping of the Pennsylvania coal fields which is now being carried on by the United States Geological Survey in cooperation with the State. Up to the present time seven quadrangles, embracing an area of 1,600 square miles in the bituminous coal fields, have been geologically surveyed.

It is generally admitted that the weakest point of the Second Geological Survey of Pennsylvania was its lack of adequate base maps on which to portray the geological data gathered in the field. It was impossible to locate geological boundaries correctly upon the crude county maps, which were the only ones available. With the aid of the recent detailed topographic maps, it is believed that the geological boundaries have been determined within an error of a few feet. The importance of such close mapping is self-evident from the fact that land underlain by the Pittsburg coal is valued at from $300 to $1,100 per acre. The investigations have also brought out many details of structure not previously known, which are of the utmost importance to mine and oil and gas well operators. In closing Mr. Campbell expressed a high appreciation of the labors of the geologists who had preceded him in this field, and stated that their results can only be superseded by the most careful detailed work and by the use of a topographic base map producing a high degree of accuracy.

ALFRED H. BROOKS,
Secretary.

BIOLOGICAL SOCIETY OF WASHINGTON.

THE 347th meeting was held on Saturday evening, January 11.

F. A. Lucas exhibited a malformed tooth of Mastodon, of an irregular shape, and with about twice the normal number of cusps, the extra cusps having been mostly added on one side of the tooth.

M. B. Waite presented 'A Problem in Plant

Pathology and Physiology,' stating that last fall he had been called upon to examine a large pear orchard belonging to Mr. A. S. Newson of Algoa, Texas, that was said to be suffering from the effects of blight. On examination it was found, in addition, to be suffering from leaf blight, from lack of cross fertilization and from unfavorable environment, having been planted on prairie soil without any proper natural drainage. Steps had been taken to combat the pear blight, but the result was very doubtful, as the disease could be readily brought in from surrounding orchards. The leaf blight could be remedied by spraying and the cross fertilization supplied by planting other varieties of pear, but it remained to be seen whether or not the locality was too far south for the successful cultivation of pears. These trees, like the peach, needed the rest gained by lying dormant during cold weather.

Wilfred H. Osgood spoke of 'The Supposed Occurrence of Caribou on the Queen Charlotte Islands,' saying that a new species, *Rangifer dawsoni,* had been described on the strength of a single imperfect skull, said to have been brought from Graham Island. Mr. Osgood reviewed the evidence relating to this skull and read extracts from a number of letters concerning it, concluding that in all probability caribou had never been seen in that locality.

Jacob Kotinsky read a paper on 'Present Opinion concerning the Home of the San José Scale,' briefly reviewing the history of the pest from the time of its appearance in California and the attempts to find its original habitat. It was supposed quite recently that Japan was the native place of the scale, but investigation showed that it did not occur in elevated portions of Japan, nor on native trees, while Mr. Marlatt had subsequently located it in China, south of the Great Wall.

F. A. Lucas.

PHILOSOPHICAL SOCIETY OF WASHINGTON.

The 31st annual meeting was held Dec. 21, 1901, President Walcott in the chair.

The report of the secretaries was presented by Mr. J. F. Hayford. During the year the principal event has been the incorporation of the Society; 16 meetings have been held for the presentation of papers; Vol. XIII. of the *Bulletin* has been completed and distributed, and 78 pages of Vol. XIV. At present the *Bulletins* are sent regularly as issued to about 300 societies, libraries, etc. A tabulation of the membership for about 20 years, during which time several other scientific societies have been formed at Washington, showed that the loss in membership due to these had now ceased and the Society has reached a steady regime. The present membership is 107. The treasurer's report presented by Mr. B. R. Green showed a healthy financial condition.

Mr. Richard Rathbun, Assistant Secretary of the Smithsonian Institution, was elected President for 1902, and the other officers were reelected.

The 544th meeting was held Jan. 4, 1902.

Mr. D. B. Wainwright, of the Coast and Geodetic Survey, described the experiments made in October last between Nantucket Light ship and the shore, a distance of 48 miles, by the aid of the Marconi apparatus in regular use there, to determine 'Longitude by Wireless Telegraphy.' It was found possible to secure chronograph records of the chronometer beats and the signals from the ship, and then to eliminate the lag of the instruments by causing the chronometer-break to excite the coherer and obtain new chronograph records. Time observations were made and the data were obtained for what is probably the first determination of longitude by wireless telegraph. In the discussion that followed, participated in by several geodesists, the opinion was expressed that even for the short distances through which the new method could now be used, the precision of observation was greater than that of any other method except the telegraphic; its special value would probably be found in work among islands and in unsettled countries like Alaska.

