Lamouroux, Meyen, Fewkes, Johnston, Busk and Verrill, one each. These figures show that although many able zoologists have studied these animals, Nutting has done far more to make known the American species than any of his predecessors.

In a few instances I find myself unable to agree with Professor Nutting's nomenclature, if I rightly understand the facts. Thus *Thuiaria dalli* is a new name for *Sertularia cupressoides,* Clark, 1876, because it is a *Thuiaria,* and conflicts with *T. cupressoides,* Kirchenpauer, 1884. The rule here followed is that recognized by many botanists, but is, I think, losing ground, while it is not usually considered valid in zoology. Surely it would be more in accordance with zoological custom (and, I think, common sense) to give priority to the older specific name, no matter what genus it was placed in, and consequently rename the species of Kirchenpauer, not that of Clark.

The natural history department of the British Museum is constantly referred to as the 'South Kensington Museum,' which is not exact, and would be understood by Londoners to refer to a different institution.

T. D. A. Cockerell.

SOCIETIES AND ACADEMIES.

THE CONVOCATION WEEK MEETINGS OF SCIENTIFIC SOCIETIES.

The American Association for the Advancement of Science, the American Society of Naturalists and the following societies will meet at Philadelphia, Pa., during the week beginning December 24, 1904:

The American Association for the Advancement of Science.—The week beginning on December 27, President, Professor W. G. Farlow; permanent secretary, Dr. L. O. Howard, Cosmos Club, Washington, D. C.; general secretary, President Charles S. Howe, Case School, Cleveland, Ohio; secretary of the council, Professor Clarence A. Waldo, Purdue University, Lafayette, Ind.

Local Executive Committee.—President, Provost Charles C. Harrison; vice-president, Professor Edgar F. Smith; secretary, Dr. Philip P. Calvert; treasurer, Dr. Samuel G. Dixon; chairman of the executive committee, Provost Charles C. Harrison; of the committee on reception and entertainment, Mrs. Charles C. Harrison; of the committee on hotels and boarding houses, Professor Amos P. Brown; of the committee on meeting places and equipment, Professor Edwin G. Conklin; of the committee on press and printing, Mr. George E. Nitzsche; of the committee on transportation, Mr. Walter Wood; of the committee on finance, Mr. S. F. Houston.

Section A, Mathematics and Astronomy.—Vice-president, Professor Alexander Ziwet, University of Michigan; Secretary, Professor L. G. Weld, University of Iowa, Iowa City, Iowa.

Section B, Physics.—Vice-president, Professor Wm. F. Magie, Princeton University; Secretary, Professor Dayton C. Miller, Case School of Applied Science, Cleveland, Ohio.

Section C, Chemistry.—Vice-president, Professor Leonard P. Kinnicutt, Polytechnic Institute, Worcester, Mass.; secretary, Professor Charles L. Parsons, New Hampshire College of Agriculture, Durham, N. H.

Section D, Mechanical Science and Engineering.—Vice-president, Professor David S. Jacobus, Stevens Institute, Hoboken, N. J.; secretary, Professor Wm. T. Magruder, Ohio State University, Columbus, Ohio.

Section E, Geology and Geography.—Vice-president, Professor Eugene A. Smith, University of Alabama; secretary, Dr. Edmund O. Hovey, American Museum of Natural History, New York, N. Y.

Section F, Zoology.—Vice-president, Dr. C. Hart Merriam, U. S. Dept. of Agriculture; secretary, Professor C. Judson Herrick, Denison University, Granville, Ohio.

Section G, Botany.—Vice-president, Professor B. L. Robinson, Harvard University; Secretary, Professor F. E. Lloyd, Teachers College, Columbia University, New York, N. Y.

Section H, Anthropology.—Vice-president, Dr. Walter Hough, U. S. National Museum; secretary, George H. Pepper, American Museum of Natural History.

Section I, Social and Economic Science.—Vice-president, Martin A. Knapp, U. S. Interstate Commerce Commission, Washington; Secretary, Dr. J. F. Crowell, Bureau of Statistics, Washington, D. C.

Section K, Physiology and Experimental Medicine.—Vice-president, Professor H. P. Bowditch, Harvard University.

