destroyers being taken by lizards. W. W. Cooke gives the seventeenth, and last, paper on the 'Migration of Warblers.' It is noted that the colored plates of warblers will be followed by those of the thrushes, and these in turn by the flycatchers, it being the laudable ambition of the editor to figure in time (a slip in the types makes it in the next volume) every species of North American bird. The number contains the Annual Report of the Audubon Societies, which shows a gratifying increase in bird protection throughout the country, though much yet remains to be done in arousing public sentiment in favor of protection, and the enactment and—what is more important—the enforcement of laws.

The Museums Journal of Great Britain for November contains articles on 'The Significance and Scope of a Museum in Lienz,' by A. B. Meyer, being advice as to the objects and administration of a local museum; 'The Equipment of a School Museum,' by Oswald H. Latter, showing the museum from the teacher's point of view; and, under the head of 'International Bureau of Ethnography,' a free translation of the memorial adopted by the congress at Mons, Belgium, in 1905. The object of the bureau, which is to be established in Brussels, is the organization at common expense, of services pertaining to the scientific documentation relative to the social state, the manners and customs of different peoples, especially peoples of inferior civilization.

The Geological Survey of Canada has recently issued a 'Catalogue of Publications' that forms a most acceptable addition to the literature of geology. It is divided into various parts, the first containing 'Reports of Progress, Annual Reports and Summary Reports in Order of Publication.' Part II. contains 'Publications arranged according to Locality'; Part III. contains 'Authors' Reports,' arranged alphabetically; Part IV. is a list of reports according to their principal topics, economics, paleontology, etc.; Part V. comprises the 'Principal Reports in the Director's Summary Reports since 1894'; Part VI. is devoted to 'Reports on Economic Subjects included in the Reports of the Mines Section' and Part VII. is a list of maps.

SOCIETIES AND ACADEMIES.

THE BIOLOGICAL SOCIETY OF WASHINGTON.

The 418th meeting was held on October 20, 1906, President Knowlton in the chair and about fifty persons present.

Dr. Evermann called attention to the capture last August (28) of a Pacific Chinook salmon, weighing 5¾ pounds, in Sunapee Lake, N. H., the second example of this species known to have been taken in Atlantic waters. This is the result of the introduction by the State Fish Commission in the spring of 1904 of fry hatched from eggs furnished by the U. S. Bureau of Fisheries. The bureau has made numerous plants of Chinook salmon in eastern waters, but, though a 14-pound specimen was caught in Lake Ontario several years ago, had despaired of establishing the species, and had begun to introduce the silver and humpback salmon with which it feels more confident of success. The Sunapee specimen was not over two and a half years old, and it seems probable that the conditions in that lake are favorable and will result in the permanence of the species on the Atlantic side.

Dr. Rose exhibited a photograph and specimen of a very curious compact desert plant[1] which resembled a giant puff ball, but with corky bark and grass-like leaves. The plant was introduced into England sixty years ago, but female flowers and fruit had never been collected until found by Dr. Rose in Mexico in 1905. These show that the plant is near Nolina and Dasylirion, but of very different habit and fruit.

Mr. Piper showed a specimen of the Japanese 'hagi,' a plant, *Lespedeza bicolor,* from the Arlington farm, and called attention to the peculiar form of fasciation which consisted in the flattening of the branches.

Mr. W. J. Spillman presented a paper on the 'Mechanism of Heredity.' It was pointed out that our present knowledge of cytology apparently enables us to form a satisfactory theory of heredity. The fundamental assumptions necessary to the theory are as follows:

1. The chromatin is the material in which hereditary qualities inhere. This assumption

[1] '*Calibanus*, a New Genus of Liliaceous Plants,' Contr. Nat. Herb., **10**: 90, 1906.

accords with the views of practically all biologists.

2. The chromosomes retain their identity. This assumption has been arrived at independently of any theory of heredity, and represents the opinion of many investigators. It has not, however, been fully established. In case it is shown that the chromosomes do not retain their identity, the reasoning by which the present theory of heredity is developed may be applied to the subdivisions of chromosomes which are the ultimate biological units, so that the theory, in its essential outlines, is independent of the theory of chromosome individuality.

