ganism. On one side are the myriad strongly constricted arterioles and, preventing the blood's escape, the capillaries of the liver intervening between the veins and the vena cava.

Dr. Cannon's plan to restore this essential blood to the systematic circulation, including that of the dying central nervous system, is to inject into the peritoneal cavity a properly adapted solution of some powerful vaso constrictant, preferably pituitrin. The expectation is that the hormone will osmose from the outside of the omenta through the thin connective tissue coverings of the veins and, by forcing the constriction of the latter, impel a liter or more of necessary blood into the badly depressed vital organs.

Dr. Cannon is in France, with his assistant, putting this theory into humane use. The whole world will wish him the best of success.

G. V. N. D.

CAMBRIDGE

SCIENTIFIC BOOKS

The Mosquitoes of North and Central America and the West Indies. By L. O. HOWARD, H. G. DYAR and F. KNAB. (Carnegie Institution of Washington.) Vol. III. 1915. Vol. IV.. 1917.

The final part of this great work has at last been issued, amid general rejoicings from those interested in medical entomology, since it contains a full account of the malaria-organism carrier, *Anopheles*. The two parts containing the descriptive matter and synonymy total 1,064 pages, and the treatment is as full and exact as it could be made. Under each species is a full list of references to literature, followed by copies of the original description and the descriptions of the synonyms, if any. Then comes a detailed new description of the adult insect, and of the early stages when known, followed by a full list of the localities from which specimens have been received or recorded. Finally, there is a discussion of the synonymy and relationships. The yellow-fever mosquito alone takes over sixteen pages. The reader finds before him practically all that is known of the species treated, and the book will stand as a model of exhaustive discussion and clear presentation.

Some difference of opinion will exist regarding the names of some of the species. The most troublesome case is that of the yellow-fever mosquito. This important insect has generally been known as *Stegomyia fasciata,* or simply as *Stegomyia,* which has almost become an English word. The name *fasciata* being preoccupied, the name *Stegomyia calopus* was substituted; but Dyar and Knab regarded *Stegomyia* as part of *Aëdes,* and called the species *Aëdes calopus.* As such it appears in the work reviewed, but a footnote is added, pointing out that *Culex argenteus,* proposed in 1787, is the oldest name. Hence we are to write *Aëdes argenteus.* Mr. F. W. Edwards, of the British Museum, maintains *Stegomyia* as a genus, and according to this plan it will be *Stegomyia argentea* (Poiret). It is admitted that *Stegomyia* is very different from the type of *Aëdes,* and evidently the question whether it should be generically separated is one concerning which there may be legitimate difference of opinion. Under these circumstances, in view of the general usage by medical authorities, it would seem better to recognize *Stegomyia.*

Another sort of difficulty arises from the mistakes of identification which have resulted from the poor descriptions of early authors. Thus the common species described at great length as *Culex territans* Walker, and so referred to in numerous works, is now said by Mr. Edwards, who examined Walker's type, to be actually quite distinct. It takes the name *Culex saxatilis,* and the real *territans* is what has gone as *Culex restuans* of Theobald. The result of this correction will be that when *Culex territans* is referred to, it will be difficult to tell which of the two species is intended, and confusion must follow. Walker's description was quite insufficient for determination, and under these circumstances it would seem proper to sink the name as unrecognizable. The two insects concerned will then stand as *C. saxatilis* and *C. restuans.*

The *Anopheles quadrimaculatus* of authors is also involved in difficulties. It is described

under this name in the book, but at the end of the account the opinion is expressed that Say's *quadrimaculatus* was really the species described as *Anopheles occidentalis*. This is determined from Say's locality, "North-west Territory." Accordingly we are told that *Anopheles guttulatus* Harris should be adopted, although it was published without any description. This seems inadmissible, and we turn to the next available name, *A. annulimanus*, which "is said" to belong here. But after all, the *quadrimaculatus* of authors occurs as far northwest as Wisconsin, and it does not appear perfectly evident that it is not Say's insect. *A. annulimanus* was also from Wisconsin.

The full citation of localities is much to be commended. It might have been still fuller, but for the unfortunate habit of a former curator, of throwing away what he regarded as duplicates. The present reviewer eagerly turned to this mass of information for light on a practical problem in which he is interested. In the course of the war, it will be necessary to establish large camps and hospitals, partly for training purposes, partly for wounded and invalided soldiers, partly, no doubt, eventually for prisoners. It will be desirable to place these camps or hospitals near distributing centers, but also in regions where the climate is favorable and the malaria mosquito is absent. In the presence of *Anopheles*, men carrying malaria organisms in their blood will constitute a menace to other soldiers and to the civilian population. The exact distribution of *Anopheles* accordingly becomes a matter of importance. On mapping the recorded distribution from the new volume, it was found that records were lacking from Quebec, Rhode Island, Vermont, Delaware, Ohio, Alabama, Iowa, Oklahoma, Nebraska, N. Dakota, S. Dakota, Minnesota, Wyoming, Montana and Saskatchewan. Obviously in the majority of these cases the absence of records is due to lack of sufficient collections. Ohio, Delaware, etc., certainly possess the same *Anopheles* as all the surrounding states. There is, however, a real blank on the map, covering Montana, Wyoming, the eastern part of Colorado, Nebraska, the Dakotas, Iowa and Minnesota. It is not to be supposed that *Anopheles* is actually absent over all this area, but it must be relatively scarce, and over a considerable region is probably altogether lacking.

