second, the preparation of the colloidal silicic acid at such a concentration that in its pure condition it will remain uncoagulated for about ten days. If the preparation is much more dilute than this it may fail to coagulate even with the good soils, while if it is much more concentrated it coagulates, presumably from mechanical reasons, almost instantly upon adding soil samples from either good or poor spots.

Whether these results may have a practical bearing upon the management of the refractory soils in question can be determined only by rather extensive field experiments. It is believed, however, that the action of calcium sulphate (gypsum) will improve these soils in the field as it has in the laboratory and that the crop-producing power of the poor areas may then approach that of the good areas.

Karl F. Kellerman
Bureau of Plant Industry,
Washington, D. C.

THE BOTANICAL SOCIETY OF AMERICA

The annual meeting of the Botanical Society of America was held at the University of Minnesota, Minneapolis, Minn., December 27 to 30, 1910.

The officers for 1911 are:

President—W. G. Farlow, Harvard University.

Vice-president—A. W. Evans, Yale University.

Treasurer—Arthur Hollick, New York Botanical Garden.

Secretary—Geo. T. Moore, Missouri Botanical Garden.

Councilors—F. E. Clements, University of Minnesota; C. L. Shear, Bureau Plant Industry; R. A. Harper, University of Wisconsin.

The following associate members were elected to full membership: O. W. Caldwell, University of Chicago; E. W. Olive, South Dakota College of Agriculture; R. H. Pond, Texas Agricultural Experiment Station; A. D. Selby, Ohio Experiment Station; M. B. Thomas, Wabash College; and the following botanists were elected to associate membership: Harley Harris Bartlett, Bureau of Plant Industry; Frederick K. Butters, University of Minnesota; H. L. Bolley, North Dakota Agricultural College; Merritt Lyndon Fernald, Gray Herbarium; Douglas Houghton Campbell, Stanford University; William Crocker, University of Chicago; Abel Joel Grout, Curtis High School, New York City; Hans Th. Guessow, Dominion Botanist, Ottawa, Canada; Frederick De Forest Heald, University of Texas; E. C. Johnson, U. S. Department of Agriculture; Frank D. Kern, Purdue University; C. H. Kauffman, University of Michigan; Ivey Foreman Lewis, Randolph-Macon College; Emile P. Mienecke, Bureau Plant Industry; Raymond J. Pool, University of Nebraska; Chas. V. Piper, U. S. Department of Agriculture; Leigh H. Pennington, Syracuse University; Carl Otto Rosendahl, University of Minnesota; Paul C. Standley, National Museum; Fred J. Seaver, New York Botanical Garden; Josephine E. Tilden, University of Minnesota; Chas.-Edw. Amory Winslow, College of City of New York; Herbert Hice Whetzel, Cornell University; E. Mead Wilcox, University of Nebraska.

The symposium on "Some Aspects of Plant Pathology" was held at the Agricultural College on Thursday and participated in by Professor L. R. Jones, who spoke on "The Relation of Plant Pathology to Other Sciences"; Professor B. M. Duggar, who spoke on "Physiological Plant Pathology," and Professor E. M. Freeman, who spoke on "Resistance and Immunity in Plant Diseases." These papers, with the discussions, will be published and reprints distributed to the members of the society.

At the close of the dinner for botanists, the conference on botanical teaching was held, in which Professor C. E. Bessey, O. W. Caldwell, F. E. Clements, J. M. Coulter, R. A. Harper and F. C. Newcombe participated. This discussion will likewise be published and distributed to the members.

Following are abstracts of the papers presented at the scientific sessions held on Wednesday and Friday afternoon.

Light as a Formative Factor in the Habit of Growth of Asparagus plumosus: Frederick C. Newcombe, University of Michigan.

The shoots of this house plant grow erect for a time, and then turn their tips to the horizontal position. Although this horizontal bend is geotropic, as shown by the klinostat, the process of bending is profoundly influenced by the presence of light. The new shoots which start up from subterranean buds are indefinitely nourished in the dark by the older shoots left in the light.

