of the water is gone and the compressed air within is now following, diffusing outward through the meshwork of colloidal molecules. The apparent decrease of T is thus spurious, merely implying that the solid bubble is continuous but leaky. This may be tested by opening the stopcock. After 4 hours no internal pressure is left. In case of the pear shaped bubble, the phenomenon was like the preceding, but much more rapid, so that stages of T could not be recognized. The T reached by the nearly solid bubble is very high, but a part of it must be referred to the change of shape specified.

In figure 2, I have shown the result of the successive dilution of the original liquid glue. The surface tension remains low and nearly constant until a dilution of the order of .005 is reached. Thereafter, with further dilution, T increases very rapidly to above 60 in the figure. Using the last (dilute) solution about a week later, bubbles were no longer obtainable, even after warming. Adding a drop of dilute soda solution, however, restored its bubbling virtue. On successive dilution by halving, this gave (in mean values) $T = 52$, 59, 63, 68, 73. With two observers, one to measure the diameter of the bubbles and the other to manipulate the interference fringes, even closer approach to a water surface would be possible. Though thick and colorless, the bubbles have to withstand an increasing capillary strain and like time and tide they tarry for no man.

CARL BARUS

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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SECTION G—BOTANICAL SCIENCES

Vice-president and chairman, Francis E. Lloyd.

Retiring vice-president, Mel. T. Cook.

Secretary, Robert B. Wylie; State University of Iowa, Iowa City, Iowa.

(*Report by R. B. Wylie*)

From the viewpoint of the botanists the Boston meeting was one of the best in recent years. While the number of members in attendance from the interior and from the west was somewhat smaller than at the Chicago meeting, there were proportionately more of the eastern workers in attendance. The botanical programs presented an imposing array of titles. Something over two hundred papers and addresses were scheduled in the various meetings for plant workers.

The extent of the program as well as diversity of interest compelled two or more series of botanical papers at each session. The efficient messenger system, however, readily enabled all to know the progress of all programs so that papers of special interest, though in different rooms, could readily be heard unless they actually conflicted in time.

An examination of the content of the botanical programs offered by the different sections of the affiliated societies shows a tendency towards greater variety than formerly. The strict categories are breaking down, along certain lines at least, and it often happens that a given paper may very properly be classified or presented in two or more sections. This may be due to broader interest or better training of the present workers, but primarily to the growing appreciation of the interdependence of the several fields of plant science.

In a still larger sense the boundaries between zoology and botany as a whole are becoming rather shadowy in many places, and the physiologists, geneticists and ecologists properly pass from one class of material to another and follow both sides with keener interest. These facts bespeak the need for large scientific meetings where members of the several sciences may hold programs in parallel series with greater profit to all concerned. Though emphasized elsewhere, it may be repeated here that modern buildings such as those at the Massachusetts Institute of Technology afford ideal conditions for holding such meetings as those recently held in Boston.

The invitation program of Section G was held on Wednesday afternoon as a joint session with the Botanical Society of America and the American Phytopathological Society. The program, which was attended by a large number of botanists, included the address of the re-

[1] Even at e the evidence of increasing T may be masked by the incipient solidification.

tiring vice-president, Mel. T. Cook, on "The original development of plant galls," and a symposium of four papers dealing with certain aspects of sterility in plants. In his address, Mr. Cook discussed the ontogeny and phylogeny of plant galls, their relations to the causal organisms and factors, together with practical considerations of their economic importance. In the symposium, Dr. A. B. Stout's paper, read by Professor R. A. Harper, discussed the cultural and experimental aspects of sterility from a physiologist's viewpoint. Professor Bradley M. Davis analyzed the bases of sterility, taking up both pollen and seed sterility, and calling attention to another type of sterility due to weak and inefficient seedlings. Cross and self sterility in their genetical bearings were taken up by Dr. E. M. East, who discussed the causes and control of pseudo-fertility, together with the mutual and reciprocal relations of self-sterile strains. Dr. M. J. Dorsey, in taking up the relations of sterility to horticulture, dealt with the status of sterility in cultivated plants, especially in relation to the environmental influences, and other problems related to the practical handling of cultivated plants.

During the autumn the Section Committee balloted by mail, and following their nomination, G. J. Chamberlain was elected vice-president for Section G, and R. A. Harper as member of the Section Committee.

