evidence of its age. The identity of the northern and southern portions of this belt is thus shown, and the eastward metamorphosed extension of the rocks of the Wappinger belt is likewise demonstrated. The intrarelationships of the western Wappinger are in some cases duplicated in part in the eastern belt. With these facts in mind the shading on the map is designed to show the gradation in metamorphism to the eastward.

To the east and south on the map are extensive areas of limestone and schist, for the most part left unmarked and unbounded, the satisfactory proof of the age of which awaits demonstration. Smaller patches not represented on the map, more intricately involved and often associated with igneous rocks, are scattered here and there in the Highlands. The great complex extends eastward into Connecticut, and southwestward into New Jersey, and has its representatives to the north in Vermont and Massachusetts. That it is a puzzling area is stating the case mildly. It must be attacked with a mind open for the reception of data bearing on the question of the possible genetic identity of extensive and disconnected masses or for the consideration of features that point the other way. The structure of the region must be unraveled and the earlier relationships of the component rocks restored. Moreover, it may be considdered an open question, if with the changes that the pre-Cambric rocks had early undergone, the later deformations and metamorphic agencies would not have produced a relatively greater alteration in the younger rocks.

It is purposed to discuss more fully certain features of the general problem in a forthcoming report on the geology of the Poughkeepsie quadrangle.

C. E. GORDON

AMHERST, MASS.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
SECTION G—BOTANY

SECTION G of the American Association for the Advancement of Science met during convocation week at Baltimore, the sessions being held at the Eastern High School. The attendance of botanists was unusually large and representative, and so many papers were offered for presentation that it was found necessary to divide into subsections. In Subsection A were presented the papers in morphology, physiology, ecology and taxonomy, while the papers in pathology were presented in Subsection B. Vice-president Richards presided over Subsection A, and Dr. F. L. Stevens, of the North Carolina College of Agriculture and Mechanic Arts, was chosen by the section to preside over Subsection B. As at the Chicago meeting the program of the section interlocked with that of the Botanical Society of America, so that program conflicts were reduced to a minimum. The address of the retiring vice-president, Professor Charles E. Bessey, on "The Phyletic Idea in Taxonomy," has been published in full in SCIENCE.

The following officers were chosen:

Vice-president—Professor D. P. Penhallow, McGill University, Montreal, Canada.

Member of the Council—Joseph N. Rose, U. S. National Museum, Washington, D. C.

Member of the Sectional Committee (five years)—Dr. D. T. MacDougal, Carnegie Institution, Tucson, Ariz.

Member of the General Committee—Professor Aven Nelson, University of Wyoming, Laramie, Wyo.

In view of the increasing difficulty of arranging the program in an equitable manner, the sectional committee appointed the retiring vice-president, Professor H. M. Richards, the incoming vice-president, Professor D. P. Penhallow, and the secretary, Dr. Henry C. Cowles, as a special program committee for the Boston meeting. In view of the coming meeting of the British Association at Winnipeg, the choice of a Canadian botanist for the vice-presidency of the section is regarded as most fortunate, and although no specific action was taken by the section at Baltimore, it was the general consensus of opinion that the American botanists should do all in their power to make the sojourn of the British botanists in America pleasant and profitable.

Abstracts of the technical papers presented at Baltimore follow, arranged in the order given in the respective subsections:

SUBSECTION A

Bog Toxins and their Effect upon Soils: ALFRED DACHNOWSKI, Ohio State University, Columbus, Ohio.

In a previous communication (*Bot. Gaz.*, 46: 130–143, 1908) attention was called to experi-

mental data showing that the inhibiting factors of bog conditions are in part due to the presence of injurious toxic water-soluble substances, reactions of the plants themselves, that such toxicity can be corrected by various methods, and that the plants grown in solutions thus treated show not only accelerated growth and an increase in transpiration, but also an increase in the green and dry weights of the plants.

Further experiments were undertaken to determine whether the toxins of bog water which are harmful to agricultural plants in water cultures are injurious also to plants growing in soil. A series of soils, ranging from pure quartz, sand and clay to humus were infected by shaking each with bog water, and filtering off the solutions. The results of these experiments indicate: (1) that the bog solutions thus treated become highly beneficial, (2) that soils absorb the toxins present in bog water, (3) that the soils are infected when treated in this manner and cease to yield a normal growth of plants when compared with similar soils serving as controls.

Initiating Licheno-ecologic Studies in the Kentucky Mountains: Bruce Fink, Miami University, Oxford, O.

The writer has long felt that most of the problems of lichen ecology require an unusually long time for their solution and during the past few months has been able to initiate such studies in two places with a view to continuing the work begun through many years. The work in the Kentucky mountains was done on the forest reserve of Berea College, five miles from Berea, Ky. This locality in the foot-hills of the Cumberland Mountains was selected because the area is to remain undisturbed. Thirty-one areas of varying size and form were marked off, some of them left undisturbed after taking careful notes of the size and condition of development of the lichens within them, others denuded to a considerable depth below the surface of the soil or rock, while on others the plants were only partially destroyed, the object being to watch the rate of growth, invasion, regeneration, etc. The areas were numbered and dated, and were selected in groups so that the study of ecologic factors to follow with instruments may be facilitated as much as possible.

Descriptions of Species of Opuntia: David Griffiths, U. S. Department of Agriculture, Washington, D. C.

An effort was made in the paper to show the relative value of diagnostic characters in this group of plants, and to show how different conditions radically affect these characters. A scale of points is made out to show a proposed sequence in descriptive literature. Stress was placed upon the necessity of field studies and descriptions drawn therein which shall describe the entire plant instead of a terminal joint or two, as has usually been done.

Physiological Studies on the Hymenophyllaceæ: Forrest Shreve, Carnegie Desert Laboratory, Tucson, Ariz.

Both physiological and anatomical evidence has been obtained to show that the leaves are the principal water-absorbing surfaces, and that there is very limited conduction of water in the vessels. Most Hymenophyllaceæ are capable of withstanding total submergence in well-aerated water for one month. Fragments of leaves with as few as ten cells are capable of maintaining normal appearance in dilute nutrient solutions for over one month. Most Hymenophyllaceæ are incapable of enduring a continued humidity as low as 60 per cent. Several hairy forms are able to endure low humidities of brief duration, and even occasional insolation. These forms are capable of surviving without liquid water if kept in air of over 90 per cent. humidity, and will continue to grow under these conditions. Isolated leaves show an ability to gain steadily in weight when kept in moist air, whereas controls killed in various reagents lost weights as did also the leaves of other species without hairs.

The Life History of Griffithsia Bornetiana: I. F. Lewis, Randolph-Macon College, Ashland, Va.

