be slightly north and very definitely east of the center of population of the United States, which in 1930 was 39°3′45″ north latitude and 87°8′6″ west longitude. On the other hand, it seems hard to find any national group for which Richmond, Va., or even Pittsburgh could be considered "far west." Quite possibly some eastern members fail to realize the size of the United States as a whole.

From one point of view, the ideal place for an annual meeting of one of these societies would be the nearest city to the center of population, for the total number of miles of travel necessary for every member to attend would thus be a minimum. From this point of view, it would certainly seem that Columbus and Cincinnati are excellent convention cities.

The writer wishes to acknowledge his indebtedness to students working under the National Youth Administration, without whose help in the routine details this study would have been impossible.

CECIL B. READ

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A NEW DISEASE OF SNAP BEANS

IN June of 1938 while the writer was making a disease survey of his hybrid progenies and varieties of snap beans in connection with a bean-breeding program, he discovered a very destructive disease which has not previously been described. During the present growing season the disease has again appeared and is even more destructive than during 1938.

The end result of this disease is a severe chlorosis followed by wilt and death of the host. Perhaps the most characteristic symptom of the disease throughout its course is a pronounced deep brown to black discoloration of the inner phloem and outer xylem of the entire plant. Of course, the extent of vascular discoloration varies with the extent and severity of infection.

When severely infected, the roots appear dark gray to black on the exterior, due to the intense discoloration of the vascular elements. Symptoms on the upper hypocotyl and stem appear as longitudinal streaks or stripes of varying width, varying in color from brown to brownish purple due to the masking effect of the chlorenchyma. The only external symptoms on infected pods is the presence of a brownish purple discoloration of one or both sutures, which might easily be mistaken for a slight anthocyanescence. In cross sections of infected pods few to all the vascular bundles are discolored, depending on the extent of infection. The chlorenchymatous pulp of severely infected young pods often presents an "inky" appearance.

This disease takes its greatest toll about blossoming time. Although some less severely infected plants survive and mature seed, fatalities are extremely high.

Numerous attempts to isolate a causal organism in culture have consistently failed. This fact, combined with other data at hand, indicates that the disease is caused by a virus. Certain experiments indicate that the virus has a long incubation period, since plants from seed taken from infected pods remain apparently healthy until about blossoming time.

Further work on the etiology of the disease is in progress. From our records we find indications that the disease was brought in on western-grown seed. This note is being published with the hope that persons noting a disease with the above described syndrome will report to the writer.

WILBERT A. JENKINS

GEORGIA EXPERIMENT STATION

GENERAL ANESTHESIA BY CHILLING

THE use of ether, chloretone and other drugs as anesthetics preparatory to operating on lower animals is often objectionable because of the after-effects of the drugs. This difficulty can be overcome by the use of low temperatures for stupefaction. Fishes, amphibians and reptiles may be conveniently and fully anesthetized by immersion in water and cracked ice or simply in cracked ice. After ten to fifteen minutes in the cooling mixture the animals are fully stupefied and, if they are laid out on cracked ice, they may be subjected to an extended and uninterrupted operation. Recovery is quick and satisfactory at the ordinary temperature of the laboratory, and the animals so treated may be almost at once tested in a particular way without waiting for the gradual disappearance from their systems of an anesthetizing drug. This method has been applied with success in the Harvard Laboratories to salt-water and fresh-water fishes, to amphibians and to reptiles. Wiesner (1935) appears to have been the first to use it. Both he and Pfeiffer have applied it to new-born rats. Whether it will have any operative significance for adult, warm-blooded vertebrates remains to be seen. Press reports of a kind of cold hibernation induced in human beings by a slight lowering of their bodily temperatures is suggestive of such a step.

G. H. PARKER

HARVARD UNIVERSITY

SCIENTIFIC BOOKS

RECENT BOTANICAL BOOKS

The Stapelieae. By ALAIN WHITE and BOYD L. SLOANE. 3 vols. xvi + 1186 + 23 + 23 pp. 1,233 + figs. + xxxix plates + 2 maps. 2nd edition. Pasadena: Abbey San Encino Press. 1937. $12.50.

