

# Book Reviews

## Patterns of Vegetation

**Plant Communities.** A Textbook of Plant Synecology. REXFORD DAUBENMIRE. Harper and Row, New York, 1968. xiv + 300 pp., illus. \$9.75.

As the world's population continues to increase, the green mantle of vegetation—that diverse mosaic of plant communities—continues to diminish or to be drastically modified by the activities of man. Consider the past overgrazing of the southwest deserts that triggered widespread geomorphic change (arroyo cutting), the slash-and-burn practices that incessantly laid waste vast acreages in the tropics, or even the more recent fire-control practices on millions of acres of woodland that were normally subjected to burning either by early man or by natural phenomena, as in certain southwest mountain ranges where over half the forest fires are due to lightning. Daubenmire's book concerns the dynamics of this fascinating pattern of plant communities covering the earth's surface. It is aimed at assisting the student of plant ecology to analyze, describe, and interpret dynamic ecological processes. This volume will join several others concerned primarily with the plant-community components of ecosystems. Designed as an introductory text, and basically synecological in approach, it will serve as a sequel to the author's earlier book, *Plants and Environment*, which takes an autecological approach.

After the two introductory chapters on the nature of and methods for analyzing plant communities, one encounters the most fascinating chapter, comprising over half the text, on plant succession. Since the early work of Weaver and Clements, the concepts of succession and climax have tended to dominate the scene in plant ecology. Daubenmire defines succession as "any unidirectional change that can be detected in the proportions of species in a stand or for the complete replacement of one community by another." He prefers dis-

tinguishing succession from vegetation change, since certain changes observable in vegetation are not successional by this definition. Climax vegetation, or what I prefer to call a relatively stable vegetation type, is defined as "a multiconditioned product of succession, its character reflecting the influences of all edaphic, aerial, and biotic factors that comprise the environmental complex"; or practically defined, as I prefer, as "communities for which there is no evidence of replacement." The student is introduced to succession on rock, dune, lake, river, terrace, talus, glacial till, grazing land, and abandoned field. Autogenic and allogenic factors, including competition, are thoroughly discussed. How the student will interpret the succession and climax concepts presented will depend upon his keenness and the insight of the instructor. The rock succession diagram shows principal stages beginning with foliose lichen and moss, leading to fruticose lichen and moss, herbaceous plants, and finally to a tree and shrub stage. In another study one learns that a forest "climax" may develop on protected sites and a lichen "climax" on exposed sites a few meters away. Therefore one might question whether there really is such a phenomenon as rock succession where periodic droughts and occasional fires keep this apparent set of belts in a dynamic oscillating equilibrium. On rock outcrops in southern New England woodlands one does not encounter a succession but rather belts of vegetation that have expanded and contracted under the adverse site conditions for some 10,000 years, where even after this length of time extensive areas of exposed rock still persist.

Pond and lake succession are recognized as autogenic processes where an actual centripetal development may occur or, in contrast, where mere belts of vegetation may give the illusion of succession, as in the case of a sphagnum bog being studied by one of my colleagues where the stunted spruce and

larch on the sphagnum-heath mat fringing the open-water area are essentially the same age as the adjacent older-appearing spruce-shrub belt. The author also makes clear that if trees eventually cover boggy sites, the forest type that develops may be similar to the surrounding forest—western hemlock in the Puget Sound region—or unlike that of the surrounding upland, as in places where white cedar dominates the bogs but not the upland.

Talus succession may or may not occur as revealed by the text, photographs, and figures. In the Grand Coulee steppe of Washington (fig. 61) lichen-covered talus represents the "climax," a pattern also observed on talus slopes in Connecticut, which are surrounded by a sprout hardwood forest. Further variants are evident from the author's studies in Idaho, where grassland and forest-scrub are the so-called end stages on north and south slopes, respectively. The foregoing examples reveal the extreme variability in vegetation development.

Abandoned-field successional processes are traced on the southern and northern Piedmont. Here a brief discussion of F. E. Egler's paper [*Vegetatio* 4, 412–17 (1954)] on initial as opposed to relay floristics would have greatly broadened the reader's understanding of vegetation development and of how what one observes in a series of fields may or may not actually relate to succession. That light-intolerant shrubs may eventually be shaded out by tree growth is not questioned, but the sequence of invasion, crucial when one is concerned with vegetation management in such areas, is often not fully understood. To construct end points dogmatically, and especially to consider the process orderly and predictable, is dangerous and often misleading; the vegetation has not read the current texts. Although climax, interpreted to mean that vegetation which is relatively stable on a given site, is a sound concept, I prefer not to use the term or its climatic, edaphic, topographic, and pyric prefixes. Over the past few decades the literature has become engulfed in this terminology and has become extremely difficult of interpretation because authors vary in their use of the terms. One new climax possibility posed by Daubenmire is neoclimax for those stable vegetation types resulting from man's introductions.