Professor Updegraff then discussed the 'Stability of Astronomical Piers.' The first astronomical instrument was only a pier, the Gromon; and by its aid the ancients determined a surprisingly large number of constants. A pier should be built on soil rather than on rock; brick was now in favor rather

than stone: at the Cape of Good Hope the piers of the meridian circle were iron cylinders filled with water. At the Naval Observatory the marble piers of the six-inch meridian circle had shown a change in azimuth of 0″.3 for 10° Fahr., and had recently been replaced by brick.

CHARLES K. WEAD,
Secretary.

NEW YORK ACADEMY OF SCIENCES.
SECTION OF BIOLOGY.

A REGULAR meeting of the Section of Biology was held on Dec. 9, Professor Bashford Dean presiding. The following papers were presented:

'The Action of Alcohol on Muscle': F. S. LEE and W. SALANT.

'Instincts of Lepidoptera': A. G. MAYER.

'The Natural History of some Tube-forming Annelids': H. R. LINVILLE.

The first paper, presented by Professor Lee, consisted of an account of an investigation carried out by the two authors jointly, by very exact methods, pure ethyl alcohol being used, and isolated muscles of the frog in the normal and in the alcoholized condition being compared. It is found that the muscle which has absorbed a moderate quantity of pure alcohol will contract more quickly, relax more slowly, perform a greater number of contractions in a given time, and become fatigued more slowly than a muscle without alcohol. The effect is most pronounced in from one half to three quarters of an hour after the liquid has begun to be absorbed, and later diminishes. Whether the alcohol exerts this beneficial action upon the muscle substance itself or on the nerves within the muscle is not yet certain. The results allow no conclusion regarding the question whether the alcohol acts as a food or in some other manner. In larger quantities its presence is detrimental, diminishing the whole number of contractions, inducing early fatigue, and diminishing the total amount of work that the muscle is capable of performing, even to the extent of abolishing the contractile power entirely. In such quantities the action is distinctly poisonous. The after-effects of either small or large doses have not yet been studied.

Dr. Mayer reported upon a number of experiments designed to determine the nature and duration of associative memory in lepidopterous larvæ. In one series the larvæ were placed in a wooden box divided into two compartments by a central partition, which was pierced by a small opening. On one side of the partition was placed moist earth containing growing food-plants, while the other chamber was barren. The larvæ were placed in the latter and found their way through the opening to the food. Apparently they never learned the path to the food, but always wandered aimlessly about, never shortening their paths. When the food was removed, however, they rarely entered this side of the box, showing that it was the presence of the food that attracted them. Individual temperament is very well shown by the larvæ, for some quickly find the food, while others are much slower. This quickness is not due to superior intelligence, however, but is owing to the fact that these larvæ remain quiet for shorter periods of time than the slower ones. A number of experiments were made upon larvæ which devour only special kinds of leaves. These can be induced to eat sparingly of previously uneatable food if the sap of their proper food-plant be rubbed into the previously distasteful leaves. Similarly, they can be prevented from devouring their proper food-plant if the juices of uneatable plants be rubbed into the substance of the leaves. However, they can always be induced to bite at or devour any foreign substance if one allows the larva to commence eating its proper food, and then slides up in front of it a distasteful leaf, sheet of paper, tinfoil, etc. The larva will take a few bites of the foreign substance, but will soon draw back its head, snapping its mandibles with apparent disgust or aversion. Very soon, however, it recommences to eat in a normal manner. If, now, the foreign substance be presented to the larva at intervals of one and one half minutes or more, about the same number of bites is taken at each presentation, thus showing that the larva does not remember its disagreeable experience for this interval. If, however, the interval be about thirty seconds the larva will take fewer and

