attack, major questions and problems. In sum, the charge by the Committee on Science and Public Policy of the National Academy of Sciences was to arrive at a "complete overview of the highlights of current understanding of the life sciences" and the consequences of further developments not only for biology but in practical terms of human existence and the use of nature for the benefit of the human species. Above all the report of the committee was expected to "convey a sense of the excitement and enthusiasm of the practitioners" of the life sciences and their sense of values.

Before describing the contents of the book, I would say that the goal of providing an overview of the state of biology at the time the panels were convened (and in some cases later, owing to the skillful editing) is met. There are earmarks of a committee production, unevenness in the way a subfield is handled, repetitions, and, in areas of my own competence, statements with which I can wholeheartedly disagree or which I would claim are downright erroneous. But these reservations are essentially trivial.

More serious is the fact that the title of the book, which derives from the ultimate chapter of some 40 pages rather than from the book as a whole, is a misnomer. Thus, although the intent of a survey of modern biology is accomplished, the predictive value implied in the title, and this reviewer's hopeful expectation that the merciless deluge of volumes and symposia on mankind's future would be cut off by a definitive book on the subject, which might have been the main virtue of the report, are not realized.

To put this in another way: I am personally grateful to have the skillful distillation of the near-current state of biology (to attempt a list of major advances since the proofs were read, let alone since the panels and review committees convened, would be sheer folly) condensed into less than 1000 pages at a reasonable cost the way books are priced now. I am distressed, however, not only at the book's failure to fulfill completely the promise of the title but also at the lack of an index. My generation of biologists still remembers the Menckenesque book reviews of Raymond Pearl in his *Quarterly Review of Biology*, wherein it was at least a sin against the Holy Ghost to publish a book without an index (a sin I happen to be guilty of myself). For a book of this scope, authority, and potential influence on the readers, this omission is inexcusable.

It is, of course, impossible within the space available to give a detailed analysis of each of the 20 chapters of the book. I shall confine myself to listing the general topics discussed with the relative amount of attention given to each, and to a more specific comment on the final chapter, not only because the book owes its title to it, but because I think that the primary concern of a biologist in 1970 does not lie in the curiosa of discovering homunculi under newfangled microscopes, or similar excitements, but rather in a responsible evaluation of such findings; in communication à la Arago; in the education of the laity; in qualified prediction of consequences; in *individual* political action —all relevant not only to the satisfaction of human curiosity or vanity, but, much more importantly, to human welfare.

It is difficult to judge what priorities guided the panels or the guiding review committee which passed on the panel reports before the editor was assigned the task of a final rewrite, or again those that motivated the editor himself. But for the record, the pages assigned to each area are, in round numbers: molecular biology and biochemistry, 130; cellular biology, 30; origins of life, 40; developmental biology, 40; organismal biology, 80; nervous system and behavior, 110; ecology, 40; heredity, evolution, and systematics, 60; food and nutrition, 40; medicine, 100; resources, technology (including computers), 150; environmental health, 60; the future of man, 40.

I, like everybody else, have prejudices as to priorities in space assignment to this variety of topics. By and large, they are very similar to those of the editor. I have no intent to quarrel with his.

Being literal-minded, I shall assume the last chapter to be the crux of the book; being old-fashioned I believe that the message of a book is epitomized in its title, and hence will devote my remaining space to the subject the title suggests. The preamble of the ultimate chapter states unequivocally that *Homo sapiens* is the only product of evolution capable of controlling its own destiny. I myself have been preaching this myth for years in my own classes, despite J. B. S. Haldane's injunction that in actual fact it is arrant nonsense. The technology of such control is here or nearly here; the social machinery of implementing the technology is light years away. In the Soviet Union scientists are confined to insane asylums for expressed dissent. In the United States, students are shot to death for presumed dissent. In Southeast Asia, in the Middle East, human beings are killed daily. In South America the kidnapping of uninvolved people is used as a means of blackmail. In South Africa racism is rampant. Hijacking of planes is the order of the day. Environmental pollution, no doubt including mutagenic effects, is not under control. How, even forebearing to enter upon the racial problems in our country, can we claim to be in control of the destiny of our species?

For the record, I would, however, like to enumerate the hazards and the opportunities listed in the book related to our galloping biological technology:

Hazards: (i) war; (ii) pollution; (iii) population growth; (iv) deterioration of the genetic quality of human populations.

Opportunities: (i) life-span extension; (ii) control of infectious diseases; (iii) organ transplants; (iv) improvement of terminal medical care; (v) euphenics and its ethics; (vi) improvement of early environment; (vii) sex determination; (viii) selection for fertility.

To be fair to the 175 people who worked on this report, their optimism with respect to the opportunities outweighs their pessimism with respect to the hazards. But in all honesty, I must, in quoting the last two sentences of the book, add one more of my own; these phrases are in reference to the evolution of *H. sapiens*: "At last he is a Man. May he behave so!" I am afraid he does.