If a new shoot, a day before the bend was to be made, were covered by an opaque inverted cone of paper, the horizontal bend would occur without noticeable change from the normal. If the light were excluded two days before the time for the

bending, the time of bending would be delayed. Still greater delay in bending would follow an earlier covering.

If, now, a subterranean bud which has started to unfold be covered and caused to grow without ever being in the light, the period of erect growth will be greatly prolonged, the horizontal bend will never be complete, but, instead, there will be nutations up and down through an arc of usually 20° to 50°, these nutations lasting indefinitely.

This behavior may fall under one of two hypotheses: (1) etiolation disarranges the normal processes; (2) there is a weak inheritance of diageotropism which needs the supporting influence of light induction to give the usual form to the plant.

The Relation of Transpiration to the Water-content of Leaves in the Ocotillo: FRANCIS E. LLOYD, Alabama Polytechnic Institute.

During the summer of 1910 at the Desert Botanical Laboratory comparative volumetric and gravimetric data were obtained for transpiration in the ocotillo (*Fouquieria splendens*) during a period of twenty-four hours. The moisture-content of the leaves of this plant was also determined for a similar period on two occasions. The behavior of the stomata was determined by the measurement of 300 for each of six hours during the twenty-four. The following conclusions are drawn.

Comparative volumetric and gravimetric data show that, in the ocotillo, the ratio between the intake and outgo of water is not a constant, but that, aside from changes of secondary nature, the outgo is greater during the day than the intake. The reverse relation obtains during the night.

The amount of water relative to the dry weight of the leaves decreases till some time in the earlier part of the afternoon. After this time it increases till about four A.M.

This change in water content of the leaf explains at least in part the discrepancy between the income and outgo of water.

The decrease of water in the leaf occurs during the period of opening of the stomata. These organs are therefore not closely regulatory of the rate of transpiration.

Relation of Certain Fungi to Nitrogen Fixation: B. M. DUGGAR and LEWIS KNUDSON, Cornell University.

As a result of comparatively recent investigations in Europe and America it has been reported that many fungi growing in solution cultures have a power of "fixing" atmospheric nitrogen.

It has seemed necessary to determine by more extensive experiments the amount of this fixation by fungi from diverse habitats grown under a variety of conditions. The following fungi were employed in two series of experiments involving about 400 flask cultures: *Coprinus comatus, Dœdalia Quercina, Polyporus sulphureus, Trichoderma lignicola* and *Aspergillus niger.*

The culture media employed consisted of (1) a nutrient salt solution, such as used by other investigators, to which was added, in some cases, known amounts of combined nitrogen, and variable quantities of sugar; (2) filter paper moistened with preceding solutions; (3) quartz or graphite moistened with nutrient solutions; decoctions of mangel-wurzels; (5) dead leaves which were dried, powdered and moistened; (6) dried leaves, as in the preceding, with varying quantities of sugar; (7) decayed leaves or leaf mould; (8) leaf mould with varying quantities of sugar, and (9) leaf mould well aerated by including with it balls of filter paper. The nitrogen determinations indicate that there is no fixation of atmospheric nitrogen except possibly in certain cultures of *Aspergillus niger.* In many cases there is a nitrogen loss which is to be accounted for, usually, by the production of N_2.

In a third series of experiments additional fungi have been tested, and the experiments of other investigators duplicated. In the light of the results reported general indications were given respecting the possibility of nitrogen fixation by this group of organisms.

Cryptomeric Inheritance in Onagra: C. STUART GAGER, The Brooklyn Botanic Garden.

Reference was made to an abnormal plant of *Onagra biennis* that appeared in a pedigreed culture following exposure to radium rays of the ovule employed in producing the plant. The plant possessed two primary shoot-systems (rosettes and subsequent cauline stems) of equivalent value, but manifesting entirely unlike morphological characters. Photographs were shown, and various possibilities were suggested as to the cause or causes of the anomaly. That the effect was due to the exposure to radium rays was held to be possible, though not conclusively shown. The antecedent history of the plant, and the fact that hybrids between the two unlike halves manifested, in the F_1 and F_2 generations, the characters of only one of the parent shoots, was interpreted to emphasize the fact, already recognized, that the inheritance of a character and its expression are two quite different phenomena.