The vegetative structures, tetraspores, antheridia, procarps and cystocarps were described in detail, as well as the germination of the spores and the development of the sporelings. Antheridia, cystocarps and tetraspores occur on separate individuals which are almost identical in vegetative structure. The size, shape and arrangement of the cells are the same in the different forms, as are also the size of the nuclei and the number of nuclei in each cell. In mitosis, however, the nuclei of the sexual plants show seven chromosomes, and the nuclei of the tetrasporic plants about twice that number. The reduction of the number of chromosomes takes place in the two divisions in the tetraspore mother cell. The double number is restored by the union of the gametes. The conclusion is drawn that the carpospores, on germination, give rise to tetrasporic plants and the tetraspores to sexual plants. In the alternation of generations thus arising, the sexual plants are to be considered as forming the "x-genera-

tion," while the "2x-generation" comprises the sporogenous cells of the cystocarp and the entire tetrasporic plant. It seems hardly likely, however, that the tetrasporic plants are analogous, save in the number of chromosomes, to the sporophyte of the archegoniates.

Vegetative Reproduction by Induced Root-regeneration in the Guayule: FRANCIS E. LLOYD, Alabama Polytechnic Institute, Auburn, Ala.

Parthenium argentatum (the Mexican guayule) and *P. incanum* (the Mexican mariola) are two woody perennials belonging to the Compositæ and are found in the northern part of the central plateau of Mexico. A comparison of these two species discloses certain differences in the methods of vegetative reproduction which have already been described by the writer. These differences appear to be quite constant in nature. It is, however, possible by experimental methods to force the guayule (*Parthenium argentatum*) to adopt the method of vegetative reproduction which is normally followed by the mariola (*Parthenium incanum*). The paper, of which this is an abstract, describes the experimental conditions and the results obtained.

The Morphology of the Peridial Cells in the Roesteliæ: FRANK D. KERN, Purdue University, Lafayette, Ind.

The value of the sculpturing on the peridial cells as a specific character in defining the species of *Roestelia* has already been ably pointed out by Dr. Ed. Fischer and a number of the American forms have been figured and described by him. Aside from the surface markings there are a number of other features about the peridial cells which are worthy of consideration. It is for the purpose of setting forth the microscopical structure with some detail that this paper is presented. The part played by the peridial cell in making the different appearance between the forms of *Roestelia* and *Æcidium* is discussed. The chief attention, however, is given to the various types of cells and to an explanation of the terms used in describing them. Concrete examples, including many little-known species in addition to the more common ones, are given, together with a number of illustrations.

The Effect of Certain Salts upon Transpiration and Growth in Wheat: HOWARD SPRAGUE REED, Virginia Polytechnic Institute, Blacksburg, Va.

An investigation has been made of the effect of some chemical compounds upon the amount of transpiration per unit of growth in wheat plants. The results are expressed in terms of the units of water transpired per unit of increase in plant substance and by curves which show graphically the increments in transpiration and growth in comparison with control cultures. The data were obtained from several thousand wheat cultures grown in a variety of soils in paraffined wire pots, or in water cultures. Salts of sodium and potassium decrease the amount of water transpired per unit of growth, while salts of calcium and some other substances exert the opposite effect. Increasing the concentration of a salt usually exerts a different effect upon the curves of transpiration and of growth.

The Peg of the Cucurbits: WILLIAM CROCKER, University of Chicago, Chicago, Ill., and LEE I. KNIGHT, University of Illinois, Urbana, Ill.

The peg of the cucurbits is a parenchymatous outgrowth between the root and the stem which aids in the removal of the coat during germination. In the Hubbard squash and some other forms all seedlings produce ring-like pegs approximately equal on all sides (or at least on the two broader faces) if arching and contact are avoided. Under similar conditions in the Big Tom pumpkin and a number of other cucurbits a considerable per cent. of pegless seedlings appear. The functioning of this organ is possible only by its development on the concave side of the arch. The one-sided development is determined by the arching (including perhaps the growth strains preceding the actual arching) of the hypocotyl. Two stimuli aid in the production of the arch-contact of the coats and gravity. The contact of the coats is by far the more effective, for it will induce very sharp arching even against gravity. Gravity, independent of contact, gives strong enough arching to produce only one-sided pegs in all seedlings when the seeds are deviated 170° from the (point downward) vertical position. There is no evidence, contrary to the conclusion of Darwin, Noll and others, that gravity directly stimulates the lateral placement of this organ.

The Effect of Illuminating Gas and its Constituents on Carnations: LEE I. KNIGHT, University of Illinois, Urbana, Ill., and WILLIAM CROCKER, University of Chicago, Chicago, Ill.

The flowers of the carnation are extremely sensitive to traces of illuminating gas in the air, while the vegetation is comparatively resistant. In the Boston Market and pink Lawson varieties three days' exposure to 1 part in 40,000 kills the young buds and prevents the opening of those already showing the petals. The buds of medium age are considerably more resistant. In the same

varieties 1 part in 80,000 causes the closing of the open flowers upon twelve hours' exposure. This injury takes place directly on the bud or flower exposed and not indirectly through absorption by the roots. No chemical test is delicate enough to detect the least trace of illuminating gas in the air. Ethylene is even more fatal to the flowers of the carnation. Three days' exposure to 1 part in 1,000,000 prevents the opening of buds just showing the petals. Twelve hours' exposure to 1 part in 2,000,000 causes the closing of flowers already open. There is much evidence that indicates that the toxic limit of illuminating gas upon these flowers is determined by the ethylene it contains.

Types of Cactus Genera, 1753–1904: J. N. Rose, Smithsonian Institution, Washington, D. C.

Linnæus in 1753 referred all the cacti known at that time to one genus, which he called *Cactus*. Otto Kuntze in 1904, one hundred and fifty years afterwards, recognized but three genera; two of these, *Pterocactus* and *Pereskia*, are small or contain less than a dozen species, and hence the great mass of cacti are to-day to be found in the genus *Cactus* as understood by Linnæus. This might indicate that Linnæus's conclusions were good, but, as we all know, Otto Kuntze was a poor botanist, although he was a great bibliographer and doubtless did more than any one in modern time to stimulate botanical bibliography. Since Linnæus's time 58 genera have been proposed.

What are the types of these genera? Naturalists are now all agreed that the type of a genus must be one of the original species in it. At the present time, however, we have two genera of cacti which do not contain any of the original species and of course are used in an entirely different sense from that which was first intended. These genera are *Pilocereus* and *Epiphyllum*.

Botanists are now pretty well agreed that we ought not to use a homonym of an older genus, and yet we have at the present time in cacti two names which come under this class, viz., (1) *Harriota* DC., 18—, while there is *Harriota* Adans, 1762, also a cactus; (2) *Mamillaria* Haw, 1812, while there is *Mamillaria* Stackh, 1809, a genus of algæ.

Botanists are now pretty well agreed throughout the world that our nomenclature should begin with 1753 and that older names shall not displace Linnæan and post-Linnæan names, but at the present time we have in cacti one pre-Linnæan name which was not taken up until 1827, viz., *Melocactus*.

In the paper as presented there follows an alphabetical list of the genera of cacti, showing the date of publication of the genus, the number of original species and the names of the type species.

Some Variations and Hybrids of Œnothera: R. R. Gates, University of Chicago, Chicago, Ill.

