

ers are all to be congratulated on a distinct botanical achievement.

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### THE MEMOIRS OF A BOTANIST

*Erinnerungen und Welteindrücke eines Naturforschers.* By HANS MOLISCH. Pp. 232. Emil Haim, Wien and Leipzig. 1934, Rm. 9.00.

WHAT makes the reading of botanical history so interesting are accounts of the personalities who participated in the advancement of this branch of science. Here belong the memoirs of outstanding botanists, especially of men whose leadership has contributed as much to botanical progress as their own research work. One of these men is Hans Molisch. His latest book is fascinating because of the many problems which occupied him during his life, the many botanists whom he met and the broad cultural background of his life and travels.

Molisch was born in 1856 at Brünn in the former Austro-Hungarian empire and as a nine-year-old boy he met Gregor Mendel, who was a neighbor and friend of the family. From his father, who was a horticulturist and commercial florist, Hans Molisch acquired in his youth a practical knowledge of gardening which in turn aroused his interest in theoretical botany and especially in plant physiology. This early training showed itself in a later book on "Plant Physiology as a Theoretical Basis for Horticulture" (1915). There, Molisch said, the plant physiologist should learn from the practical horticulturist and the latter in turn from the physiologist. It became his most popular book and has had six editions to date, besides being translated into several languages.

Molisch attended the University of Vienna, where he became Wiesner's assistant. Later he taught at the Technische Hochschule in Graz, where the author of this review was one of his students. From Graz he was called to the German university of Prague and finally, as Wiesner's successor, to Vienna.

A considerable portion of the book is devoted to observations of tropical plant life during a visit to Buitenzorg in Java in 1897-98. On his return trip Molisch visited the United States. From 1922 to 1925 he taught plant physiology in the University of

Sendai in Japan where he had been called to organize the botanical division of the newly founded institute of biology. After his retirement from the University of Vienna, Molisch taught for one year (1928-29) at the institute for plant physiology of Sir Jagadi Chandra Bose in Calcutta and traveling home he again visited the United States. He always showed great interest in the botanical work done in this country and had accepted an exchange professorship at Columbia University when the great war broke out, which frustrated this plan.

The "Erinnerungen" gives a detailed account of the research work done by Molisch. Among his earlier studies he mentions a histologic chemistry of vegetable foods (1891), a treatise on iron in its relation to plants (1892), investigations about the nutrition of algae, the freezing of plants and the luminosity in plants. Fruits of his first visit to the tropics were researches about the forming of indigo, of palm-wine and about the secretion of water by liana-stems. He was always greatly interested in plant chemistry and in 1913 he published a "Microchemistry of Plants," of which three editions have appeared to date. His book on plant physiology and horticulture (1915) has been mentioned. The three years in Japan resulted in a volume entitled "Plant Physiology in Japan on the Basis of Personal Observations" (1926) and the more personal experiences of this trip found their expression in a book "In the Land of the Rising Sun" (1927). The observations gathered during his second trip to India are contained in a book entitled "A Naturalist in India" (1930). Even after retirement from teaching such contributions were made by Molisch, as "Duration of Plant Life" (1929) and "Plant Chemistry and Plant Relations" (1933). Naturally all Molisch's books are written in German and the titles as given in this review are translated into English.

Any student of botany who can read German fairly fluently will find the "Erinnerungen und Welteindrücke eines Naturforschers" easy and pleasant reading and will enjoy making the acquaintance, through this book, of an excellent botanist and a most delightful personality.

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## REPORTS

### APPROPRIATIONS FOR GRANTS-IN-AID BY THE NATIONAL RESEARCH COUNCIL

As announced in SCIENCE for January 18, 1935, the National Research Council has been given funds for grants-in-aid for the year 1935. Applications for grants from this fund must be in the hands of the

secretary of the Committee on Grants-in-Aid on or before April 1, 1935. Additional information and blank forms for filing application will be furnished upon request. Action on these applications will be taken about the middle of May.

At meetings in November and December, 1934, the

Committee on Grants-in-Aid made the forty-four following awards:

#### PHYSICAL SCIENCES

J. W. Beams, professor of physics, University of Virginia, "investigation of Allison's magneto-optic method of chemical analysis"; P. Gerald Kruger, assistant professor of physics, University of Illinois, "artificial radioactivity"; M. Stanley Livingston, instructor in physics, Cornell University, "high speed ions"; Overton Luhr, assistant professor of physics, Union College, "source of helium ions"; Walter C. Michels, associate professor of physics, Bryn Mawr College, "temperature variations of the photoelectric effect"; Rose C. L. Mooney, assistant professor of physics, Newcomb College, Tulane University, "x-ray crystal structure"; J. C. Stearns, professor of physics, University of Denver, "cosmic rays"; Joel Stebbins, director of the Washburn Observatory, University of Wisconsin, "photometry of stars."