Sex Latency in the Gametophyte of Onoclea struthiopteris: F. C. Newcombe. University of Michigan.

The experimental work of Miss Wuist on the sex of the gametophyte of *Onoclea struthiopteris* showed, as published last year in the *Botanical Gazette*, that the female gametophyte may be made to give rise to antheridia. Miss Wuist's later work has shown that spores of the same species, which formed at first narrow ameristic plants bearing antheridia, subsequently developed heart-shaped proliferations at their apices bearing archegonia. To stimulate the outgrowth of the archegonia-bearing proliferations, the antheridia-bearing gametophytes were transferred from humus soil in pots to a Knop's solution, where they produced the meristic, heart-shaped, secondary gametophytes with their archegonia.

Reversible Sex-mutants in Lychnis dioica: George Harrison Shull, Station for Experimental Evolution, Carnegie Institution.

Hermaphrodite mutants were discovered in 1908 in cultures of *Lychnis dioica*, and the following year a report was made on the first generation cross of these with females and normal males. The present paper presents data from more than one hundred families in which these hermaphrodites were used, most of these families representing the second generation from the original hermaphrodites. It is shown that the hermaphrodite character is a modified male condition, not due to the presence of an independent modifying factor which was suggested by Correns, but obviously a modified condition of the male-producing gene itself. The hermaphrodite character is not transmitted by the egg, but only by the sperm. Among the offspring of these hermaphrodites have appeared a few normal males in such small proportions (a small fraction of one per cent.) that they can only be considered male mutants, since they also breed true to their male character. The appearance of hermaphrodite mutants in families produced from normal males and the appearance, in turn, of male mutants in families produced by hermaphrodites, suggest reversible modifications of a single gene rather than the addition of a gene to those previously present, and a subtraction of a gene from them. These results may thus have an important bearing upon the "presence and absence" hypothesis.

An Isolated Prairie Grove and its Ecological Significance: Henry Allan Gleason, University of Michigan.

Bur Oak Grove is located in Champaign County, Ill., and is about one by three miles in size. It is peculiar in being located at some distance from a stream and surrounded on all sides by prairie, while most of the forest tracts in central Illinois are along the larger water courses. The prevailing trees in the grove are *Quercus velutina, Q. imbricaria, Q. macrocarpa, Carya ovata, C. cordiformis* and *Juglans nigra*, with scattered individuals of other species. The variation in the composition of the forest indicates that it migrated into the region from the northeast. The grove is not continuous, but is broken by areas of low ground which contain permanent standing water. On the moraine north of the grove are found some plants which are regarded as forest relics, now growing in the prairie. It is concluded that the whole moraine was formerly covered with forest, which extended also some distance out on either side. Since the introduction of prairie fires this forest has been destroyed, except Bur Oak Grove, which is protected by the standing water against attacks of fire. The more general conclusion drawn is that forests were formerly of much wider extent in Illinois than at present, but it is distinctly stated that the prairies do not owe their origin to prairie fires.

Evaporation in its Relation to the Prairie Problem: B. Shimek, Iowa State University.

The fact that surfaces exposed to the south and southwest in the Mississippi Valley are treeless has been frequently noted. Where changes in topography are abrupt the transition from forest to prairie is likewise abrupt. The prairie plants are essentially xerophytic, the forest plants mesophytic. The former are found upon the surfaces exposed to sun and summer winds, the latter in sheltered places. Field observations on rate of evaporation on treeless and forested areas, made in western and northwestern Iowa, show that it is much greater on prairie surfaces than in the adjacent forest, and materially greater than on contiguous areas which had been covered with forest but are now cleared. This is true even in the vicinity of larger bodies of water. The results of these observations are presented in tabulated form, and are represented by curves. They show that evaporation increases with temperature and velocity of the wind, and that when the temperature is high the fluctuations in evaporation are caused by changes in wind velocity. The bearing of these results upon the prairie problem is discussed.

Structure of Adult Cycad Trunks: Charles J. Chamberlain, University of Chicago.

