

not be most wisely studied first, as they can be, without extended reference to other parts of the subject; and then knowing the raw materials with which forces and processes deal, the student can most intelligently follow out the various modifications produced upon them by the geological agents.

Professor Park does not take up rocks as objects in and of themselves, but views them as products of geological processes. Thus, sedimentary rocks are first outlined following the introductory chapters already mentioned, and even after joints, faults and cleavages have been described. Igneous rocks are introduced by a preliminary chapter on volcanoes and volcanic action. Before the individual rocks are taken up we find the topics—alteration, magmatic differentiation and Atlantic and Pacific types discussed, inevitably with the use of rock names with whose significance the student can not yet be familiar. In these particulars it seems to the reviewer that the natural order of treatment is reversed.

A chapter on fossils and a following one on conformity and unconformity lead up to the great subject of stratigraphical geology which forms Part II., and to which fifteen chapters or more than one third the work are devoted. One hails with satisfaction this recognition of the great stratigraphical part of the subject, by one who writes primarily for mining schools. The tendency to minimize this enormously important branch of the subject in favor of purely structural and dynamic portions has become pronounced in later days, and yet mistakenly. The great conceptions of older and younger strata, of succession in time, of recognition by organic remains; of the growth of land masses, are all fundamental to the applications of the subject as well as to its proper understanding. The treatment is well balanced and the succession of living forms is brought out by reasonably full numbers of illustrations. Sections are given for all the better explored portions of the globe.

Part III., Economic Geology, embraces two very condensed chapters, one relating to mineral deposits of all kinds and one on the methods of field work and geological surveying. Be-

sides two brief appendices on special field methods, a condensed bibliography of geological works, classified by subjects, is given at the close of the work. All in all, Professor Park's work is well written, interesting, and will prove a serviceable text-book.

J. F. KEMP

BOTANICAL NOTES

A STUDY OF A DESERT BASIN

SEVERAL months ago there appeared from the Carnegie Institution of Washington, as "Publication No. 193" an interesting paper entitled "The Salton Sea," by Dr. D. T. MacDougal and his collaborators. It fills a quarto volume of nearly two hundred pages, and is illustrated by thirty-two full-page plates, and four text figures.

The whole book is full of interest to the scientific reader, and especially to the geologist and geographer, as shown by the titles of the chapters, "The Cahuilla Basin and Desert of the Colorado"; "Geographical Features of the Cahuilla Basin"; "Sketch of the Geology and Soils of the Cahuilla Basin"; "Chemical Composition of the Water of Salton Sea, and its Annual Variation in Concentration," etc. Several of the chapters, including the major part of the volume, are devoted to botanical aspects connected with the formation and recession of the limits of the Salton Sea. And here it may be remarked that this sea is in southern California, and occupies a portion of a great desert depression of the earth's surface below sea level. The sea was formed a few years ago by an inrush of water from the Colorado River which flooded an area of over four hundred square miles of the lower portions of the Cahuilla Valley. Since then the sea has been subsiding, and this fact has enabled the botanists to study the incoming vegetation under the peculiar conditions here found.

The distinctly botanical chapters are those on the "Behavior of Certain Microorganisms in Brine"; "The Action of Salton Sea Water on Vegetable Tissues"; "Plant Ecology and Floristics of Salton Sink"; "Movements of

Vegetation due to Submersion and Desiccation of Land Areas in the Salton Sink," and the final "General Discussion." In the third of these there is given a catalogue of 202 species of plants collected in the Salton Sink. Of these, 23 species are lower (spore-bearing) plants, while 179 are seed-bearing. Of the seed-plants 131 are indigenous, and 48, introduced, the latter almost wholly confined to the reclaimed areas (by irrigation and cultivation), and it is said that in no case have they been able to intrude where natural (*i. e.*, desert) conditions remain.

In the fourth chapter "the main thesis has been the manner in which seed-plants were carried into moist zones or strands around the receding lake which had been completely sterilized by immersion in the salt water." During the six years of close observation five trees, 17 shrubby species, and 38 herbaceous forms appeared upon the beaches of the receding lake. Lists are given of the earlier species to appear on the newly emerged beaches, but their significance is hard to understand, no doubt because of the many factors entering into the problems of dissemination, succession, elimination, etc. The transformation of a waterless desert of excessively high temperature into a saline lake with broad beaches, which range through all degrees of moisture from soft mud to almost complete desiccation, involves a great number of physical and biological factors, and this paper is a notable contribution to this phase of botany, which will be of interest to all ecologists.

VASCULAR PLANTS OF OHIO

THE state of Ohio is fortunate in having had for so many years a succession of systematic botanists who have gone over their territory again and again until its higher plants are now very well known. Fifteen years ago the lamented Professor W. A. Kellerman with the help of a considerable number of contributors published the "Fourth State Catalogue of Ohio Plants," and now his successor, Professor J. H. Schaffner, issues another list under the title "Catalogue of Ohio Vascular

Plants."¹ As indicated by its title it is confined to the higher plants, and includes 2,065 species, "about one fourth of which are non-indigenous."

