the surroundings showed them not liable to pollution. These, for the most part, are through the eastern section of Massachusetts. Most of the samples contained forms liquefying gelatin so rapidly as to make the counting of numbers impossible after forty-eight hours at 20° C. The most striking fact is the prevalence in these open waters of the development of red colonies on lactose-litmus-agar, sixty of the samples showing distinct red colonies either on the surface or imbedded in the medium. All typical growths have been differentiated and found to give more or less fully the colon reactions. Open brooks such as would be used for any impounding reservoir give often the most questionable data when rigidly interpreted; for example, from a small brook flowing through woodland and abandoned pasture with no tillage land above gave as high as six red colonies, differentiating out as modified colon forms, to the cubic centimeter. In but two cases, however, has the writer been able to isolate the streptococci—once in an open brook near Whitman, Mass., and once near the mouth of Elmer's Brook in South Hadley, a famous trout stream. Neither of these are polluted waters as we understand them, but the above determinations should not be accepted as final until further study of the area may have removed all possibility of contamination from animals. So far as we have gone in this inquiry the statements of Houston appear to be justified. It is of some importance, therefore, that careful inquiry as to the occurrence of the streptococci forms in nature be continued. Any considerable pollution of a natural water by fecal material will show these forms, which are readily distinguishable on the litmus-lactose-agar plate; and if continued examinations may show them not to be present in normal country waters their significance from the sanitary point of view is evident.

The Steam Still: F. C. Harrison and B. Barlow, Ontario Agricultural College.

Some Large but Inexpensive Incubators for Teaching and Working Laboratories: S. C. Prescott, Massachusetts Institute of Technology.

Some Experiences with Test-tubes: H. A. Harding, Experiment Station, Geneva, N. Y.

Frederic P. Gorham,
Secretary.

Brown University,
Providence, R. I.

THE SOCIETY FOR PLANT MORPHOLOGY AND PHYSIOLOGY.

The eighth annual meeting of this society was held, in conjunction with the meetings of the American Association for the Advancement of Science and the affiliated societies, at the University of Pennsylvania, Philadelphia, December 28–30, 1904, under the presidency of Dr. George T. Moore. The meeting was large in point of numbers, and in all ways successful. The following officers were elected for the ensuing year:

President—Professor E. C. Jeffrey, of Harvard University.

Vice-President—Dr. C. O. Townsend, of the United States Department of Agriculture.

Secretary-Treasurer—Professor W. F. Ganong, of Smith College.

The following new members were elected: Dr. G. P. Burns, of the University of Michigan; Dr. A. L. Dean, of Yale University; and Messrs. C. F. Kellerman, W. M. Scott and D. B. Swingle, of the United States Department of Agriculture. As its delegate to the International Botanical Congress in June the society elected Professor Farlow, and made provision for an alternate if he can not be present. The society accepted the principles, recommended by its committee of conference (published in this journal, XXI., 197), upon which it will merge, along with the Botanical Society of America and the American Mycological Society, into a national Botanical Society. A committee, consisting of the present and retiring presidents and the secretary, was appointed to cooperate with committees of the other societies to take further steps towards bringing the union into effect. The society expressed by special vote its great appreciation of the hospitality of the university during the meeting, and its sincere thanks therefor.

The address of the president dealt with 'Applied Botany and its Dependence upon Scientific Research.' It has been printed in full in this journal. The papers, of which abstracts follow, were with but two exceptions presented in full and discussed, and include all that were admitted to the program. The abstracts are in every case by the authors.

Causes Inducing the Habit of Growth of Asparagus plumosus: Professor F. C. NEWCOMBE, University of Michigan.

The common asparagus fern so-called is grown as a dwarf or as a climbing plant, according to the space afforded the roots. It bears no functional leaves, but the work of carbon assimilation is performed by the branches, the ultimate ones of which occur in little tufts of needles. The remarkable thing about the habit of growth of the plant is its change from a radial structure to a dorsiventral, and a rather sudden change in its response to environment.

