is to be found in the columns of such easily accessible periodicals as the Philosophical Magazine, the Proceedings of the London Mathematical Society and the Proceedings and Transactions of the Royal Society. A full index of titles of papers up to date, with short abstracts, is obtainable from the Jahrbuch über die Fortschritte der Mathematik and the *Revue Semestrielle*.

It is, of course, unfair to ask anyone successfully engaged on his or her own special line of research to leave it for doubtful profit in another. But much may be done by those who have the direction of the studies of the future generation by interesting and suggestive courses of lectures. Pure mathematicians will not find their knowledge useless here, and students will not be backward in following the footsteps of such men as Laplace, Stokes, Kelvin, von Helmholtz and Rayleigh. The tendency towards the separation of pure mathematics from their applications to physical problems has already been arrested. The future progress of Hydrodynamics appears to demand a closer union of these two branches of science.

ERNEST W. BROWN.
HAVERFORD COLLEGE.

BOTANY AT THE ANNIVERSARY MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

I.

SECTION G was organized Monday noon, August 22d; Dr. W. G. Farlow, President. Regular sessions were held Tuesday morning, afternoon and evening and Thursday morning and afternoon; Wednesday and Friday being given up to excursions. Fifty-six papers were listed and forty-seven were read.

Thursday morning Mr. A. B. Seymour, on behalf of the Committee on Bibliography, appointed at the Madison meeting, made a report of progress, which dealt principally with the question of subject arrangement. On motion of the Secretary, the Section directed the Committee to include Bacteriology in the list of subjects covered by this Bibliography.

The large number of papers and the limited time prevented full discussion in many instances. Numerous excursions also interfered more or less with the regular work of the Section, but these afforded much pleasure to all who could take part in them and were not least of the Boston attractions.

Visiting botanists were very hospitably entertained, and altogether the Boston meeting was exceedingly pleasant and profitable.

The following abstracts have been prepared with much care, in most cases from the authors' MSS. or abstracts, and it is to be hoped that they are reasonably free from errors, and ample enough to give the many who could not be present a clear idea of what was said and done.

The Carposporic Type of Reproduction of the Rhodophyceæ. BRADLEY M. DAVIS.

RECENT investigations in this field of research show a tendency to depart from the teachings of Fr. Schmitz. These were characterized by the assumption of a second act of fertilization in the Rhodophyceæ exhibited in the phenomenon of fusion between auxilliary cells and filaments or processes put out by the carpogonium. The speaker described studies of his own upon *Champia*, showing their divergence from the doctrines of Schmitz, and followed with a more general discussion of the peculiar conditions found here, expressing himself as in sympathy, in the main, with the recently published views of Oltmann. All evidence at present points to the probability that the cell-fusion phenomenon following the development of the carpogonium is associated with and the result of nutritive functions. The entire group of Rhodophyceæ is so pe-

culiar that any attempt to establish a general type of reproduction is fraught with great danger.

The Comparative Morphology of the Pistils of the Ranunculaceæ, Alismaceæ and Rosaceæ. Ernst A. Bessey.

The uni-ovulate pistil in the Ranunculaceæ originates as an open leaf in whose axil grows a mass of cells from the receptacle forming one side of the cavity of the pistil whose other sides are formed by the laminæ and by the curved distal portion of the carpel. Into this cavity grows a median ovule from the axillary mass of receptacular cells. *Sagittaria* and *Alisma* have practically the same structure, except that the ovule in the latter grows directly from the receptacle instead of from an outgrowth of it. *Potentilla* and *Fragaria* show a course of development very similar to the foregoing; an open pistil is formed, but the ovule, instead of growing from the receptacle, grows from the thickened edge of one or the other of the laminæ. This similarity of development apparently supports that system of classification of the Angiosperms, in which there are three diverging lines of development having a common origin, one with the Alismaceæ first, being the Monocotyledonæ, the two others forming the Dicotyledoneæ, one with the Ranunculaceæ lowest being the Thalamifloræ and passing up to the Heteromeræ and to the Bicarpellatæ, the other with the Rosaceæ lowest being the Calycifloræ and passing up to the Inferæ.

