REVIEWS

The Natural Geography of Plants

By Henry A. Gleason and Arthur Cronquist. Columbia University Press, New York, and Copp Clark Publishing Co., Toronto. 1964. 420 pp. $10.00.

In this excellent book the authors present a fascinating picture of the floristic provinces of North America, their intergradations, the origins of the plants characteristic of each province, and the factors that control the present distribution of these plants. The book is copiously illustrated with excellent photographs, finely reproduced, of habitats and individual plants. The illustrations, from many sources, but notably the United States Forest Service, occupy about half the book. The text is thus quite short, but it is packed with information.

The approach is predominantly ecological, and it is notable that the authors, writing primarily for the amateur naturalist, have been able to present their points clearly and concisely without the complex vocabulary that many ecologists consider essential. Only in presenting a modification of Raunkiaer's classification of life forms do they introduce any complexity; and here their explanations take more space than a discussion in plain English need have done.

In a brief coverage of so large a field some generalizations are inevitable; and, despite evident care, brevity has led to the inclusion of some statements that may mislead the unwary. We have considerably more information on postglacial migration rates (and posthypsithermal retreats) than is suggested on page 81. The factors limiting tree growth at the arctic tree line are much more numerous and complex than merely adequate temperature for an adequate time as indicated on pages 99 and 202. The discussion of speciation (p. 113) is very superficial, with inadequate emphasis on the importance of physical isolation in allowing variants to reach the species level. Hybridization certainly does produce some new species, but the parents must first speciate in isolation. There are many exceptions to Jordan's law (p. 123), or the competitive exclusion principle, in severe ecological conditions, especially in the high arctic where several species of a genus may be seen in a square meter of uniform ground. Dr. Gleason's apparent preoccupation with the spread of seeds on birds' feet has caused him to neglect other, generally more effective, means of long-range dispersal; and some of his examples are unfortunate. Thus *Butomus umbellatus* is spread predominantly by aquatic means. Although *Endothia parasitica*, the chestnut blight pathogen, was isolated from the feet and plumage of birds collected from cankered trees, birds were never implicated as significant vectors. The conidia are splashed by rain, and the ascospores, after forcible discharge, are carried by wind. The steady radial spread from the site of introduction was typical of wind dispersal and unlike the random occurrence associated with bird vectors.

A few factual errors have crept in, which may be pointed out in view of the likelihood of such a valuable book undergoing revision. *Epilobium angustifolium*, which sprang up in bombed areas of London is, of course, as much a European as a North American plant, and there is no mystery in its occurrence on such sites. Moreover every British plant examined has proved to be diploid, like the rest of the European population. The temperate population in North America is tetraploid and only the subarctic and subalpine plants are diploid, as Dr. Mosquin has shown. It is stated (p. 206) that the forest advanced into the prairie at the end of the hypsithermal period (or xerothermic as the auth-

ors, like many other botanists but no zoologists or glaciologists, call it), and that the Indians started burning the grass later, perhaps 5000 years ago; but the hypsithermal ended about 3000 years ago. Inevitably the authors are less well informed about the arctic than the floristic provinces in which they have worked. The last plants do not vanish among bare rocks, ice and snow as one travels north. When the northernmost land is reached at 83° North, there are still a substantial number of species; and more than 100 species occur at a single site at 82° North. It is only on the very flat, gravelly western shores, some 300 miles further south, that, in the last mile or so, one may leave all plants behind. The whole of the tree line in Canada is shown on air photographs; and only the complexity of the floristic boundary, not lack of exploration, makes its position on the map uncertain. Sphagnum is common only in the low arctic, and absent from many islands. Although much of the arctic is a wet desert, some parts are extremely arid, supporting little but scattered bunchgrasses with tightly involute leaves.

Such small errors detract very little from the book, which will add greatly to the pleasure and profit that any naturalist gets from excursions either close to home or into other floristic provinces.

D. B. O. SAVILE

Plant Research Institute
Canada Department of Agriculture,
Ottawa, Ontario

The Mosses of Michigan

By HENRY T. DARLINGTON. Edited by Howard Crum. Cranbrook Institute of Science, Bloomfield Hills, Michigan (Bulletin No. 47) 1964. pp. I-X, 1-212. Fig. 1-147. 1 map. $12.00.

Students and amateur bryologists will welcome this new book on mosses. The author was in his ninetieth year when he published his manual and he admirably incorporated in his work the pedagogical knowledge and know-how of his prolonged experience as a professor.

Three hundred and ninety-nine species from 125 genera and 43 families are described briefly. Emphasis is placed, whenever possible, on those particular morphological features that can be observed in the field. All the genera, but only one third of the species, are illustrated. However, the author mentions for each species illustrations present in other manuals readily available, such as Conard's *How to Know the Mosses* or Welch's *Mosses of Indiana*. Most of the illustrations, borrowed from Braithwaithe's *British Moss Flora*, are surprisingly well reproduced. Notes following the description of species refer to habitat, general world-wide occurence and geographical distribution within the various counties of the Upper and Lower Peninsulas in Michigan. Students will appreciate the extensive glossary at the end of the volume. This glossary (and the same is true of figure 2 where cell length-breadth ratios are illustrated) would have proved more useful if the author had referred to specific examples from some of the illustrations of his book. Noticeable errors in typography appear extremely rare. It is evident that the editor of this manual, a well-known bryologist, not only devoted much of his time and knowledge to the scientific aspects of this work (such as revising the descriptions and improving the keys) but also spent considerable time planning the material composition as well. A feature one would like to see incorporated in manuals of this kind would be a chapter (or at least a few pages) on ecology. Students are always stimulated when shown in the field the ecological significance of bryological communities and their importance in various phytecenoses.

To this reviewer it was a surprise to learn that only 399 species of mosses had been found in a State so well known bryologically as Michigan. We are certainly more fortunate here in eastern Canada where bryophytes form such an