While the structure of the cycad seedling is

fairly well known, comparatively little attention has been given to the structure of the adult plant, doubtless on account of the difficulty of securing material.

In an adult stem of *Zamia floridana* 5.5 cm. in diameter the zone of vascular tissue was 2.5 mm. in width. In a plant of *Ceratozamia mexicana* with a stem 14 cm. in diameter the zone measured 5 mm. in width. In *Dioon edule* a stem 21 cm. in diameter showed a vascular zone 9 mm. wide. Compared with these narrow zones, the vascular zone in *Dioon spinulosum* is surprisingly wide, reaching a width of 7.5 cm. in a trunk 32 cm. in diameter.

In *Dioon spinulosum* there are definite growth rings but they are not annual, for not more than one ring is formed in a dozen years, or perhaps in twenty. Medullary rays are as prominent as in a dicotyl. *Dioon edule* also shows growth rings but they are not so prominent as in *D. spinulosum*. No growth rings were found in the specimen of *Ceratozamia*.

In none of these specimens were there any zones of wood in the cortex. It is possible that the periodicity which in *Cycas* produces a zone of wood in the cortex, produces in *Dioon* a growth ring resembling the annual ring.

Spruce Burls: HERMANN VON SCHRENK, Missouri Botanical Garden.

The author describes some burls observed in certain parts of Maine and Minnesota on the white spruce. They occur on all parts of an affected tree, either singly or in large numbers on one tree. The external appearance of the burl is described and their internal structure. Attention is called to the formation of diamond-shaped holes, which are probably the result of unequal strains.

The Origin of the Blepharoplast in Polytrichum: C. E. ALLEN, University of Wisconsin.

A dark-staining granule, the center of a system of radiations, appears in the cytoplasm of each cell of the penultimate antheridial generation. In previous cell generations there were kinoplasmic bodies of varying forms whose behavior was definitely related to spindle formation; but no structure that seems genetically related to the centrosome-like body that participates in the final division.

This central body divides; the two daughter granules, each surrounded by an aster, diverge until they lie at opposite sides of the nucleus, and a rudimentary spindle appears between them. The central bodies are conspicuous until about the time of the disappearance of the nuclear membrane; from this time on, they stain less deeply; some of the polar radiations disappear; and, although a granule can usually be recognized at either spindle pole which is probably the central body already described, its identity is often uncertain; and sometimes no such granule is visible.

After cell division is completed, a conspicuous body is again visible in each daughter cell, usually appearing to lie in the neighborhood of the former spindle pole; this body functions as a blepharoplast. There seems no reasonable doubt that the blepharoplast is identical with the previously present central body, which persisted during the division of the mother cell, although the lessened affinity of the central body for stains made it less conspicuous at certain stages.

The Method of Chromosome Reduction: R. R. GATES, Missouri Botanical Garden.

I have previously suggested that in some plants reduction takes place by telosynapsis, and in others probably by parasynapsis. Comparative studies have confirmed this view, but the difference between telosynapsis and parasynapsis is not believed to be of hereditary or phylogenetic significance. Rather is it merely a matter of cell mechanics, long, thread-like chromosomes usually pairing side by side and short ones end to end. The only essential and universal feature of meiosis is the segregation of the members of homologous pairs of whole somatic chromosomes. The function of synapsis is not to bring about a pairing of these homologous chromosomes, because they are paired throughout the sporophyte or soma. Neither is it to effect an interchange of chromomeres or other particles, since the chromosome is considered the unit of morphological nuclear structure; or even of "influences," since this could take place equally well or better in any "resting" nucleus. Synapsis is, therefore, not the final delayed act of fertilization, and is not of fundamental significance in the life cycle. It is, partly at least, explained by the change in the karyoplasmic relation which takes place during synapsis, owing to the fact that a segregation of chromosomes is intercalated between two ordinary mitoses.

On the Organization and Reconstruction of the Nuclei in the Root-tips of Podophyllum peltatum: JAMES BERTRAM OVERTON, University of Wisconsin.