3. Synapsis in organisms exhibiting alternate inheritance consists of the union of homologous chromosomes received from different parents. This is the view arrived at independently of theories of heredity by the majority of investigators.

4. If the chromosomes themselves are the ultimate biological units, in the first postsynaptic division the position of bivalent chromosomes is so far governed by chance that any given segment of the bivalent is as liable to go to one pole as the other. This conclusion was arrived at by Sutton independent of theories of heredity, and its possibilities have been pointed out by Cannon, Boveri, Wilson and others, who have also called the attention of the relation of this phenomenon to the laws of alternate inheritance.

If independent unit characters reside in the same chromosome, alternate inheritance shows that two homologous chromosomes must exchange character determinants. There is no cytological evidence of such exchange. It is admitted as a possibility. If it does occur, the theory here developed will apply to character determinants consisting of subordinate constituents of the chromosomes as it is here developed for the chromosome itself. Since there is evidence of the chromosome distribution called for by alternate inheritance and no evidence of such distribution of parts of chromosomes, we accept tentatively the simpler assumption that chromosomes retain their identity and are the bearers of hereditary characters. The following facts follow as necessary consequences of the above assumptions:

Two characters inhering the same chromosome are transmitted together. Cases of such gametic coupling of characters were cited. The facts of alternate inheritance and of evolutionary changes are made clear without resort to ids, pangens or other elements subordinate to the chromosomes themselves. Illustrations were given of the mechanism by which Mendelian characters, both simple and compound, are distributed to progeny.

Many mutations may be accounted for as the sudden appearance of characters which have developed through an indefinite period unsuspected until a chance cross revealed their identity. Examples of such characters were given.

Mendelian unit characters are, for the most part, non-essential characters. When vital characters attempt to become Mendelian, which they continually do, they lead to elimination by natural selection.

The chromosomes of a given nucleus are not essentially differentiated with regard to vital characters. That is, vital characters are functions common to all chromosomes, and hence do not obey Mendel's law, but a different law, which was stated.

Mendelian unit characters (simple characters) are functions of single chromosomes or a single pair of homologous chromosomes. (Homologous chromosomes are those that unite in synapsis to form a bivalent and are supposed to relate to the same characters.) Homologous chromosomes are of common recent descent.

Non-homologous chromosomes are not of common recent descent, but are of common descent in the distant past.

Synapsis and reduction require the finest adjustment of function of any office performed by the chromosome, as shown by the sterility of hybrids. Hence, organisms that interbreed freely must vary together if they vary at all. Isolation (cessation to interbreed) is, therefore, the prime condition in the differentiation of species.

Natural selection affects evolutionary changes in the following ways:

1. Homologous chromosomes must retain sufficient similarity of function to function together in synapsis and reduction. They may vary in function, but must vary together.

2. Non-homologous chromosomes must function together in mitosis and in synapsis and reduction. Hence, if they vary in a given interbreeding group, they must vary together within narrow limits.

3. Chromosomes must not disagree in the expression of vital characters to such a degree as to interfere with the development of a perfect organism.

4. In non-essential characters that do not interfere with proper functioning in mitosis, synapsis, and reduction and in the development of a perfect organism, chromosome functions are free to vary.

5. If a change in the expression of a character changes an essential relation between the organism and its environment, natural selection favors or retards variation according as the variation affects the relation to environment favorably or unfavorably (protective adaptation, for example).

6. Chromosome variation is limited by the constitution of the chromatin itself.

Organisms that reproduce asexually are freer to vary than others. An organism continuously propagated by cuttings may, by unrestrained variation of chromosome function, lose the power of sexual reproduction, *e. g.*, the banana plant. Presumably, variation is here so rapid as to secure the advantages ordinarily conferred by sexual reproduction.