The young main stems of the plant are at first erect, positively heliotropic and negatively geotropic. At the time the secondary branches begin to grow out, however, in the dwarf plants the upper part of the main stem, or in the climbing plants the oldest lateral branch, assumes the horizontal position, and all members which subsequently grow from this horizontal piece take the horizontal position. This change to the horizontal position is made in the course of three to four days. It may be considered as due to the plant becoming diaheliotropic, or diageotropic, or the position may be the resultant of the antagonistic action of negative heliotropism and negative geotropism.

Experiments have shown that the horizontal position is the result of the plant changing its behavior towards gravitation. The stem changes from negative geotropism to diageotropism.

Further Observations on the Nature of Color in Plants: Dr. HENRY KRÆMER, Philadelphia College of Pharmacy.

1. According to the author's studies, plant color substances may be divided into two classes: (*a*) Organized color principles, which are characterized by being an organic part of the plastid body, these being insoluble in water or dilute alcohol, but soluble in xylol and similar solvents; and (*b*) unorganized color principles, which are not a fundamental or organic part of the plastid, these occurring in the vacuoles of the cells of the higher plants as well as fungi, and in the vacuolules of the plastids of the brown and red seaweeds, being further distinguished by being soluble in water and dilute alcohol and insoluble in xylol and similar solvents.

2. In the photosynthesis of the chloroplast the unorganized color substances may be produced in comparatively large amounts, as in (*a*) early spring foliage; (*b*) autumnal foliage; (*c*) the foliage of alpine plants; (*d*) the brown and red marine algæ; (*e*) the foliage of certain species or varieties of rose, beech, nasturtium, etc.

3. The original color of the unorganized color principle is neither blue as stated by Wiesner, nor red as given by Berzelius; but these colors, namely, blue and red, and their various shades and tints are dependent upon substances dissolved in the cell sap and which are associated with the color

substance; or are the result of decomposition or oxidation processes.

4. Unorganized color substances are distributed usually in largest amount at the terminus of the branch, as in foliage and flowers, or in roots, or in both tops and roots.

5. The wide distribution of so-called flower color substances in other parts of the plant than the flower, points to the conclusion that they are products of plastid activity, and are not to be considered as designated primarily for the attraction of insects when found in the flower.

6. The occurrence of chromoplasts in a reserve organ, as the tuberous root of the carrot, and the similar occurrence of chromoplasts and of reserve starch in the petals of the buttercup, suggests that the petals of the buttercup like the root of the carrot have the function of storing nutrient material. In both cases cells containing chromoplasts rich in nitrogenous substances are associated with cells containing reserve materials.

Some Undescribed Fossil Trees from the Eocene of Vermont: Professor E. C. Jeffrey, Harvard University.

As a result of the coal famine of the winter of 1902–3 the lignite beds of Brandon, Vt., were considerably exploited for fuel. A number of more or less well preserved specimens of wood were secured by Professor Perkins, of the University of Vermont, and communicated to the author for identification. A few pieces of the material were in a good state of preservation and proved to be a species of *Laurinoxylon.* Nearly all the remaining fragments belonged to a single species, which proved to be very badly decayed, so that it has not been possible as yet to determine it satisfactorily.

New Data Bearing on the Phylogeny of Pinus (illustrated): Professor E. C. Jeffrey, Harvard University.

As the result of the study of both internal and external features in a large number of species of *Pinus* ranging throughout North America, Europe and Asia, the following conclusions have been reached:

The genus *Pinus* is divisible into two series, *Scleropitys* and *Malacopitys,* which are not coincident with the sections *Pinaster* and *Strobus* of recent authors. In *Scleropitys* the cones (female) are generally strongly sclerified, and are often provided with a prickle or spine on the generally median umbo, especially when young; leaf-sheath persistent; leaf-trace double; two or more rows of resin canals in the first annual ring of wood, one of which is near the pith; marginal cells of the wood-rays dentate. In *Malacopitys* the cone (female) is of softer texture, and is generally quite without a prickle or spine on the generally terminal umbo; leaf-sheath deciduous; leaf-trace single; a single series of resin canals in the first annual ring of the wood, not near the pith; marginal cells of the medullary rays not dentate. Internal features of structure are of greater constancy and consequently of more value in tracing the larger lines of affinity in the pines.

The Bud Rot of the Coconut Palm in the West Indies (illustrated): Dr. Erwin F. Smith, Department of Agriculture.