On Thursday evening occurred the dinner for all botanists, following which was given the address of the retiring president of the Botanical Society of America, Dr. C. E. Allen. In his address Dr. Allen dealt with the potentialities of the plant cell as expressed in its structural and functional specializations. Other speakers on the program discussed the need of a tropical research laboratory, and the present status of *Botanical Abstracts*.

THE BOTANICAL SOCIETY OF AMERICA

President, Henry C. Cowles.

Secretary, Ivey F. Lewis, University of Virginia, University, Va.

(*Report by I. F. Lewis*)

The seventeenth annual meeting of the Botanical Society of America was held in affiliation with the American Association for the Advancement of Science at the Massachusetts Institute of Technology on December 27, 28 and 29.

Officers were elected as follows: *President,* B. M. Duggar; *vice-president,* J. R. Schramm; *secretary,* I. F. Lewis; *treasurer,* I. W. Bailey; *editors, American Journal of Botany,* William Crocker, R. A. Harper, Donald Reddick; *representative, division of biology and agriculture, National Research Council,* J. M. Coulter.

For the first time in the history of the Society "corresponding members" were elected, these being Hugo De Vries and F. O. Bower.

Formal approval was given to the project to establish in Washington a national arboretum and garden, and cooperation was promised the Botanical Society of Washington to bring this about.

The annual dinner for all botanists was held on Thursday evening. President H. C. Cowles presided. After short talks by Dr. A. S. Hitchcock, Dr. William Crocker, and Professor B. M. Davis, the retiring president, Dr. C. E. Allen, delivered the annual address on "The potentialities of a cell."

The Society met with the New England Botanical Society on Friday evening at the home of the American Academy of Arts and Sciences.

General Section

(*Report by John T. Buchholz*)

In a brief discussion, A. J. Eames, of Cornell University, called attention to the remarkable uniformity in vascular anatomy of the nodes of plant stems, suggesting how the facts of plant anatomy may be used in solving the puzzles of the relationships of plant orders and families. Carpels have three bundle traces without known exception, while stamens have only one bundle trace, this being derived from three. Since petals have only one trace a majority of them are stamens, while sepals are bracts or leaves in origin. The fact that gymnosperms have only one or two traces, never three, suggests that angiosperms are an isolated group and were not derived from known gymnosperms.

As an illustration of the use which may be made of vascular anatomy in solving problems of relationships, Dr. Eames presented a paper by Miss Mary Jones Fisher, in which the morphology of the flower of willows was investigated. This work in vascular anatomy shows that the floral parts of willows have suffered a

reduction, having been derived from a more highly specialized insect pollinated flower. They are therefore specialized groups rather than primitive plants, as looked upon at present by taxonomists.

Miss Alma G. Stockey, of Mt. Holyoke College, announced the discovery of the prothallium of *Lycopodium obscurum,* and exhibited living specimens of these gametophytes with young sporelings.

The structure and development of the polycladous form of *Sphærocarpus Donellii* was described by Alfred M. Wolfson, of the University of Wisconsin. This liverwort is also being investigated by C. E. Allen and his coworkers for the heredity of this character, this phase of the work having been reported by Dr. Allen before the Joint Genetics Section.

E. C. Jeffrey, of Harvard University, presented some new evidence that the crystals of Ginkgo are extracellular. His statement that the protoplast of these crystals together with its nucleus is entirely within the crystal brought forth a sharp discussion in which skepticism was expressed on the question of whether these observations were correctly interpreted, while Dr. Jeffrey indicated with no hesitation that he accepted the challenge to prove this point.

P. C. Mangelsdorf, of the Bussey Institution, described the nature of a number of endosperm anomalies in maize, some of them involving almost complete absence of endosperm.

That color inheritance in maize endosperm is an exceedingly complex problem was indicated by R. A. Harper, of Columbia University, who exhibited color plates showing a wide range of colors produced in the F_1 generation when certain strains are crossed, though the parent strains had been inbred for many generations. It has been generally accepted that all F_1 hybrids between highly inbred strains are similar.

Michael Levine, of New York City, who has been studying plant gall tissue in comparison with animal cancers, pointed out some important differences in these neoplasms. He explained that in animal cancers many cells go into division simultaneously, while in plants these cell divisions are uneven.

