

reproducing half-tone plates on the same paper as the text is doubtless dictated by economic factors, but it cannot always give the highest quality of reproduction.

These, however, are relatively small matters; Dr. Cosslett is to be warmly commended for his labours in writing this clear and stimulating manual, the lines of which lay down the scientific principles and practice. Between the lines we read of the artistic skill and patience which all good electron microscopists must strive to develop and achieve.

J. T. RANDALL

THE CALIFORNIAN FLORA

A Manual of the Flowering Plants of California

By Willis Linn Jepson. Pp. 1238. (Berkeley and Los Angeles: University of California Press; London: Cambridge University Press, 1951.) 37s. 6d. net.

An Illustrated Manual of California Shrubs

By Howard E. McMinn. Pp. xi+663. (Berkeley and Los Angeles: University of California Press; London: Cambridge University Press, 1951.) 49s. net.

W. L. JEPSON'S "Manual of the Flowering Plants of California" was first published in two parts in 1923 and 1925 and has been the standard work on the flora of that region ever since. The present volume has been produced by offset-printing from the original and is therefore identical with it. While in consequence no advantage could be taken in this issue of any additions to our knowledge of the flora of this area during the past quarter of a century, yet, on the other hand, this indispensable and authoritative work first issued at seven and a half dollars is thus made available to students at what is to-day a remarkably low figure, namely, about two-thirds of the original cost.

The text contains descriptions of more than four thousand species and is illustrated by more than a thousand line-drawings. The author, who died in 1946, was one of the leading taxonomists of the United States and the outstanding expert on the Californian vascular plants, so that it is a great boon that this classic flora should thus again have been rendered readily available, the more so having regard to the intrinsic interest of the vegetation of this area both botanically and horticulturally.

More than a third of the native flowering plants of California are endemics and include some that are notable alike for their botanical interest and their beauty. Such are the mariposa lilies (*Calochortus* spp.), with their exquisite flowers and remarkable hairy glands upon the petals, or the monotypic *Carpenteria californica*, with its profusion of stamens, that decks the foothills of the Sierra Nevada.

The second work here under review, that by Prof. H. E. McMinn, is similarly offset-printed and again provides, at a remarkably low price, a handbook to the shrubs of California, this category being widely interpreted to include a total of about a thousand species and varieties. The Californian shrubs include many horticultural favourites such as the flannel bush (*Fremontia californica*), a monotypic tree of short life-span not normally attaining more than twenty-five years, and the fuchsia gooseberry (*Ribes speciosus*).

Among the more characteristic of the shrubby genera of the area may be mentioned *Ceanothus* and *Arctostaphylos*. Of the total species of the former,

numbering about forty, no less than two-thirds are native to California, and indeed *Ceanothus thyrsiflorus* is known in British gardens as Californian lilac, while *C. dentatus* and *C. papillosus*, also from the Santa Cruz mountains, are other horticultural favourites. *C. purpureus*, which is represented in a coloured frontispiece, is perhaps the most beautiful of the genus but not hardy in Britain. Of the species of *Arctostaphylos*, numbering about fifty, some forty occur in California, of which perhaps the best known is the endemic manzanita. The seeds of these are said to germinate freely only after a fire has swept over them, though this does not apply to those of the arctic-alpine species. An interesting feature of geographical distribution is the occurrence in California of one species of *Lithocarpus*, whereas all the remaining species, numbering about a hundred, occur in south-east Asia. From California comes the giant *Coreopsis* that attains a height of up to ten feet, although it has a span of life of only about six years. The garryas (*Garrya elliptica* and *G. fremonti*) are both natives of California, although found also in Oregon. Among annuals mention may be made of *Clarkia pulchella* with its three-lobed petals, and the well-known species of *Eschscholtzia* and of *Platystemon californica*.

Both manuals contain very adequate descriptions of, and keys to, all the species treated and are fully illustrated; in the "Manual of Shrubs" these are amplified with more detailed geographical, biological and morphological data. These two works are too well known to need description and treat of a flora that is of wide interest to all who study and cultivate plants. The University of California is to be congratulated on having rendered such useful handbooks again available at so reasonable a price. Their significance as object-lessons in the use of non-conventional methods of printing should not be lost sight of.

E. J. SALISBURY

ABSTRACT ALGEBRA

Lectures in Abstract Algebra

By Prof. Nathan Jacobson. Vol. 1: Basic Concepts. (University Series in Higher Mathematics.) Pp. xii+217. (New York: D. Van Nostrand Co., Inc.; London: Macmillan and Co., Ltd., 1951.) 37s. 6d. net.

ABSTRACT algebra is a difficult subject, which has taken a long time to evolve. Algebra of the ordinary kind has been known for many centuries, but it was not until the nineteenth that Boole showed that there could also be algebras of other kinds. Cayley dealt with matrices and Hamilton with quaternions, for both of which the commutative law of ordinary algebra ceases to hold. The consideration of such systems, suitably generalized, led to the study of abstract linear algebra. But modern abstract algebra owes even more to the unsuccessful efforts to solve an algebraic equation of degree higher than the fourth. Consideration of the underlying reason for this failure led Lagrange, Abel, Galois, Kronecker and others to such fundamental ideas as those of groups and fields. Concepts derived from various sources have been studied in an abstract way in the twentieth century, and great advances have been made, notably by Emmy Noether.

How is the result of this long process of development to be presented to the student? To lead him through the historical route would involve burdening