The American Society of Naturalists.—December 27, 28. President, Professor E. L. Mark, Harvard University; secretary, Dr. Chas. B. Davenport, Station for Experimental Evolution, Cold Spring Harbor, Long Island, N. Y.

The Astronomical and Astrophysical Society of America.—December 28, 29. President, Professor Simon Newcomb; secretary, Professor Geo. C. Comstock, Washburn Observatory, Madison, Wis.

The American Physical Society.—December 30. President, Professor Arthur G. Webster; secretary, Professor Ernest Merritt, Cornell University, Ithaca, N. Y.

The American Chemical Society.—December 28–31. President, Professor Arthur A. Noyes, Massachusetts Institute of Technology; Secretary, Professor William A. Noyes, the Bureau of Standards, Washington, D. C.

The Geological Society of America.—December 29–31. President, Professor J. C. Branner, Stanford University; secretary, Professor Herman L. Fairchild, Rochester, N. Y.

The Botanical Society of America.—December 27–31. President, F. V. Coville; secretary, Dr. D. T. MacDougal, N. Y. Botanical Garden, Bronx Park, New York City.

The Society for Plant Morphology and Physiology.—December 28, 29, 30. President, Dr. G. T. Moore, Department of Agriculture, Washington; secretary, Professor W. F. Ganong, Smith College, Northampton, Mass.

The Botanical Club of the Association.

The Fern Chapter.

Sullivant Moss Chapter.

Wild Flower Preservation Society of America.

The Society for Horticultural Science.—President, Professor L. H. Bailey, Cornell University; secretary, S. A. Beach, Geneva, N. Y.

The Society for the Promotion of Agricultural Science.—December 26. Secretary, Professor F. M. Webster, University of Illinois, Urbana, Ill.

The Association of Plant and Animal Breeders.

The Association of Economic Entomologists.—President, Professor A. L. Quaintance, Washington, D. C.; secretary, Professor H. E. Summers, Ames, Iowa.

The Entomological Club of the Association.

The American Society of Zoologists (Eastern Branch).—December 27, 28. President, Professor E. A. Andrews, Johns Hopkins University; secretary, Professor Gilman A. Drew, University of Maine.

The American Society of Vertebrate Paleontologists.—December 28–30. President, Professor H. F. Osborn, Columbia University; secretary, Dr. O. P. Hay, American Museum of Natural History, New York City.

The Society of American Bacteriologists.—President, Professor F. G. Novy, University of Michigan; secretary, Professor F. P. Gorham, Brown University, Providence, R. I.

The American Physiological Society.—December 27, 28. President, Professor R. H. Chittenden, Yale University; secretary, Professor Lafayette B. Mendel, New Haven.

The Association of American Anatomists. December 26, 27, 28. President, Professor Charles S. Minot, Harvard Medical School; secretary, Professor G. Carl Huber, 333 East Ann St., Ann Arbor, Mich.

American Folk-Lore Society.

The American Anthropological Association.—December 27–Jan. 2. President, Dr. W J McGee, Washington; secretary, Dr. Geo. Grant MacCurdy, Yale University, New Haven, Conn.

The American Psychological Association.—December 28, 29. President, Professor William James, Harvard University; secretary, Professor Livingston Farrand, Columbia University, New York City.

The American Philosophical Association.—December 28, 29, 30. President, Professor George T. Ladd, Yale University; secretary, Professor H. N. Gardiner, Northampton, Mass.

The Sigma Xi Honorary Scientific Society.—President, Professor S. W. Williston, University of Chicago; secretary, Professor Edwin S. Crawley, University of Pennsylvania, Philadelphia, Pa.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE 590th regular meeting was held November 12, President Marvin in the chair.

Mr. Marsden Manson, of San Francisco, presented by invitation a paper on 'The Evolution of Climate.' In opposition to the modern views which attribute geological climate to solar control and the glacial epoch to astronomical causes, the author emphasizes the influence of the dense aqueous atmosphere which must have surrounded the earth in early times, and the change that occurred when the sun's rays could reach the surface. The ice-age was a transition period between the long periods of earth-controlled and sun-controlled surface temperature. His conclusions were:

1. At the dawn of geologic time two sources of heat were active agents in the control and conservation of temperatures, (*a*) earth heat,

(*b*) solar energy converted in the upper atmosphere into heat.