J. D. Hale reported that true bars of Sanio are found only in the secondary wood and are of diagnostic importance in relation to the groups in which they occur. In another paper, Mr. Hale interpreted the trabeculæ of Sanio as arising through fungal infection of the cambium and that they are associated in a radial series of locally depressed annual rings. J. D. Hale and M. J. Brophy reported that the strength of timbers varies with the rate of growth and is correlated with definite morphological characters.

R. H. Wetmore in tracing the evolution of lenticels showed that whereas in primitive forms they were related to appendages in higher type they are correlated with the rays. A. E. Longley in studying pollen development found but four out of thirty-seven forms of *Rubus* with normal pollen production and an even higher degree of irregularity in *Cratægus,* suggestive that most of these forms are of hybrid origin.

A study of traumatic tissue by A. E. Longley strengthens the hypothesis that the pines stand in a primitive position in the Abietineæ, rather than as reduced forms.

Physiological Section

Chairman, William Crocker.

Secretary-treasurer, R. B. Harvey; University of Minnesota, University Farm, St. Paul, Minn.

(*Report by R. B. Harvey*)

The program of the Plant Physiologists consisted of three general sessions and two symposia. The 29 papers presented in the general sessions displayed greater interest in plant physiological problems than has been shown at any previous meeting. Papers on salt absorption and general nutrition occupied the major part of the Wednesday morning and the Friday afternoon sessions. Papers relating to permeability and oxidative changes were given on Friday morning. Among the papers given at this session there was presented a method for determining the oxygen-supplying power of the soil, a factor which is of much importance and which has been difficult to determine. At the symposium on "Mosaic diseases," held in joint session with the American Phytopathological Society, the contributions on this subject mark an epoch in the study of these important diseases. The symposium with Section C (Chemistry) held Thursday afternoon, on photosynthesis and photochemical reactions, attracted much attention; it was a very thorough and complete presentation of the problems related

to photosynthesis. The discussion covered the general nature of photochemical reactions in plants, in particular, and the physiology and chemistry of the utilization of the assimiliate. The program was of great interest throughout, although unusually long.

The following officers were elected: *Chairman,* Professor Lewis Knudson; *vice-chairman, Pacific Section,* E. T. Bartholomew, R. B. Harvey; *secretary-treasurer,* R. B. Harvey.

Mycological Section

Chairman, C. L. Shear.

(*Report by C. L. Shear*)

Two sessions of the Mycological Section of the Botanical Society of America were held, at which 19 papers were presented. About 50 members were in attendance.

R. H. Colley and Minnie W. Taylor discussed peridermia of five-needled pines, pointing out that there are two other species besides the one belonging to *Cronartium ribicola* which are very closely related to it but distinguishable by certain spore characters. Dr. Colley also discussed methods in spore measurement, pointing out the necessity for standardizing our methods of measuring spores so that the results of different workers may be comparable.

H. S. Jackson and E. B. Mains discussed *Aecidium Myosotidis* Burr., a rather rare species which is connected with telia on grasses. Dr. Jackson also gave observations on the Micro-Puccinias, pointing out the remarkable similarity between the telia-spores of certain short-cycled forms and long-cycled forms on the same host.

B. O. Dodge discussed the morphology and host relations of *Pucciniastrum americanum,* a rust of red raspberries which was rather severe in a plantation near Washington the past season. Dr. Dodge also discussed the systematic infection of species of Rubus with the orange rusts, showing how and when infection occurs, and that systematic infection can be easily demonstrated by microscopic examination of sections of roots or stems.

F. D. Fromme gave a description with illustrations of an undescribed species of rust on the cow-pea. This is closely related to, and has been confused with other common rusts on closely related plants.

E. M. Gilbert read a paper on cytological studies of some uredineæ, discussing the nuclear behavior in short-cycled puccinas on Circaæ and from Cryptotænia.

S. A. Wingard read a paper on nuclear phenomena in ascospore formation of a parasitic yeast, tracing the development of the ascospores in a remarkable fungus which has been found parasitic on lima beans.

In a paper by Leva B. Walker, giving observations on the development of *Endogone malleola,* the morphology of this rather rare fungus was described as it appears in pure culture and in nature.

Cultural studies of *Armillaria mellea* Fr. and *Clitocybe monodelpha* Morg. were presented by Miss C. Audrey Richards. The close similarity in appearance of pure cultures of these two fungi was pointed out, and the slight difference in the Armillaria taken from different hosts were shown.