fewer bites of the disagreeable leaf, soon refusing it altogether. Here again individual temperament is shown in the reaction of larvæ in this respect. When spinning their cocoons the larvæ of *Samia cynthia* and *C. promethea* are geotropic, for if the cocoon be inverted soon after the completion of the outer envelope, the pupæ are sometimes found reversed also, and may thus be imprisoned in the cocoon; for the densely-woven (normally lower) end of the cocoon is probably impenetrable to the issuing moth. A series of experiments are now being tried to determine whether the peculiar coloration of male moths in dimorphic species is due to sexual selection on the part of the female. In the case of *Callosamia promethea* there appears to be none, for males are accepted even when female wings are pasted upon them, or when their wings or scales are entirely removed. In the case of *O. dispar,* however, there is a decided selection against males whose wings have been cut off; 57 per cent. of the perfect males succeed in mating with the females, while only 19 per cent. of the wingless males are successful. The peculiar coloration of the males in these cases has probably not been brought about through the agency of sexual selection on the part of the female, but may be due to race-tendency toward variation in a definite direction unchecked by natural selection.

Dr. Linville, in his paper, showed that the investigation of the habits of *Amphitrite ornata* and *Diopatra cuprea* brings to light many interesting adaptations. The first named lives in U-shaped tubes in sand and mud, access to food and water being possible at either end. Additions to the tube are made at the ends by the tentacles, which are continually drawing in small masses of sand. However, there is every indication that in this animal, where no occasion exists for a protecting tube, continued tube-building is merely incidental to food-getting. Food is brought to the mouth, which is always concealed, in the masses of sand and in water currents created by the inward-lashing cilia which thickly cover the tentacles. *Diopatra* lives in a tough, mucus-lined tube, with its deeper end bare and serving as an anchor, while its outer free end is studded with bits of shell and gravel. The animal may expose its anterior portion while searching for food and for suitable material to add to its tube. Observations made in the laboratory indicate that the animal chooses these materials by tactile sense-organs in the cephalic cirri. The particle is grasped between the palps or by the mandibles, or by both, and is then conveyed with a fair degree of precision to a place at the edge of the tube. During the construction, *Diopatra* periodically ceases to build in order to 'glue' the gravel and shell together. The mucous-secreting organs are pads upon the ventral surface near the head. These organs are brought in contact with the inner surface of the tube by long and vigorous contractions and expansions of the trunk segments. All or nearly all of the newly constructed portions are gone over in this way before the animal renews its search for new bits of gravel and shell.

Henry E. Crampton,
Secretary.

THE BOSTON SOCIETY OF NATURAL HISTORY.

An interesting exhibition of lantern slides of New England Birds was given by Mr. Reginald Heber Howe, Junior, at the meeting of December 4, 1901. Among the more interesting views shown was one of a phœbe's nest built inside a barrel, and a series taken on Seal Island, Maine, illustrating the breeding-grounds and nesting-tunnels of the Leach's petrel. A unique photograph was that of a male chestnut-sided warbler standing on the edge of its nest, in the act of removing excrement of the young. A number of views were shown of ospreys' nests, some built, as along the Maine coast, in trees by the shore, others, as commonly in Rhode Island, on cartwheels, elevated on the ends of poles for the use of the birds.

At the meeting of December 18, Mr. John G. Jack gave an account of forestry and grazing in the Bighorn Reserve, Wyoming. The great value of the forest for holding water, and thus insuring a permanent water supply, was pointed out, and the disastrous effects of forest fires were illustrated by a series of lan-

tern slides. Englemann's spruce and lodgepole pine were the chief timber trees noted on the reserve. An interesting view was shown of a valley, running east and west, on whose sunny southern slope grew the *Pinus flexilis,* while the cooler slope with the northerly exposure supported a growth of Englemann's spruce. A view of especial interest was shown, of a group of trees on whose sides were long and deep-worn scars, made years before and partially healed over, where elk had persistently rubbed their antlers while in the velvet.

Mr. Henry L. Clapp gave an account of school gardens in Europe and in this country. There are in Europe over 80 such gardens, from Sweden to Switzerland. The methods of laying out the gardens, preparing the soil, and planting of the flowers and vegetables by the children were explained by the speaker and illustrated by a fine series of lantern slides. Only recently has this practical and interesting method of teaching botany to children been introduced into this country, but the results have already been noteworthy, and more such gardens should be established for our own schools.

GLOVER M. ALLEN,
Secretary.

THE KANSAS ACADEMY OF SCIENCE.