The extreme variant of *O. rubrinervis* which appeared[1] in my cultures is found to breed true to its peculiarity. The presence of red on the hypanthium and in excess on the sepals is correlated with its development in excess on the under surface of the rosette leaves. The same correlation exists in one of the types from *O. nanella* × *O. biennis*. The *O. biennis* in these crosses was from the type growing wild around the New York Botanical Garden. Seven plants germinated from this cross and five of them reached maturity. These were of two sorts, four of which belonged to one type. In this type the rosette leaves were long, rather narrow and pointed, like *O. rubrinervis*. The petioles were red above but more conspicuously so on the under surface. The buds were large like *O. Lamarckiana* and, like the extreme variant of *O. rubrinervis* mentioned, the hypanthium and sepals were red throughout. The excessive development of red pigment from a cross between two types, neither of which shows much red, is an unexpected result several explanations of which are possible. In the second type the buds were small and greenish, showing the *O. biennis* characters.

O. Lamarckiana × *O. biennis*. Nine plants matured, all of one type. The rosettes were very much like *O. nanella* × *O. biennis*, type I, but larger, and the petioles were bright red above but without red on the under surface. The buds showed the *O. biennis* characters, being small, with little red on the sepals and with a short style. The petals varied in size from that of *O. biennis* to intermediate between *O. biennis* and *O. Lamarckiana*.

These crosses were made by Dr. D. T. MacDougal, who presented the seeds to the writer for further cultures.

An interesting "combination type" appeared in a culture of English evening primroses which contain some of the mutants of *O. Lamarckiana* and in addition some new types. The type in question showed the characters of *O. Lamarckiana* in its rosette and stem leaves (absence of red) but the buds were typical *O. rubrinervis*. This combina-

[1] See Science, 27: 209, 1908.

tion type might be called *O. Lamarckiana rubrinervis.*

On the Nature of the Fertile Spike in the Ophioglossaceæ: M. A. CHRYSLER, University of Maine, Orono, Me.

A study of the vascular system of the leaf in the Ophioglossaceæ supports the view that the fertile spike is to be regarded as two fused pinnæ, viz., the two basal ones, which are comparable to the fertile pinnæ of *Osmunda Claytoniana* and *Aneimia* spp. It is found in *Botrychium* that the vascular supply of the fertile spike is double; that the two bundles arise from a curved leaf-trace, at or near its extremities, and higher up approximate but do not fuse. The vascular bundles of the sterile pinnæ arise in a manner identical with that of the vascular bundles of the fertile spike. The mode of origin of the bundles of the fertile spike in each species of *Botrychium* examined may be paralleled by that seen in various genera of ferns, especially *Osmunda.* The genus *Ophioglossum* may be derived from the simpler species of *Botrychium,* while *Helminthostachys* shows certain complications. These facts point to the conclusion that the Ophioglossaceæ are to be regarded as a specialized family of ferns, rather than as a primitive order of pteridophytes.

Origin of Heterospory in Marsilea: C. H. SHATTUCK, Clemson College, S. C.

It is possible by means of a spray of cold water to kill the megaspores, which occur only in the oldest sporangia and then, putting the plant under good conditions, to mature sporocarps without megaspores. The greatest variation occurs when the megaspores and oldest microspores are blasted. Enlargement does not appear among the microspores when less than half the spores abort, and the surviving spores are larger the greater the amount of abortion. The mother cells may be checked in their development till the tapetal nuclei completely invest them. A perinium will then form around the four nuclei, sometimes enclosing them during the first and second mitoses. In such cases the sporangium invariably contains sixteen large bodies, each containing four nuclei. At other times when growth is less checked, the spores are more or less completely free and show great variation in size and shape.

The contest for supremacy among the young megaspores is very evident, many of them assuming considerable proportions, but one, centrally located, invariably secures the ascendancy. Sometimes the contest is very close between two or more members of the same tetrad. Very often the surviving member will carry attached to its papilla the aborted members even to germination.

The enlarged microspores vary in size from eight to sixteen times that of the normal ones, the nucleus shifting from a central (normal) to an apical position as in the megaspores. As vacuolation is more extensive the shape of the nucleus also varies from the normal spherical form to the oval, and finally, in the largest to the meniscus shape in the megaspore.

In extreme cases of abortion in the microsporangia only one spore survives which is about sixteen times as large as the normal microspore. The aborted tetrads remain as in the megasporangium, but better developed, thus showing a sharper contest for supremacy.

In plants kept from fruiting till September 1, many microsporangia (by position) developed megaspores and a few megasporangia developed microspores. In such cases the megaspores were intermediate in size and were also more nearly the spherical shape of the microspores. A few cases were noted in which the megaspores did not develop a perinium but enlarged considerably and became gorged with starch. *Marsilea* may be made to repeat, under culture, all the phases in the development of heterospory reported by Williamson and Scott for both *Calamostachys Benneyana* and *C. Cosheana.*

Movements and Reactions of Fern Spermatozoids: W. D. HOYT, Johns Hopkins University, Baltimore, Md.

The movements of the spermatozoids of ferns are complex and varied and depend on the conditions in which they are placed. When the conditions are unfavorable, they frequently reverse their direction of rotation, and they swing their anterior ends through a larger spiral and change their direction of movement more often than they do when in favorable conditions. The result of this is favorable to the organism in that they come in contact with a larger amount of the medium and so stand a better chance of reaching favorable conditions if these exist anywhere within the medium.

Different spermatozoids may react differently to the same stimulus at the same time, and the same spermatozoid may react differently to the same stimulus at different times. In some cases these differences in behavior can be ascribed to differences in physiological condition induced by different past experiences.

The cases where the movements have been sufficiently slow for exact analysis indicate that ori-

entation is attained by a series of random movements continued until a position favorable to the organism is reached, and not by a direct modification of the motor mechanism due to the local action of different concentrations of the medium on different portions of the body. This conclusion seems reasonably certain for negative reactions and probably for positive ones. The results obtained so far indicate that the movements and reactions of fern spermatozoids are of the same nature as those described for protozoa.

Some Aspects of the Mycorhiza Problem: Benjamin C. Gruenberg, DeWitt Clinton High School, New York, N. Y.

Mycorhiza is found on the roots and underground stems in many families of plants. The identity of the fungus in the symbiosis has been determined in but few cases, and in these not always with certainty.

Many theories as to the relationship between fungus and phanerogam have been offered, but none fits all the facts. It is, however, not to be expected that the mycorhiza has the same significance in all cases: in the different forms the relationship may be of different types, as nitrification, humus disintegration, water absorbing or storing, etc.

To the mycorhizas occurring in plants free from chlorophyll, there has been ascribed the function of obtaining organic nutrients directly from the humus. In several species of *Corallorhiza* examined there are present considerable quantities of starch, notwithstanding the entire absence of chlorophyll from the plants. The constituents of the humus that may yield carbohydrates, and the mechanism for the conversion of these materials into starch remain to be determined.

The solution of certain practical problems, as some in forestry, the transplanting of certain trees, tuberization, nitrification of the soil, etc., may have to wait upon the solution of some of the problems presented by the mycorhiza.

The Morphology of Salvinia (preliminary): Wanda M. Pfeiffer, University of Chicago, Chicago, Ill.