In New Mexico, the southern and Pacific *A. pseudopunctipennis* gets as far north as Las Vegas Hot Springs. In Colorado, *A. quadrimaculatus* comes over from Utah as far as Delta County, on the western slope. This same insect is common eastward, in Illinois, Indiana, Missouri, etc., and it may occur right across the country. More exact investigations, which are planned, may be expected to determine whether this is the case.

In order to form an opinion whether the apparent lack of *Anopheles* in the region just cited was wholly due to the absence of collections of mosquitoes, I listed all the reported species of the states involved. Montana has no less than ten recorded species, Colorado six, North and South Dakota each three, Nebraska two, Iowa seven, Minnesota and Wyoming one each. Evidently collecting is greatly needed in several of these states, and the apparent absence of *Anopheles* requires confirmation. It is to be remarked, however, that if it should prove to be scattered here and there over the western plains and valleys, it will probably be absent in several localities, and often when present so localized that it can readily be exterminated

It is a singular thing that there seems to be an almost total absence of any endemic mosquito fauna in the central arid region. The few species found are mostly widespread, the only partial exceptions being a few *Aëdes*. *A. nigromaculis* is peculiar to the arid western-central regions, south to the Mexican State of Chihuahua. *A. fletcheri* belongs to the prairies of western Canada and adjacent United States. *A. idahoensis* is from Idaho, Montana and Nevada, and *A. aldrichi* so far from Idaho only. There is no series of peculiar forms, such as Dyar found in the mountains of California, or such as occurs in parts of Canada.

The total number of species described from

the region indicated in the title is 398. We may surmise that no less than 500 actually occur.

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May 13

NOTES ON METEOROLOGY AND CLIMATOLOGY

PHENOLOGY

PHENOLOGY is the study of the periodic phenomena of plant and animal life in their relation to weather and climate. Phenology is most important in forestry, agriculture, horticulture and ornithology. In spite of the wide application of such data there has been but little phenological observing done in this country. The extent of such work here and abroad is summarized by J. Warren Smith in Monthly Weather Review, Supp. 2, October, 1915, in connection with the remarkably long and extensive records of Thomas Mikesell at Wauseon, Ohio. These Wauseon records began in part in 1869 and are published including 1912; complete data are given concerning 114 kinds of wild plants, 48 forest trees, shrubs and vines, 16 kinds of fruits, 20 field and garden crops (with yields of some), and the temperatures, rainfall, frosts and first and last snows. In parts of Europe similar records though of fewer plants have been taken by many observers in the British Isles for more than 20 years and in Hessen 33 years.[1]. Ihne[2] in charge of the latter has made a map of phenological spring, and also compared the distribution of population with the phenological maps.

The Bureau of Entomology and the Forest Service are studying phenology as an aid in planting and cutting trees and in the control of pests.

Dr. A. D. Hopkins, of the former, has formulated in a general way the law of phenological variation as follows:[3] "The average variation in the dates of a phenological phenomena of a species is in uniform proportion to the variation in the controlling factors of climate." The general average is the only one for drawing reliable conclusions. A variation of 4 days is to be found with a difference of 1° in latitude, 400 feet in altitude, 5° in longitude westward, or 1° F. The longitude variation seems to be connected with the increasing dryness and strength of sunlight for the Central United States, and with the warmth of the Pacific as the west coast is approached. Departures from the theoretical are the result of local factors. Prevailing sunshine, aridity, absence of large bodies of water, warm ocean currents, prevailing warm winds, S., S.E. and S.W. slopes, narrow summits or plateaus of hills and mountains, broad valleys, open forests, barren or sandy and dry soils—these are accelerating; the opposite conditions are retarding. The size of departures are roughly as follows: error in interpretation, 2 days; southern or northern slopes 1 to 4 days, other retarding or accelerating factors, 1 to 4 days, early and late individuals 1 to 8 days, coastal influences 10–14 days.

The results of collection made by the Forest Service of a large amount of phenological data on 72 common trees in the eastern United States is published in Monthly Weather Review, Supp. 2, October, 1915, pp. 5–9 incl., "A Calendar of the Leafing, Flowering and Seeding of the Common Trees of the Eastern United States," by George N. Lamb. The dates are given only for the extreme north and south limits of their ranges. Further cooperation in the collection of such data is desired by the Forest Service.

In agriculture, phenology contributes not only to the control of pests, but also is of use in determining the proper dates for planting certain crops. On the basis of a thorough study of the Hessian fly at one or more control stations in West Virginia, Dr. Hopkins was able to construct a map and table with which if he knew his location and altitude a farmer could plant his winter wheat during a short period immediately after the usual disappearance of the Hessian fly. In the spring, wild plants are used by many to indicate the proper

[1] Quart. Jour. Roy. Meteorological Soc., J. E. Clark—13 common plants, 6 birds, 5 insects, more than 100 stations.

[2] "Arbeiten der Landwirtschaftskammer für das Grosherzogtum Hessen."

[3] "Report on Forest Trees," 1914.