2. The functions of these two sources were separate. Earth-heat controlled the surface temperatures during its prevalence, and by the laws of cooling solids was uniformly distributed at sea level; it was held near the planetary surface by the enshrouding media, by which it was trapped and through which it escaped slowly, not by direct radiation, but by the performance of work, namely the evaporation of water, and by convection currents which carried warm air to the upper regions of the atmosphere, from which regions only could free radiation of heat into space take place. Solar energy did not directly affect surface temperatures, during the existence of earth heat as a sensible factor, by reason of the intervention of a dense cloud-sphere incident to the universally warm oceans whose temperature is attested by early fossil life; but during this period solar energy acted as a conservator of planetary heat by warming the upper regions of the atmosphere and clouds.

3. Under these conditions, lower and lower temperatures supervened and were recorded by fossil life and ice action distinctly nonzonal in distribution, but varying locally through wide ranges by reason of differences in elevation.

4. Land areas reached glacial temperatures whenever and wherever they were thrust up above a snow-line controlled by earth heat, and such snow-line was in the main continuously lowered but may have fluctuated and was independent of latitude until the culmination of the ice-age; land areas reached glacial temperatures earlier than ocean areas, by reason of the low specific heat of earth and rocks, their more intense rate of radiation, through the cooling action of rain and snow and by reason of greater elevation, and they were subjected to maximum glaciation along lines of maximum precipitation, and may have escaped all but light local glaciation in regions of minimum cloud formation and precipitation.

5. Upon the cooling of the oceans, the effective remnant of earth-heat was exhausted and cloud formation reached a minimum, permitting solar energy to reach the surface and to assume domination and control of its temperatures; the climates of such control became zonal by reason of direct exposure to a zonally distributed source, and these climates gradually rose in temperature by reason of the trapping of heat rays emitted by the warming planetary surface; such rise is yet in progress as recorded by retreating glaciers and advancing plant and animal life.

6. These progressive changes of climate have been in harmony with the principles of climatic evolution herein set forth; and the principles are substantiated by the facts of geology and by the phenomena now taking place.

Mr. C. G. Abbot, of the Astrophysical Observatory, under the title 'Radiation and Terrestrial Temperature,' discussed the substantial equilibrium of temperature of the earth, and consequent equality of solar radiation absorbed in and about the earth to that emitted from and about the earth to space. After speaking of the great complexity of the earth and atmosphere as an absorber and radiator, certain maximum and minimum values of the solar constant and of the possible terrestrial temperature were obtained by considering the substitution of a black body or perfect radiator for the earth. In this way it was shown that the solar constant can not exceed 3.88 calories, and may be indefinitely below this according as the earth reflects less than 44 per cent. of solar radiation, or radiates to space less perfectly than a black body. Taking 1.9 calories as the minimum allowable assumption of the solar constant, it was shown that the mean temperature of the earth would remain above —33° C. if the earth were a perfect radiator and the reflection of solar rays did not exceed 44 per cent. Accordingly we owe not exceeding 58° rise of temperature to the imperfect radiation of the earth. But in the absence of clouds the mean earth temperature would certainly exceed 0° C. It appeared that if the temperature of the oceans could be raised 25° C. the cloudiness would so far increase as to make glaciation of the land a probable consequence. Professor Arrhenius's carbonic acid theory of glaciation was discussed, and it was shown that the author of it had assumed the applicability of Stefan's law to the temperature of the gases of the air, and had neglected the dependence of connection between earth and air on the relative temperatures of the two in framing the theory. Inasmuch, therefore, as not only his fundamental equation and much of the numerical data which had been used in the computations were open to serious question, grave doubt was expressed as to the validity of Professor Arrhenius's computation of the effect of variation of the carbonic-acid contents of the air, and also of the glacial theory which Arrhenius and Chamberlin had founded upon it.

In the long discussion that followed several geologists dissented from Mr. Manson's views, holding that various important facts found no place in it.

CHARLES K. WEAD,
Secretary.

AMERICAN CHEMICAL SOCIETY. NEW YORK SECTION.

THE first regular meeting of the season was held at the Chemists' Club, Friday evening, October 7. A number of the visiting English members of the Society of Chemical Industry were present as guests of the section. Mr. Chas. C. Cresswell, of London, the general secretary of the Society of Chemical Industry, gave a brief address, expressing appreciation of the many courtesies shown to the English members of the Society of Chemical Industry during their tour of the United States.

