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BOOK  
REVIEWS

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**B.M. Mirkin and L.G. Naumova,**  
***Nauka o rastitel'nosti. Istoriya i sovremennoe sostoyanie***  
***osnovnykh kontseptsii* (The Science of Vegetation:**  
**The History and Current State of Basic Concepts),**  
**Ufa: Gilem, 1998, 412 p.**

In the book reviewed, the science of vegetation (SOV) is regarded as an interdisciplinary complex of several scientific fields in which the same object—the plant cover—is investigated from various aspects and at different levels of its organization. The authors undertook the task of analyzing the formation of modern concepts in the SOV from the standpoint of the model of convergently advancing knowledge. According to this model, more or less similar ideas concerning a particular problem appear in different countries (or even in different scientific teams of the same country) independently and, later, converge to give rise to a unified concept.

The methodological basis of the modern SOV is found in the concept of continuum as a system of ideas concerning continuous changes of the vegetation in space (Chapter 1). Referring to the works of L.G. Ramenskii and H.A. Gleason as the founders of this theory, the authors characterize the recent history of phytocenology as the “victorious advancement” of corresponding ideas. Such an approach appears to be biased because, according to V.D. Aleksandrova (1969), it is more correct to regard the plant cover as the unity of continuity and discreteness. It should be noted, however, that the authors eventually came to a contradiction: in Chapter 4 (p. 210), they stated that the ratio of continuity and discreteness in the vegetation varies depending on its type.

Chapter 2 deals with the study of vegetation at the species level. Initially, the authors review the development of physiognomics (the study of life forms, growth forms, and functional types of plants), concluding that there is no principal difference between these notions. Among the existing classifications of life forms, some are very detailed (29 million possible types, including 10000 types described to date), whereas others are extremely simplified (only 15 types). Against such a background, the system of life forms proposed by I.G. Serebryakov can be regarded as a major achievement in the SOV.

The section devoted to ecological and geographic characterization of species contains a large amount of useful information. The optimal approach to ecological

characterization of species still consists in analyzing their distribution over ecotopes and communities. In the field, the physiological method is labor-consuming and inefficient, and the correlation method proved to be applicable only to the mass species. Gradient analysis used for identifying the ecological groups of species does not allow the complete factoring of the ecological space, as groups reliably differentiated from one another with respect to a certain factor inevitably “fuse” in a multivariate continuum. Hence, individual ordination with respect to different factors is necessary for the direct gradient analysis. For practical reasons, the number of such factors is no more than two or three, and they should be measurable. Otherwise, indirect ordination methods are used.

The ecocenotic groups, formed by species that share the same range in the syntaxonomic space, can sometimes be identified with the diagnostic sets of characteristic species used in the ecological–floristic classification of the vegetation. Assessing the environment by the plant cover, specialists use ecological scales, which can be either very detailed (L.G. Ramenskii’s scale with 120 grades of moistening) or fairly rough (E. Landold’s five-grade scale).

The ecophytocenotic strategies of plants characterize the systems of species survival under any conditions in any part of the species range. This concept replaced that of phytocentotypes, which prevailed until the late 1980s. To date, two systems of strategies have been better elaborated: Macleod–Planka’s one-dimensional system and Ramenskii–Grime’s two-dimensional system. The authors emphasize Ramenskii’s priority in naming the types of ecophytocenotic strategies and note that these names are more correct. They justly regard the latter system as an achievement in the SOV, with its graphic interpretation (Grime’s triangle) reflecting all the possible variants of adaptive species strategies.