General attention was first called to this disease by the reports of army officers during the American occupation of Cuba. The coconut palms were said to be dying in large numbers of some mysterious disease which should be investigated. Mr. Busck was sent by the U. S. Department of Agriculture to eastern Cuba, and subsequently reported on the entomological aspects of the disease. Later Mr. F. S. Earle reported the occurrence of a bacterial bud rot of the coconut in Jamaica. The writer has since heard of its occurrence on the mainland in Central America, so that it may be assumed to occur all round the Caribbean. It was studied by the writer at Baracoa, Mata and Yumuri in eastern Cuba in April, 1904.

The disease has made decided advances since it was studied by Mr. Busck in 1901, especially at Mata, and if it continues to spread as it has done during the past ten years it will inevitably destroy the coconut industry of the island, and that, too, within the next ten or fifteen years. Already many of the planters are discouraged and not setting any more trees, since it now attacks trees of all ages, including quite young ones and those on the hills as well as those close to the sea. The disease is frequently known as 'the fever,' and often one sees where the bases of the trunks have been scorched with an idea of preventing the development of the disease. The disease is not lodged in the roots, however, nor in the stem. These in all cases appeared to be sound. The general symptoms are the yellowing and fall of the outer leaves, the shedding of the nuts, and some months later the death of the whole crown. The cause of this decline is not apparent until the tree is felled and the crown of leaves removed, including the wrappings of the strong terminal bud. The latter is then found to be the seat of the disease. This bud with its wrappings of young and tender leaves is found to be involved in the vilest sort of a bacterial soft rot—not unlike that of a decaying cabbage or potato, but smelling much worse, the stench resembling that of a slaughter-house. This rot, invisible until the numerous outer leaf-base wrappings are removed, often involves a diameter of several inches of soft tissues and a length of three or four feet, including flower buds and the whole of some of the soft fleshy white undeveloped leaves covering the bud and forming the so-called 'cabbage' of the palm. The rot stops very promptly with the harder tissues of the palm stem immediately under the bud and does not attack any of the developed leaves. It is a disease of the undeveloped tissues. When the tree is felled and opened up, carrion flies and vultures are promptly attracted by the horrible smell. Fly larvæ and various fungi were found in the parts most exposed to the air and longest diseased, but the advancing margin of the decay was occupied only by bacteria, of which there appeared to be several sorts. No yellow or green fluorescent bacteria were obtained from the rotting tissues. All were white organisms of the 'soft-rot' type, mostly plump short rods with rounded ends, but occasionally longer rods, all apparently gas producers. One of the commonest sorts formed round dense creamy white opalescent colonies on agar. Another formed thin gray-white iridescent colonies on agar. A terminal spore-bearing, tetanus-like organism was also often abundant in the decayed tissues, even close to the advancing margin of the rot, and this is probably an anaerobe as it was not obtained in any of the many cultures.

The picture of one diseased tree will answer for many. No fungi or insect injuries were found which could in the least account for the death of the trees. The disease is the result of a bacterial rot of the terminal bud and its wrappings, including the flower buds. The bacteria probably find their entrance through wounds of some sort, and their distribution is undoubtedly favored by carrion creatures. The larva found deepest down in the rotting tissues was that of the common scavenger fly, *Hermetia illucens* L. Occasionally the crown of a tree was found yellow from other causes, but if the youngest visible leaf (projecting five or six feet) was observed to be lopped over and wilting or shriveled, the soft rot was sure to be found on cutting down the tree and removing the close-wrapped leaf bases. No attempt has yet been made to produce the disease by pure cultures.

Diseased trees should be felled and the terminal bud burned or properly disinfected with sulphate of copper. Only the most energetic action is likely to avail.

Some Diseases of Loblolly Pine Timber: Dr. HERMANN VON SCHRENK, Department of Agriculture.

The wood of the loblolly pine when still in the living tree is destroyed by several fungi, notably *Trametes pini* and *Polyporus Schweinitzii.* After the timber is cut from the tree, it is very susceptible, particularly in southern climates, to fungus attacks, and is probably the least resistant of all American woods. A number of fungi grow on the outside of the timber, notably *Schizophyllum commune* and several Thelephoraceæ. These, however, do not attack the wood fibers, but grow on the sugar, starch or exuding resins. The worst enemy of the loblolly pine timber is *Lenzites sepiaria,* which causes the brown rot. The description of the various forms of fruiting bodies of this fungi were given, and an account of the experiments which were made during the last year to test the susceptibility of this timber, when cut during different months of the year. It was shown that by proper piling, the attacks of this fungus ought to be prevented for periods of at least twelve months.

