being; but evolution of cosmic proportions is now recognized as well as the evolution of the living, and the marvelous development or responsiveness of a living organism is not unmatched in certain physical systems and machines. Yet Dubos is surely right in stressing the painful mistake of depending always upon the analytical method and never attempting a synthesis; and he is again surely right in urging that we recognize the existence of a feedback relationship between the organism and its environment.

The Spirit of Science

In the next-to-last lecture, Dubos cries out against the tendency, in writing about science, to dehumanize it. This has led not only to a misunderstanding of science and the scientist, but to outright contempt in such philosophers as Unamuno and Ortega y Gasset. How important it is to deal with the paths of discovery, the motivations of the scientist, including his childlike curiosity and enthusiasm, his errors, and his blindness! The experience of the Biological Science Curriculum Study during the past two years, while introducing into the teaching of high school biology as much as possible of this spirit and emphasis, indicates both what a profound effect it can have upon young students' attitudes toward science and also how hard it is to get some teachers to see the importance of this and to change their habitual emphasis upon science as a crystallized, authoritative, anonymous body of facts and concepts. It is indeed the "humanness of science" that we must depict, for science, as we tell the BSCS students, "is a social undertaking . . . a group activity, resting upon the labors of many men directed at a common problem. Where some fail, others succeed. Together they accomplish far more than even a genius working in lonely isolation is likely to achieve. What is more, any scientist today can build on the earlier as well as contemporary investigations of men of other races, tongues, and kinds of insight." Dubos points out that "when they are reduced to intellectual and technical presentations, humanistic studies are just as devoid of popular appeal as are scientific studies. . . . For the scientist a cultured attitude implies the ability and willingness to relate his field of work to historical developments, to emphasize its bearing on the future, and, more generally, to recognize its relevance to other human interests. . . . Unless he becomes concerned with social philosophy, the scientist will increasingly hear the words of Oscar Wilde applied to him: that he knows the price of everything, but the value of nothing." In doing so, says Dubos, a scientist might emulate Michael Faraday. Today he might well emulate Dubos.

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Fortschritte der Zoologie. vol. 14. Hans Bauer, Ed. Fischer, Stuttgart, Germany, 1962. ix + 547 pp. Illus. DM. 98.

This new volume in the excellent series of "progress reports," sponsored by the German Zoological Society, deserves the same praise as the previous volumes, and it should be on the desk of all those who teach graduate students in zoology or related fields. The well-written individual articles represent concise and complete coverage of the advances made in the last 5 to 10 years, a period of special importance owing to the increased use of the electron microscope. This German book has used advantageously many more simple, but excellent illustrations than comparable American publications do. However, the *Fortschritte* lacks an alphabetical subject and author index.

K. G. Grell (Tübingen) discusses the morphology, propagation, developmental physiology, and genetics of the protozoa; he gives special attention to the submicroscopical structure of cilia, flagella, and nuclei and also describes the various mating types in Paramecium. F. J. Gouin (Strasbourg) covers the morphology and the developmental aspects of the myriapodes and insects, with special emphasis on the structure of the eggs and of the chorion of insects. The report on the porifers, by H. V. Brøndsted (Copenhagen), includes a detailed discussion of polarity, of the skeleton including spiculae, as well as of cytotaxis and of gemmulae. O. Hess (Tübingen) is responsible for the chapter on the molluscs, which deals mainly with the early stages of embryonal development and with the development of the trochophora larvae. D. Brückmann (Göttingen) reports the complicated developmental aspects of the arthropoda (mainly of crustacea and hexopoda), with emphasis on the postembryonal development and the hormonal regulation of molting, growth, and regeneration. G. Szihak (Tübingen) treats the developmental physiology of the echinoderm, with special emphasis on biochemical aspects and the so-called animal and vegetative factors. The longest article (nearly half the volume, including a 90-page list of references), and the one that I found most interesting, is by K. Günther (Berlin-Dahlem), whose report discusses the many new, partially revolutionary discoveries and ideas which were made in the field of animal systematics and evolution during the period 1954 to 1959. He places special emphasis on the history of evolution and on the newer formulations of the species problem.

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Abridged Translation

Psychotherapy in the Soviet Union. Ralph B. Winn, Editor and Translator. Philosophical Library, New York, 1961. 207 pp. $6.

As the editor-translator states in his preface, this book is a set of translations of papers presented at a conference on psychotherapy, which was held in Moscow in 1956. The Russian-language proceedings were published as *Voprosy Psikhoterapii* (Questions of Psychotherapy) (Medgiz, Moscow, 1958). Because such a small amount of information is available in the United States about psychology and psychiatry in the Soviet Union, the book is distinctly a useful one, in spite of some imperfections.

Many of the papers deal with hypnosis. Both experimental findings on the physiology of hypnosis and therapeutic effects are reported. As a general rule, the attitudes of Soviet psychotherapists toward hypnosis are much more favorable than the attitudes prevalent in the United States. Therapeutic successes are reported in making childbirth painless, in regularizing the

milk secretion of breast-feeding mothers, in treating alcoholics, and in other examples. In some instances the results of follow-up study over long periods are reported.