THE Kansas Academy of Science held its thirty-fourth annual meeting at Iola, Kansas, on December 30 and 31, 1901, Professor E. Miller, of the Kansas State University, in the chair. While the meeting did not have an attendance equal to that of some former years, there was much interest manifested in its work and an unusually full program presented. Fourteen new active members were elected, and seven active members advanced to life membership. About forty papers, mainly on biological, geological and chemical topics, were presented, many of the more technical ones being read by title only.

A paper by Professor J. T. Lovewell, formerly chemist in Washburn College, Topeka, on 'Gold in Kansas Shales,' provoked considerable discussion. The author announced as the result of a very large number of assays, that gold in paying quantities exists in the vast beds of shales which cover such a large section of western Kansas. The chemists and geologists of the State University and many others have positively denied that gold exists in these shales. A warm discussion followed the reading of the paper, with the result that the Academy appointed a commission of three of its members to investigate the matter further, and to report at the next meeting of the Academy.

On Tuesday evening, December 31, President Miller gave the retiring president's annual address, choosing for his topic, 'The Growth of Science during the Nineteenth Century.'

'A New Plesiosaur' was described by Dr. S. W. Williston, of the State University. The remains of this animal, as well as those of many others, were discovered during the past season by Mr. Charles H. Sternberg, of Lawrence. Mr. Sternberg spent several months in the field, part of the time in the employ of a noted foreign museum, which thus obtained many of his most valuable discoveries. He read before the Academy an interesting paper on 'The Permian Beds of the Big Wichita Valley of Texas.' At the conclusion of his paper much interest was manifested in deploring the loss of these rapidly disappearing paleontological specimens to American institutions, and especially to those of Kansas. A lack of funds for employing explorers or buying the specimens is responsible for this condition.

The members of the Academy were shown every courtesy by the people of Iola, who interested themselves in showing their visitors through the vast industrial plants located there. These include several large zinc smelters, an acid manufactory, cement works, etc., all made possible by the vast field of natural gas which underlies this beautiful part of Kansas.

The following is a list of the officers for the ensuing year: President, J. T. Willard, of the State Agricultural College, Manhattan; First Vice-President, Edward Bartow, of the State University, Lawrence; Second Vice-President, J. A. Yates, of Ottawa University, Ottawa; Secretary, G. P. Grimsley, of Washburn Col-

lege, Topeka; Treasurer, E. C. Franklin, of the State University.

The next annual meeting will be held in Topeka.

D. E. Lantz,
Secretary.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

At the meeting of the Academy of Science of St. Louis on the evening of January 6, 1902, about forty persons present, the following officers for 1902 were installed: President, Henry W. Eliot; Vice-Presidents, D. S. H. Smith, William E. Guy; Recording Secretary, William Trelease; Corresponding Secretary, Ernest P. Olshausen; Treasurer, Enno Sander; Librarian, G. Hambach; Curators, G. Hambach, Julius Hurter, Hermann von Schrenk; Directors, Amand Ravold, Adolf Alt.

On behalf of herself and a considerable number of other persons, Mrs. William Bouton presented to the Academy a collection of 633 butterflies mounted on Denton tablets, on condition that the collection should be made accessible to the public.

The following papers were presented by title:

'New Species of Plants from Missouri': K. K. Mackenzie and B. F. Bush.

'Revision of the North American Species of Triodia': B. F. Bush.

Professor A. S. Chessin exhibited a gyroscope and explained how an accurately constructed and rapidly rotated gyroscope might be made to indicate the position of the meridian plane, the direction of the polar axis of the earth and the latitude of the place of observation, thus serving the purpose of the mariner's compass, but more accurately, because of the fact that the compass indicates the magnetic pole and not the true pole. The following formulæ pertaining to the subject were furnished:

$$T=\pi\sqrt{\frac{A+C_1+A_2}{C\omega\Omega\cos\lambda}} \qquad T'=\pi\sqrt{\frac{A+C_1+A_2}{C\omega\Omega}}$$

where T and T' are the durations of a complete oscillation of the gyroscope when its axis is made to remain in the horizontal and the meridian planes, respectively; ω and Ω the angular velocities of rotation of the earth and the gyroscope, respectively; A, A_1, A_2 and C, C_1, C_2 the equatorial and the axial moments of inertia of the gyroscope and the two rings on which it is mounted. From these formulæ the latitude (λ) of the place of observation is derived, namely:

$$\cos\lambda=\frac{T'^2}{T^2}.$$

Professor F. E. Nipher made a further statement concerning his results in the attempt to produce ether waves by the explosion of dynamite. He had obtained some results which seemed to show that magnetic effects could be thus produced. "There is apparently no doubt that great solar outbursts like the one which Professor C. A. Young saw at Sherman in 1872* produce enormous distortions of the ether. Why should it not be possible to reproduce this result? It goes without saying that large sun-spots may be slowly formed, without such ether disturbance; and certainly we can hardly expect to reproduce solar velocities. But terrestrial explosions do yield tremors and sound vibrations, and these lead to experimental difficulties. The nickel-silver coherer can be operated by the sound-waves from a tuning-fork. The coherer can be either opened or closed, by sound-waves, when the coherer is properly placed in a magnetic field. The same result may be produced by changes in the magnetic field, due to the slow approach of a horseshoe magnet. After the coherer circuit has been closed by a spark, the slow approach of a horseshoe magnet will often open the circuit, precisely as it does when the coherer has been closed by the magnet held in a position of reversed polarity. When the magnet fails to open the coherer circuit, the cause is either a too rapid approach, which causes the coherer to close by reversal of magnetic polarity, or a wrong presentation of the magnet, which confirms the condition produced by the spark discharge. The conditions under which experiments are made as yet, with the jarring due to the street traffic and the explosions, and the changing magnetic field due to the electric cars, have proven to be a source of some perplexity. It throws some doubt

*'The Sun,' p. 156.

upon the results reached. However, there seems to be a residual effect which cannot thus be accounted for, and it may be due to an ether displacement. This matter is being carefully studied, and it is intended to use more violent explosives."

WILLIAM TRELEASE,
Recording Secretary.

DISCUSSION AND CORRESPONDENCE.

AN AMERICAN GEOGRAPHICAL SOCIETY.

As has been announced, the next meeting of the International Geographical Congress is to be held in Washington, D. C., in 1904. It must be apparent, I think, to every one familiar with the status of geography in America, that we are not prepared for such an invasion, and that a better organization of our geographical ranks is highly desirable.

There are now at least ten geographical societies in the United States. How many more there are in other parts of the two Americas I am not informed. Each of these societies is a local organization and there is no tangible bond of union between them. It needs no argument to show that some form of cooperation or of union between these various societies is much to be wished, not only that we may make a creditable showing at the coming meeting of the International Congress, but what is much more important, in order that mutual assistance may be had, and the science of geography advanced in a more efficient way than is practicable at present. This matter is not new, and at the risk of seeming to assume undue responsibility, I venture to state a plan of reorganization which embodies ideas gathered from various sources.

My thesis is: There should be an American Geographical Society having for its territorial limits the New World. The aims of this society should be in the main threefold:

1st. The holding of a general meeting each year, preferably during convocation week.

2d. The publication of an illustrated monthly magazine, devoted to geography in its widest aspects.

3d. The promotion of geographical exploration and research.

In reference to the first of these aims, I need not enlarge on the desirability of an annual meeting at which the results reached by various students of geography may be presented and discussed, and acquaintances made or renewed, since abundant justification for such a course is known to every one, from the success that has attended the annual meetings of several national and international scientific organizations during the past decade. Geographers certainly need to know their fellow workers as much as geologists, chemists, etc., need to know each other. This would be one of the chief results of an annual meeting of geographers, held perhaps at the same time and place as the annual winter meeting of the Geological Society of America.

The greatest gain to be expected from the proposed reorganization lies in the second of the aims to be fostered by the new society, namely, the publication of a strong, attractive, well-illustrated monthly magazine, in the place of the several publications now issued by existing societies. Some of the reasons for this are: The saving of expense in editing, and in duplication, especially of news items, reviews, etc.; concentration and ready reference. The concentration of American geographical literature would be a blessing to future generations, in view of the fact that complete files of the present publications are not readily accessible, and to find all of them in one library is seldom possible. With a central bureau of publication, also, it is to be hoped that the standard of the articles published would be higher. While the expense of a monthly magazine representing the interests of all classes of geographers, and well edited and well printed, would perhaps be greater than that of any one of the single publications referred to, it would be much less than all of them combined. It would also, I venture to assert, reach a wider audience than all of the publications combined which it would replace. Such a magazine would place American geography in a far more favorable light than it now enjoys, in the eyes of the geographers of other continents.

While a few of the existing societies have assisted in geographical research, their efforts