as "naturalist, teacher and minor prophet of democracy." He has been great in all these characters.

The story of his highly successful development, in the face of seemingly insuperable obstacles, of Stanford University; of his contributions to internationalism by his services as official representative of the United States in connection with the solution of the fur seal problem and as unofficial but powerful representative of this country on many visits to Japan, Australia, and Europe; his consistent struggle against the Gods of War through a period where these Gods had their way with mankind; the stories of all these are illuminatingly told in the "Days of a Man." They are all inspiring; they all point the way toward human advancement; they all make one eager to go and try to do likewise. The "Days of a Man" is a good book for youth to read, and a good book for men and women, eager to help in the progress of humanity but occasionally discouraged by their hard contacts with the inertia and sordidness of much of our governmental and educational politics, to have conveniently at hand from which to draw new encouragement and determination.

VERNON KELLOGG
NATIONAL RESEARCH COUNCIL
WASHINGTON, D. C.

SPECIAL ARTICLES

USE OF THE CARBON DIOXIDE FREEZING ATTACHMENT ON THE ROTARY MICROTOME

SEVERAL years ago in the *Botanical Gazette* (Vol. 63, pages 236-239, 1917) Professor N. L. Gardner described a method for securing sections of various plant objects easily, quickly, and in large numbers by means of a brine-cooled microtome stage mounted on a rotary microtome. This apparatus has proven particularly useful in preparing sections of fresh leaves, or other living plant objects containing little woody tissue, for study by students in general botany. When sections prepared by this method are examined within an hour or two of cutting, the cells show no evidence of injury from the short exposure to low temperature. They appear to be in all respects equal to fresh free hand sections and are superior in that they are complete and much thinner than those usually secured by hand sectioning.

There are two serious disadvantages, however, in using this method in preparing sections for a large class. First, the preparation of the ice, its mixture with salt, and the charging of the containers which deliver the brine to the freezing chamber are rather arduous and time consuming tasks and second, if laboratory classes are spread over four or five days each week it is necessary either to charge the apparatus with ice and salt on several occasions in order that fresh sections may always be available or to use sections which have been cut for several days. Such sections are entirely unsatisfactory even if kept on ice.

It had occurred to the writer that, in place of the brine freezing attachment, a carbon dioxide freezing attachment might be connected to a rotary microtome and that thus both of the disadvantages mentioned might be avoided. The only objection which presented itself was that the short metal tube of the carbon dioxide attachments furnished by the dealers in microtomes might prove so rigid as to interfere with the free movement of the microtome stage on the rotary microtome and thus cause considerable irregularity in the thickness of the sections and perhaps injure the microtome. To avoid this the tube of a Spencer Carbon Dioxide Freezing Attachment was separated from the threaded connections for the CO_2 tank and microtome stage, and in its place was brazed a ten-foot length of one quarter inch, a one thirty-secondth inch wall copper tube such as may be secured for a small sum from any dealer in automobile garage supplies. The greater length of this copper tube and its somewhat greater flexibility permitted such freedom of movement of the freezing chamber that the latter could be safely attached to the rotary microtome and sections of uniform thickness could be secured. This application of carbon dioxide freezing to the rotary microtome has proved entirely satisfactory and much more economical than brine freezing except where cutting is to be continued without interruption over a period of three or four hours.

With the rotary microtome and CO_2 freezing attachment set up in the preparation room adjoining the elementary laboratories it is now

possible for an assistant within five or ten minutes to prepare the material, freeze it, and cut enough sections for several hundred students. With very little expenditure of time and energy fresh sections can be provided for all laboratory classes.

The material is frozen in a small quantity of relatively thick gum arabic solution. The temperature which must be used to convert this mucilage into a firm supporting mass is apparently not sufficiently low to cause visible injury to living plant tissues by freezing.

A feature which adds much to the convenience of the method is the use of a small wooden block, described in Professor Gardner's article. This block is so cut away on one side as to form with the microtome knife to which it is fastened by means of a wire clamp, a chamber into which the sections fall as they are cut from the frozen mucilage mass. The chamber is partly filled with water, the contact of the block with the knife is made water tight by means of a thin layer of vaseline. When cutting is completed the sections may be easily poured from the chamber with the water.

It is perhaps not superfluous to add that sections thus cut are given to the student for study only after he has cut and examined free hand sections of the same material.

RICHARD HOLMAN
UNIVERSITY OF CALIFORNIA

THE AMERICAN MATHEMATICAL SOCIETY

THE two hundred and twenty-seventh regular meeting of the American Mathematical Society was held at Columbia University, New York City, on Saturday, February 24, extending through the usual morning and afternoon sessions. The attendance included thirty-five members of the society.

The secretary announced the election of twenty-six persons to membership, and the entrance into the society since the annual meeting of seven additional members of the London Mathematical Society under the reciprocity agreement.

At the meeting of the council, the secretary announced the appointment by President Veblen of a committee on endowment, with Professor J. L. Coolidge as chairman. A committee on arrangements for the summer meeting at Vassar College was appointed consisting of Professors H. S. White *(chairman)*, G. M. Conwell, E. B. Cowley and L. D. Cummings and the secretary. Professor E. V. Huntington was appointed representative of the society in the Division of Physical Sciences of the National Research Council for the period of three years beginning July 1, 1923.

The following papers were read before the society at this meeting:

Circular plates of constant or variable thickness: C. A. GARABEDIAN.

Permutable rational functions: J. F. RITT.

The maximum number of cusps of a space curve: T. R. HOLLCROFT.

Theory of the octavic: A. M. WHELAN.

Analogy between electromagnetic field and analytic function: G. Y. RAINICH.

The existence of closed geodesics on surfaces. Preliminary communication: J. W. ALEXANDER.

The asymptotic expansion of the functions $W_{k,m}(z)$ *of Whittaker:* F. H. MURRAY.

Some geometric applications of symmetric substitution groups: A. EMCH.

A property of Haar's system of orthogonal functions: J. L. WALSH.

The Riemann adjoints of certain completely integrable systems: C. A. NELSON.

Intermediate curvatures in Riemann space: E. KASNER.

Concerning the common boundary of two or more regions: G. A. PFEIFFER.

Some theorems on insolvible groups: L. WEISNER.

Values in terms of Bernoulli and Eulerian numbers: I. J. SCHWATT.

On the reduction of differential parameters in terms of finite sets. Preliminary report: O. E. GLENN.

A new form of Stirling's interpolation formula: G. RUTLEDGE.

On the angle between two curves in V_n*:* J. LIPKA.

On the accessibility of the boundary of a domain: R. L. WILDER.

Determinantal relations based on a matrix whose elements fall into two classes: L. H. RICE.

Maximum modulus of some expressions of limited analytic functions: S. KAKEYA.

The society will meet at the University of Chicago April 13-14 and at Columbia University April 28.

R. G. D. RICHARDSON,
Secretary