Bacterial Infection by Way of the Stomata in Black Spot of the Plum: Dr. ERWIN F. SMITH, Department of Agriculture. (By title.)

Experiments were continued during the summer of 1904 with the bacterial black spot of the plum, and numerous infections by way of the stomata were obtained on leaves and green fruits by simply spraying upon the tree, agar-cultures of *P. pruni* dissolved in sterile water. This was done during a damp still evening, in which several light showers occurred. The spots were visible at the end of seven days and continued to increase for several weeks in the typical manner. Microtome sections in early stages of the spots show abundant bacterial occupation, beginning in the substomatic chamber. The organism was also recovered from the spots by means of agar poured plates in pure culture. A neighboring tree inoculated at the same time and in the same way, but with a different yellow organism, never showed any results of this copious inoculation. Neither did any spots develop on a second check tree. The disease appears to be one of meristematic tissues. No spots were obtained on full-grown green plums, inoculated two or three weeks prior to their ripening, although numerous attempts were made under what appeared to be very favorable conditions.

Burrill's Bacterial Disease of Broom Corn (illustrated): Dr. ERWIN F. SMITH and Miss FLORENCE HEDGES, Department of Agriculture.

In the summer of 1904, on one of the Agricultural Department farms in Washington, D. C., this disease was observed in such abundance and with such typical characteristics as to remove all doubt as to its origin. The elongating red-brown blotches were extremely numerous and fused readily, causing the death of many large leaves. The disease began on the lower leaves; but by the end of September it had reached the top of the plants (twelve feet) and had destroyed all leaves on the lower six feet, and badly spotted the remainder. A microscopic examination of various spots showed a bacterial focus to be present in each one. Poured plates made from these spots on several different occasions yielded bacteria in enormous numbers, of one kind and in practically pure culture. Very characteristic also was the appearance on the under surface of the spots (the season was wet) of red crusts or scabs. These were so numerous as to be quite conspicuous. They consisted of bacteria which had oozed from the interior of the spots.

The infection takes place by way of the stomata and is favored by rainfall or dewfall. No insect injuries are necessary. The disease was obtained in the hot-house under strict control conditions by dissolving pure slant-agar cultures of the organism in sterile water and atomizing this upon the plants. Spots were visible at the end of ten days and were well developed in five or six weeks. Such spots contained the characteristic bacterial focus and yielded, on making poured plates, enormous quantities of the organism used, and in most cases nothing else. The disease was likewise produced in broom corn, starting with bacterial colonies obtained from leaf spots on field sorghum.

The red stain is a host reaction. The organism is not red, nor yellow, but pure white. It is not a yeast and is not associated with yeasts or with fungi. It does not produce gas but is strictly aerobic in peptone water with various carbon foods (dextrose, saccharose, lactose, maltose, mannit and glycerine). It forms small, round, white, slow-growing shiny surface colonies on agar plates. The growth on agar is often sticky and hard to remove; the organism blues litmus milk decidedly, and finally renders it gelatinous; it does not liquefy gelatin, does not reduce nitrates, produces little if any indol, grows very slowly on moist silicate jelly made with Fermi's solution, has little diastasic action on potato starch jelly. On potato cylinders growth is white and much the color of the potato; grays the potato moderately; clouds bouillon moderately. In bouillon there is a thin white rim, and in old cultures often zooglœæ and sometimes a thin pellicle breaking down easily. Slow, long-continued growth in Uschinsky's solution, not much precipitate. Resisted drying 96 hours. Grows not at all or very feebly at 37.5° C.; grows more rapidly at 30° than at 20° C.; minimum temperature about 6° C. Thermal death point 47° C. Stands freezing well, *i. e.*, only about 20 per cent. killed. Occurs in the host plant and in culture media as a short rod with rounded ends, single or in pairs or rarely fours. It is motile but non-sporiferous, so far as yet observed.