Doctor J. Lewkowitsch, of London, the well-known authority on oils, fats and waxes, then gave a discourse on the most recent advances in the chemistry of oils and fats. He mentioned, in the first instance, the theory of saponification of glycerides. Up till a few years ago the equation representing the hydrolysis of oils and fats, *i. e.*,

$$C_3H_5\begin{cases}OR\\OR\\OR\end{cases} + 3HOH = C_3H_5\begin{cases}OH\\OH\\OH\end{cases} + 3R\cdot OH,$$

was taken as the true expression of the reaction in the sense that one molecule of triglyceride was converted into one molecule of glycerol and three molecules of fatty acids. Geitel, however, first showed by physico-chemical experiments that the reaction underlying the hydrolysis is a bi-molecular one; according to this view the saponification of glycerides takes place in stages, the triglyceride passing through the diglyceride into monoglyceride, to be finally resolved into glycerol and free fatty acid. As the correctness of this view was doubted, he (Dr. Lewkowitsch) had tried to prove its correctness by purely chemical methods. If diglycerides and monoglycerides did appear as intermediate products in a partially saponified fat, then it should be possible to prove the presence of lower glycerides by converting the lower glycerides into a triglyceride by boiling with acetic anhydride. The then resulting triglycerides could be readily examined for the presence of acetyl groups. On carrying out the experiments, he actually proved that acetic acid was obtained on saponifying the acetylated mass. The acetic acid could be determined quantitatively in the usual manner. Now if a natural fat was saponified slowly in a manner simulating the process carried on on a large scale, and samples from the partially saponified mass were acetylated, varying amounts of acetic acid were obtained from them. On plotting the results in a system of coordinates, zigzag-like curves were observed. This proved that lower glycerides did occur in the partially saponified mass, and hence that the *progress* of saponification takes place in accordance with the view that the triglycerides pass through the diglycerides and monoglycerides, and that all three possible reactions occur simultaneously.

Dr. Lewkowitsch explained next his views on the hydrolysis of triglycerides and showed that water alone must be considered as the hydrolizing agent. The saponification processes applied in practise must, therefore, be explained by the assumption that the bases only act as catalyzers (or accelerators) and that the fundamental equation,

$$C_3H_5\begin{cases}OR\\OR\\OR\end{cases} + 3H_2O = C_3H_5\begin{cases}OH\\OH\\OH\end{cases} + 3ROH,$$

actually represents the primary chemical change. He fully explained this in the instance of the saponification process by means of lime. In order to hydrolyze (saponify) a fat by means of lime in an open vat the theoretical quantity of CaO, namely, 9.7 per cent., was not sufficient to produce complete saponification, and no less than 12 to 14 per cent. were necessary to completely convert triglyceride into glycerol and the calcium salts of fatty acids. If the view were correct that the lime acts as an accelerator, then it should be possible to completely hydrolyze a triglyceride by a smaller amount of the base than theory requires for the complete saturation of the fatty acids. The theory further predicts that if the temperature and the pressure under which the reaction is carried out are increased, the amount of base may be reduced. As this is borne out by the methods practised on a large scale in which practically complete saponification is effected with from one to three per cent. of lime under pressures of twelve to eight atmospheres, the view that the bases act as accelerators was amply confirmed.

On the strength of the foregoing views one could give a rational explanation of the phenomenon of rancidity. In the first instance the triglycerides were hydrolyzed by the minute quantities of moisture which always found access to thin fats, however carefully they might be preserved. He likened the slow hydrolysis to the slow decomposition of granite in the course of centuries. The free fatty acids thus formed were then degraded in a secondary reaction into lower volatile acids, on being oxidized by the oxygen of the air, thereby acquiring that disagreeable taste and smell which we comprise under the term 'rancidity.'

Dr. Lewkowitsch next touched upon the discovery of mixed triglycerides in natural oils and fats. He first showed that theory predicted the existence of two isomeric monoglycerides, as also of two isomeric diglycerides having the same acid radical. Triglycerides, in which all three acid radicals had the same composition, could exist in only one form.

Thus in case two different acid radicals are combined with one molecule of glycerol, then theory predicted the existence of two isomerides, and if all three fatty acid radicals in one molecule of a triglyceride were different, then three different substances could exist.

