$$d\lambda/\lambda = D\, dh/R\sqrt{D^2 - \lambda^2}$$

where D is the grating space, R the path length and dh the displacement of the second grating G', normally to itself, between like rotational phases of the two sodium lines. The second member of the equation is roughly dh/R and if $dh. = .003$ cm. is still guaranteed and $R = 300$ cm. as in my apparatus, the limiting resolving power is $d\lambda/\lambda = 10^{-5}$ or .06 *A. U.* If $d\lambda/\lambda = 10^{-3}$ for the two sodium lines, $dh = .3$ cm., which is about what I found.

An interesting application of the apparatus (Fig. 1) or the other similar types may be suggested. By half silvering the mirrors and providing a similar set *beyond* them, there should be no difficulty of bringing the interferences due to crossed rays, and to parallel rays, into the field of the telescope, *together*. Strictly homogeneous light (mercury arc) would be needed to obviate the duplications of the sodium arc. In such a case, therefore, the parallel fringes could be used after the manner of a vernier on the crossed fringes. One might think of this with a view to a repetition of the experiment of Michelson and Morley, if this experiment had not been so thoroughly carried out by the original investigators. However, the plan would be to rotate the apparatus, as a whole, so that the two crossed rays would be alternately in and at right angles to the earth's motion, whereas the two parallel rays would preserve the same relation to that motion. Naturally the parallel and crossed paths would in such a case have to be enlarged by multiple reflection. Another favorable feature of the reversed spectrum interferometer is the small displacement, x, of micrometer per fringe. This is $x = \lambda/2(1 + \cos\theta)\cos\sigma/2$, θ being the second angle of diffraction, σ the sum of the two. Hence roughly $x = \lambda/4$, or the sensitiveness is about twice that of the customary types of apparatus.

Carl Barus

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SOCIETIES AND ACADEMIES

THE BOTANICAL SOCIETY OF WASHINGTON

The 107th regular meeting of the Botanical Society of Washington was held in the Assembly Hall of the Cosmos Club, at 8 P.M., Tuesday, November 2, 1915. Forty-five members and six guests were present. The following papers were presented:

Relation of Catalase and Oxidases to Respiration in Plants (with lantern): Chas. O. Appleman. (To be published in full as bulletin number 191 of the Maryland Agricultural Experiment Station.)

The chemical mechanism of respiration in plants is very complex and imperfectly understood. Enzyme action undoubtedly plays the most important rôle. Among the enzymes which have been assigned various functions in respiration, we find the oxidases and catalase, although their relation to this process is almost entirely hypothetical. Respiration in potato tubers is not only greatly accelerated by various artificial treatments, but is subject to fluctuations under natural conditions, such as greening and sprouting. The rate of respiration also varies in different parts of the same tuber and tubers of different varieties. Since these tubers also contain very active catalase and oxidase, they were chosen as specially favorable material to make a quantitative study of the relation of both catalase and oxidase activity to the intensity of respiration. The data seem to justify the following conclusions:

1. The oxidase content in potato juice gives no indication of the intensity of respiration in the tubers. In other words, there is no correlation between oxidase activity and the rate of respiration in these organs. The author does not disclaim any rôle of the demonstrable oxidases in respiration, but they certainly are not the controlling factor in regulating the rate of respiration in potato tubers.

2. Catalase activity in the potato juice shows a very striking correlation with respiratory activity in the tubers.

Some Philippine Botanical Problems: E. D. Merrill.

To be published in full elsewhere.

Botanical Notes of a Trip to Japan: W. T. Swingle.

To be published in full elsewhere.

The 108th regular meeting of the Botanical Society of Washington was held in the Assembly Hall of the Cosmos Club, at 8 P.M., Tuesday, December 7, 1915. Thirty-two members and three guests were present. Messrs. A. T. Speare, James Johnson, H. R. Rosen and H. C. Rose were elected

to membership. The following papers were presented:

Dr. W. Ralph Jones: An Appreciation: DR. C. L. SHEAR.