Some varieties are much more subject to the disease than others, and there is good hope of overcoming the disease by selecting resistant plants for propagation.

Pecan Scab (*Fusicladium effusum* Wint.): Mr. W. A. ORTON, Department of Agriculture.

This paper will be published later as a bulletin of the Bureau of Plant Industry, U. S. Department of Agriculture. It describes a disease of considerable economic importance, caused by the above-named fungus, which attacks the leaves, twigs and nuts of cultivated pecans in our southern states. The fungus occurs on either side of the leaves and on the petioles, producing dead spots or distortions and defoliation. The new growth of the twigs is sometimes killed, but the greatest injury is to the nuts. The microscopic and cultural characters of the fungus were described. *Fusicladium caryigenum* E. & L. was found to be the same species. Favorable results from spraying experiments were reported.

Factors which Determine the Spread of Pear Blight: Mr. M. B. WAITE, Department of Agriculture.

(It has been impossible to obtain an abstract of this paper.)

Further Studies on the Starch Grain (third paper): Dr. Henry Kraemer, Philadelphia College of Pharmacy.

The author called attention to the alteraation in the compound starch grains of the seeds of *Theobroma Cacao* on the application of heat, producing masses resembling the natural starch grains of corn, wheat, barley, rye and potato, in size and shape, and showing in some cases even a concentric or excentric lamellated structure.

In the micro-polariscopic examination of reserve starch grains of different origin, it was observed that in using a red and green selenite plate the yellow and blue areas did not occupy the same relative position in all of the grains, so that in the same field with the analyzer at a given position two kinds of grains were observed which were the complement of each other. Three explanations are suggested as accounting for this difference in the polarizing effects of different starch grains of the same origin:

1. It may be due to a difference in the shape and structure of the individual grains.

2. It may be due to a difference in composition of the different parts of the same grain.

3. Or it may be that there are two distinct kinds of grains. This view seems to offer the most plausible explanation for this phenomenon.

Regarding the Cause of Sap Pressure and Flow in the Maple: Dr. K. M. Wiegand, Cornell University.

Researches by various investigators have shown that the seat of pressure in the maple, during the sugar season, is not in the root, but in the aerial parts, principally in the trunk. It seems to be induced by temperature acting as a stimulus. When this rises past 2°–4° C. pressure results, but a freezing of the tissue is by no means necessary. The author has attempted, by the aid of mathematical calculation and the employment of other evidence at hand, to compare critically the various theories. It becomes evident that neither gas, water nor wood expansion, nor any combination of these, can account for the phenomenon. Neither can the freezing theory. We have left the theory that pressure is due to the living cells, which agrees well with the facts. Only the pith rays seem to be in the proper position in the wood to allow the production of pressure. Pressure in this case could be due only to the unequal permeability, in opposite directions, of the membrane at the two ends of the cell. This, quite likely, is caused by the penetration of the morning temperature. Water would tend to pass from the inner layers to the outer; and the solute, sugar, would be excreted as a necessary factor in the production of pressure.

Notes on Some Species of Agaricus (Psalliota): Professor G. F. Atkinson, Cornell University.

Photographs of eight or ten species were shown to illustrate characters and show some points in the development and formation of the veil and annulus. Photomicrographs of the spores of nearly all the species in the United States were also shown, and special attention was called to the value of these in a study of different species.

Nuclear Changes in Germinating Seeds: Professor Carrie M. Derick, McGill University.

In this paper a brief summary was given of the results of part of an investigation into the cytological conditions connected with anabiosis which had been begun under the direction of Professor Strasburger, at Bonn, and continued at McGill University.

Studies of resting seeds belonging to several genera and of germinating seeds indicate that the nucleus of the resting seed is homogeneous, with the exception of the nucleolus in which the chromatin is aggregated. As the nucleus passes from the resting to the active state, the nucleolus becomes vacuolated, and chromatin is gradually given off by it and distributed in the form of granules throughout the body of the nucleus. These granules increase in size and number and finally are aggregated to form the spireme, which segments, as usual, into chromosomes. The chromosomes do not, therefore, retain their individuality throughout the life-cycle of the organism, and are not constantly present as the differentiated bearers of the hereditary qualities of the plant.