SINCE the Stapelias are found only in the eastern

hemisphere, they have hardly received due consideration in our general concepts of xerophytic plants. Extending from India and Ceylon to Spain, and south to Cape Province in southern Africa, this group of twenty genera is widely spread, though South Africa is spoken of as "the broad paradise of the Stapelieae."

The treatment of the distribution of this tribe of Asclepiads, the discussion of the history of previous work on the group, the descriptions of the twenty genera and all the known species, the copious and beautiful illustrations, thirty-nine in full-page color plates, and the mass of pertinent data assembled about these plants make these three volumes a monumental compendium of information on this unique alliance. They will prove invaluable to the specialist. In *Caralluma* 105 species are given, in *Stapelia* 99, in *Huernia* 45, while *Frerea, Drakebrockmania, Stapeliopsis, Diplocyatha, Hoodiopsis* and *Luckhoffia* are monotypic.

The normal tremor that accompanies the opening of a volume essentially taxonomic is rightly lacking in the case of "The Stapelieae." The general botanist as well as the layman can read this work with pleasure and with profit. Even a partial study and an examination of the excellent figures leave the reader with a distinct impression of the group, with its succulent, rather spiny, photosynthetic stems—only the genus *Frerea* has fleshy leaves—its striking, mottled, showy, flesh-colored, rather complex flowers and its silky-haired seeds. The authors tell us that "the ability of Stapeliads to attract desert flies and a predisposition to succulence were doubtless principal factors in enabling the tribe to dwell in the semi-arid societies they frequent."

Those who study "The Stapelieae" should gain a knowledge and an appreciation of these Asclepiads. Most of us will never have an opportunity of finding them in their native habitats, and many of the genera and species are not often seen in cultivation. These books therefore fill a real need; reading them is almost as satisfactory as studying the plants in the field, though the reader will wish all the more that he might do both.

It is also distinctly refreshing to come upon a work that seems so free of the usual restrictions on pagination and on quality of reproduction. These three volumes give every indication of being exactly what the authors wished them to be; neither effort nor expense has been spared. Such books are lasting.

A Textbook of General Botany. By RICHARD M. HOLMAN and WILFRED W. ROBBINS. xvii + 664 pp. 482 figs. 4th edition. New York: John Wiley and Sons. 1938. $4.00.

FOUR years have elapsed since the publication of the third edition of this justly popular book, and although a number of changes have been made in the new edition, they are not really basic alterations. In format, in style and in contents—even to most of the details—the fourth edition parallels the third closely, and thus maintains the high standards and effectiveness of its predecessors.

The first half of this book deals with the structure and physiology of seed-bearing plants. In this the usual material on stem, root, leaf and flower is presented, along with a concise treatment of the functions of each. In the second half the groups of the plant kingdom are taken up; theories of evolution, heredity and fossil plants are also ably discussed.

In the fourth edition certain changes have been made. There is greater emphasis on active solute absorption, the part on conduction has been altered, the tissue classification has been revised. In the previous edition the plant kingdom was divided into the Thallophyta and Embryophyta; the new book suggests also an alternative grouping in which the vascular plants or Tracheophyta are composed of Psilopsida, Lycopsida, Sphenopsida and Pteropsida. A glossary has been added, and the list of books for reference and collateral reading has been brought up to date.

The new edition has 482 figures, compared with 463 in the third; the additional illustrations are largely half-tones of photographs or of photomicrographs, and some of the old figures have also been replaced. Most of the original excellent drawings and diagrams have been kept, however.

This text is outstanding in the ease with which it can be studied and in the diagrammatic clarity with which the material is presented. It is still the answer to a freshman botanist's prayer.

An Introduction to Botany. By ARTHUR W. HAUPT. xii + 396 pp. 278 figs. New York and London: McGraw-Hill Book Company. 1938. $3.00.

A NEW text-book of botany, added to the volumes recently printed, some of which are still moist, should bear certain marks of distinction to warrant its publication; these are happily not wanting in "An Introduction to Botany."

The author has digested and presented clearly and concisely the rich botanical heritage of the past several generations. There are adequate discussions of the structure, physiology, reproduction and heredity of plants, while six chapters, covering 113 pages, are devoted primarily to their evolutionary development. Thus the usual material of botanical texts is included, though the sequence in certain cases departs from the traditional.