The nomenclature conforms mainly to that of the second edition of Britton and Brown's "Illustrated Flora of the Northern United States, Canada, and the British Possessions," and the arrangement is in accordance with the well-known phyletic classification proposed by the author of the publication. Thus the phyla are Ptenophyta (Ferns, 49 species); Calamophyta (Horsetails, 8 species); Lepidophyta (Lycopods, 8 species); Strobilophyta (conifers, 11 species); Anthophyta (Flowering Plants, 1,989 species). Among the flowering plants one finds 526 monocotyledons, against 1,463 dicotyledons. Again we find 161 sedges (Cyperaceae), and 178 grasses (Gramineae). So, in the dicotyledons we find 72 mustards (Brassicaceae); 94 rosaceous plants (Rosaceae, in the wider sense); 87 legumes (Leguminosae, in the old sense, although listed under Fabaceae); 6 ragweeds (Ambrosiaceae); 202 composites (Helianthaceae); 25 chicories (Cichoriaceae).

A convenient map of Ohio showing the counties, and a full index complete this notable catalogue.

A STUDY OF A CARBONIFEROUS FLORA

IN a paper entitled "The 'Fern Ledges' Carboniferous Flora of St. John, New Brunswick," published as Memoir 41, of the Geological Survey of Canada (1914) Dr. Marie C. Stopes gives descriptions of the species of plants from these interesting deposits. The genera *Calamites*, *Asterophyllites*, *Annularia*, *Sphenophyllum*, *Lepidodendron*, *Sigillaria*, *Stigmaria*, *Psilophyton*, *Sphenopteris*, *Crossotheca*, *Diplothema*, *Oligocarpia*, *Pecopteris*, *Alethopteris*, *Megalopteris*, *Adiantides*, *Neuropteris*, *Trigonocarpum*, *Rhacopteris*, *Sporangites*, *Pterispermotrobis*, *Whittleseyia*, *Dicranophyllum*, *Cordaites*, *Poacordaites*, *Dadoxylon*, *Cordiaianthus* and *Cardiocarpon* are represented by one or more species. Many of these are illustrated by half-tone reproductions

¹ Ohio State University Bulletin, No. 24.

of photographs of the actual specimens. Since these half-tones have not been "touched up" they must prove of the greatest value to students of Carboniferous plants.

A USEFUL SOCIETY

THE Sixth Annual Report of the "Quebec Society for the Protection of Plants from Insects and Fungous Diseases" (Quebec, 1914), calls attention to a society that must prove to be most useful to the people of the province of Quebec in particular, as well as of all eastern Canada in general. The report itself covers less than a hundred pages, and yet it includes more valuable articles than many much larger reports. Thus among botanical papers there is a short, crisp report of the committee on the flora of the province of Quebec recommending the early publication of a new "Flora of Quebec"; another on Downy Mildews; still others on Some Plant Diseases of 1913; Storage Rots of Potatoes and Other Vegetables; A Bacterial Soft Rot of Turnips; Injury and Abscission of *Impatiens sultani*. One can not help feeling that these Canadians have managed to organize a most useful society, for which they deserve to be congratulated.

CHARLES E. BESSEY

THE UNIVERSITY OF NEBRASKA

SPECIAL ARTICLES

THE ELECTRIC MOTOR NERVE CENTERS IN THE SKATES (RAJIDÆ)

WHILE the electric lobes of the brains of torpedos, with their massed motor nerve cells of the electric apparatus, are classic subjects of study, and while the physiologically corresponding motor centers of the central nervous system have been described superficially in *Malopterurus*, *Gymnarchus* and *Gymnotus*, the motor nerve apparatus of the other three types of electric fishes (two Teleosts) have never been adequately worked out. The writer has recently worked on this nerve center of the electric apparatus in the skates with results that promise to be of interest.

Ewart has already described a motor electric nerve cell from Raja, but it is not certain that

the cell, which he figures and describes in his short report in the *Proc. Royal Soc.*, Vol. 53, pp. 388-391, is a motor nerve cell belonging to the electric organ or a motor nerve cell belonging to the muscle that surrounds the electric organ.

The writer examined the spinal cords of eleven species of skates and found remarkable cells placed in the anterior horn of the cord at various regions which were all opposite the well-known spindle-shaped electric organs found in the tail and lower body of this fish. While these cells were placed thus in the cord among other nerve cells and corresponded in their anterior-posterior distribution with the extent of the electric organ, yet their cytological character was such that it could scarcely be believed that they were nerve cells at all. They are of unusually large size, irregular in configuration, with many angles and projecting points some of which might be nerve processes. The large cytoplasmic body contains an irregular branching and lobular nucleus containing much chromatin but no definite plasmosome, the opposite condition to that found in most nerve cells. This chromatin is distributed in the form of numerous (several hundred) masses of considerable size, evenly and regularly strewn through the caryoplasm.

This type of nucleus is so unusual for a nerve cell that these cells were traced backward through a series of embryonic skates to their origin, which proved to be the same as the other motor nerve cells of the anterior horn. Stages were clearly traced that showed them being differentiated from these other cells at an early stage of the embryo within the egg. The physiological activity of these large cells was evidenced by the formation of series of vacuoles which coalesced into larger vacuoles that finally condensed and precipitated their contents into a number of heavy, homogeneous granules which were discharged from the cell in a ventral direction and became distributed through and around the tissues of the gray matter. This material appears to be finally absorbed by the blood. Its composition has not yet been determined.