But indiscriminate use of hypnosis is not recommended. One author (Miasishchev) cites the need for "deep psychotherapy" in cases of complex psychogenic causation; deep psychotherapy apparently means discussion between the therapist and the patient, which is aimed at helping the patient to understand his past (including its traumatizing aspects) and his present life situation. One paper presents (among others) the case of a seven-year-old girl who was a domestic tyrant and a stutterer. She was sent to the outpatient department of a hospital and there joined a group of children who were having meetings at which they discussed each other. The patient became enthusiastic about the group and changed her behavior at home so that she would deserve the group's praise. Her stuttering disappeared within a few weeks.

In two papers nonhypnotic suggestion techniques are presented and are said to be about as effective as hypnosis.

One paper, which deals with psychotherapy of the smoking addiction, presents examples of the need for exact formulation of posthypnotic suggestions; thus, in one case, the patient was told that henceforth she would find smoking disgusting, but she was not told that her craving for smoking would disappear; as a result, she came to experience smoking as something she both craved and found disgusting. The author's (Povorinsky) preferred therapeutic technique included, as its principal component, the keeping of detailed records of all acts of smoking, including all the components (for example, striking a match) of these acts. The author states that smoking is a complex habit with many semiautomatic components and that keeping a record trains the patient to become conscious of the semiautomatic components and eventually to acquire conscious control over them.

Only one paper reports the utilization of classical conditioning as a therapeutic technique.

It should be noted that the translation is not always exact and that it is not complete. Nineteen papers out of 55 in the Russian book have been omitted by Winn, and the translated papers are sometimes incomplete. In one instance, about three-fourths of a paper is omitted. A number of omitted passages were found to contain references to Pavlovian theories of disturbed relations between stimulation and response, which may be the result of over-strong stimulation, of over-strong drive, or of pathological factors. These theories ("of phase phenomena"), which are very influential in Soviet psychiatry, are underrepresented in this book of translations. The omissions are not mentioned in the preface.

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Change and Alteration

Mutation. An introduction to research on mutagenesis. vol. 1, *Methods.* Charlotte Auerbach. Oliver and Boyd, London, 1962. xii + 176 pp. Illus. Plates. 12s. 6d.

"The ultimate aim of mutation research," writes Charlotte Auerbach, "is a full understanding, in chemical, physical and biological terms, of mutation and its consequences for the genic material." This is the first of three projected volumes; the succeeding ones are to cover the results of mutation research and statistical methods. The methods considered in this volume are biological, and the usefulness of different organisms for mutation research is considered against a background of particular life cycles. This consideration of the life cycles and biology of the organisms should be of considerable value to the nonbiologist attempting to evaluate data obtained from research on unfamiliar organisms.

Auerbach spends about a quarter of the book discussing the methodology of research on *Drosophilia.* The evaluation of lethal and visible mutations and of deletions and translocations in this material is discussed at some length. A larger portion of the book is spent discussing a variety of methods useful with bacteria, fungi, algae, and viruses. *Paramecium* and the mouse are considered in the chapter "Animals other than Drosophila," while the advantage of using flowering plants for certain types of analysis is discussed in a separate chapter. Although most of the author's work has been with *Drosophila,* she illustrates the possible difficulties of work with other organisms with real understanding. As she indicates in the preface, the details of the methods are not given, as befits a volume intended to be an outline and guide to the literature rather than a handbook of techniques.

Some space is given to a justification for using the measurement of lethal mutation as an estimate of general mutagenic effects. The author points out that recent work has shown that different sites may respond in specific ways to treatment with mutagens: study of specific sites may give a false picture if the results are generalized to all sites, mutagens, or organisms. Consequently Auerbach concludes that "the general mutagenic situation" may be best studied by the technique of measuring lethal mutation, since this technique samples many different genes and can give some sort of average response. Actually, and properly, the author concludes that particular systems must be selected for particular purposes.

As a result of work done in the past few years, it seems that in the foreseeable future it will be possible to define mutagenic change more precisely as a particular base change at a particular location in the deoxyribonucleic acid. The problems that this type of formulation raises are different from those historically considered as part of mutation research, and they require a set of methods different from those discussed in this book. Considerations of the rate and mechanisms by which one base is substituted for another will require knowledge not only of the chemical mechanisms involved, but, in view of the existence of "hot spots" for mutation, also a detailed structure of the neighboring nucleotide sequences. Information of this sort may possibly be obtained as modern methods of protein analysis are applied to specific proteins obtained from mutants induced by particular chemical mutagens and checked against a genetic code elucidated by the techniques of modern enzymology and by the genetic fine-structure analysis of bacteriophage. These are methods which have only recently been applied to the mutation problem and which must be superimposed upon proper biological methodology. Certainly these chemical methods are, as yet, of no particular importance to workers attempting to apply mutation research to