More striking for an elementary book is the chapter on environmental relations, which reflects the growing emphasis of the biological sciences on ecology. Here the elementary student can gain an acquaintance with

the floristic regions of North America, as well as a conception of the characteristic associations and successions. Structural adaptations to the factors of the environment are not neglected, and such time-honored topics as saprophytism, parasitism and symbiosis are given due consideration.

Indicative of the modern trend to consider biological science from some of its broader aspects—from without as well as from within—are three chapters, one on "The Principles of Evolution," one on "The Causes of Evolution" and one on "Plant Life of the Past." These cut across the subject-matter of various fields and leave the reader with an inkling, at least, of the magnitude of the organic world.

Some will wish, perhaps, that the author had entrusted to his students more of the choice bits of the results of modern research, even though such findings may not be destined for eternity; but that is largely a matter of individual preference, and this book, intended primarily for a one-semester course, is necessarily limited in length.

The illustrations are superior—clear and convincing, artistically prepared and largely original.

The author aims "to introduce the college student to the science of plant life"; this he does, admirably.

General and Economic Botany. By ERNEST ELWOOD STANFORD. xxix + 675 pp. 436 figs. New York and London: D. Appleton-Century Company. 1937. $4.00.

SINCE the subject-matter of botanical science continually increases, the text-book extract prepared for student consumption tends to become more and more concentrated. There is a feeling of luxury, therefore, in opening a volume like this, that exceeds somewhat the usual limitations on length and that offers the reader a glimpse of some of the more interesting and humanly important features of this field of endeavor.

"General and Economic Botany" covers the subject-matter included in the standard texts somewhat more fully than usual. There are chapters on cells and tissues, the morphology of leaves, stems, roots and flowers; the functions of these parts of the plant are largely woven into these same chapters, although fifty-seven pages are set aside for "The Seed Plant and Its Environment."

The plant kingdom is divided into the Thallophyta and the Embryophyta, the former being subdivided into the Schizophyta, Phycophyta and Mycophyta, while the latter includes the Bryophyta, Pteridophyta and Spermatophyta.

The seed plants are obviously the author's forte, as might be expected in a book placing emphasis on the economic aspects of the subject. One hundred and forty-four pages are devoted to the groups of the Angiosperms alone. Our more common and important orders and families are considered carefully, along with a considerable number of those more characteristic of the tropics.

Within the covers of this volume information is assembled on a wide variety of botanical topics. Most of our other general texts, for example, contain little or nothing on such items as glutathione, phyllodia, kapok, marihuana, dulse, rainfall and erosion areas of the United States and countless other subjects here included.

The broad basis on which this work is fashioned is reflected also in the 436 illustrations, not a few of which are original, though many have been culled from a wide variety of sources. The lack of uniformity in the figures is more than offset by their diversity of origin and by the scope of the subjects that they portray.

Specialists in particular fields will undoubtedly find shortcomings and inaccuracies. They are almost inevitable in a book of this breadth prepared by one man. From its very scope it lacks the unity of a more compact treatise—it suggests the banyan tree rather than the Colorado blue spruce.

The author writes that his aim is "to introduce the student to one great area of the biological world as a larger place to live in, rather than to train botanists to join an overcrowded profession." If those who study this book are willing to contribute some leisure and some meditation, he will succeed, and they will profit.

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SPECIAL ARTICLES

ADSORPTION OF ANTIBODIES BY EGG ALBUMIN FILMS

THE possibility of demonstrating immunological reactions with films on a water surface, or those transferred on to metal plates by the Langmuir technique has been dealt with in several recent papers.[1] We have carried out experiments with solutions of crystallized hen egg albumin and anti-egg albumin rabbit sera. Films were deposited under a pressure of 12 dynes/cm on chromium-plated slides covered with 37 to 51 layers of barium stearate. Increments of thickness were followed optically as described by Blodgett and Langmuir.[2] Polarized sodium light was used as source of illumination and the value 1.495 was assumed for the index of refraction of the proteins. When a 1 per

[1] *Cf.* E. F. Porter and A. M. Pappenheimer, *Jour. Exp. Med.*, 69: 755, 1939; M. F. Shaffer and T. H. Dingle, *Proc. Soc. Exp. Biol. and Med.*, 38: 528, 1938.

[2] K. B. Blodgett and J. Langmuir, *Phys. Rev.*, 51: 964, 1937.