Origin and Homologies of Blepharoplasts. Herbert J. Webber.

The new features emphasized by the author in this paper were as follows: The blepharoplasts in *Zamia* arise *de novo* in the cytoplasm of the generative cell, as previously described by him in the case of *Ginkgo*. They appear first as minute bodies with a few kinoplasmic filaments centered upon them. At this time no differentiation into outer membrane and interior contents can be distinguished. As they increase in size the radiating filaments become more abundant and an outer membrane becomes plainly differentiated.

In the bursting of the blepharoplast to form the spiral cilia-bearing band of the spermatozoid the first change, other than increase in size, is distinguishable in an early prophase of the division of the generative cell. The vacuolated contents of the blepharoplast begin gradually to contract away from the outer membrane, which meanwhile increases in size. When the division has reached the metaphase the contents have become contracted to a very small body, and the outer membrane, which has become considerably extended, is shown in section to be broken into numerous segments or plates. The disappearance of the central nucleolus-like contents seems to be correlated in some way with the growth of the outer membrane. Appearances suggest that it is utilized as food matter in the growth of the membrane. In the next stage which the writer has studied, an early telephase, the blepharoplast is represented by numerous round or oblong granules grouped in a somewhat irregular spherical mass, which stain the same as the outer membrane of the blepharoplast in the preceding stage. It would seem that the outer membrane of the blepharoplast breaks up into numerous segments which assume a roundish form and become crowded together into a spherical mass through the action of the cytoplasm.

In a late telephase a slender membrane can be discovered protruding from this mass of granules and bending toward the nucleus. As the development advances, the membrane grows in length and width, and the granules meanwhile gradually arrange themselves along one side and decrease in number. During the further development

of the membrane the granules gradually disappear and apparently either unite directly to form the membrane or are absorbed through its growth. Some preparations give evidence that the granules fuse together to form the membrane, and the writer is inclined to this interpretation of the phenomena presented.

The further stages in the elongation of the membrane into the cilia-bearing band of the antherozoid have been described by the writer in another place.

The Blepharoplast in the Spermatogenesis of Marsilia. DR. W. R. SHAW.

IN the development of the male prothallia of *Marsilia vestita* no blepharoplasts or other centrosome-like bodies are found in any of the six cell divisions or resting stages preceding the formation of the primordial spermatogenous cell, 'central cell,' of each of the two antheridia; nor are any such bodies found in that cell or during its division. The first appearance of centrosome-like bodies is in the spindle poles during the telephase of the second division of the spermatogenous tissue. After this division is complete, *i. e.*, in the 'grandmother cells' of the spermatids, each of these bodies grows into a pair of *blepharoplastoids* which increase in size. They remain together and move into the other region of the cytoplasm, and disappear during the following cell division. During the anaphase or telephase of this division there are formed, at the poles of the spindle, new bodies. After the division, *i. e.*, in the 'mother cells' of the spermatids, each of these bodies develops into a pair of *blepharoplasts*. The blepharoplasts separate, at the same time increasing in size, and move to opposite poles of the cell, where they remain throughout the last division leading to the formation of the spermatids. The further development closely resembles that of the blepharoplasts in the spermatozoids of the cycads.

Observations on the Relative Moisture Content of Fruit Trees in Winter and in Summer. PROFESSOR C. S. CRANDALL.

FROM samples of trunks and branches of apple trees taken January 15th and 16th and August 3d, and thoroughly air-dried, with careful weighing before and after, the author concludes that, as grown under Colorado conditions at least, there is hardly an appreciable difference between the summer and winter moisture.