The early stages in the development of sporocarps are as described in Juranyi's "Ueber die Entwickelung der Sporangien und Sporen von *Salvinia natans*" (1873). In the young condition megasporocarps can be distinguished from microsporocarps only by the relatively smaller number of sporangia which they contain.

Later stages in the development of sporangia are very different from Juranyi's figures, since the tapetum was never observed to become two-layered, although the tapetal cells were often multinucleate, and since in no case were there more than eight spore mother cells found in either megasporangium or microsporangium.

The behavior of abortive megaspores was as described by Heinricher, in so far as the position taken by such spores is concerned. The activity of these spores in the formation of the perineum, however, is extremely doubtful since this seems to be entirely built up by the activity of the large, deeply staining tapetal cells.

The relationship of *Azolla* and *Salvinia* is still an open question.

A Preliminary Account of Dioon spinulosum: Charles J. Chamberlain, University of Chicago, Chicago, Ill.[2]

Dioon spinulosum is a Mexican plant and has been known only from the leaves and some small trunks. The plant was found in abundance at Tierra Blanca and at Tuxtepec in March, 1908. The trunk is often six meters in height and occasionally reaches a height of 16 meters. The ovulate cones are very large, elongated ovoid, about 70 centimeters in length and about 30 centimeters in diameter. They often weigh 14 kilos. The sporophylls are comparatively much shorter than in *D. edule* and the seed much larger. The staminate cone is ovoid and measures about 21×10 centimeters. Material is being secured for an extended study.

Demonstration of Seedlings of Selaginella sempervirens: Francis E. Lloyd, Alabama Polytechnic Institute, Auburn, Ala.

A Statistical Criterion for Species and Genera among the Bacteria: C. E. A. Winslow, Massachusetts Institute of Technology, Boston, Mass.

The existence of an almost infinite number of minute varieties has so far almost nullified any attempt at a natural classification of the bacteria. The vast numbers of generations which succeed each other in a short space of time, the absence of the swamping effect of amphimixis and the direct effect of the environment all help to make boundaries indistinct among these simple forms. The attempt has been made by the author and his colleagues to attack the problem by the statistical method, and the genera and species of the Coccaceæ have been mapped out in the following way: A number of characters (mostly biochemical, for it is precisely along physiological lines that the bacteria have differentiated, as the higher forms

[1] Investigation prosecuted with the aid of a grant from the Botanical Society of America.

have varied along morphological ones) were measured in a series of 500 cultures by quantitative methods. The results when plotted and compared showed that, on the average, certain properties were notably correlated with each other, and with particular habitats. A parasitic and a saprophytic subfamily were clearly distinguished and within each subfamily several genera were established based on the general correlation of several independent properties. Within the genera each distinct modal point for a particular character was given specific rank. A species is therefore one of the centers about which the numerous existing varieties are grouped; and according to this method a species can be defined, not by the description of an individual, but only by the statistical study of a considerable series.

Effect of Age on the Venation of Leaves: H. M. BENEDICT, University of Cincinnati, Ohio.

The size of the small areas into which the leaves of dicotyls are divided by veinlets is affected by the age of the plant which bears the leaves. The younger the plant, the larger are these "vein islets."

That the size of these areas is not merely a measure of the available nutrition is shown by the fact that leaves from water-shoots which are usually of larger size than normal show smaller areas than smaller leaves from younger plants. Young and old plants growing under the same conditions of environment show the characteristic difference in venation.

As an example of the relation between age and size of areas, some data from a study of *Vitis vulpina* L. may be given. Ten mature leaves from different parts of each vine were taken; pieces 4 by 10 mm. were cut from the same part of each. These were arranged in series and photographed by transmitted light and the number and size of the areas calculated. Since the material was collected where it was impossible to cut down the vines the relative ages of the plants were judged by the diameters of the stems. Care was taken to select vines growing under the same conditions.

Vitis vulpina L.

Diameter of Vine	Average Area of Vein Islets in sq. mm. Smallest	Largest	Average Area for Plant
¼ inch	.49	.51	.50
½	.39	.41	.40
¾	.36	.39	.37
3	.25	.29	.27
6	.12	.16	.14

Observations were made on *Ulmus americana, Castanea dentata, Quercus alba, Q. rubra, Tilia americana, Acer saccharinum, Fraxinus americana* and *Vitis bicolor.*

The Perennation of Cuscuta Epithymum Murr: F. C. STEWART and G. T. FRENCH, New York Agricultural Experiment Station, Geneva, N. Y.

Although Kühn proved clover dodder to be perennial, by observations made in Germany forty years ago, the belief is still current that the species of *Cuscuta* are all annuals. With the exception of a brief note by the senior writer there is no record of any dodder in the United States surviving the winter in the thread form. Yet our observations indicate that *Cuscuta Epithymunt* is frequently perennial. During the past three years this species has lived over winter in New York alfalfa fields, hibernating on the crowns of alfalfa, red clover and certain weeds. This is not accidental or occasional, but of common occurrence. In the writer's opinion it is the chief method by which dodder is carried over from one year to the next in New York alfalfa fields.

The First Generation Offspring of Œnothera lata ♀ × *O. gigas* ♂: ANNE M. LUTZ, Carnegie Station for Experimental Evolution, Cold Spring Harbor, N. Y.

(No abstract is published, because the full paper has appeared in SCIENCE.)

The Plant Formations in Eastern Colorado, and What They Indicate: H. L. SHANTZ, U. S. Department of Agriculture, Washington, D. C.

Three chief plant formations are recognized. They are discussed with respect to general appearance, types of root systems, the water relation of the soil, the influence of breaking the native sod, and the changes which bring about secondary and primary succession.

Notes on the Anatomy of Juncus (preliminary): AMON B. PLOWMAN, Beaver, Pa.

In their minute anatomy the Juncaceæ are strikingly similar to the more aerenchymatous representatives of the Cyperaceæ, such as *Dulichium, Eleocharis* and the limicolous species of *Scirpus.* The central cylinder of the rhizome shows typical amphivasal fibrovascular bundles, which are more numerous and more highly developed in those species of which the rhizomes are short and compact. In the aerial stems showing nodes, the nodal complex is similar to that in *Dulichium.* The reproductive axis contains only simple collateral bundles, arranged in the typical dicotyledonous order.

Are Alpine Plants exposed to Increased Evaporation? Charles H. Shaw, Ambler, Pa.

Schimper, Flahault, Schroeter and others lay considerable emphasis on the fact that alpine plants are exposed to more rapid evaporation. Their statements appear to rest on the fact that air movement increases and pressure decreases with altitude, and upon instances of apparent rapid drying, and upon the xerophilous character of many alpine plants.

During the summer of 1908 two series of porous cup atmometers were set up in the Selkirks at altitudes ranging from 800 to 2,788 meters. The stations from 800 to 1,700 meters (first series) were on the same hillside, had the same exposure, and were separated by a total horizontal distance of less than one kilometer. Those from 1,800 to 2,788 meters (second series) were located as far as possible with similar exposure on Mt. Grizzly, and included a horizontal distance of about one and a half kilometers.