Evolutionary changes may, in general, be accounted for as the result of slow, gradual changes in the functions of the chromosomes. It was shown, however, that bud variations are possibly marked changes in chromosome function due to a new adjustment between the constitution of chromatin and the food supply or other elements of the environment. Presumably, such changes are most likely to occur in forms propagated asexually, and especially when propagated under conditions of forced growth, where the food supply is abnormally large. Bud variations may possibly be correlated with changes in the numbers of chromosomes.

It was pointed out that a widely distributed species might present a series of forms, adjacent sections of which might differ so little as to interbreed freely, while the extremes, if they met, might not be able to interbreed at all.

In the discussion which followed Dr. O. F. Cook pointed out that the doctrine of the permanent identity of the chromosome has not been established, and that the indications of the more recent cytological research were against it. Mr. Spillman replied that a different interpretation might be placed upon the cytological phenomena cited by Dr. Cook.

In response to a question by Mr. M. B. Waite, whether the view set forth by Mr. Spillman, in addition to explaining geographical species, would not tend also to explain what a species is, Mr. Spillman replied that the theory formed important evidence on this question, stating that while specific distinctions differ in different groups and in the minds of different investigators, we might go so far as to say that two groups which can not interbreed must be distinct species. Even if they do not present morphological differences that will permit their identification variation will soon bring about such differences in the absence of interbreeding. On the other hand, the term species has acquired such a meaning that we can not state that two groups that can interbreeed are the same species. Inability to interbreed may be taken as the outer margin of the field of specific distinction.

Mr. Doolittle cited as examples analogous to that of the goldenrod referred to by Mr. Spillman (as a widely distributed group adjacent sections of which interbreed but extreme forms of which might not interbreed) certain species of rodents described by Dr. Merriam, and Dr. Stejneger mentioned two butcher birds (*Lanius*), subspecies in Central Asia which came together by different routes in the Scandinavian peninsula as separate species.

M. C. Marsh,
Secretary.

The Torrey Botanical Club.

The meeting of the club on November 13, 1906, was called to order by President Rusby

at 8:15 o'clock, at the American Museum of Natural History.

The following scientific program was presented:

Account of a Collecting Trip in the Adirondack and in the Catskill Mountains: Dr. PER AXEL RYDBERG.

Dr. Rydberg gave an account of botanical field studies and collecting in the regions mentioned, giving special attention to the blackberries. The talk was richly illustrated by herbarium specimens collected on the trip.

Remarks on the Flora of China: Dr. AUGUSTINE HENRY.

Dr. Henry gave a very interesting account of some features of the flora of China, pointing out its richness and great diversity, which are correlated with diversity of topography and climate, and emphasizing both the slight amount of collecting that has as yet been done there, and the important results to be obtained by ecological and systematic studies in that region. As an illustration of this he called attention to the fact that several genera, recorded in existing manuals as monotypic, are known to be represented in China by several distinct species.

THE club met on November 28, 1906, at the museum building of the New York Botanical Garden, at 3:30 P.M. In the absence of President Rusby, Dr. H. L. Lighthipe was called to the chair.

The following scientific program was presented:

Some Costa Rican Orchids: Mr. GEORGE V. NASH.

The speaker referred to the little known country of Costa Rica, and the desirability of securing material from there. Mr. Wm. R. Maxon, of the United States National Museum, during the early part of the year, made an exploration in this region in the interests of the New York Botanical Garden, and brought back with him, not only a valuable collection of herbarium material, but also a large collection of living plants, representing mainly the orchid, fern, bromeliad and cactus families. This material, owing to the care taken by Mr. Maxon in collecting and packing it, arrived in excellent condition. A great many orchids were among the lot, and several of these have already flowered, revealing new and interesting species. Living material is especially desirable in this family of plants, as the color and shape of the flowers play a large part in their classification, and these characters are difficult to determine from dried material. The genera *Pleurothallis, Elleanthus* and *Zygostates* have each already yielded one species new to science. The new species of *Zygostates* is a particularly interesting discovery, as it proves not only to be a species hitherto unknown, but also brings into the flora of North America a genus known formerly only from Brazil and Peru. Among other things worthy of note are: *Warscewiczella Wendlandii discolor,* originally described and known only from Costa Rica; *Maxillaria iridifolia,* found throughout tropical America, but certainly differing much in general appearance from the other members of the genus; and *Cycnoches Rossianum,* originally described from a plant which flowered in cultivation in the Garden of Mr. Ross, at Florence, Italy, in 1889. The origin of this plant was unknown, and it is now interesting to have its home revealed in this collection of Mr. Maxon's. The remarks were illustrated with living plants of the species referred to, supplemented with herbarium specimens, drawings and material preserved in formalin.