In the discussion which followed, Professor D. T. MacDougal stated that the water content in the trees in August was practically the winter content, the separative layer in the leaves having probably already begun to form, and that for the determination of the *summer moisture* samples should have been taken sixty to seventy days earlier.

Some Observations bearing upon the Symbiotic Mycoplasm Theory of Grain Rust. PROFESSOR H. L. BOLLEY.

MANY facts and arguments go to show that Erickson's hypothesis has not been established, and is not necessary to account for the first appearances of grain rust. The author finds that uredo and æcidiospores (*Aec. berberidis*, *U. rubigo-vera* and *U. graminis*) germinate readily when placed under favorable conditions; that, when other conditions are the same, shaded, spindling plants are as much subject to infection as those grown in the sunshine, and, finally, that when oats and wheat were grown in rust-proof cages there were no infections whatever, although close outside and for miles around every plant bore numerous pustules.

Some Unique Examples of Dispersion of Seeds and Fruits. PROFESSOR W. J. BEAL.

A POPULAR account, illustrated by specimens. To be printed in full in *The American Naturalist.*

Starch Distribution as affected by fungi. DR. BYRON D. HALSTED.

The leaves to be studied are placed in 50 per cent. alcohol to remove the chlorophyll, and are then passed into a weak solution of iodine. In a few hours, if the leaf is thin, the starch responds to the iodine test and is located by the blue color it assumes. Tested in this way the parts of plants which are attacked by fungi, *e. g.*, leaf spots due to Peronospora, Cystopus, Synchytrium and Puccinia, and galls due to Cystopus, Gymnosporangium, Plasmodiophora and Rhizobium show a marked accumulation of starch. The starch is either in the discolored spot or immediately around it. This distribution is very striking in the leaves of Podophyllum attacked by *Puccinia podophylli*, starch being abundant in the well-defined areas, while none was met with beyond the small veins that served as boundaries to the infested portions. The galls of peach roots, the cause of which is still unknown, are gorged with starch. Turnips affected by club root carry a large amount of starch, while the healthy tissue is comparatively free from it. In like manner, the root tubercles of the Leguminosæ contain much starch, while the roots which bear them are comparatively free from it.

The Effect of an Atmosphere of Ether upon Seeds and Spores. Dr. C. O. Townsend.

In order to determine the effect of ether upon the germination of seeds and spores a series of air-tight damp-chambers holding one litre were prepared. After soaking the seeds for twenty-four hours in pure water they were transferred to the damp-chambers which contained respectively 1, $2\frac{1}{2}$, 5 and 10 cc. of ether dissolved in 100 cc. of water. One chamber was left free from ether for comparison. It was found that 1 cc. of ether hastened the process of germination slightly, but the subsequent growth of the seedlings was somewhat retarded by the action of the ether. In the chambers containing $2\frac{1}{2}$ and 5 cc. of ether the process of germination was retarded. The amount of retardation varied from a few hours to several days, depending upon the strength of the ether atmosphere and upon the kind of seed used. An atmosphere containing 10 cc. of ether prevented the seeds from germinating. If the seeds were removed from this strong atmosphere of ether at the end of from seven to ten days, and placed under favorable conditions, they germinated as readily as if they had not been placed in the ether atmosphere. On the other hand, if the seeds remained in the strong atmosphere of ether two weeks they seemed to lose their vitality.

The influence of an ether atmosphere upon spores was investigated by placing the spores upon plates of gelatine containing 10 cc. of sugar. These plates were then placed in damp-chambers containing $\frac{1}{10}$, $2\frac{1}{2}$, 5 and 10 cc. of ether, one chamber remaining free from ether for control, the spores in the atmosphere containing $\frac{1}{10}$ cc. of ether germinated a little earlier than did those in the ether-free atmosphere, while those in the stronger atmospheres of ether were retarded in germinating. Not only did the spores continue to live in the atmosphere containing 10 cc. of ether, but they were able to germinate in about ten days without removing from the ether atmosphere. The amount of retardation was found to depend upon the strength of the ether atmosphere and upon the kind of spores.