Two stations were chosen at each altitude, since a substantial agreement would afford a test of the reliability of the scheme. The instruments of the first series were in continuous operation twelve weeks and those of the second series, for shorter periods. The weather was unusually favorable, there being little rain, clouds or frost during a term of seven weeks. Weekly readings were taken. In most cases the instruments of the several pairs gave approximately the same result.

The maximum in every case was found at the second station, at 1,100 meters altitude. At increasing altitudes, there was a gradual and irregular diminution.

The results of the first series appear to be unquestionable, as also a certain portion of the second series. Taken together they seem to exclude, so far as these mountains are concerned, the idea that evaporation increases with altitude.

Possibly the standard writers may have overlooked the part played by temperature, which is a factor in the evaporation rate, and might more than counterbalance the results of the other two factors.

The above data represent only weekly totals. The possibility of excessive evaporation at high altitudes during certain portions of the day remains to be studied.

Mitosis in Œdogonium: A. H. Tuttle, University of Virginia, Charlottesville, Va.

A brief review was given of the work of previous observers, and a statement of facts that appear to have been overlooked by them, or whose significance has not been noted.

Attention was particularly directed to the change in size and the marked change in form of the dividing nucleus; and, in addition, to the persistence of a distinct nuclear contour until a very late stage in the anaphase, also to noteworthy features in the mode of formation of the chromosomes, and in their behavior before, during and after splitting. Facts of importance regarding the formation and persistence of the achromatic figure were also presented, with others pertaining to the behavior of the daughter nuclei.

Preliminary Notice of Physiological Studies on Papaver somniferum: R. H. True and W. W. Stockberger, U. S. Department of Agriculture, Washington, D. C.

This paper discusses some studies made on the opium poppy, showing the distribution of oxidizing enzyms in the plant, the distribution of morphin and the relation of morphin production to oxygen.

The following papers were read by title:

Orientation of the Cotyledon of Wheat and Corn Seedlings Stimulated by Light: S. O. Mast, Woman's College, Baltimore, Md.

Some Fundamental Errors in Botanical Teaching: E. C. Jeffrey, Harvard University, Cambridge, Mass.

Methods of Demonstrating the Oxidizing Power of Roots: Howard S. Reed, Virginia Polytechnic Institute, Blacksburg, Va.

The Collection and Storage of Tree Seed: Hugh P. Baker, Pennsylvania State College, State College, Pa.

Preliminary Report of the Result of Observations on the Relation of Evaporation to the Treelessness of the Prairies: Bohumil Shimek, University of Iowa, Iowa City, Ia.

A Summer Laboratory for Mountain Botany in Colorado: Francis Ramaley and W. W. Robbins, University of Colorado, Boulder, Colo.

The Morphology and Development of the Cystocarp in Callithamnion Baileyi: R. P. Hibbard, Mississippi Agricultural Experiment Station, Agricultural College, Miss.

SUBSECTION B

Two North Carolina Plant Diseases: Hypochnose of Apple and Colletotrichose of Fig: F. L. Stevens and J. G. Hall, North Carolina College of Agriculture and Mechanic Arts, West Raleigh, N. C.

Hypochnose of apple, pear and quince, which is widely distributed throughout the United States,

but of which the causal fungus has not been before recognized except by Noack in Brazil, is described and notes on its geographical distribution given. Colletotrichose of the fig, *Ficus Carica*, is described and its causal fungus, *Colletotrichum Carica* n. sp., characterized.

A Bacterial Rot of the Muskmelon: N. J. GIDDINGS, University of Vermont, Burlington, Vt. (Read by L. R. Jones.)

One fourth of the fruit in a field of Montreal muskmelons at St. Albans, Vt., was ruined by soft rot in the autumn of 1907. This has been proved to be due to a new species of *Bacillus* which will be described in detail and named in the next Annual Report of the Vermont Experiment Station. Its characters in brief summary follow: 1–1.7 μ by .6–.9 μ. Actively motile by 4–6 peritrichic flagella. No endospores; not stained by Gram's method.

(Gelatin cultures at 20° C., others at 30° C.)

Nutrient broth: Strong clouding in 24 hours; no pellicle or ring formation; slight sediment. Agar stroke: abundant, slightly spreading, contoured, slimy, glistening, translucent-opalescent, growth, umbilicate in elevation. Agar stab: filiform. Agar plate: colonies round or amœboid. Gelatin stab: infundibuliform liquefaction in two days. Milk: coagulation and some separation in two days; acid production of + 55 in twenty-one days. Fermentation broths: growth in closed arm in saccharose, dextrose, maltose, lactose, mannite, urea, asparagin, not in glycerin. Vegetables rotted: muskmelon, citron, carrot, potato, beet, turnip. Indol production: slight. Nitrate reduction: abundant. Acid production: slight from carbohydrate broths; pronounced from milk. Ammonia production: strong from asparagin. Gas: slight from asparagin; abundant from milk. Over 99 per cent. of gas from milk was CO_2.

The White Pine Blight: PERLEY SPAULDING, U. S. Department of Agriculture, Washington, D. C.

This popular term includes several well-marked and distinct diseases: a leaf blight accompanied by *Septoria parasitica*, two leaf diseases caused by *Lophodermium brachysporum* and *Hypoderma lineare*, a leaf and twig blight caused by winter freezing and a twig blight probably caused by insects.

Some Toxic Properties of Tannic Acid: MEL T. COOK, Agricultural Experiment Station, Newark, Del.

Within recent years a great deal of work has been done in growing fungi on substances containing different chemicals and in studying the responses to the different stimuli. The series of experiments of which this is a part proposes to treat certain fungi with substances which occur in considerable quantities in the host plants. Tannic acid was selected as the first of these substances because it is so widely distributed and occurs in such great abundance, also because of its occurrence in abnormal growths. It is by no means well understood and is probably somewhat different in different families, genera and species. It has been studied by the chemists and pharmacologists but neglected by the botanists. It is frequently referred to as a waste product, although it is sometimes asserted that it may afford a protection against the attacks of insects, fungi, etc. It has been used to some extent as a germicide and fungicide.

This study has been divided into five series of experiments as follows:

First Series.—A study of the histology of pathological tissues; not treated in this paper.

Second Series.—The growing of fungi in pure media and in the same media to which has been added varying percentages of tannic acid. *Heterosporium, Ascochyta, Macrosporium, Phyllosticta* and *Rhizoctonia* are checked by small percentages of tannic acid. *Glœosporium, Colletotrichum, Cladosporium, Fusarium* and *Sphæropsis* were retarded in most cases, but in some instances were stimulated by small percentages of tannic acid. *Alternaria, Sclerotinia, Necosmospora* are stimulated by amounts not exceeding two fifths per cent. Those which are most strictly parasitic are more sensitive to tannic acid than those which are facultative saprophytes. A number of saprophytic forms were also used and were found to be stimulated by or at least to tolerate large quantities of tannic acid in most cases; this was especially true of wood fungi.

Third Series.—Consisted of growing fungi surrounded by barriers of tannic acid. Briefly discussed.

