Book Reviews

Ecological Investigation in the Arctic

It seems unlikely that there ever before has been such a sophisticated, comprehensive description and interpretation of the environment of a relatively small, undeveloped, isolated area as that presented in **Environment of the Cape Thompson Region, Alaska** (Norman J. Wilimovsky and John N. Wolfe, Eds. U.S. Atomic Energy Commission, Washington, D.C., 1966. Available as PNE-481 from Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 1266 pp., illus., maps. $9.25). The book is the report of a large group of investigators who studied an area in northwestern Alaska that had been selected as the site of a possible experimental excavation of a harbor with the use of nuclear explosives. As John S. Kelly states in the foreword, "Because the project site was in an environment for which there was no prior nuclear test experience and little scientific knowledge of the environment, bioenvironmental investigations in addition to the usual public-safety program were approved to allow adequate assessment of the effect of the proposed project and to assure that it could be conducted safely." The project was designated "Chariot" and was a part of the Plowshare Program of study of the peaceful uses of nuclear explosives. The investigations were made largely between 1959 and 1961. It was decided in 1962 to suspend Project Chariot without the detonation of any explosives, and of course many predictions would have been tested and many questions would have been answered if the explosions had taken place and the environment subsequently studied again. However, the information collected during the lifetime of the project stands as a monument to what can be done when a careful, comprehensive, integrated study is made of a selected site.

The work was guided by a small committee which, in addition to appropriate representation from the Atomic Energy Commission, included outstanding scientists from a wide range of disciplines. Furthermore, the committee was delegated appropriate authority to do its job. The preface of the book notes that almost 100 scientists participated in the environmental investigations. The results are incorporated in 41 chapters dealing with the physical characteristics and bioenvironment of the land, the coast, and the Chukchi Sea, the population, and radioactivity in the area. Altogether 71 authors are represented in the book. To anyone with any experience in the administration of an integrated research program and in the publication of the results of such a program it is obvious that a tremendous amount of effort was required in planning, coordination, field logistics, report preparation, and eventual publication. The product reflects that effort and must be a source of pride and satisfaction to those who participated.

The technical editing of the book, which must have been a staggering responsibility, is superb. Nevertheless, a few critical comments may be helpful if any similar volumes are attempted. The discussion of previous scientific explorations (chapter 1) is much too limited. Its author apparently sets out to discuss all previous "scientific activities," but in fact restricts the discussion very largely to earlier biological investigations. Nothing is included about the scientific work of P. H. Ray in northern Alaska during the First Polar Year, for example, nor is any mention made of the explorations of W. J. Peters and F. C. Schrader of the Geological Survey in 1901, those of E. de K. Leffingwell (largely in the Canning River area), or those of P. S. Smith and J. B. Mertie, Jr., as recorded in *U.S. Geological Survey Bulletin 815*, or even of the scientific knowledge gained in the exploration for oil of Naval Petroleum Reserve No. 4 that went on from 1944 through 1953. This limitation does not significantly reduce the value of the book, but a more comprehensive outline of earlier work would have been an improvement.

There may be some confusion in referring to the illustrations in the text, because they are numbered separately for each chapter and no list of them is included in the book. Moreover, the quality of the folded plates could have been greatly improved. For example, on plate 1 some stream and lake areas appear in solid black for no apparent reason, and a number of symbols are included whose meanings are not apparent. The cartographic quality of the soils map, plate 4, is not as high as that of the other folded illustrations. Presumably a higher level of cartographic quality was judged not to be worth the additional cost. Finally, the binding is not up to the highest standards. For example, the rather thick sheaf of folded maps stuck in an envelope on the inside of the back cover soon warps the shape of the whole book.

These faults are generally trifling and do not detract, except in appearance, from a fine product achieved under the direction of a competent and dedicated committee working with a large number of projects in a variety of disciplines. Furthermore, the whole Chariot idea was a touchy one scientifically and politically, and that such an outstanding product was achieved so promptly under these circumstances is noteworthy indeed.

Environment of the Cape Thompson Region, Alaska could well become a model for coordinated investigations of the environments of other areas. It is much more comprehensive than is needed for many environmental studies. Nevertheless, decisions regarding the feasibility of many projects in the fields of conservation, the development of natural resources, and the uses of terrain for the purposes of man would have a solid foundation in fact if based upon comparable studies.

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Man and His Future

Science traditionally has not been concerned with human values, and scientists have been judged on their objectivity. This, of course, is not to say that a particular scientist may not be both a scientist and a human being

imbued with concern. As an involved person, the scientist takes on a creative role in which he must be a competent representative of his discipline but also should be as free as any other member of society to express his views on "the eternal questions, Where do we come from? Who are we? Where are we going?" Such a man is John Rader Platt, formerly a professor of biophysics at the University of Chicago and recently appointed associate director of the Mental Health Research Institute at the University of Michigan.

