Book Reviews

Scientists and Their "True and Lawful Goals"

The Dreams of Reason: Science and Utopias. René Dubos. Columbia University Press, New York, 1961. xii + 167 pp. Illus. $5.

A new book by René Dubos is a rare treasure in the plethora of ill-written and philosophically sterile books of science and books about science that today crowd the tables and bookshelves of the hapless reviewer. There are indeed few biologists who can write with the charm and lucidity of Dubos, and even fewer who can match him in the realm of ideas. *The Dreams of Reason*—let us see, what is this one about?

It is a small book of seven lectures given at the Brookhaven National Laboratory under the George B. Pegram Lectureship. The idea for the lectures seems to have emerged, at least in part, from the fact that 1961, the year of publication of the lectures, was the 400th anniversary of the birth of Francis Bacon, who foresaw the development of great scientific institutes and laboratories, like Brookhaven, "dedicated to the enlightenment and service of mankind." So the "dreams of reason" are the utopias that scientists imagine when they become social-minded, the "brave new worlds" envisioned from Plato to Aldous Huxley and other moderns. The titles of the successive lectures provide a measure of the flow of Dubos's thoughts. They are as follows: Background and Prejudices; Solomon's House and the Baconian World; Visionaries and the Era of Fulfillment; Medical Utopias; Illusions of Understanding; The Dehumanization of the Scientist; and The Humanness of Science.

Bacon, of course, gloried in the usefulness of science, saying: "The true and lawful goal of the sciences is none other than this: that human life be endowed with new discoveries and powers." Or again: "Knowledge, that tendeth but to satisfaction is but as a courtesan, which is for pleasure, and not for fruit or generation." How clear that the influence of Bacon was never higher than now, when Marxian countries exalt science as the servant of the state and when, among Western nations, the United States spends one-eighth of its entire federal budget on "research and development." Yet this quadricentennial evoked not a tenth of the discussion and celebration of the Darwin centennial shortly before. Why was this?

Many scientists refuse to dream, or if they dream, they are ashamed to say so. Yet among the utopias sketched by the devotees of science there is much that is instructive. Dubos points out that H. G. Wells was the first of these utopists to realize that societies, like other living things, are in "unstable dynamic equilibrium with their environment . . . [and] must not be static but kinetic . . ." Utopias never come into being, or else die shortly after being born, but they serve nonetheless as "catalysts converting the crude materials of reality, the tools and products of experience and of science, into civilizations which take the shape developed first as an image in the mind of man. Utopias," says Dubos, "are like holy spirits which give the breath of life to matter."

Foundling and Stepchild

The critical problems of science, in shaping either utopias or the real civilizations of the future, quickly shift from the sphere of the technical into the realm of values and goals. Ethical problems arise, change shape, demand solution. Dubos quotes with approval Ritchie Calder's remark that "scientists leave their discoveries like foundlings on the doorstep of society. The step-parents do not know how to bring them up." Where, then, does the responsibility of the scientist stop? The issue, says Dubos, both for scientists and for society as a whole, "is now to decide *what* to do among all the things that could be done and should be done." This will require hard thought, and devotion as well.

Dubos speaks with highest authority on the subject of our medical utopias, the commonest of which is the vision of a society in which everyone is healthy and disease has been completely banished. Dubos gives sober warning. Does not every civilization create its own diseases? Will the rapid increase in population not bring new health problems? Will teen-agers not be bound to develop new health problems "if society does not recognize that fully developed, well-fed young bodies need satisfying and worth-while forms of expression in order to remain creative and healthy"? Will the continuing advance of medicine not produce more problems than it solves? Can the production of food and the provision of balanced diets possibly keep up with the increase in world population? Is the genetic burden of the future not being steadily increased by the survival to mature years of many biologically defective persons? Can people really adjust themselves to the rapidity of the changes taking place in the modern world? Dubos does not believe that the burden of disease will decrease in the future. It will assume new forms, present new challenges to the physician and to society.

The comments on the illusions of scientists apply particularly to biologists. Dubos singles out as prime example Descartes' mind-body dualism, from which grew the view of the body as a machine and the oversimplified mechanistic theory of life entertained by so many biologists today. Without reviving vitalism, Dubos prefers the view that "some unknown principle runs like a continuous thread through all living forms and governs the organization of their physicochemical properties." But, it seems to me, he does not succeed in indicating what kind of "unknown principle" he has in mind, if it is not a physicochemical one. He refers to the need to emphasize that life is even more *becoming* than it is

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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German Zoological Society

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