The concept of the ecological niche of a species is largely abstract but, at the same time, is basic in the modern ecology. Formulated by zoologists in the beginning of the 20th century (Grinnell, 1904), it had not been used in the SOV until the early 1960s,

although there are indications that Ramenskii tended to accept the existence of ecological niches in plants as early as in 1924. By analogy with multivariate gradient analysis, in which an increase in the number of factors reduces resolving power (in distinguishing the ecological groups), the concept of the ecological niche is unlikely to provide a reliable methodological basis for practical estimations, as the results are dependent on the number of axes included in analysis. On the one hand, the authors correctly noted that "the actual number of axes in the hyperspace of the niche [...] is apparently incognizable" (p. 76); on the other, the probability that readily measurable parameters actually correspond to the key environmental factors is fairly low. Hence, it is unreasonable to overestimate the practical significance of the concept of the ecological niche. However, the authors appropriately finished this chapter by analyzing the concepts of "fundamental" and "realized" niches from the botanical standpoint, thus helping the reader to develop very useful ideas.

Chapter 3, "Studies on Plant Populations," logically follows from the previous section. To analyze heterogeneity of plant populations, two approaches are used today: the ontogenetic approach (age spectra) and estimation of vitality. The authors prefer the latter approach as more simple and generally no less informative because, in this case, the researcher does not need to "subjectively deduce the age of plants from their habitus" (p. 95). Of two variants of the method for assessing vitality (one- and two-dimensional), developed by Yu.A. Zlobin, the authors decided to discuss only the first one. Based on results of their four-year experiment with grass mixtures, they revealed the dependence between vitality and the cenotic status of the species, estimated by its dominance in the grass stand. In the one-dimensional (linear) scheme, they consecutively used three characters (plant height, number of shoots, and plant weight) and found that the latter is more promising as an indicator for assessing vitality.

Among statistical parameters used for estimating morphological heterogeneity of plant populations, the authors pay special attention to the coefficient of asymmetry, excess, and variance, which they regard as very informative. It should be noted that, compared to variance, the coefficient of variation as a universal index offers more opportunities for comparative analysis and, hence, should be preferred in this context. This chapter also includes important sections dealing with the analysis of clonal and criptogamous plants as objects of population research.

The population biology of plants as an element of the SOV is a well-developed science with its specific approaches. However, the authors emphasize the necessity of improving the entire system of its methods and remind that simple methods of research should not be neglected: concerning populations, less accurate but more extensive studies often provide more representa-

tive data on their state than the detailed analysis of a limited number of objects.

In Chapter 4, dealing with the study of vegetation at the phytocenotic level, the authors indicate that this level is the most important. It begins with the review of discussions on the nature of phytocenosis and the problem of continuum in the plant cover, which took place between the 1930s and 1960s and in the early 1990s. Bright and vivid, this introduction appears to involve the reader in these discussions. Evaluating the dynamics of ratio between the proponents of continuity and discreteness in the SOV, the authors state that today, several decades after these discussions, the corresponding polar views on the vegetation still exist.

The critical analysis of the so-called systems approach and the problems in applying it to the study of vegetation is very useful: its results stimulate researchers to always correlate the complexity of problems they address with the actual possibilities of solving them.

In the section "Factors and Models of Phytocenosis Organization," the authors describe the concept that integrates six models representing "terminal points of axes in the  $n$ -dimensional space of organization forms" (p. 122). As the factors of phytocenosis organization, they consider ecotope, biotic transformation, horizontal and vertical relationships, intensity of disturbances, and differentiation of niches. In particular, analyzing the role of disturbances with reference to the specific features of different models, the authors note that any factor can both maintain the structure of a community and, under different conditions, promote its destruction.

Chapter 5, "Studies at the Infracenotic Level," describes the methods for analyzing floras, spatial continua, and territorial units of the plant cover. The authors indicate that the regional approach (studies on the flora within the boundaries of administrative units) is still prevalent, although the ecological trend in this research (A.I. Tolmachev's method of concrete floras) dates from the early 1930s. They emphasize that a necessary step in any analysis of floras consists in describing their spectra (taxonomic composition, life forms, and geographic elements). To compare the floras, it is recommended to use the parameters of similarity and the graphic presentation of results commonly accepted in phytocenological research. The authors conclusively demonstrate the close relationship between floristics and phytocenology (in particular, syntaxonomy) and the factual similarity of their methodologies: "Although specialists in floristics do not employ the three-level system of species diversity, which owes its origin to phytocenology and ecology, these three types of diversity are in the background of logic used in their investigations" (p. 235). Thus, by analyzing the well-known Arrhenius and Gleason formulas, they show that the assessment of gamma-diversity (the total species diversity in a landscape) involves the assessment of both alpha- and beta-diversities, i.e., the species richness of communities and the diversity of communities.