The Recognition of Hybrid Characters in the Structure of the Vascular Cylinder as Expressed in the Genus Catalpa: Professor D. P. PENHALLOW, McGill University. (Presented in synopsis.)

In 1889 Professor C. S. Sargent published an account of an interesting and newly observed case of hybridization between two species of *Catalpa* which he designated as *Catalpa* × J. C. Teas in reference to the origin of the tree in the nursery of Mr. Teas of Carthage, Mo. The account referred to states that *Catalpa kaempferi* was planted in 1864 in a nursery containing *C. speciosa* and *C. bignonioides*. Eventually the first species produced a single pod of seeds which were wholly unlike anything hitherto known. When these seeds were planted they produced a tree almost intermediate in character between *C. kaempferi* and one of the American species. Mr. Teas was of the opinion that the cross was with *C. speciosa,* while Professor Sargent considered *C. bignonioides* as the other parent, basing his conclusions upon the fact that the flowers of *C. speciosa* were two to three weeks earlier than those of *C. kaempferi,* while the flowers of *C. bignonioides* are contemporaneous with those of the Japanese species. No other evidence has since been forthcoming, so far as I am aware, and the real American parentage of a most noteworthy addition to the ornamental trees of this country still remains in doubt. Within the last twelve years, opportunities have been presented to inquire into the evidence which might be secured from an anatomical point of view, and to determine to what extent, if any, the external alterations attendant upon hybridization were accompanied by corresponding internal structural changes. It was felt that the answer to this question might very largely contribute to a solution of the difficult problems relating to the origin of species, either by mutation or by hybridization, and permit of a more precise limitation of the characters which define a species.

An examination of typical material taken from the mature stem of the hybrid and from each of the possible parents, showed that the characters were to be most clearly recognized in transverse and tangential sections, especially in the former. A very careful analysis of all the structural features showed that out of a possible maximum of thirty-two, 34 per cent. were common to *Catalpa speciosa* only, and from the well-defined characteristics which it exhibited, it was possible to eliminate it from further consideration and to definitely determine that it could not be one of the parents. On the other hand, it appeared that there were 31 per cent. of characters common to the hybrid, *C. bignonioides* and *C. kaempferi,* while in the hybrid it was also possible to determine features which could not be accounted for except as the resultant of action between *C. kaempferi* and *C. bignonioides.* The evidence available shows that:

1. Hybrid characters are expressed in the structure of the vascular cylinder as well as in external alterations of form and color.

2. *Catalpa speciosa* is not in any way concerned in the production of the hybrid.

3. Teas' hybrid *Catalpa* is the product of a cross between *C. kaempferi* and *C. bignonioides,* thus confirming the conclusions already reached by Sargent on the basis of external morphology.

4. The dominant characters of the hybrid, as expressed in the internal structure, are those of the Japanese parent as similarly manifested externally.

5. The resultant characters are most strongly exhibited in transverse section, less so in the tangential and least of all in the radial.

6. Teas' *Catalpa* presents a degree of stability directly comparable with that exhibited by the willows, various species of *Cratægus* and many other plants which are commonly recognized as distinct species. Its origin is in direct harmony with Mendel's law and it should be given the status of a species for which the name *Catalpa teasi* is appropriate.

Polyembryony in Celtis (illustrated): Professor J. W. Toumey, Yale Forest School.

In the spring of 1901, 500 of the normal one-seeded fruits of *Celtis occidentalis* were planted. Seedlings grew from 98 per cent. of these fruits. The total number of seedlings obtained, however, was 580; that is, a little more than 10 per cent. of the fruits sown produced more than one seedling.