In chapter 4, "Vegetation and ecosystem classification," the author alludes to a more rational approach. Within a

given geographical region of relatively uniform climatic conditions one can recognize a certain floristic spectrum of species, for example, central hardwoods predominating in southern New England and northern hardwoods in northern New England. Within each of these vegetation zones there are a variety of site or habitat types: lower slopes, mid slopes, upper slopes, crests, talus slopes, sand plains, river terraces, and so on. Each of these sites within a given zone can display a distinctive and relatively stable vegetation. For each site one can discuss future trends, incorporating all environmental factors, including historical, catastrophic, edaphic, and biotic influences and the role of fire and of measures to protect against it. An extremely lucid interpretation of the vegetation, free of climax terminology, can result. My plea to students using this text is constantly to look at vegetation with an open mind, rather than with preconceived ideas of what it is *supposed* to be doing. Arrowed successional diagrams may be real, or they may merely represent relatively stable belts not really headed toward any one so-called end stage. The succession and climax concepts have had tremendous appeal, for they tend to simplify complex phenomena, but they also have the inherent danger of stymieing thinking. I remember a book editor's comment to a colleague when discussing this question—"you may be right but this approach [succession-climax] is more teachable." As our problems of maintaining a high level of environmental quality intensify, we will need more and better ecologists to analyze and interpret ecosystem dynamics constructively. A basic understanding of vegetational change is essential, not in preconceived terms, but by a holistic analysis of all the factors, past and present, that are modifying process and change.

The book is clearly written and well illustrated. The nearly 500 references keyed by numbers in the text give the reader a good insight into the literature of plant ecology. Although vegetation as a continuum is discussed, papers concerned with this subject are poorly represented in the bibliography. This may well reflect the author's skepticism of the concept. To the student with an open mind, Daubenmire's book can provide a considerable background of information on the methods of study and the dynamics of plant communities.

WILLIAM A. NIERING

Department of Botany, Connecticut College, New London

## Sleep

**The Biology of Dreaming.** ERNEST HARTMANN. Thomas, Springfield, Ill., 1967. xiv + 206 pp., illus. \$9.75. American Lecture Series, No. 686.

Few working sleep researchers recently have attempted single authorship of books or monographs intended to review in detail the physiology, let alone the "biology," of dreaming sleep. The many recent publications have all been conference proceedings or collections of papers. This is understandable, for the prospective author is faced with examining not merely the advances of a particular scientific discipline but the progressive unfolding of knowledge in the physiology, chemistry, pharmacology, endocrinology, neurophysiology, psychology, phylogeny, ontogeny, and pathology of an entire state of existence. Sleep research in the last decade and a half has simply extended all our biological and psychological curiosities about man to a round-the-clock concern. What perils, for example, might we expect for the author who announced that he was embarking on a review of *awake* research?

Under these difficulties, Ernest Hartmann has singly authored an extensive, pertinent, and always readable monograph in *The Biology of Dreaming*. The advantage of single authorship in this instance is that we have been provided with a well-integrated account of the manifold properties and phenomena—drawn from extensive research with animals as well as with humans—of rapid-eye-movement (REM) sleep.

To a considerable degree Hartmann has formulated an enviably clear statement of what might be termed the "dominant" (though encrusted) view in the field during the last several years. Though he is careful in his assessment of the data and alerts us with a *caveat lector* as to the limits of current knowledge, he nevertheless presses the beliefs, first, that dreaming represents a unique biological condition, and second, that during dreaming the operations of the brain may be regarded as analogous to those of the awake brain. However, this view, which sees REM-state activation as equivalent to the mechanisms at work in a hypothetical "awake dreamer," now seems overdrawn.

Most workers agree that vivid dreaming occurs in the REM stage. However, it is unfortunate that Hartmann has added yet another to the many extant designations for REM sleep, the *D-state*, "'state,' to emphasize the qualitative

differences from waking and from ordinary sleep; 'D,' to emphasize the important psychological experience of dreaming." That this state *within* sleep has amazing properties is well known, but to circumscribe its significance prematurely with a label is a mistake, especially since there is virtually no information available as to whether animals actually "dream." Also, there is a current disagreement as to whether man's dreaming is confined to the REM stage.

The author argues hard for a now more than ever questionable tie-in between variations in psychological drive pressure and variations in REM sleep time. He also suggests that stress and "psychic pain" may cause an increased "need for D." Psychological drive intensity is doubtless expressed in dream content, but most recent evidence would dispute a connection with the *amount* of dreaming. There is also some tentatiousness and excessive speculation in Hartmann's handling of the relationship of REM sleep to mental illness and to other pathological conditions. This is revealed in his approach to the reasons for death in central pontine myelinolysis, for delirium following cardiotomy procedures, and for the psychological symptoms in the premenstrual period.

One problem with a book such as this is that, in spite of the author's obviously careful attention to cogent synthesis of the material, it quickly becomes substantially out of date. Though written in 1965–66 and published last year, some of Hartmann's covering concepts now read as shopworn or oversimplified. More unfortunate, in the areas where Hartmann has stressed an individual point of view (the association of depression and high REM time, serotonin as a possible neurochemical mediator of REM sleep, and hormonal influences on the sleep stages), information has become available since the writing of this book which either reverses these hypotheses or complicates the questions.

Hartmann's book is recommended for those to whom it seems addressed—interested lay readers and scientific workers in other fields who want a short but extensive introduction to the status of physiobiological studies of dreaming sleep. Nevertheless, the book has some new facts and interesting points for everybody's attention. Certain chapters, such as that on neurophysiology of the "D-state," are detailed and excellent in light of the time at which they were written. For workers in the field, how-