Fourth Series.—Consisted in treatment of fungi with varying percentages of tannic acid for varying periods of time and then placing them under favorable conditions for growth. In most cases the fungi were uninjured by this treatment.

Fifth Series.—Consisted in growing fungi through sheets of cork. Most fungi will penetrate cork readily if the tannin has been removed.

The Present Status of Rice Blast: HAVEN METCALF, U. S. Department of Agriculture, Washington, D. C.

The parasitism of a fungus of the genus *Piricularia*, announced before this section in 1906, and since confirmed by Fulton, has been verified by over six hundred inoculations. The parasite is a *vera causa*, although the occurrence of blast is enormously favored by a soil rich in nitrogen. It is doubtful whether a specific designation of the fungus can be made without revising the genus. The speaker's investigations in Italy in 1908 indicated the identity of blast with *brusone*, and tended to confirm the views of Farneti on the etiology of the disease. As *brusone* has already been shown to be identical with the *imochi-byo* of Japan and the *omo-mentek* of Java, the evidence is strong that blast is a world-wide disease which has only recently reached America. In Italy the disease is practically under control by use of resistant varieties of rice. These were imported by the author and will be tested in 1909.

A Few Diseases of Bamboo and Sedge: Flora W. Patterson and Vera K. Charles, U. S. Department of Agriculture, Washington, D. C.

This paper discusses a few diseases occurring upon these hosts, their morphology, systematic position and especially their economic significance in relation to future foreign introductions. It includes pathological and histological notes on species previously known to cause diseases and the description of a new genus.

Specimens of diseased bamboo, and specimens of diseased sedge with water-color illustrations of the latter, accompanied the presentation of the paper.

Pathological Notes Concerning a Few Ornamental Plants: Flora W. Patterson and Vera K. Charles, U. S. Department of Agriculture, Washington, D. C.

This paper discusses the occurrence of a *Botrytis* disease of peony and chrysanthemum, including cultural notes and statements as to preventive treatment.

A new disease on *Cyclamen* caused by *Colletotrichum* is described together with cultural notes on its development.

Necrosis of the Grape: Donald Reddick, New York State College of Agriculture, Cornell University, Ithaca, N. Y.

Necrosis is a very common fungous disease of the cultivated Labrusca varieties of grape in New York state, and it occurs also on the white scuppernong grape in Alabama.

The disease may be recognized as follows: Vines trimmed and tied up which fail to put out shoots; a dwarfing of shoots and leaves and a light setting of fruit; leaves reduced in size, crimped about the margin and chlorotic; the sudden wilting of vines in late summer; the presence of longitudinally ribbed excrescences or tuberculous masses on any part of the stem; small, black, slightly sunken lesions on the green shoots.

This disease is caused by *Fusacoccum viticolum* n. sp. The fungus causes a dry rot in the stem, the effects on other parts, except lesions on the shoots, being purely physiological.

The fungus has been isolated from the interior of many diseased stems, from lesions on green shoots and from spores developed in stromata on the surface of dead parts. Pathogenicity is not yet absolutely demonstrated, but this is the only organism constantly associated with such conditions. The most serious effects of the fungus are found in very young vineyards and it is thought that this is due to the use of diseased cuttings for stock.

Root crowns are often free from disease and this affords a means of control, viz., by renewal with a sprout from the root.

A Blight of Cultivated Ginseng caused by Alternaria Panax n. sp.: H. H. Whetzel, New York State College of Agriculture, Cornell University, Ithaca, N. Y.

The greater part of the million dollars' worth of ginseng now annually exported from the United States is grown under cultivation. Though but very recently brought under domestication, it is known to be subject to a number of diseases.

The most common and destructive disease is the so-called *Alternaria* blight. It is characterized by the appearance of brown cankers on the stems and large watery spots in the leaves which may eventually involve the entire leaf and top. Badly blighted plants appear as if drenched with boiling water.

The pathogenicity of the *Alternaria* constantly occurring in the lesions has been definitely determined by inoculation.

Experiments extending over three years have shown that it may be controlled by the thorough application of Bordeaux mixture.

On a Method of Developing Claviceps purpurea Tul. with Notes on Claviceps rubra n. sp.: H. H. Whetzel and Donald Reddick, New York State College of Agriculture, Cornell University, Ithaca, N. Y.

Early in August, 1907, sclerotia of *Claviceps*

were collected in heads of Volunteer rye, and of roadside timothy in Noble County, Ind. August 20, 1907, sclerotia on *Dactylis glomerata* were collected at Ithaca, N. Y., and, on August 23, on *Festuca elatior*. On the latter date these collections of sclerotia were encased separately in ordinary wire screening and placed on the ground under a grape arbor to mature. April 6, 1908, all were brought to the laboratory and placed on moist sand in a covered stender dish. April 18, 1908, a few sclerotia in all dishes were found with developing stromata. At this time the stromata on timothy were further advanced and were very evidently different. Stromata from ergot on rye had mature perithecia about May 1, while those on *Dactylis* and *Festuca elatior* were mature May 6. May 23 all had fruited and gone.

The *Claviceps* on rye, *Dactylis* and *Festuca* all belong to the same species, at least morphologically, *i. e., C. purpurea* Tul. A few sclerotia on *Phleum* unmistakably developed typical *C. purpurea;* most of them developed a Claviceps with much smaller stromata which are of an entirely different color, have fewer and more prominent perithecia, and these contain smaller spores. It seems to be an undescribed species. Careful search was made in June, 1908, for the sphacelial stage in the type locality but it was not found.

Some Little-known Diseases of Conifers found in Connection with a Disease Survey of our Western Forests: GEORGE GRANT HEDGCOCK, U. S. Department of Agriculture, Washington, D. C.

The disease survey of our western forests which is now being conducted by the Laboratory of Forest Pathology, although it has not passed the preliminary stage, has brought forth some interesting data concerning a number of wood-rotting fungi which may be properly classed as wound parasites. These cause great losses to the country by diminishing to a very considerable extent the available supply of mature timber. They do not occur uniformly in any given forest, but abound in certain favorable environmental conditions.

Echinodontium tinctorium is the cause of a destructive heart rot of living trees belonging to a number of species. It attacks the following species: *Abies nobilis* Lindl., *A. concolor* (Gord.) Parry, *A. grandis* Lindl., *A. lasiocarpa* (Hook) Nutt., *Tsuga heterophylla* (Raf.) Sargent and *Picea Engelmanni* Engelm. In a few localities as high as sixty per cent. of *Abies* and nearly one hundred per cent. of *Tsuga* have been reported diseased by this fungus. The fungus usually enters the heart wood of the trees attacked either through a broken limb, fire scars or other wound. The mycelium evidently secretes a solvent for wood fibers, since they are often entirely dissolved in the later stages of the rot produced by the disease. The sporophores contain a red pigment which is especially characteristic of this species. This is used by the Indians for making paint for facial decorations, etc. The red coloring matter in the pigment is insoluble in the ordinary solvents, with the exception of the alcohols, which apparently dissolve out a yellow color.