The Toxic Action of a certain Group of Substances. Dr. Rodney H. True.

Zoologists and botanists have long regarded certain salts, of which sodium chloride and potassium nitrate are commonly-used representatives, as being essentially lacking in toxic action and operative only through their osmotic activity. In this study cane sugar was assumed to be a purely osmotic agent, and the concentration

in which the majority of a number of filaments of Spirogyra survived, after an exposure of twenty-four hours, was regarded as the measure of the osmotic action which the alga can endure. This boundary concentration was found to lie at 0.75 gram molecules per litre. Assuming the action of the other substances studied, viz.: glycerine, potassium nitrate and sodium chloride, to be likewise purely osmotic, the boundary concentrations were calculated to lie as follows: glycerine, 0.75 gram molecules per litre; potassium nitrate, 0.45 gram molecules; and sodium chloride, 0.47 gram molecules. The actual boundary concentrations found by the method used for sugar were as follows: glycerine, $\frac{1}{2}$ gram molecules per litre; potassium nitrate, $\frac{1}{16}$ gram molecules; and sodium chloride, $\frac{1}{10}$ gram molecules. The concentrations producing plasmolysis were as follows; glycerine, $\frac{1}{3}$ gram molecules per litre; potassium nitrate, $\frac{1}{4}$ gram molecules; sodium chloride, $\frac{1}{4}$ gram molecules; and sugar, $\frac{1}{3}$ gram molecules. The boundary concentration for glycerine lies at a concentration greater than that of the cell sap, and probably causes death by osmotic action. The boundary concentrations of potassium nitrate and sodium chloride lie much below the point having the same osmotic value as the cell sap, and much below the boundary concentration calculated on the assumption of purely osmotic action. Consequently, potassium nitrate and sodium chloride exert a pronounced toxic influence upon Spirogyra.

Types of Vegetation on the Florida Keys. C. L. POLLARD.

PAPER, partly ecological, partly floristic. Six distinct belts or zones of plant life are recognized. The main part of the paper consisted of an enumeration and discussion of the characteristic species of these belts, as observed during a six weeks' visit in the spring of 1898.

Potato as a Culture Medium with some Notes on a Synthesized Substitute. DR. ERWIN F. SMITH.

THE length of this report makes it seem best to relegate the abstracts of my own papers, which are long and rather technical, to the forthcoming volume of the Proceedings of the Association, where they may be found by those who desire to consult them.

Some Little Used Culture Media, which have proved valuable for Differentiation of Species. DR. ERWIN F. SMITH.

The Temperature and Transpiration of Desert Plants. PROFESSOR D. T. MACDOUGAL.

THE author reported data taken from field notes made in the desert of the Little Colorado River in 1898.

The temperatures of the bodies of succulent plants in this region at midday is often as high as 45° C., the critical point of protoplasm, and 6° to 8° higher than the surrounding air. The enormous transpiring force exerted is met by the high-soil temperature, which in volcanic sand reaches 40° to 42° C. around the absorbing roots. The actual amount of water used by desert plants, when furnished with an unlimited supply, is very small, however. By use of a potometer it was found to be not more than one-tenth as much as from a corresponding mesophyte of temperate latitudes. Desert plants are, therefore, incapable of great transpiratory or absorptive activity.

The Leaf-spot Disease of the Apple, Phyllosticta pirina, and Several Unrelated Forms occurring therewith. PROFESSOR WM. B. ALWOOD.

PAPER records common occurrence and life cycle of *Phyll. pirina* Sacc. and the occurrence therewith of three apparently unrelated forms, viz.: *Sphæropsis malorum*, *Hendersonia mali*, and an undetermined species.

Notes on Some Diseases of Southern Pines. Hermann von Schrenk.