Although a number of valuable papers, dealing with vegetative nuclear divisions, have recently appeared, notably those of Van Wisselingh

Grégoire and his students, Haecker, Strasburger, Bonnevie, Němec and Lundegård, a detailed account of the behavior of the chromosomes during rest has until recently been largely neglected. I have endeavored to follow in detail the various changes which the chromosomes of the telephase undergo during their passage into the resting nucleus, to follow their structural changes and arrangement in the resting nuclei, and also to determine how the visible chromosomes are reformed preparatory to division. During the passage of the chromosomes from the equatorial plate to the poles, they exhibit a progressive alveolation and vacuolation. Transparent spots appear in each chromosome. Each chromosome is composed of chromatic granules, closely massed in a linin substratum. By means of the progressive alveolation and vacuolation these chromatic granules are eventually separated. This process continues until conspicuous anastomosing vacuoles appear on the inside, increasing the size of the chromosome. These enlarged chromosomes often touch each other laterally, but never anastomose, as has been described by some authors. Each chromosome ultimately forms an independent reticulum. The reticulum of the resting nucleus thus consists of a number of these smaller elementary reticula. Conversely, during the earlier prophases of division, the chromosomes become more condensed and distinct and, joining end to end, give rise to the spirem, which is at first broad and reticulate, but eventually becomes densely chromatic. The mature spirem is not continuously chromatic, but consists of the individual condensed chromosomes united serially by visible linin intervals. In the writer's opinion the results strongly support the view of the individuality of the chromosomes.

The Nuclear Conditions in Certain Short-cycled Rusts: Edgar W. Olive, South Dakota State College.

Two general types of short-cycled lepto- and micro-rusts have been recognized with reference to the time of inauguration of the binucleate condition. In one type, the binucleate condition arises at the base of the young teleutospore sori. This type is illustrated by *Puccinia elegans*, *P. asteris* and *P. malvacearum*. In the other type, the binucleate condition arises at some indefinite point earlier in the life history, in the vegetative mycelium. Illustrations of this type are apparently more numerous.

Except the one species, *Puccinia elegans*, in which sexual cell fusions have already been worked out, the method of initiation of the binucleated condition is still problematical.

In two forms, evidences of occasional multinucleated cells were found in the young sori.

Uromyces Rudbeckiæ was found to present an enigmatical variation, in that all the cells, teleutospores as well as vegetative mycelium, were discovered to possess each but one nucleus. No explanation can be offered at present for this unique phenomenon.

Teratological Forms of Oxycoccus macrocarpus: C. L. Shear, U. S. Department of Agriculture.

A malformation of the cranberry plant, of both economic and scientific interest, occurs about Grand Rapids, Wis. Metamorphy of the floral organs is the most important and striking characteristic of the trouble. The flowers become erect instead of drooping, the calyx and corolla, and frequently the stamens and pistil, are changed into leaf-like structures. In the most aggravated cases the floral axis is elongated and the floral organs are represented by whorls of small leaves, or the flower may be replaced by a slender shoot bearing small alternate leaves. No insects or fungi have been found to bear a causal relation to the malformation. It is believed to be due, primarily, to prolonged and excessive stimulation of vegetative growth.

Rust of Tsuga canadensis: Perley Spaulding, U. S. Department of Agriculture.

Collections of the rusts occurring on *Tsuga* have been made for several years. Most of them have proved to be *Peridermium Peckii*. This ranges from Wisconsin to northern New York and Vermont, southward to North Carolina. It has been collected on the new host *Tsuga caroliniana* in North Carolina by Dr. A. H. Graves. The collections not belonging to *Peridermium Peckii* were separated into two forms: one on the young shoots, and the other on the green cones, in both cases on *T. canadensis*. The latter form is named *Cæoma tsugæ* sp. nov. The former presents no apparent specific difference from the latter, and it is for the present considered identical with it. Fresh material is necessary to determine this point with certainty, however.

A Plea for Organized Research in the Tropics: Pehr Olsson-Seffer. (Introduced by Wm. Trelease.)

A general discussion of the history of scientific research as carried on by various nations, with a special consideration of the conditions in tropical America and the numerous possibilities for work in all lines of botany.