Fomes laricis attacks the heart wood of a number of species of conifers. The fungus gains entrance into the heart wood in the same manner as *Echinodontium*. It has been found on the following species: *Pinus ponderosa* Laws., *P. Murrayana* "Oreg. Com.," *P. Lambertiana* Dougl., *Larix occidentalis* Nutt. and *Pseudotsuga taxifolia* (Lam.) Britton. The effect of this fungus on the heart wood of trees is somewhat different from that of *Echinodontium;* it does not so completely dissolve the wood fibers, but apparently carbonizes them, causing the wood to break up into blocks or rectangular pieces. Large sheets of punk or tinder are formed by the mycelium adjacent to sporophores in later stages of the disease. The decayed wood is of a red-brown color, resembling very much that produced by *Fomes pinicola* (Sw.) Gill., which is frequently the cause of a sap-rot of mature conifers, but is rarely found fruiting on living trees. *Fomes laricis* usually forms sporophores on living trees, but may in case of very large trees consume the heart wood for years before it brings forth fruiting bodies. The white chalky sporophores are often of very great size. They have been powdered and used as a medicine in Europe for ages, and owing to the bitter taste of the substance of which they are composed, have been designated as the "quinine fungus."

Several other wood-rotting fungi of lesser importance have been found in various localities, a study of which will be undertaken later. In our disease survey work the investigation of such problems is not confined to the immediate study of the parasite, its effect on the host and remedial and preventative methods. It is our purpose in the future to collect data upon the conditions in the forest which make the trees of certain areas more subject to disease than those of others in the same locality. This involves a study of the physical conditions of those localities where disease is prevalent in order to find out how they

vary from the conditions in adjacent localities where the trees remain healthy.

The Present Treatment of Monotypic Genera of Fungi: C. L. Shear, U. S. Department of Agriculture, Washington, D. C.

The following seven monotypic genera of fungi, *Cœlosphœria* Sacc., *Cryptosphœria* Grev., *Cylindrosporium* Grev., *Isothea* Fr., *Nœmaspora* Willd., *Septaria* Fr., *Sphœropsis* Lev., selected at random from the Pyrenomycetes and Fungi Imperfecti are cited as examples of the present condition of the nomenclature of the fungi as represented in recent general systematic works such as Saccardo, "Sylloge Fungorum," Engler and Prantl, "Pflanzenfamilien," Rabenhorst's "Cryptogamenflora" and Ellis and Everhart's "North American Pyrenomycetes." The rule adopted by the international zoologists and the American botanists that a monotypic genus must always contain its monotype appears to receive no particular recognition. The original monotypes of the genera mentioned have been transferred to other genera of later date and the original generic names are now applied to other groups of species and frequently attributed to other authors. The desirability of recognizing the fixity of monotypic genera and genera having a species specifically designated as type is suggested as an essential part of the rules to be formulated by the section of the International Botanical Congress which is to consider the nomenclature of cellular cryptogams at its meeting at Brussels in 1910.

A Bacterial Disease of the Peach: James Birch Rorer, U. S. Department of Agriculture, Washington, D. C.

For the past three seasons the writer has made observations on a disease of peach leaves, twigs and fruit, evidently caused by a bacterium.

The form on the leaves is the commonest and most widespread. It causes somewhat angular purplish-brown spots one eighth to one fourth inch in diameter, which soon drop out, giving a shot-hole effect. Serious outbreaks of the disease cause a premature defoliation of the trees. This leaf spot was first seen by the writer on peach leaves collected in Georgia in 1903 by Mr. P. J. O'Gara, of the Department of Agriculture. During the same season Clinton observed a disease, evidently the same, in Connecticut and reported in the Report of the Connecticut Agricultural Experiment Station for 1903, Part IV., page 337. In 1906, 1907 and 1908 the writer found the disease to be prevalent throughout the south and middle west.

In August, 1906, pure cultures of an organism were obtained from the leaf spots and in the following spring inoculations made with this organism caused spots in all respects similar to those from which the bacterium was originally obtained. The same organism was again obtained in pure cultures from the spots which were artificially produced.

The disease on the twigs was first observed in 1907 at Siloam Springs, Ark. It kills the bark of young shoots, forming purplish-black, slightly sunken areas one eighth to one fourth inch wide, which may extend for two or three inches along the stem. In 1908 this twig disease was found in an orchard in Bentonville, Ark. Numerous sections through the youngest spots showed the presence of bacteria in large quantities and by the poured plate method cultures of an organism similar to that from which the leaf spots were obtained. No attempt has been made as yet to produce this form of the disease by inoculation.

The disease on the fruit is very characteristic. It was found in two orchards at Bentonville, Ark., during the past season. It causes a very small purplish spot over which the skin soon cracks, in either a straight or an angular way. The spots are usually very numerous (two hundred and fifty have been counted on one side of a peach), and often coalesce so that the cracks become continuous and extend for an inch or more. Sections through the smallest spots showed that bacteria were present in abundance and evidently the cause of the trouble.

Though not entirely proved, it is assumed that the three forms of the disease mentioned above are caused by *Bacterium pruni* Erw. Smith, which causes the bacterial black spot of the plum, for the following reasons: (1) the leaf spot of plums caused by *B. pruni* is very similar in appearance to that of the peach; (2) by inoculation with pure cultures of *B. pruni*, spots may be produced on peach leaves similar in all respects to those occurring naturally; (3) the organism isolated from the peach leaf spot and twig spot have the same cultural characteristics in all the different media in which they have been grown as *B. pruni;* (4) though the organism has not been obtained in pure cultures from the peach fruit spots, the megascopic and microscopic appearance of these spots is identical with the small spots on the plums, especially those which result from late infections.

The Cause of Trembles and Milk Sickness: E. L. Moseley, Sandusky High School, Sandusky, O.

Experiments made in 1908 confirm the conclusion reached after experimenting on various animals in 1905, viz., that *Eupatorium ageratoides* is the cause of trembles and milk sickness. A rabbit with four sucking young was fed with this plant, causing trembles in all of them. Two of the young were killed and cooked and fed to a cat, causing trembles. Milk from a cow with whose food *Eupatorium* leaves were mixed caused trembles in cats and rabbits. The milk was found to contain aluminum and an increased quantity of magnesium. The urine of a rabbit fed with the weed contained much aluminum. These substances exist in large quantities in the ash of the plant, the amount of magnesium differing in plants from different sources. Magnesium nitrate mixed with the food of a rabbit produced trembling. The symptoms of trembles observed by those who have lost stock from this cause are the same as result from aluminum and magnesium compounds when they get into the blood.

Peach Yellows Disseminated by Nursery Trees: J. L. PHILLIPS, Blacksburg, Va.

Peach pits and buds are sources of infection. The disease does not usually appear in nursery stock. It appears in orchards in the second and third years. Peach pits should be sold under certificate of inspection.

A New Anthracnose Attacking Certain Cereals and Grasses: THOMAS F. MANNS, Ohio Agricultural Experiment Station, Wooster, O. (Read by A. D. Selby.)