The last-named class of glycerides was appropriately termed 'mixed glycerides.' The occurrence of such glycerides has been proved hitherto in a number of cases. Thus they were shown to exist in Kokum butter, cacao butter, olive oil, tallows, lard and human fat. The enormous amount of theoretically possible triglycerides opened out a wide vista of researches that would undoubtedly lead to important results in the near future.

Discussion.—In reply to Professor Bogert, Dr. Lewkowitsch said that it was almost certain that lecithin contained several fatty acid radicals in one molecule.

In reply to Dr. Ittner, Dr. Lewkowitsch agreed that optically active glycerides should exist theoretically, and he pointed to some work he had carried out over twenty years ago, when, basing himself on such theoretical considerations, he had resolved glyceric acid into two optically active components. As regards the acidic component of the glycerides, the fatty acids themselves had hitherto, with the exception of ricinoleic acid, been found optically inactive, but a few months ago Dr. Power had discovered in Chaulmoogra oil a new class of fatty acids, which were remarkable not only for containing a closed carbon ring, but also for exhibiting the property of rotating the plane of polarized light.

In reply to the chairman, Dr. Lewkowitsch pointed out that hydrolysis in alcoholic solution need not be looked upon as differing from the hydrolysis occurring in aqueous solution, if one looked upon C_2H_5 as being a basic ion. He himself thought that under pressure the conversion of a glyceride into ethylic esters might be carried out to a large extent, although, judging from the classical researches of Berthelot and Pean St. Giles he would not expect the reaction to be a complete one. The reaction may be explained by the two groups C_2H_5 and R changing places. The correctness of this view was proved by the fact, that if a fat was saponified in alcoholic solution in an insufficient amount of KOH, ethylic esters were obtained as the immediate products of the reaction, which in their turn were hydrolyzed in a second stage with the formation of the potassium salts of the fatty acids.

The regular program of the evening was then taken up, and the following papers were read:

Inactive Thorium. CHARLES BASKERVILLE and FRITZ ZERBAN.

The authors continued the work on the complexity of thorium, in connection with the question of its radioactivity. They did not succeed, however, in entirely removing the activity from active thorium preparations, but they found originally inactive thorium in a rock from South America. This rock is gray, similar to slate, and consists mainly of barium carbonate. It does not show any radioactivity, emitting neither + nor — radiations. It contains only a small percentage of thorium and no uranium. The thorium from this source, identified by all the characteristic reactions, did not affect the photographic plate through black paper within 290 hours, nor did it give any evidence of radioactivity with the Elster and Geitel electroscope. Further investigations will be made concerning the elementary nature of this new variety of thorium, as no determination of its atomic weight has been made.

This work has been assisted by the Carnegie Institution.

The Use of Copper Sulphate as an Algacide in the Treatment of Water Supplies. DANIEL D. JACKSON.

Since the publication of the paper by Drs. Moore and Kellerman, of the Bureau of Plant Industry, U. S. Department of Agriculture, a very wide interest has been expressed in the use of copper sulphate in the treatment of water supplies. During the past five months more than fifty different sources of supply throughout the United States have been treated by this method, and the results obtained have exceeded all expectations. Both as an algacide and as a germicide the chemical is remarkable. Those micro-organisms which cause the greatest amount of trouble from tastes and odors in water supplies are the ones which are most effectively acted upon by this treatment. Also, the bacteria which are of intestinal origin are killed off with much higher dilutions than the ordinary germs.

The use of covered reservoirs to prevent microscopic growths will no longer be a necessity, as the copper sulphate treatment may be applied once or twice a year and prevent all trouble from those sources. The dilution required for such treatment is usually about one part of copper sulphate to eight million parts of water. This dilution is so great that in order to obtain a medicinal dose of the chemical it would be necessary for an individual to drink about forty gallons of water each day. After two or three days the copper is absolutely removed by precipitation.

Landscape architecture is also greatly benefited by this discovery, as unsightly and foul-smelling green growths in ponds and lakes can be easily removed and prevented. The Department of Water Supply and the Department of Parks of New York City have both had waters treated by the author during the summer with decided success, and in each case only one treatment extending for a period of one hour was necessary. The sulphate is applied by rowing a boat over the surface of the water, from the sides of which are suspended bags containing the crystals of copper sulphate. These are dissolved in the water as the boat is rowed over the surface.