#### ENGINEERING

Walter G. Whitman, professor of chemical engineering, Massachusetts Institute of Technology, "gel structures in the setting of cement."

#### CHEMISTRY

J. R. Bates, L. S. Anderson and J. C. Halford, assistant professors of chemistry, University of Michigan, "Raman spectra of compounds of deuterium"; Ralph A. Beebe, associate professor of chemistry, Amherst College, "measurement of the heats of adsorption of gases on solid adsorbents at low temperatures"; Malcolm Dole, instructor in chemistry, Northwestern University, "studies on the glass electrode"; W. George Parks, assistant professor of chemistry, Rhode Island State College, "the e.m.f. method for determining heats of dilution and transfer."

#### GEOLOGY AND GEOGRAPHY

Kenneth E. Caster, instructor in geology, Cornell University, "the stratigraphy and paleontology of the Pocono formation of Pennsylvania and adjoining territory"; Maurice Ewing, instructor in physics, and Albert P. Crary, assistant in physics, Lehigh University, "a geophysical investigation"; Frank F. Grout, professor of geology, University of Minnesota, "the mechanics of igneous action"; Elmer H. Johnson, industrial geographer, Bureau of Business Research, University of Texas, "physical and economic characteristics of the natural regions of the Gulf Southwest"; George W. Rust, post-graduate student in geology, University of Chicago, "studies of a newly discovered center of ancient volcanic activity in southeastern Missouri"; J. Russell Whitaker, assistant professor of geography, University of Wisconsin, "regional geography of southern Ontario."

#### MEDICAL SCIENCES

G. Howard Bailey, associate professor of immunology, School of Hygiene and Public Health, Johns Hopkins

University, "the heterophile antigens of bacteria"; David M. Greenberg, associate professor of biochemistry, University of California, "the effect of diets low in magnesium on Vitamin G requirement"; Louis N. Katz, director of cardiovascular research, Michael Reese Hospital, assistant professor of physiology, University of Chicago, "various factors operating to modify the coronary blood flow"; Pearl Kendrick, associate director, Bureau of Laboratories, Michigan Department of Health, "the antigenic properties of bacillus pertussis"; Albert P. Krueger, associate professor of bacteriology, University of California, "the nature of bacteriophage"; Orthello R. Langworthy, associate professor of neurology, Johns Hopkins University Medical School, "control of the urinary bladder by the peripheral and central nervous system"; J. P. Quigley, assistant professor of physiology, School of Medicine, Western Reserve University, "the rate of absorption of oxygen from the intestinal lumen of unanesthetized dogs"; H. D. Senior, professor of anatomy, University and Bellevue Hospital Medical College, "the anomalies of the limb arteries in embryos."

#### BIOLOGICAL SCIENCES

Ernest Anderson, professor of chemistry, University of Arizona, "the polyuronides of woods"; Robert K. Enders, assistant professor of zoology, Swarthmore College, "the myology and general anatomy of Didelphids, Alouatta, Cebus and Bats"; Denis L. Fox, instructor in the physiology of marine organisms, Scripps Institution of Oceanography, "physiological effects of deuterium oxide on certain marine animals"; F. G. Hall, professor of zoology, Duke University, "the physiological effects of high altitudes on man and animals"; Hudson Hoagland, professor of general physiology, and director of the Biological Laboratories, Clark University, "repetitive rhythms of activity"; Carl L. Hubbs, associate professor of zoology, University of Michigan, "interspecific hybridization in fishes"; F. B. Isely, professor of biology, Trinity University, Texas, "acridian plant and soil relations"; Frank R. Lillie, dean, division of biology, University of Chicago, "the mathematical analysis of feather pattern as affected by sex hormones and thyroxin"; H. D. Reed, professor of zoology, and Myron Gordon, Heckscher research zoologist, Cornell University, "cytological investigations of certain species of fish"; C. B. vanNiel, associate professor of microbiology, Hopkins Marine Station, "study of the pigments of purple bacteria"; John E. Weaver, professor of plant ecology, University of Nebraska, "effects of great drought upon prairie vegetation and the relation of natural plant cover to soil erosion."