Of the numerous fungous parasites of the southern pines *Trametes pini* is one of the most destructive. It attacks older trees, entering through a knot and causing decay of the heartwood up and down the trunk. The mycelium dissolves portions of the wood fibers, at first changing them to cellulose. After a time the solution stops, and the wood then appears full of holes with a white lining, the holes separated by lamellæ of apparently sound wood. The 'local' action of the mycelium is characteristic of numerous fungi destroying wood. The wood not destroyed seems to be protected against the attacks of the fungus ferment by some substance which infiltrates into the wood cells. In the wood attacked by the mycelium of *Trametes pini*, a compound allied to the humus compounds was found, giving the wood a brown color. It is possible that this may be one of a class of preventive substances.

Another prevalent disease is due to *Trametes radiciperda*, which enter the trees through the roots. The mycelium passes up the trunk, causing decay similar to that of *Trametes pini*. It was found destroying numerous trees of *Pinus palustris* and *P. echinata*.

A remarkable Increase in Size of Leaves of Kalmia angustifolia apparently due to Reduction of Light. Professor W. J. Beal.

On May 14, 1898, before flowering, some plants with a little soil attached were removed from an open place at Grayling, Michigan, where they are common, and transferred to the State Agricultural College, 130 miles south, where they were planted in muck, kept wet, and screened about 8 feet from the ground with laths and the leaves of trees, which cut off at least one-half of the light during the middle of the day and a larger per cent. morning and evening. On July 28th the three branches here exhibited were cut from the plants and pressed till dry. The largest leaf on each branch (measured when dry) is 37×17, 45×16 and 47×15 millimeters, while the largest evergreen leaf (growth of the previous year) is 22×9, 25×6 and 25×6 millimeters, *i. e.*, a leaf of this year easily has a surface four times that of a leaf of last year. Similar results were obtained with *Kalmia glauca*. No control plants were retained.

Half Shade and Vegetation. Dr. Byron D. Halsted.

Experiments were made in shading various truck crops with frames of lath placed upon supporting stakes. The space between the lath equalled the width of the lath, so that one-half of the direct rays were intercepted. The temperature under the frames (monthly averages of daily observations) was lower than in the full sun, as follows: May, 4°; June, 4,2°; July, 6.5°; August, 7.7°; September, 16.6°. In general the shade retarded germination, noticeably of the first crop of lima beans, but the opposite was true for the second, or mid-summer planting. All root crops, such as turnips, carrots, potatoes, had a larger leaf surface in the shade, but the roots were smaller. Shade improved the salad crops, lettuce, spinach and Swiss chard. The crop most improved of all by shade was celery. With seed, or fruit-producing crops, such as beans, peas, egg-plants, tomatoes, cucumbers, the time of blooming was retarded and the period of fruitfulness materially prolonged. The foliage is of a deeper green in the shade than in the open. In carrots there is a strong tendency to broaden the dissected portions; in short, in the various crop plants there is an attempt to increase the size of the blade of the leaf. The behavior of the plants was also dissimilar. For example, the exposed bean plants in

the brightest and warmest days made all sorts of shifts to reduce the exposure, changing the position of the leaflets from morning until evening, while in the shade the leaflets hung out horizontally and were not noticeably heliotropic. The leaves in the shade were usually much thinner than those grown in full exposure. The record of this fact was made by sunprints of the leaves themselves, the shaded ones invariably being less opaque than the ones grown in the sun. Numerous sunprints were shown to establish the fact of the lesser density of the shade-grown leaves. A study of wild plants along the same lines was made in a wood lot and adjoining clearing. The cinnamon fern (*Osmunda*) was noted in particular to have graceful, drooping leaves in the wooded land, while in the open the fronds were nearly upright. The leaflets of this fern grown in the shade were .098 millimeters in thickness, while in the cleared land the thickness was .258 millimeters. Many other differences as to hairiness, color of stems, etc., were noted.

