Ways of Viewing Evolutionary Processes

Kratkii Ocherk Teorii Evolyutsii. (An Outline of Evolutionary Concepts.) N. V. TIMOFEEFF-RESSOVSKY, N. N. VORONTSOV, and A. V. YABLOKOV. Izdatelstvo Nauka, Moscow, 1969. 408 pp., illus. 1 R 92 K.

Prichiny Vymiraniya Organizmov. (Causes of Extinctions of Organisms.) L. SH. DAVITASHVILI. Izdatelstvo Nauka, Moscow, 1969. 440 pp., illus. 2 R.

Voprosy Metodologii v Izuchenii Organicheskogo Mira. (Problems of Methodology in the Study of Evolution of the Organic World.) L. SH. DAVITASHVILI. Izdatelstvo Metsinereba, Tiflis, 1968. 218 pp.

It is easy to assume that the thinking and fundamental concepts, at least as expressed in print, are much the same throughout a monolithic, centrally controlled state such as the Soviet Union, particularly in fields whose subject matter has played a role in political history and is involved in the social and state philosophy. Evolution, of course, is part of the core of dialectical materialism, and some aspects of evolutionary studies, especially genetics, have had great political significance in past years. In this context the three books under review seem to me to be of special interest. Because they probably will be read by relatively few English-speaking people, and because much of the subject matter is familiar to most students of evolution, I will concentrate more upon the concepts that these books bring out than upon the wealth of substantive material that each contains.

In a review of an earlier book by one of the authors, L. Sh. Davitashvili (*Evolution* **22**, 426–36 [1968]), I made an effort to explore the role of dialectical materialism in the thought of Soviet scientists and, from a rather small sample of their publications, found a significant spread in opinions and in philosophical consciousness. Hundreds of books on evolution and related subjects have been published in the Soviet Union during the last two decades, and many of these are cited in the books reviewed here. Within them are to be found almost all shades of opinion, with considerably more diversity, on the whole, than can be found in comparable English literature. These three books cover the spectrum of thought relative to dialectical materialism, two falling more or less at the extreme ends and one at least superficially appearing to occupy a more or less middle ground.

The book by Timofeeff-Ressovsky, Vorontsov, and Yablokov, "An Outline of Evolutionary Concepts," shows no evidence of philosophical self-consciousness, other than its adherence to the basic materialistic tenets of science in general. The authors are zoologists, each of whom, though their interests otherwise differ, has in his other published work given serious attention to both particular and general problems of evolutionary theory. Their book is a well-developed, concise account of the aspects of evolution that are of special interest to them. Emphasis is placed upon evolutionary processes as revealed by studies of existing organisms, but, in keeping in particular with some of the interests of Vorontsov, heed is paid to historical aspects of evolution. Almost nothing on molecular biology is included.

A short introductory section of about 60 pages considers general biological problems and the history of life. The second section, occupying about one-third of the book, treats microevolutionary processes. In many ways it forms the heart of the study. Later parts on "Interpretation of general evolutionary phenomena" and "General levels of evolution" are more descriptive and relate back to the processes developed in the treatment of microevolution, which is considered by the authors, as by most biologists, to hold the key to the explanation of organic change. The final section takes up trends in evolution and covers a variety of subjects, including levels of organization of life, in only about 40 pages. In this allocation of space the book is somewhat irregular.

This book, like the other two, was of course written for Russian-reading audiences and cannot fairly be judged by comparison with English publications of the same general nature. It is more or less a textbook, but is designed as well for persons in fields of biology, biophysics, and biochemistry that are not directly evolutionary but depend to some extent upon evolutionary concepts. Translated into English it would be a good supplementary text for intermediate and advanced courses in evolutionary biology. Many of the discussions are augmented by examples, which include useful additions to the ones most commonly found in Western texts.

The authors conclude their treatment of microevolution with a discussion of the directions that studies might profitably take in the future. The need for analysis of complex field problems, with special attention to the multiple variables in "real" situations, is emphasized. Mathematical modeling and simulation are regarded as extremely important adjuncts to such work. Such studies will help to relate experimental evidence from the laboratory and the grosser observational studies of natural history. They should include models of the type that have already proven so useful in studies of population structure and dynamics.

The books by Davitashvili, one of the veteran paleontologists of Russia, contrast sharply with the one just discussed both in content and in point of view. Davitashvili is of course primarily concerned with phenomena revealed in the fossil record. His efforts to treat the problem of extinction have taken him into one of the most difficult phases of paleontology. During the long history of life, an immense number of species and higher categories of organisms, up to subphyla and perhaps phyla, have become extinct. The ways in which this happened, the temporal coordination of multiple extinctions, and the relationships to possible causative factors must be understood through processes known from modern organisms and the record in the rocks, which is at best very incomplete and subject to a wide range of interpretation. Interpretation inevitably depends upon the conceptual basis that underlies the apprehension of the evidence.

Davitashvili gives a comprehensive account of extinctions at all levels and brings a wealth of first-hand knowledge of the fossil record and of the literature to bear on the subject. He draws his documentation from a wide range of sources, including many that are rarely encountered in English publications. He arrives at a consistent conclusion applicable to all cases of extinctions of biological groups that have had extensive geographical ranges. The evidence, as he interprets it, is contrary to the existence of massive, sudden extinctions in which simultaneous losses of a wide variety of "thriving" organisms occurred. Rather he sees a gradual dying out of the "old" as they are replaced by the "new." He denies the existence of genetic or phylogenetic aging and considers the principal causative factor of extinction to be biological competition, with the replacement of less progressive by more progressive.