A catalogue of Platt's amazingly versatile and well-paced essays would be impossible here, but I have been watching for them since his delightful essay "Style in science" appeared in *Harper's* magazine in October 1956. There Platt addressed himself to the question "Is the detached and objective scientist completely impersonal?" and concluded that "the nature of the achievements of a large competing scientific group is determined by the group and its history, and depends little on the behavior of individual discoverers. . . . But the pressure of scientific determinism becomes weak and random as we approach the great unitary syntheses. For they are not only discoveries. They are also artistic creations, shaped by the taste and style of a single hand."

A collection of 12 of Platt's more recent essays, including six which have been published previously, has now appeared under the title **The Step to Man** (Wiley, New York, 1966. 224 pp. $5.95). Many readers of *Science* will recall the provocative essay "Strong inference" [**146**, 347 (1964)], which began "Scientists . . . tend to keep up a polite fiction that all science is equal." This essay seems to imply that all scientists should proceed by inductive leaps and multiple alternative hypotheses, the prescribed manner, despite the diametrically opposed conclusion that they must proceed as they are able, which was expressed earlier in *Harper's*. Perhaps in recommending the essay on strong inference I should refer to the strong reply it provoked, in which Hafner and Presswood discussed research on the universal Fermi interactions under the title "Strong inference and weak interactions [*Science* **149**, 503 (1965)] and suggested that "the notion of strong inference is an idealized scheme to which scientific developments seldom conform."

But the prescription of how to do scientific research was not the motive for publishing the book. Platt, like many others, is ambivalent about the future of man. Aware that 20th-century man may be hurtling forward to a point of no return, and tortured by the specter of "a blind, aimless, self-motivating, ever-growing engine of technology" as Gerald Holton has expressed it, Platt seeks relief in the expression of thoughts that hopefully say yes when most of the signs say no to the questions "Will the near future witness a unique transformation in the human condition, a transformation that will enable man to understand his destiny and to shape it?" "Is man moving toward a new kind of life?"

Thus in his final chapter, which bears the title of the book, Platt regards the "step to man" as a kind of Teilhard de Chardin dream world growing out of the present, which "has now become too dangerous for anything less than Utopia." Things will get better because they can't go on getting worse. In the not-too-distant future population growth will either slow up by intention or level off from starvation. Either the bombs will be controlled or they will be used, high-energy accelerators will reach their ultimate size, travel will reach its ultimate speed, disease will be under control, perhaps thousands will climb Everest and millions will ride dolphins. Platt is not always starry-eyed but he is sometimes carried away by evangelistic fervor as he seeks to persuade anyone who will read that "it is clear that if we survive this shock-front, this roaring waterfall of change, we could be within sight of what Churchill once called the 'sunlit uplands'." The motivation behind all of this is clear enough: we must do something to make mankind make the right decisions. We must understand "Social chain reactions" and "Seed operations" and start them in the right direction. To this end we should take note of "Limits, balance, and guidance in society." We should build in a "Design for stabilization," taking the federalist's model as a prototype, and we should institutionalize "Research and development for social problems." We should take note of the nature of "Man and his indeterminacies" learn how to "Change human nature," and "Start here." Then only can we take "The step to man." Platt's compulsion to find a way out leads to some curious conclusions about man's indeterminacies. Platt is for free will all the way, since we obviously can't leave the world up to determinism. Since he insists upon being responsible for his own choices and acts he is blind to the middle ground between 100 percent determination and 100 percent free will. Man's choices, other than those determined by heredity, conditioning, and environment, must be made *either* responsibly, according to a consistent sense of values, *or* as a result of the random jumping of electrons in his nervous system. *Either* they are supplemented by spiritual signals *or* by the noisy uncertainties of an atomic roulette wheel. It is in dealing with such problems (in chapter 9) that Platt seems most wishful, when he might have conceded that just an occasional random electron in his nervous system, plus an adequate sensor and feedback, is really all that is needed to provide an escape hatch from full-blown determinism.

In this connection, Platt might have profited from a closer assimilation of some of the ideas expressed in the series of lectures which he helped to organize at the University of Chicago in 1965, now published under his editorship as **New Views of the Nature of Man** (University of Chicago Press, Chicago, 1965. 162 pp. $5). Considerably less evangelistic than *The Step to Man*, these lectures are similarly oriented toward satisfying Platt's aspiration to set up "the intellectual and philosophical substructure" upon which he thinks "any coming society must be built." Particularly he might have dwelt on Clifford Geertz's lecture, "The impact of the concept of culture on the concept of man." For those who underline as they read, this chapter will take a lot of ink—for example, "Scientific advancement commonly consists in a progressive complication of what once seemed a beautifully simple set of notions but now seems an unbearably simplistic one." The chapter by Geertz is alone worth the price of the book to natural scientists who, like Geertz, have been dissatisfied with the available views of the nature of man but have been unable to achieve the integration that Geertz presents. "For the 18th century image of man as the naked reasoner that appeared when he took his cultural costumes off, the anthropology of the late 19th and early 20th centuries substituted the image of man as the transfigured animal that appeared when he put them on." After 13 pages in which both of these historical concepts are rejected, Geertz gets to his own viewpoint: that cul-