Influence of Wet Weather upon Parasitic Fungi.

DR. BYRON D. HALSTED.

THIS paper records a striking parallelism between excessive rainfall and the abundance of fungi. May of the present year was remarkably wet, and the following June brought an abundance of parasitic fungi, rust of hollyhock, cedar and mandrake; smut of spring lily, wheat and oats; and many other. The peach-leaf curl fungus was common everywhere. The year 1889 was noted for its wet summer and also for the destruction of potatoes by the rot. The year, since then, nearest like 1889 was 1897, when again July was phenomenal for heavy precipitation, it being 10.19 inches in 1889 and 11.42 in 1897. Last season was like that of 1889 in the outbreak of the *Phytophthora* in the potato fields, causing the wholesale rotting of the tubers. The *Phytophthora phaseoli* Thaxter was discovered in 1889 and reappeared destructively last season. The records of the New Jersey Experiment Station show that in both of the years mentioned there was much black rot (*Physalospora Bidwellii* Ell.) of the grapes and rust (*Gymnosporangium macropus* Lk.) in the apple orchards. In 1894 the growing season opened with a wet May and closed with a rainy September. There were long periods of cloudy weather, and often it was hot and showery. It was this year that witnessed the unprecedented outbreak of the fire blight of apple, quince and pear.

In 1896 there was a rainy June and July, and during this period the asparagus rust (*Puccinia asparagi* DC.) made its appearance in the eastern United States to an alarming extent, and last year it was in even greater abundance. There are not sufficient data for safe and substantial generalizations, but heavy rainfalls in spring seem to induce rusts in grains and orchard and garden crops, and the fire blights of fruit trees. Mid-summer precipitations favor the decay of fruits, particularly the stone fruits, and the rotting of potatoes. Rainfall does not express all the meteorological conditions that need to be taken into consideration in this connection.

In the discussion Dr. Smith noted that peach-leaf curl, *Taphrina deformans*, was reported to the United States Department of Agriculture in the spring of 1898 from a great many places throughout the country, causing more complaint than at any time during the previous 12 years.

The Botanic Gardens of Buitenzorg, Java.

DAVID G. FAIRCHILD.

THIS was a popular lecture, illustrated by about forty lantern slides. The speaker announced that one of the main objects of the lecture was to interest Americans in the establisment of a stipendium of $1,000 by means of which an American botanist

or zoologist could visit the gardens every year and spend from six to eight months in study there. Slides were exhibited showing the remarkable extent of the gardens, their adaptability to the cultivation of any tropical plant, their especially rich collection of palms, Pandanus and ficus trees, their many new and well equipped laboratories, the herbarium and library. Photographs of the native gardeners and collectors, which form such an important part of the gardens, were also exhibited. The attempt was made to give an idea of the wealth of biological, both botanical and zoological, material which was to be found there, and stress was laid upon the importance of laboratory facilities in the tropics. The beauties and charms of Dr. Treub's mountain garden at Tjibodas were illustrated, and botanists and zoologists were exhorted to make the effort to see this unparalleled hermitage of tropical biology. The remarkable growth of the gardens in recent years, and the attention and stipendia which Dr. Treub has attracted to it, made it seem probable in the speaker's mind that Buitenzorg will be soon the International Biological Institute of the Tropics, as Naples is the International Marine Biological Institute.

Notes on the Strand Flora of Florida. HERBERT J. WEBBER.