This paper stated briefly the results of culture investigations of a fungus described as *Colletotrichum cereale*, n. sp. This has been found to be present generally over the state of Ohio, attacking the spikes, culms and sheaths of rye, the culms and sheaths of wheat, oats, chess, orchard grass, timothy, red-top and blue-grass. Upon the cereals the attack is timed to the approaching maturity of the plant and produces marked shrivelling of the grain. The behavior of the fungus on different media is stated, and different illustrations are included.

A New Bacterial Disease of the Sugar-beet Leaf: NELLIE A. BROWN, U. S. Department of Agriculture, Washington, D. C.

Last summer a new disease of the sugar beet was observed in the beet fields in Utah and California by Dr. C. O. Townsend, pathologist in charge of sugar-beet investigations, Department of Agriculture, Washington, D. C., who sent material to his laboratory for investigation.

The leaves had dark brown, often black, irregular spots from 3 mm. to 1.5 cm. in diameter. They occurred on the petiole, midrib and larger veins. Occasionally the discoloration extended along a vein some distance and the tissue on either side was brown and dry. An organism was plated out of these spots without difficulty and found to be a schizomycete. Inoculations were made in the greenhouse and in the open field at Garland, Utah. The infection did not fail to take in any case.

So far as the work has been carried, the organism is infectious to the sugar-beet root, leaves of lettuce, sweet pepper, nasturtium, egg-plant and leaves and pod of the bean.

On agar plates the colonies are cream-white by reflected light, bluish in transmitted light, thin circular, rapid-growing, appearing in twenty-four hours. In three days the surrounding agar becomes a yellowish green color.

The organism liquefies gelatin, turns litmus milk-blue, does not grow on Cohn's solution, clouds bouillon in twenty-four hours, and is motile by means of one to three polar flagella. It occurs singly or in chains, the elements being short rods from 2 to 4 μ long and 1 to 1.5 μ wide, when grown in agar two days and stained with Loeffler's stain. It grows best at a temperature of about 28° C. and is not killed when kept at — 2° C. for six days.

From spots produced by inoculation, the organism has been reisolated and the disease reproduced. One hundred per cent. of the inoculations have given positive results. Both young and old tissues are alike susceptible to the disease.

A New Bacterial Disease of Nasturtium: CLARA O. JAMIESON, U. S. Department of Agriculture, Washington, D. C.

In May, 1908, Dr. C. O. Townsend, pathologist in charge of sugar-beet investigations, Department of Agriculture, Washington, D. C., received a few diseased nasturtium leaves from Richmond, Va. The wilted and partly discolored leaves showed water-soaked-looking spots from 3 to 5 mm. in diameter. Investigation proved the disease to be due to a bacterial organism belonging to the genus *Bacterium*. Inoculations of healthy leaves produce small dark, watery areas, and the tissue within them discolors, shrivels and often breaks.

The bacterium is a short rod from 2 to 4 μ in length, occurring singly or in chains. The polar flagella vary from 1 to 3 μ. The organism has moderate vitality on culture media, clouds bouillon in 24 hours and grows rapidly on agar, appearing on poured plates as small round, bluish-

white colonies. The bacterium liquefies gelatin, gives an alkaline reaction in litmus milk and produces no gas in fermentation tubes containing peptone-water and 1 per cent. solutions of diffused sugars.

The organism is not killed when kept at a temperature of —2° C. for six days. It grows best on agar at about 25° C., and its thermal death point, found by exposing ten minutes in nutrient solution, is between 49° C. and 50° C.

The bacterium is pathogenic on the leaves of sweet pea, lettuce, pepper and sugar-beet and on the leaves and pods of the bean.

Decay of Potatoes Due to Rhizopus nigricans: W. A. Orton, U. S. Department of Agriculture, Washington, D. C.

A study has been made by the Bureau of Plant Industry of potato diseases in the peat lands of San Joaquin County, Cal.

The most prevalent form of decay is a rapid soft rot, caused by *Rhizopus nigricans* Ehrdt. This is characterized by a dull-brown discoloration of the outer skin and a slight brown discoloration of the flesh, which when cut open soon oxidizes to a reddish-brown. The tissue becomes soft, owing to a solution of the cell walls, and on squeezing there is liberated an abundance of clear brown liquid. This feature has given the disease the local name of "leak" or "melters." There is no bad odor until the invasion of secondary saprophytes.

The large, hyaline, non-septate hyphæ of the fungus are abundant in the tissue. No other organism occurs in the typical "leak." Pure cultures are readily obtained, and a similar decay may be produced by inoculation of sterile raw potatoes under suitable conditions of temperature and moisture. Differences were observed in the rate of decay produced by *Rhizopus* from different sources, that from potatoes producing decay in potatoes sooner than a culture from bread.

Rhizopus nigricans is a wound parasite, capable of affecting potatoes only through abrasions of the epidermis. It appears to spread most rapidly during the "sweat" following the digging of early potatoes in warm weather and gives no trouble after frost comes.

The same fungus causes a destructive rot of sweet potatoes, and will quickly liquefy apples and pears. *Rhizopus necans* Mass., a related species, causes a decay of lily bulbs in Japan.

Some Devices to Facilitate Work in Plant Pathology: E. Mead Wilcox, University of Nebraska, Lincoln, Nebraska.

The method recommended in this paper is, in brief, to arrange all of the material used in pathology work according to one method. It has been found very useful to arrange lantern slides, negatives, index cards, herbarium material and publications alphabetically by the scientific name of the diseased plant, with sub-headings for the several diseases. The herbarium specimens are kept in the ordinary envelopes, which are attached to cards arranged behind guide cards in a vertical file case. The color of the card indicates the part of the plant which is diseased. For example, on the green card would appear specimens of leaf disease, etc. The publications bearing on plant pathology are gathered together and bound by subjects; this necessitates in many cases the partial destruction of a larger publication containing articles on several subjects, but the result is a compact mass of literature on one subject.

The following papers were read by title:

The Spraying of Cedars for "Cedar Apples": F. D. Heald, University of Texas, Austin, Tex.

A Fusarium Disease of the Pansy: Frederick A. Wolf, University of Texas, Austin, Tex.

Studies in Sclerotinia; Sclerotinia fructigena (Pers.) Schröt.: J. M. Reade, University of Georgia, Athens, Ga.

Experiments in the Production of an Anthracnose Resistant Clover: S. M. Bain and S. H. Essary, University of Tennessee, Knoxville, Tenn.

Two Interesting Smuts: L. H. Pammel, Iowa Agricultural College, Ames, Ia.

Henry C. Cowles,

SOCIETIES AND ACADEMIES

THE NEW YORK ACADEMY OF SCIENCES
SECTION OF BIOLOGY

A regular meeting of the section was held at the American Museum of Natural History, on March 8, 1909. In the absence of the chairman, Professor Bashford Dean presided for the evening. The following papers were read:

Genetic Relations of the Insectivora to other Orders of Mammals: Mr. W. K. Gregory.

The Harpswell Biological Laboratory: Mr. Max Morse.

The speaker showed a series of slides illustrating the Harpswell region and environs. The laboratory was founded by Dr. J. S. Kingsley in 1898 in the little fishing village of South Harpswell, Maine, eighteen miles from Portland. The immediate region is rich in interesting forms of