ture is a set of control mechanisms for governing behavior and that man is precisely the animal most desperately dependent on such extragenetic control mechanisms for ordering his behavior (pp. 106–7). Geertz reasons that the cultural context constitutes the mechanism by which the breadth and indeterminateness of man's inherent capacities are reduced to the narrowness and specificity of his actual accomplishments. Thus we all begin with the natural equipment to live a thousand kinds of life but end, in the end, having lived only one. Here we have an insight into a possible new way of understanding free will, determinism, and the nature of man. This insight seems not to have been appreciated by Platt or by the other contributors to the lecture series: Willard Libby discusses "Man's place in the physical universe." George Wald considers "Determinacy, individuality, and the problem of free will" and oddly concludes that we are wholly determined but we have free will because we are unique and unpredictable. Derek de Solla Price examines "The science of science," and Roger W. Sperry dissects "Mind, brain, and humanist values," dismissing indeterminancy as unpredictable caprice, unaware of the middle ground between freedom and determinism and therefore unable to encompass feedback responses to an occasional randomly initiated event. James Redfield gives a fascinating analysis of the parallels between the Greek city-states and our culture in "The sense of crisis."

The diversity of views on determinism and free will and the resulting indecision on the nature of man and of the world are not dispelled by a third contribution in this area, Lord Russell Brain's **Science and Man** (Elsevier, New York, 1966. 109 pp., illus. $3.75), a collection of four lectures, entitled "Science and behavior," "Perception, a trialogue," "The status of mind," and "Science and antiscience," the last of which has been published in *Science* [**148**, 192 (1965)].

These books on the nature of man are all worth reading more than once and form good companion volumes to *Man Adapting* by Dubos and *Mankind Evolving* by Dobzhansky, reviewed in these pages in 1966 and 1962 by G. G. Simpson. If anything can be said about what society must do to survive it is not explicit in any of these books, but all are highly relevant. Perhaps the most urgent need is to keep the situation open-ended and to encourage scientists like John R. Platt to continue to be involved persons.

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Plant Biochemistry

In recent years the field of plant biochemistry has lacked a comprehensive treatise covering the major areas of research within the rather broad scope of the discipline. This gap is nicely filled by the recent publication of **Plant Biochemistry** (Academic Press, New York, 1966. 1072 pp., illus. $19), edited by James Bonner and J. E. Varner. The avowed purpose of the volume is to provide detailed information for both the advanced student and the research worker interested in plants, and in general this aim is amply fulfilled.

The book is divided into five main sections, covering subcellular structure and function, basic metabolism, specialized aspects of plant metabolism, control, and autotrophic nutrition. Subcellular Structure and Function includes a chapter on plant mitochondria and electron transport by W. D. Bonner, Jr., and a nicely illustrated chapter on chloroplasts by R. B. Park, as well as chapters on ribosomes (J. Bonner), the nucleus (J. Bonner), enzymes (Varner), cell membranes (G. A. Thompson, Jr.), and the cell wall (P. Albersheim). In addition to a bibliography of technical papers relevant to each topic, each chapter contains a listing of more general references for the benefit of readers unfamiliar with the necessary background information.

Basic Metabolism covers respiratory metabolism, protein, lipid, and carbohydrate metabolism, the biosynthesis of amino acids and coenzymes, and mineral nutrition. More specialized topics, including plant acids, the biosynthesis of alkaloids, isoprenoids, and porphyrins, and the chemistry of tannins, coumarins, flavonoids, steroids, and so on, are treated in the third section. The section on control includes a discussion of seed development and germination (Varner), fruit ripening (M. Spencer), cell extension (Lockhart), and development (Bonner). This section might well have included a chapter on the biochemistry and related physiology of phytochrome, as well as a more detailed discussion of the relationship of plant growth hormones to RNA metabolism, although some of the latter material is treated in various parts of the book. Also, there is no single chapter which discusses the biochemistry of growth substances. Autotrophic Metabolism includes two informative chapters on the path of carbon in photosynthesis (Bassham) and the path of energy in photosynthesis (Kok), and a discussion of nitrogen metabolism (Burris).

In summary, the book provides a useful compilation of information from many areas of plant biochemistry and should be a welcome addition to the bookshelf of students and research workers in the field.

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Timberlands in Russia

Although the Soviet Union possesses much greater forested area than any other country and has long been prominent in the international timber trade, it has hitherto been difficult for interested English-speaking readers to lay their hands on a detailed survey of the Soviet forests. The translation of V. P. Tseplyaev's comprehensive work **The Forests of the U.S.S.R.** (A. Gourevitch, Transl. Israel Program for Scientific Translations, Jerusalem, 1965; Davey, New York, 1966. 527 pp., illus., maps. $19), which originally appeared in the Soviet Union in 1961, should therefore be a great boon to many specialists. This applies not only to students of forestry and related subjects, but also to those of Russia in general, since the forests have had a profound effect on the country's development from the beginning.

The book has a short introductory section on the history of forest surveys, general classifications, and the "natural zones," and even briefer concluding sections on the wood-using industries and world forest resources. However, nearly four-fifths of it is taken up by a detailed regional inventory of the forests. This is organized by general species (pine, spruce, and so forth) and, within these categories, by