THIS was a popular lecture illustrated by fifty lantern slides. The east coast of Florida as far south as Biscayne Key (latitude about 26° 75′) is lined with low sand dunes ranging from ten to thirty feet in height. The coast line is being gradually extended by the deposition of sand, which is probably carried southward from the Cape Hatteras region. In almost every peninsula and island along the coast of this portion of the State numerous ridges or series of ridges several hundred feet apart, evidently lines of old dunes, run parallel with the coast and mark various stages in its recession. The deposition of sand carried by the waves forms shoals or banks 200 to 400 feet from the shore. This gradual piling-up under the action of currents and waves evidently goes on until the bank becomes sufficiently high to protrude from the water at low tide, and then the wind and waves throw it up still higher. Where these banks remain above water for several months certain dune-building plants, such as *Sesuvium portulacastrum*, *Iva imbricata*, *Cakile maritima*, *Panicum amarum*, etc., spring up, and as they grow the wind banks the sand around them, thus forming a low lines of dunes, to which the sand washed up by the waves is being continually added.

The formation of new lines of dunes in front of the old ones, now lining the shore, plainly shows the gradual recession of the coast line. The dunes now lining the coast at Daytona consist of two parallel ridges of equal height, close together (50 to 100 feet apart), and in some places of a third line in various stages of formation. After the dunes reach the usual height vegetation covers their surface, and thereafter the wind has little effect on them, except gradually to increase their width and height.

Uniola paniculata is the main sand-binding grass to be found on the top and seaward side of the first line of dunes. Here it forms almost 75 per cent. of the vegetation, and this zone may, therefore, be properly termed the *Uniola* formation. Species of *Spartina*, *Panicum*, *Ipomœa*, *Yucca*, *Serenoa*, *Croton*, *Euphorbia*, *Opuntia*, etc., are also commonly found mingled with *Uniola*, but only to a small extent. At the base of the main line of dunes a number of plants grow naturally and serve as dune builders. The principal ones of these are *Pancium amarum*, *Ipomœa pes-caprœ*, *Batatas littoralis*, *Iva imbricata*, *Cakile maritima*, etc. These are also found to a greater or less extent on

the tops of the main dunes and in salt marshes, but play their most important rôle in dune building. Growing in bunches, as they do, they catch and hold the sand which is continually drifting about at the base of the dune, and in the course of time banks of increasing height are formed about them until a second line of dunes, nearer the water, is formed.

The islands and keys along the mainland from Biscayne Bay to Key West are of coral formation. Here the vegetation, which is mostly tropical, differs totally from that of the sand dunes above described; the 'mangrove formation,' so well described by Schimper and Karsten, being the most common. Probably the most interesting strand plant of the open beaches in this section is *Agave decipiens*, which is widely distributed along the strand of tropical Florida, being disseminated almost wholly by bulblets produced in place of the flowers. These bulblets are not injured by extended soaking in salt water. They are usually carried here and there by the tide, are thrown up on the beach by the waves, take root, and produce new plants.

The islands along the west coast of Florida are largely of mangrove formation. Shoals are formed by the action of the water, and on these the mangrove finally takes root, and the roots catch and retain sea weeds and other floating matter, thus gradually building up a humus earth around the trees. On the seaward side these trees interrupt the waves, and thus in time a bank of shell is thrown up, and where the forces continue for long periods more or less extended islands are formed. In their simplest form these consist of a low ridge along the seaward shore, composed mainly of fragments of shell thrown up by the waves, and a mangrove swamp on the landward side. In time the interior of the forming island becomes too high for mangrove vegetation, and the latter gradually gives place to the typical hammock vegetation, that is, live oak, palmetto, etc., which in Florida usually covers all soils rich in humus. The typical islands along this section of the coast, therefore, are composed of a central tract of hammock bordered on the seaward side by a belt of sterile shell land from 100 to 600 feet wide and on the landward side by a mangrove swamp.

The most characteristic plants of the mangrove formation are *Rhizophora mangle*, *Avicennia nitida*, *Laguncularia racemosa*, etc. The most characteristic of the shell belt on the seaward side are probably *Forestiera porulosa*, *Myrsine rapanea*, *Coccoloba uvifera*, *Juniperus virginiana*, etc. Here, as on the east coast, *Iva imbricata*, *Cakile maritima*, *Ipomœa pes-caprœ*, etc., grow abundantly on the margin of the water.