The Sedges of Jamaica: Dr. N. L. BRITTON.

Dr. Britton exhibited specimens of all species of Cyperaceæ known to occur on the island of Jamaica, including several species new to that island, collected by Professor Underwood, or by himself during a visit to Jamaica in the month of September. He remarked on the distribution of many of these species, and on the fact that a number of them are found in the West Indies only in Jamaica, their further distribution being Central America and South America. This distribution of these sedges is paralleled by that of a considerable number of species in

other families, so that the South American relationship of the Jamaica flora is more intimate than that of Cuba, Hayti or Porto Rico, and it is suspected that this may be an indication of a former land connection between Jamaica and the continent to the west or southwest. Dr. Britton's paper included a complete enumeration of the species now known, together with diagnostic keys for their determination and as much of their synonymy as relates to Jamaican records. No undescribed species were found, but the collections made by recent explorers added a number to those recorded by Mr. Clarke in his monograph of the West Indian Cyperaceæ, published in the second volume of Professor Urban's 'Symbolæ Antillanæ.'

Exhibition of Photomicrographs of North American Woods: Dr. C. Stuart Gager.

Numerous specimens were shown from a collection of photomicrographs of cross-sections of North American woods, recently acquired by the garden from Mr. James A. Weale, of the firm of Williams, Weale & Co., of Liverpool, England. These photomicrographs are all enlarged ten diameters, thus facilitating comparison. They are of very superior quality, so that many finer elements of the histology of the various woods can be demonstrated under a lens with nearly as great satisfaction as from the original sections. They possess the advantage of being less fragile than the sections themselves, and of serving better than they for purposes of demonstration before classes and otherwise. The collection contains representations of practically all North American species.

By way of comparison, specimens were shown of Hough's 'American Woods' and of Nördlinger's 'Holzquerschnitte.'

C. Stuart Gager,
Secretary.

The American Chemical Society. New York Section.

The second regular meeting of the session of 1906–7 was held at the Chemists' Club, 108 W. 55th St., on December 7. The present councilors, Messrs. Leo Baelkeland, F. D. Dodge, T. J. Parker, W. J. Schieffelin and Hugo Schweitzer, were reelected.

The following papers were presented:

A Necessary Modification of Volhard's Method for the Determination of Chlorides: M. A. Rosanoff and Arthur E. Hill.

The authors set forth the advantages of filtering off the insoluble silver chloride formed in the reaction demonstrating by experiment the indefinite end point obtained when this is not done. The subject awakened considerable discussion among several members present who had made many determinations by Volhard's method and who questioned the advantage of the modification.

The Color Change in Chromic Chloride Solutions: Arthur B. Lamb.

The speaker showed, by an experiment on the lecture table, that the change in color from green to violet of a solution of green chromium chloride was accelerated by adding a salt of a weak acid like acetic and greatly retarded by adding a strong acid as hydrochloric. The application of the principles of the ionic theory to this and related transformations was dealt with at some length. Attention was called to the explanation, afforded by this investigation, of some results by Weinland and Koch, showing the varying amount of chlorine precipitated from solutions of green chromium chloride by different silver salts.

Some New Double Phosphates: L. J. Cohen.

The properties of a number of salts of phosphoric acid were described and their analyses compared with the theoretical.

Note on a Strange Case of Poisoning: M. T. Bogert.

A case of poisoning in the distillation of certain bromine compounds, where deep destruction of tissue, with no apparent external injury, was caused by very brief contact of the hand with the vapors. Professor Bogert further spoke of the desirability of calling attention to injuries received in handling corrosive materials in order that suitable precautions might be taken by future investigators.

C. M. Joyce,
Secretary.