"The concept of topographic continuum is a cornerstone of continualism, and all other forms of continuity are its derivatives" (p. 240). Broad personal experience in analyzing topographic clines on the territory optimal for such research (Mongolia) allowed the authors to develop an efficient method of rank gradient analysis. The analysis of methods for assessing beta-diversity is illustrated with the data obtained in central Yakutia. However, the authors agree that estimations of both beta- and gamma diversity have a limited information content and propose a more comprehensive combined approach, which includes the analysis of vegetation, its mapping, and zoning.

In Chapter 6, general trends in the development of SOV and its current state are analyzed. According to the authors, the pluralism of opinions in this science is determined by (1) personal qualities of researchers and specific features of the national character, (2) socio-economic factors, and (3) qualitative diversity of the objects studied.

The data included in the book are presented in the way obviously reflecting personal views of its authors, and the discussion of some problems appears to be biased. In particular, the authors actively promote the concept of continuity of the plant cover and unconditionally accept the Braun-Blanquet system as the only valid and promising one. At the same time, they disregard the advantages of studies performed by Russian phytocenologists (V.N. Sukachev, A.P. Shennikov, and E.M. Lavrenko) who agreed that the plant cover is discrete and paid much attention to the role of dominants as indicators. Meanwhile, botanists experienced in the study of vegetation know very well that the boundaries between individual communities may be very distinct, whereas investigations performed according to the Braun-Blanquet system often have certain disadvantages (formalism, insufficient attention to the analysis of environmental conditions, the structure of plant communities, their dynamics, etc.). In the future, specialists will probably create a more perfect classification of plant communities on the basis of both the detailed analysis of their floristic composition and the use of cenotic criteria, including the composition of dominants.

The authors regard their book as both a scientific monograph and a college textbook on a special subject. We have no doubt that this is a monograph, although it remains unclear why the authors did not consider in it

some major fields of the SOV, such as the chorology and cartography of the plant cover, anthropogenic transformation of floras, and phytomonitoring. On the other hand, the book does not satisfy all the requirements placed upon textbooks: it is overloaded with particulars at the expense of integrity and contains a great number of special terms. In some cases, the authors tinker with the latter without any apparent need.

Unfortunately, the book contains numerous mistakes and errors. In particular, the German city of Rinteln-am-Weser, which is well-known to botanists of the world as the place where R. Tüxen lived, worked, and conducted famous international symposia, received two different Russian names, both erroneous (pp. 253 and 270); the name of the city of Bailleul (France), where the famous Regional Center of Phytocenology and the International Phytocenological Station are located, is simply transliterated, although its Russian pronunciation is different. Moreover, the same terms of foreign origin are used in different transliterations. It is impossible to understand why the same characters of plant communities are alternatively referred to as "physionomic" and "physiognomic," and why the analysis of floras based on phytocenological data is designated "phytosociological," although the term "phytocenology" is generally accepted in the text. The use of new and foreign words is sometimes excessive: for example, the authors chose the English word "gap" to designate openings in the forest canopy that appear when individual trees die off, whereas our specialists in forest science commonly use the corresponding Russian term. Such an "enrichment" of the Russian scientific language with additional foreign words appears unnecessary. In addition, there are many misprints in the text and errors in the Latin names of plant species.

On the whole, the book reviewed makes a highly favorable impression. Being based on the analysis of abundant data (especially those published recently), it is informative and introduces the reader to fundamentals and many debatable issues of the SOV. This book will be useful to a wide circle of specialists in ecology and botany.

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