Dr. Jones was quiet and retired in disposition and of excellent habits. He had a great aversion to taking animal life and would not take courses in zoology involving the death of higher animals; neither would he hunt nor fish. His chief recreation and amusement were novel reading and music. He was very fond of reading good French novels in the original, and of the opera. He showed an interest in natural science early in life and as a boy began a collection of minerals and also an herbarium of flowering plants. His interests in botany were broad and his training in languages, chemistry, physiology, etc., were such as to give a broad and substantial foundation for research. He possessed three of the fundamental requirements for success in scientific work, that is, love for truth, combined with thoroughness and accuracy. His notes, drawings and manuscripts were models of neatness and accuracy. He had undertaken several lines of investigation in connection with blackberry, currant and gooseberry diseases, but had practically completed only one of these. This was a study of what appears to be a new species of *Thielavia* isolated from diseased dewberry plants. It is to be deeply regretted that a man so well equipped by temperament and training for research should be cut down in the prime of life and usefulness.

Experimental Study of the Life Duration of Seeds (with lantern): DR. WM. CROCKER.

To be published in full elsewhere.

Notes on Variations in Chinese Chestnuts (specimens): P. L. RICKER.

To be published in full elsewhere.

THE 109th regular meeting of the Botanical Society of Washington was held in the Assembly Hall of the Cosmos Club at 8 P.M., Friday, January 14, 1916. Seventy members and five guests were present. Messrs. Rodney B. Harvey, G. McMillan Darrow and Roland McKee were elected to membership.

Economic-Botanical Exploration in China (with lantern): FRANK N. MEYER.

Mr. Meyer, an agricultural explorer of the United States Department of Agriculture, has spent nine years in China and adjoining countries studying the flora of this region and searching for plants of economic value for introduction into the United States. He found quite recently a hickory in China which has never been recorded in botanical literature. As yet no sycamores nor any papaw (*Asiminia triloba*) or leather-wood (*Dirca palustris*) have been found in China. Field work in botany in China is extremely difficult because most of the wild vegetation near densely settled parts has been exterminated. However, Buddhist and Tavist priests have preserved many specimens in their temple compounds. Mr. Meyer made reference to the discovery of the wild peach in the provinces of Shansi, Shensi and Kansu, and to the expertness of Chinese gardeners in grafting. He expressed the opinion that in this country there is great need of national arboreta and permanent botanical collections.

The Recent Outbreaks of White Pine Blister Rust: DR. PERLEY SPAULDING.

When this disease first reached this country, it was thought repeated annual inspections of the lots of diseased trees would soon result in the complete eradication of the disease. Our experience since that time, together with increasing knowledge of the characteristics of the disease, shows us that this is not true. Apparently the only method of completely eradicating this disease in any lot of infected trees is that of total destruction of that lot. While large numbers of plantings of diseased imported trees were made in 1909, the careful inspection work done since that time by the states has kept the disease in them almost completely in control. It has become increasingly evident that our great danger lies in lots of diseased trees which were imported before 1909. These in most cases we know nothing about and of course have not been able to give them the necessary inspection. In the years 1909 to 1914, inclusive, there were eleven outbreaks of this disease, that is, cases where it escaped from the diseased pines on to neighboring currants or gooseberries. In 1915 the weather conditions were so favorable for the disease that it spread very readily and for relatively long distances. Last year twelve outbreaks occurred. These areas vary in extent from only a few currant or gooseberry bushes up to a single area of some 400 or 500 square miles. Experiments have shown that the wild currants and gooseberries of the Pacific coast and Rocky Mountain regions are susceptible to it. In fact it may be stated that all species of currants and gooseberries, so far as they have now been tested, are susceptible. The ordinary cultivated black currant, *Ribes nigrum*, however, is far more susceptible than any other species. While it