The use of copper sulphate as a germicide is being very extensively experimented upon, and it is probable that typhoid fever will be entirely removed from any source of supply by a dilution of one part copper sulphate to two million parts water. In this case it is desirable to treat the contaminated stream or portions of supply at the source of the contamination, the treatment being applied at such a dilution that bacillus coli is removed.

Great credit is due Drs. Moore and Kellerman for their remarkable discovery of this treatment, which marks a decided advance in sanitary science and which undoubtedly will modify many engineering ideas regarding water supplies.

F. H. POUGH,
Secretary.

THE AMERICAN CHEMICAL SOCIETY. NORTHEASTERN SECTION.

The fifty-fifth regular meeting of the section was held Friday evening, November 18, at the 'Tech Union,' Massachusetts Institute of Technology, with President W. H. Walker in the chair. About 150 members and guests were present. The following officers were elected for 1904–5:

President—James F. Norris.
Vice-President—Walter L. Jennings.
Secretary—Arthur M. Comey.
Treasurer—John W. Brown.
Executive Committee—Gregory P. Baxter, Edgar F. Billings, Robert S. Weston, Carl O. Weber, Lyman C. Newell.
Councillors—Charles R. Sanger, Charles L. Parsons, Albert E. Leach.

The annual reports of the secretary and treasurer were read.

President W. H. Walker opened the discussion of the subject of the 'Future Supply of Available Nitrogen,' by giving a résumé of the methods, by which the nitrogen, taken up by plants, is replaced by a fresh supply obtained from the air by chemical and electrical processes, describing the formation of calcium and barium carbamides, and the process and apparatus used for the direct conversion of nitrogen into nitric acid by using an electric arc.

Dr. George T. Moore, Director of the Laboratory of Plant Physiology of the U. S. Department of Agriculture, described the recent work carried on under his direction on the fixation of atmospheric nitrogen by means of bacteria, in which he described how the nodules formed on the roots of leguminous plants have been found to contain bacteria, which are able to fix the nitrogen of the air, and make it available for the use of the plants. These nodules are not formed naturally in all soils, owing to the lack of the presence of bacteria, and in order to make up for this deficiency, pure cultures of the bacteria in the nodules have been made and added to the soil. It was found if this was done, using the ordinary media containing nitrogen, that the bacteria were weakened, and no longer possessed the power of forming nodules, but if no nitrogen was present in the media used, the new organisms possessed the power of forming nodules to a high degree, when the seed or ground in which it was sown was inoculated with the cultures. These cultures have been dried on cotton, and distributed with the necessary food and directions for their development to about 10,000 farmers during the past year. The results so far sent in have been very satisfactory, the crop being increased in almost all instances by the use of the cultures, in some cases as high as 1,000 per cent. The lecture was fully illustrated with lantern slides, showing sections of the nodules, specimen plants, etc.

Arthur M. Comey,
Secretary.

THE ELISHA MITCHELL SCIENTIFIC SOCIETY.

The 156th meeting of the Elisha Mitchell Scientific Society of the University of North Carolina was held in the chemical lecture room, Tuesday, November 8, 7:30 P. M., the following program being rendered:

Professor J. E. Mills: 'Molecular Attraction.'
Professor H. V. Wilson: 'Experiments on the Development of the Skeleton in Sponge Larvæ.'
Professor A. S. Wheeler: 'The Theories of Dyeing with Special Reference to the Constitution of Cellulose.'

Alvin S. Wheeler,
Recording Secretary.

DISCUSSION AND CORRESPONDENCE.

STYLE IN SCIENTIFIC COMPOSITION.

The employment of a direct and perspicuous style is of immense advantage in scientific writing, perhaps more so than in other forms of literature. In scientific composition, as elsewhere, the art of writing well depends primarily upon *right thinking,* this being, as was said by Horace centuries ago, 'the beginning and fount of excellence'; and in scarcely inferior degree it depends upon *correct expression.* Concede with Pope that 'expression is the dress of thought,' and it follows that careless or faulty expression detracts as much from our appreciation of an author as slovenliness of apparel.

Superelegance of style is neither necessary nor desirable in every-day science, any more