American Botanical Societies and Meetings: W. F. GANONG, Smith College.

Report upon the results of an inquiry among a number of botanists regarding the present relations of the various botanical societies and the methods of conducting the meetings.

GEORGE T. MOORE,
Secretary

THE SECOND ANNUAL MEETING OF THE AMERICAN SOCIETY FOR PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS[1]

THIS society had a very successful meeting at the Yale Medical School and the Sheffield Scientific School; the Physiological and Biochemical Societies met at the same time.

The following program was presented; unusual interest was taken in the discussions.

W. Salant, "The Pharmacology of Oil of Chenopodium."

A. S. Loevenhart, "Further Observations on the Action of Iodoso- and Iodoxybenzoic Acids."

C. W. Edmunds and W. W. Hale, "Physiological Standardization of Ergot."

L. G. Rowntree (with J. T. Geraghty), "Additional Data relating to the use of Phenolsulphonephthalein as a Functional Test for the Kidney."

H. C. Wood, Jr., "The Vaso-motor System of the Pulmonary Circulation."

C. J. Wiggers, "The Modifying Influence of Anemia on the Actions of some Well-known Drugs."

L. G. Rowntree and J. J. Abel, "Further Experiments in the Field of Specific Chemo-therapeutics."

T. S. Githens and S. J. Meltzer, "The Control of Strychnine Poisoning by Means of Insufflation and Ether."

C. W. Green, "The Action of Strophanthin on the Isolated Mammalian Heart."

G. Carr (by invitation), "The Action of Acetanilid on Cardiac Muscle."

W. Salant (with J. B. Rieger), "The Elimination of Creatin and Creatinin after the Administration of Caffeine."

W. Salant (with I. K. Phelps), "The Influence of Caffeine on Protein Metabolism."

C. Voegtlin (with B. M. Bernheim), "The Rôle of the Portal Circulation of the Liver in Bile Formation and Jaundice."

H. G. Barbour (by invitation) and J. J. Abel, "Tetanic Convulsions in Frogs produced by Acid Fuchsin and their Relation to the Problem of Inhibition in the Central Nervous System."

J. Auer and S. J. Meltzer, "On Intramuscular Absorption."

D. R. Joseph and S. J. Meltzer, "The Action of Sodium Chloride upon the Phenomena following the Removal of the Parathyroids in Dogs."

W. J. Gies, "Experiments with Salts of Aluminium and Beryllium."

The following new members were elected: S. P. Beebe, Cornell University Medical College, New York; R. B. Gibson, University of Missouri; P. H. Hiss, Jr., Columbia University; Paul Lewis, University of Pennsylvania; L. B. Mendel, Yale University; Isaac Ott, Medico-Chirurgical College, Philadelphia; J. H. Pratt, Harvard University.

The following officers were elected for the year 1911:

President—J. J. Abel.

Secretary—Reid Hunt.

Treasurer—A. S. Loevenhart.

Additional Members of Council—W. deB. MacNider, G. B. Wallace.

Membership Committee—S. J. Meltzer, C. W. Edmunds, Torald Sollmann.

The following resolutions were adopted concerning the recent death of Dr. C. A. Herter, one of the charter members of the society:

"By the death of Dr. Christian A. Herter, one of its charter members and founders, the American Society of Pharmacology and Experimental Therapeutics has suffered a loss which it can but inadequately express. Dr. Herter's breadth of view, his intimate knowledge and grasp of vital experimental problems, his clearness of expression and his valuable contributions to medical science made his connection with the society of great value to it. His encouragement and ever-ready assistance in the work of younger men, his appreciation of their difficulties, his own constancy in adhering to the high ideals of earnest and sincere work which he taught to them have made his death a personal loss to each individual member.

"The sorrow felt by the members of the society, however deep it may be, is but a small part of the general sorrow felt by the large number of men throughout this country with whom Dr. Herter came directly or indirectly in contact. The society desires to express its share of this sorrow, however, and it is therefore

"*Resolved*, that there be spread upon the record of its minutes this expression of its feeling of loss at the death of Dr. Herter, of its sincere

[1] New Haven, Conn., December 28–30, 1910.