is not grown in large quantities, it is very widely scattered; enough so that the disease during the past season readily spread upon this single species for miles. The future of the white pine, which has been quite largely depended upon for the forests of the northeastern states, is very seriously threatened by this disease, unless efficient efforts are made to control it. The character of this fungus is such that the removal of all wild and cultivated currants and gooseberries from the affected areas will stop its further spread in those areas. If the cultivated black currant could be eliminated from the nursery trade so that it would not be sold and its use could gradually be discontinued everywhere within the affected states, a great step would be taken toward the control of this disease. But more than this, state officers must have absolute power to destroy diseased pines and currants and gooseberry bushes, in order that unanimous action can be carried out within these affected areas. With this power should also be given the power to declare and enforce quarantines against shipments of stock from other states. When compared with minute search which is required in finding gypsy and brown-tail moth nests in southern New England, the search for wild and cultivated currants and gooseberries is comparatively simple. It also is comparatively easy to carry out when compared with the climbing of trees 75 to 100 feet in height in certain sections of New England for the removal of brown-tail moths' nests, as is done every year. An efficient fight against this disease even now is not impossible, but it very shortly will be if not started at once.

Catha edulis: A Narcotic of the Southern Arabs (with specimens): PAUL POPENOE.

The kat, Arabic *qat*, shrub is a native of Africa, but much cultivated in Yaman, where its use is increasing so that the town of Aden now consumes annually more than 2,000 camel-loads of the leaves and twigs, which are chewed for their stimulating properties. The plant contains small quantities of an alkaloid called *katrine*, which seems to resemble cocain. It has been introduced into the United States by the Office of Foreign Seed and Plant Introduction, United States Department of Agriculture, and grows well in the South. The dangers from its use have probably been much exaggerated. This plant may present commercial possibilities as the source of a new beverage to compete with tea.

W. E. SAFFORD,
Corresponding Secretary

THE BIOLOGICAL SOCIETY OF WASHINGTON

THE 550th regular meeting of the society was held in the Assembly Hall of the Cosmos Club, Saturday, February 12, 1916, called to order at 8 P.M., by President Hay.

Fifty persons were present.

On recommendation of the council Walter P. Taylor, Museum of Vertebrate Zoology, Berkeley, California, was elected to active membership.

Under the heading Brief Notes and Exhibition of Specimens, Dr. Howard called attention to the work lately done by Dr. W. V. King, of the Bureau of Entomology, in demonstrating that *Anopheles punctipennis* was a carrier of both tertian and estivo-autumnal malaria parasites. He exhibited lantern slides of this mosquito and photo-micrographs of the stages of the malaria organism in this hitherto supposedly harmless species of mosquito.

Under this same heading W. L. McAtee gave some of his recent observations on the vegetation in Virginia in the region south of Washington.

The first paper of the regular program was by Henry Talbott: "Nepigon." Mr. Talbott gave an entertaining account of a trip made by himself and others to Lake Nepigon. The fishes of the lake and neighboring region were especially dwelt on. Mr. Talbott's paper was discussed by Dr. Howard.

The second and last paper of the regular program was by Vernon Bailey, "Game and Other Mammals of the Yellowstone Park Region." Mr. Bailey gave a short outline of his itinerary on a recent trip through the Yellowstone Park and the neighboring region, particularly to the south. The ground covered was mainly off the tourist track. The speaker described the beauties of the park from the viewpoint of the lover of wild life; he called particular attention to the loss of fear of men by wild life when protected from guns, dogs and cats; he called to notice the thriving condition of herds of ruminants in the park and the successful efforts now made to supply hay to the needy in winter, and to keep the antelope from wandering out of the park. Mr. Bailey's communication was profusely illustrated with lantern slide views of the park and its wild life, in especial, the white-tailed deer, mule deer, elk, moose (recently described as *Alces shirasi*), antelope, bison, some of the smaller mammals, and Canada geese.

M. W. LYON, JR.,
Recording Secretary