#### ANTHROPOLOGY AND PSYCHOLOGY

Forrest E. Clements, associate professor of anthropology, University of Oklahoma, "mound sites of the Lower Mississippi prehistoric culture in eastern Oklahoma"; T. M. N. Lewis, professor of archeology, University of Tennessee, "archeological sites in Tennessee"; Morris E. Opler, research assistant in anthro-

pology, University of Chicago, "cultural relationships of Apache tribes"; George M. Peterson, assistant professor of psychology, University of New Mexico, "the effect of variations in the wave form of an electric stimulus on the response of conscious animals"; Otis C. Trimble, associate professor of psychology, Purdue University, "analy-

sis of wave-form as a determining factor in auditory localization"; Wilson D. Wallis, professor of anthropology, University of Minnesota, "anatomic lag."

ISAIAH BOWMAN,  
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## SCIENTIFIC APPARATUS AND LABORATORY METHODS

### REGULATING THE FLOW OF SOLUTION FOR PLANT CULTURES

SEVERAL articles have recently appeared in *SCIENCE* on devices for securing a slow and accurately controlled flow of a liquid.<sup>1</sup> The purpose of the present note is to call attention to the simple and efficient method devised by Shive and Stahl<sup>2</sup> and to describe a modification of this method that permits considerable latitude in regulating the rate of flow.

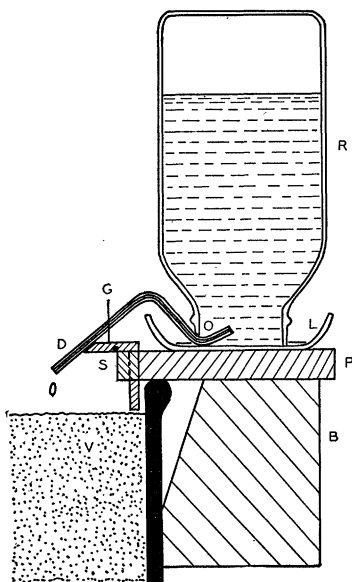


FIG. 1

Fig. 1 shows the main features of the Shive and Stahl apparatus. The solution reservoir (R) is a 2-quart Mason jar with a V-shaped orifice (O) that has been cut with a whetstone. The reservoir, acting as a Mariotte flask, maintains an approximately constant level of solution in the glass dish (L)—a Woolworth "ash tray." Solution flows at a practically constant rate through the small-bore delivery tube (D) and drips regularly into the sand in the culture vessel (V). The apparatus is supported on a platform (P) provided with a bracket (B).

<sup>1</sup> J. H. Wales, *SCIENCE*, 79: 545-546, 1934; W. A. McCubbin, *SCIENCE*, 80: 144, 1934; H. F. Pierce, *SCIENCE*, 80: 339, 1934; R. H. Lambert, *SCIENCE*, 80: 361-362, 1934.

<sup>2</sup> J. W. Shive and A. L. Stahl, *Bot. Gaz.*, 84: 317-323, 1927.

The modification consists in the addition of a notched support (S) for the delivery tube. The desired rate of flow through the delivery tube (D) is then readily obtained by adjusting the position of the apparatus on the platform (P). Movement to the right raises the delivery tube (D), since this rests on the notched support (S) and is guided between two wire nails (G); this decreases the "head" and, consequently, decreases the rate of flow through the tube. To increase the rate of flow, the apparatus is moved to the left on the platform. A change in "head" of about 3.5 cm may be obtained with the apparatus illustrated. After the apparatus has been adjusted to the desired rate of flow, a mark is made with a wax pencil on the delivery tube even with the guide nails (G); this allows immediate resetting of the apparatus after the reservoir is refilled.

The addition of the tube support allows the rate of flow to be varied through a considerable range, and therefore obviates the necessity of extreme care in the selection of capillary tubing of suitable bore. In culture studies the rate of flow may easily be increased as the plants grow.

Small fluctuations in the solution level in the reservoir dish (L) occur, since air is admitted intermittently into the reservoir; changes in the temperature of the air in the reservoir also affect the solution level. These sources of variation in the rate of flow, though generally not significant in culture studies, may be avoided by employing a separate constant-level device, provided with an overflow.<sup>3</sup> But the simplicity, compactness and ease of manipulation of the apparatus of Shive and Stahl make it extremely useful in investigations of the mineral nutrition of plants.

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### THE CHICAGO SOIL-NUTRIENT-TEMPERATURE TANK

THE Botanical Laboratory of the University of Chicago has developed the Wisconsin soil-temperature tank into a soil-nutrient-temperature tank.<sup>1</sup> By its use the direct pathogenic effects of deficient soil aera-

<sup>3</sup> S. F. Trelease and B. E. Livingston, *SCIENCE*, 55: 483-486, 1922. Pierce, *loc. cit.*

<sup>1</sup> W. H. Tisdale, *Phytopathology*, 7: 356-360, 1917; L. R. Jones, *Plant World*, 20: 229-237, 1917; J. John-