J. J. Taubenhaus and D. T. Killough presented recent advances in our knowledge of Texas root rot of cotton, *Ozonium omnivorum,* describing successful inoculation experiments not previously reported and giving data relating to the mode of over-wintering of the fungus in the field.

The physiology of perithecia formation in *Valsa leucostoma* was given by Leon H. Leonian. It was shown that the formation of pycnia and perithecia could be controlled by variations in the nutrient media and by transfers to media of different composition.

Michael Levine gave results of further study on the behavior of crown gall on the rubber tree, *Ficus elastica,* showing the effect upon plants in which the tips had been killed by the gall organisms.

C. L. Shear in a paper on Phoma—as a sample of mycological nomenclature and classification—pointed out the great confusion which now exists in the application of this name and the wide departure from its original usage by its author, Fries, as a monotype genus, showing the need of fixing generic names by the application of the type method.

Margaret B. Church and Charles Thom discussed the relation of commensalism in common molds to taxonomy, pointing out the confusion which sometimes arises from the fact that certain molds frequently grow in such close association in culture that they are easily confused.

A preliminary note on the peculiar marine phycomycete, Coenomyces, by I. F. Lewis and W. H. Weston, Jr., was presented by Dr. Weston. This peculiar and interesting fungus has not heretofore been reported except from Russia.

David H. Linder reported on a Rhizopogon new to the eastern United States. The fungus appears to be a species identical with one from California.

H. M. Fitzpatrick gave an outline of a monograph of the genus Nitschkia and related genera, indicating his proposed method of treatment of the group.

Dr. W. H. Weston, Jr., of Harvard University, was elected chairman of the section.

Systematic Section

Chairman, M. L. Fernald.

Secretary, Alfred Gundersen, Brooklyn Botanic Garden, Brooklyn, N. Y.

(*Report by Alfred Gundersen*)

Two sessions were held and fourteen papers presented. On Thursday F. W. Pennell presented evidences of parallel lines of evolution in *Afzelia.* M. L. Fernald, speaking of the flora of eastern Canada, concluded that no fundamentally distinct species had evolved there since the glacial periods. Miss A. Brackett compared seeds and floral characters in *Hypoxis.* W. W. Eggleston presented researches on *Zygadenus.* N. C. Fassett spoke on estuary floras. C. O. Rosendahl described two new species of *Sullivantia,* his paper being read by Mr. Butters.

At the session on Friday, P. A. Rydberg proposed dividing the *Galegeæ* into eleven subtribes instead of five. A. S. Hitchcock spoke on the type-basis code, a modified form of the American code. Alfred Gundersen presented a diagram of orders of dicotyledons. A. J. Eames and P. A. Rydberg discussed the nature of epigynous flowers. I. M. Johnston spoke on the fauna and flora of southern Lower California, concluding that the fauna has a northern and the flora a Mexican origin. B. L. Robinson urged the need of greater monographic activity in America, as contrasted with regional investigations.

Following the reading of papers, John H. Schaffner, of Ohio State University, was elected chairman for 1923, and Alfred Gundersen was reelected secretary.

THE AMERICAN PHYTOPATHOLOGICAL SOCIETY

President, E. C. Stakman.

Secretary, G. R. Lyman, U. S. Department of Agriculture, Washington, D. C.

(Report by F. D. Kern)

The program for the Boston meeting of the American Phytopathological Society included eighty-nine papers. In addition two sessions were in the nature of conferences at which formal papers were not presented. Most of the papers were presented, but a few authors, as usual, sent titles without any provision for their presentation. The custom of publishing the abstracts so that each member may have a copy at the meeting was continued this year. There was but a single session at which miscellaneous papers were read. Special sessions were as follows: Mosaic diseases, diseases of fruits and trees, diseases of potatoes and truck crops, diseases of cereals, a conference on potato inspection methods, a round-table discussion on extension methods as applied to plant pathology, a joint session with the American Association of Economic Entomologists on plant quarantines, and a joint session with Section G and the Botanical Society of America in which the address of the retiring vice-president, Mel. T. Cook, of Section G, was on a pathological topic, "The origin and structure of plant galls."