Notes on the relative infrequency of Fungi upon the Trans-Missouri Plains and the adjacent foothills of the Rocky Mountains. PROFESSOR C. E. BESSEY. (Read by title.)

Fungus gardening as practiced by the Termites in West Africa and Java. DAVID G. FAIRCHILD and O. F. COOK.

IN the absence of Mr. O. F. Cook the matter relating to Javanese Termites alone was given. Mr. Fairchild called attention to the presence of three species of Termites as yet unidentified which are fungus growers. The nests of these insects are composed of two parts: (1) the earthen-walled galleries, consisting of tunnels in every direction through the earth or even above it, made by cementing together mouthfuls of mud which the workers of these colony-producing insects deposit like brick layers on a wall; and (2) the wooden maché combs which form the gardens of the Termites, which are built up of wood particles that have passed through the bodies of the workers. These combs are miniature labyrinths, the walls of the passages being covered, top, bottom and sides,

with a microscopic sward of fungal hyphæ, which give to it the appearance of a neatly-cut lawn. Rising scattered over this lawn are innumerable cabbage-shaped bodies from microscopic beginnings up to sizes as large as that of a pin head. These bright, almost pearly lustrous bodies, which give to the galleries a most fairy-like appearance, are the compound conidiophores of a species of fungus, presumably a hymenomycete, although cultures of the spores of the mature hymenomycete found growing from the combs failed to establish a connection between the mature form and the cabbages, or more properly termed *cauliflowers*, since they, like the cauliflower, contain organs of propagation.

Photographs showing the nests of three distinct species of Termite possessing three distinct forms of cauliflowers were shown, and attention was called to the fact that these three species of Termite, although building their nests side by side, often in contact with each other, begin immediately a deadly warfare with each other whenever the workers or soldiers, which latter possess large shear-like mandibles, of one nest trespass upon the domains of a neighbor. Unlike the wars of the real ants, in which, as Lubbock has shown, each nest is a unit and its inhabitants war with the inhabitants of any other nest of the same species, the wars of the Termites are race or species affairs. Termites of one species collected in Buitenzorg, Java, and taken to Tjibodas, some 15 or more miles distant, showed the friendliest relations with individuals of the same species collected there, while individuals of different species, though coming from nests actually almost touching each other in the same hill, fought in the arena of an inverted watch glass, invariably, until one or the other was killed, and often mutilated in a most shocking manner. The fights of these Termites offer unrivalled opportunities for a study of the psychology of these lower animals. The fact that these Termites do actually live upon the 'cauliflowers' of the fungi found growing in their nests was proved by repeated examinations of their stomachs, in which the remains of characteristic conidiophores and half-digested conidia were discovered. The extreme sensitiveness of the insects to light prevented direct observations being made as to their method of eating the cauliflowers.

The three forms of conidiophores were remarkably distinct mycologically, and yet the general effect of the cauliflowers made up of these conidiophores grouped together in masses was much the same. Drawings illustrative of these differences were shown.

Erwin F. Smith,
Washington, D. C. *Secretary.*

(*To be concluded.*)

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*ACTA OF THE INTERNATIONAL CONFERENCE ON SCIENTIFIC LITERATURE.**

OPENING MEETING, TUESDAY, OCTOBER 11

1. Professor Darboux moved that Sir John E. Gorst be the President of the Conference. The vote having been unanimously accepted—

2. Sir John Gorst took the chair and welcomed the delegates. It was then resolved:

3. That Professor Armstrong be the Secretary for the English language.

That Professor Korteweg be the Secretary for the German language.

That M. La Fontaine be the Secretary for the French language.

4. That the Secretaries, with the help of shorthand reporters, be responsible for the *procès verbal* of the proceedings of the Conference in their respective languages.

5. Professor Foster read out the names of delegates appointed to attend the Con-

* From *Nature*; a copy has not as yet been received by Science.