It is unnecessary to list the subjects Davitashvili covers, for he leaves almost nothing relative to the geological record untouched. He treats all major questions fully and gives ample illustrations. The analyses include such examples as an account of the sequential changes in the "Paratethyan" sea and their effects on the biota of successive times of high and low salinity. A parallel is drawn with the Permian, also a time in which there were alternating periods of high and low salinity and one which was followed by what many have considered to be an epoch of major extinctions. He outlines the evidence for a gradual change from the Precambrian into the Cambrian, with documentation from rather obscure parts of the record. The role of restricting ranges and information from studies of relicts are given special attention. Considerable space is devoted to birds.

From these studies, and comparable ones of other geological ages, Davitashvili reaches the conclusion, which is certainly sound from what he has to say of the evidence, that biotic factors involving competition among organisms are critical and that abiotic factors, even those induced by major geological changes, are secondary, being active only over limited areas. This he has found to be the case at all stages in geological history and to apply equally to all groups of invertebrates, vertebrates, and plants.

Although hints of Davitashvili's devotion to dialectical materialism appear at places in the book, they are not obvious. His conclusions are cast within this framework, however, and with this background it seems impossible that he should have reached any others. It is important to understand this to evaluate the book. The work of Davitashvili and other dialectical-materialist evolutionists is not unique in this respect, however, for the conclusions that a scientist comes to depend on the assumptions, conscious or unconscious, with which he begins. This is particularly the case in the study of extinction, where the data are indefinite and difficult of interpretation and the events can be reconstructed only according to some fundamental framework.

Dialectical materialism in evolution abrogates the possibility of catastrophism and establishes gradualism, with causal factors related to the inevitability of "spiral" progress in which the "negation of negation" is basic. This pattern is explicitly outlined by Davitashvili in "Problems of Methodology in the Study of Evolution of the Organic World." Beyond the systematic presentation and discussion of these problems and recommendations on ways they may be handled, the major value of this book for non-Russians lies in the fact that it makes clear what is involved in the application of the evolutionary elements of dialectical materialism to organic evolution. It must be recognized that there are serious students of evolutionary biology who approach the subject in this way, and the work of these persons should not be cast out without a hearing. Davitashvili himself makes a plea that the data accumulated in recent years by Michurinists, some of which he cites, at least be looked at.

One way in which the philosophical assumptions of this book and of others with a similar base are manifested is in the frequent use, in criticism of other studies, of such words as "metaphysical," "idealistic," "finalistic," "fixistic." Special meanings are attached to these words which must be taken into account. For example, Davitashvili uses the term "metaphysics" ("Problems of Methodology," chapter 7) "in the sense in which it is understood in Marxian dialectical philosophy—as a method of thinking contrary to the position of dialectics." The point does not need to be labored, for without full reading such a discussion cannot be very helpful.

There are some sharp contrasts in the ways of thinking revealed in the books reviewed here. Whereas microevolutionary processes, especially the genetics involved in the origin of variation, are held to be basic in the book by Timofeeff-Ressovsky, Vorontsov, and Yablokov, Davitashvili rejects genetics as a part of the science of evolution, although he acknowledges its significance as a field in its own right. What we see instead is adherence to classical Darwinism, which he continually affirms, and criticism of the post-Darwinian studies, which make up one side of the neo-Darwinian school of the authors of "An Outline of Evolutionary Concepts."

Why, one may ask, does Davitashvili reject genetics? This question is difficult and subtle, but to me the rejection seems related to the principles of dialectical materialism. He and others feel Darwin's work admirably demonstrated the necessity of the "inner" and "outer" duality, whereas genetics, which finds cause of change without dual negation, is necessarily "idealistic" and hence objectionable.

All three books treat progress in evolution as a major issue. Timofeeff-Ressovsky, Vorontsov, and Yablokov consider several ways in which the term "progress" may be interpreted. These are more or less traditional, and accord with much Western thinking. By some their discussion will be thought to leave serious questions unanswered. Davitashvili thinks the question of progress has been largely ignored by followers of the "synthetic" or "post-neo-Darwinist" theory. In his treatment progress is basic and inevitable, a major principle, essentially *the* principle, upon which interpretation of evolution is to be based. Progress is a law of nature, and organic evolution is one of the clearest examples of its operation in the natural world. Further, evolutionary progress can be understood only on the basis of the methods of dialectical materialism (pp. 121–22 in "Problems of Methodology"). Only in the study of human development do other laws, those of social evolution, come to contribute to total understanding.

Viewed together, these three books strongly contrast the way of thought of two very different schools. Without arguing the merits of one or the other, which would require judgment concerning the basic premises, I think it is important that students of evolution, regardless of their convictions, be aware of the implications of these two ways of thought. In addition, of course, an understanding of the relationships of these views to still other ways of viewing the panorama of life, such as catastrophism, to which both schools take strong exception, is important to round out our efforts to understand the organic world.

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Folk Architecture

House Form and Culture. AMOS RAPOPORT. Prentice-Hall, Englewood Cliffs, N.J., 1969. x + 150 pp., illus. Cloth, $4.50; paper, $1.95. Foundations of Cultural Geography Series.

What factors can best account for the great variety of house forms among so-called "primitive" and "folk" societies? In this suggestive essay containing