Without doubt the most important section of the program was that dealing with mosaic diseases of plants, a joint session with the Physiological Section of the Botanical Society. The most striking contribution, and one that marks a great step forward in the science of phytopathology, was a demonstration of the occurrence of protozoans in plants affected with mosaic and related diseases. In the mosaic of tomato, bean and clover, and also in potato leaf roll, Ray Nelson demonstrated in longitudinal sections the presence of biflagellates and trypanosomes. Kunkel and McKinney, Eckerson and Webb made contributions concerning the presence of intracellular bodies in mosaic tissues of *Hippeastrum* and in rosette of wheat. The distribution of both the flagellates and intracellular bodies in the host tissues and their frequent application to the host

nuclei further indicate their association with mosaic-like diseases. Other papers presented facts concerning the conditions which lead to the masking of mosaic and leaf-roll of potato in certain northwest areas and at high altitudes. Another paper dealt with the specificity of six mosaic-like diseases of the potato. The eradication of the perennial weed hosts as a means of control in tomato mosaic was the topic of another paper. Altogether fourteen papers on mosaic were presented.

In a paper on crown-gall, Riker presented evidence to the effect that the bacteria exert their influence from an intercellular rather than intracellular position.

Several papers were presented extending our knowledge of biological specialization in the cereal rusts. Evidence was presented in one paper indicating that dust for stinking smut of wheat is a promising method of control.

Two papers presented new facts concerning apple blotch control; four papers contributed further information concerning white pine blister rust both in America and Europe; two papers reported progress and methods of barberry eradication; and six papers referred to various phases of the cereal-fusarium problem.

The round-table discussion on extension work in plant pathology was the first session of this kind that has ever found a place on our program.

The success of this session emphasizes the interest in this subject, and indicates that future annual meetings must provide opportunity for similar discussions.

The symposium on plant quarantines, in joint session with the American Association of Economic Entomologists, was of great importance in that it outlined the history of plant quarantines, summarized our experience to date and permitted discussion of future plans.

The officers of the American Phytopathological Society for 1923 are as follows: *President,* G. R. Lyman, West Virginia College of Agriculture, Morgantown West Virginia; *vice-president,* F. D. Fromme, Virginia Polytechnic Institute, Blacksburg, Virginia; *secretary-treasurer,* R. J. Haskell, U. S. Department of Agriculture, Washington, D. C.; *additional members of the council,* I. E. Melbus (College of Agriculture, Ames, Iowa), M. F. Barrus (College of Agriculture, Ithaca, N. Y.), E. C. Stakman (*ex officio*) (University of Minnesota, St. Paul, Minn.), Perley Spaulding (*ex officio*), (U. S. Department of Agriculture, Washington, D. C.), W. P. Fraser (University of Saskatchewan, Saskatoon, Saskatchewan, representing the Canadian Division), F. D. Heald (State College of Washington, Pullman, Washington, representing the Pacific Coast Division), L. R. Hesler (University of Tennessee, Knoxville, Tenn., representing the Southern Division).

THE SULLIVANT MOSS SOCIETY

President, A. LeRoy Andrews.

Secretary, Edward B. Chamberlain, 18 West Eighty-ninth Street, New York.

(Report by Edward B. Chamberlain)

At the meeting of the Sullivant Moss Society on December 28, Mr. Beals discussed and demonstrated the use of a large plate camera in photographing *in situ* small plants and mosses, either natural size or enlarged; Dr. Grout remarked upon a recent discovery of fossil mosses in the Iowa glacial deposits; Dr. Andrews outlined the need for a more natural grouping of the bryophytes, for greater monographic activity and for greater conservatism in specific and generic segregation. Attention was directed by Dr. Bailey to the rapid disappearance of the mosses of the Pacific Northwest through the combined operations of lumbering, fire and settlement; Dr. Conklin emphasized the value of the society collections in studying the distribution of American Hepaticæ; Mrs. Britton cleared up the confusion existing in certain West Indian species of *Fissidens;* and Dr. Holzinger gave an outline of the present status of the specific rank of *Desmatodon arenaceus.* Papers by Miss Lorenz and by Dr. Plitt dealt with the hepatic and the lichen flora of Mt. Desert Island, Maine. Mrs. Read told of the active study of mosses carried on for forty years by a section of the New England Women's Club, and Miss Cherrington made a plea for greater aid to the beginner in moss study.

The officers for 1923, given above, as well as the vice-president, Professor Charles C. Plitt, of the University of Maryland, were elected before the Boston meeting.