In 1902 and again in 1903 the drupaceous fruits of this species were again sown, with similar results. In 1903 the fruits of *Celtis reticulata* and *Celtis Mississippiensis* were sown. Both of these species, in some instances, developed more than one seedling from a single fruit, but not so frequently as in *Celtis occidentalis.*

On examination of a large number of ovaries in various stages of development, and mature fruits of *Celtis occidentalis* it was found that the development of more than 1 embryo in a single fruit arose as follows: (1) From double fruits. In 1,000 fruits examined 3 double ones were found. (2) From the development of two seeds within the same fruit. In 400 fruits examined 7 were found which contained 2 ovules each. In each of these cases one ovule was much larger than the other and both were attached to the wall of the ovary by a common funicle, indicating that they both arose from the same fundament. (3) From true polyembryony. In 200 of the young ovules that were fixed and sectioned 16 were found with from 2 to 4 embryos within a single embryo sac. In these cases the embryo arose directly from the tissue of the nucellus at the micropylar end of the ovule. When seeds, containing ovules resulting from true polyembryony were sown usually all of the embryos developed, as high as 4 developing from the same seed. The young seedlings that developed from such embryos were often imperfect and more or less grown together. Occasionally, however, they were approximately the same size, perfect and wholly separate. (4) From false polyembryony. From 200 of the young ovules fixed and sectioned 3 were found where 2 nucelli developed within the same integuments. Each nucellus developed an archesporium and ultimately an embryo sac. Assuming that both embryo sacs become fertilized and develop normally we would here have a case of 2 embryos within common seed coats; both developing from fertilized eggs. This is believed to be very unusual among angiosperms.

Nymphæa and the Monocotyls: Dr. Henry S. Conard, The Johns Hopkins University.

The speaker discussed some observations on the structure and development of

Nymphæa from a paper now in press. The embryo in its development and mature form is typically dicotyledonous in *Nymphæa,* though it lacks a suspensor in *Nuphar.* The primary root quickly perishes, and the stem becomes tuberous immediately above the epicotyl. The root tip of *Nuphar* resembles that of *Zea mais,* but in *Nymphæa* it is like that of Papilionaceæ and Cucurbitaceæ. The vascular bundle of the root of *Nymphæa* is radial and polyarch. The scattered bundles of the stem of *Nuphar* and some *Nymphæas* give place to a distinct vascular cylinder with leaf-gaps in the primitive *Nym. mexicana.* In no case are the bundles oriented as in monocotyls. From each leaf three traces come into the stem, one central and two lateral; they differ from many dicotyls only in possessing a transverse commissure connecting the three traces. No secondary growth of the bundles takes place in any part of the plant. In this and in the polyarch roots and in the short life of the primary root are the only similarities between *Nymphæa* and the monocotyls. These are best explained as adaptations to a long established aquatic habit.

An Exploration of a Peat-forming Lake (illustrated): Dr. G. P. BURNS, University of Michigan.

Perhaps no line of ecological research shows the deficiency of present methods better than the work on peat bogs. These are cited as examples of 'xerophytic' habitats and there are many theories offered explaining the presence of plants growing in them.

These theories differ widely. Nor can we expect them to do otherwise under present methods.

The first problem of the ecologist must be to gather and record facts, but these must be submitted, as far as possible, to experiment before attempting to determine their final value. As in all other lines of botanical research, experimental work is indispensable.

A study of the plants in peat-forming lakes near Ann Arbor, Mich., shows that they are by no means all xerophytes. With xerophytes are found many plants whose structure is either mesophytic or hydrophytic.

In fact, within a circle whose diameter is only a few feet may be found plants belonging to all three of these groups of plants.

Peat bogs then, as such, can not be called 'xerophytic' habitats.

W. F. GANONG,
Secretary.

SCIENTIFIC BOOKS.

Die Gletscher. By Dr. HANS HESS. Braunschweig, Friedrich Vieweg und Sohn. 1904. Large 8°, pp. xi + 426.

This is the only important work on glaciers that has appeared since the well-known book of Professor Heim was published in 1885, and it is of the same general excellent character. Dr. Hess has had a good preparation for writing the book by his training as a physicist, which is of much importance in the actual study of glaciers, and by many years of careful observations and measurements of the glaciers of the Oetzthal in conjunction with Professor Finsterwalder and Dr. Blümcke; and he makes many references to the very important observations which they have made, especially on the Vernagt and Hintereis glaciers, which have thrown so much light on the theory of glacier motion.

The plan of the book does not differ essentially from that of Professor Heim. The matter is presented inductively; first assembling the observations and facts and then giving the theories to account for them. The large amount of work which has been done in the last twenty years makes such a work very desirable and Dr. Hess has collected all the material and has presented it in a most attractive and interesting form.