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Biological Substances

Pigments in Pathology. MOSHE WOLMAN, Ed. Academic Press, New York, 1969. xviii, 554 pp., illus. $29.50.

Pigments, as defined by the editor of this book, are "substances . . . which absorb visible light." Using this broad definition, the editor has assembled 16 chapters on these various substances by authors from widely scattered geographic locations.

The chapter titles clearly indicate that the term "pigment" does not imply a substance of any common origin or similarity in chemical composition or biologic significance. Pigments can be

exogenous, such as inhaled carbon particles or ingested drugs, or endogenous, such as bile, melanins, lipofuscins; melanins, in fact, are the subject of only three of the chapters in this monograph.

Some of the chapters could well have been dispensed with. The chapter "Histochemistry of melanins" is an exhaustive tabulation of archaic and undocumented statements about the histochemistry of melanin and melanogenesis, for example. A serious omission in this monograph is that there is no summary of the recent findings on the chemistry of melanins by the Nicolaus group in Naples.

There are, however, worthwhile discussions of bile pigments, the Dubin–Johnson syndrome, lipids, the nature of the pigmentation in ochronosis, and the curious pigmentation of the intestinal tract. There is a lucid and comprehensive summary entitled "Normal and abnormal melanin pigmentation of the skin." The presence of melanin in neurons is a subject of much interest because of the successful treatment of Parkinson's disease with L-dopa. The author concludes, after a thorough review of the literature, that "neuronal melanin is not synthesized by a tyrosine-tyrosinase system as in skin melanocytes, but by a different pathway involving oxidation of brain catecholamines, in particular, dopamine."

This monograph is a necessary reference book for the library of the pathologist and a good source book for the biologist and the physician.

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Plants

Biologie Végétale. Vol. 1, Cytologie. A. NOUGARÈDE. xii, 600 pp., illus.; 130 F. Vol. 2, Nutrition et Métabolisme. R. HELLER. viii, 580 pp., illus.; 115 F. Vol. 3, Croissance, Morphogenèse, Reproduction. R. CHAMPAGNAT, P. OZENDA, and L. BAILLAUD. viii, 512 pp., illus.; 115 F. Masson, Paris, 1969. Précis de Sciences Biologiques.

This treatise in three volumes has been written to fill the need for an up-to-date presentation of plant biology in the French language, for the benefit of university students. One can feel that the first volume, devoted to plant cytology, has been prepared by one who is both an excellent teacher and an expert in her field. The methods that have opened new vistas in the study of cells are clearly and accurately presented: phase microscopy, autoradiography, electron microscopy, freeze-etching, ultracentrifugation, and so on. Fundamental aspects of proteins and nucleic acids are reviewed as a background to the study of the constitution and functions of the cytoplasm and its inclusions. The mode of formation of the latter and the figures seen in the electron microscope for the plasmalemma, endoplasmic reticulum, Golgi apparatus, mitochondria, and chloroplasts are very well illustrated through numerous diagrams and full-page electron micrographs. The author does not hesitate when necessary to bring in examples from animal cytology, such as the fine structures of the mitochondrial cristae of beef heart or those of flagellae of the branchial epithelium of the mussel. An explanatory presentation of the process of cell division constitutes the last part of the volume. On the whole, the author has achieved the difficult task of bringing together in a clear picture the outburst of investigations in the fields of electron microscopy and biochemistry which have been directed at the cell in the past 25 years.

The second volume, devoted to nutrition and metabolism, has a much drier presentation. The story of mineral nutrition follows a classical pattern. Certain terms are left unexplained. It is stated, for example (p. 4), that the structural proteins of the protoplasmic gel are held to water by "imbibition forces," which are not defined. In the chapter concerned with the assimilation of nitrogen, nothing is said about the fact that nitrate reductase is an inducible enzyme. Such fundamental processes as the incorporation of the nitrogen atom into an organic molecule and the fixation of reduced nitrogen on keto acids are barely mentioned. A few good metabolic maps would more suitably fill the two and a half pages that are occupied by drawings and photographs of insectivorous plants. Also, the metabolic chains of the biosynthesis of phenolic compounds which are specific to the plant world and have been so intensively studied would have been interesting to discuss. In general, the presentation of plant metabolism is weak.

Three authors have cooperated in writing the third volume, which deals with growth, morphogenesis, and reproduction. On the whole, the subjects of growth, differentiation, morphogenesis, and correlations are adequately treated. Auxins are dealt with in some detail, in contrast to gibberellins and cytokinins. Several auxin tests are presented, but the inhibitory part of the curves, which is known (and has been for four years now) to be due to the endogenous formation of ethylene, is left unexplained. Ethylene itself, which is now recognized as a genuine plant hormone, is not mentioned (not even as a fruit-ripening agent, since ripening and senescence are not discussed). In the chapter dealing with plant movements, nothing is said about the biochemical aspects of tendril excitation, for example the role of flavonoids. The part devoted to plant reproduction gives a fairly complete botanical base for the reproduction of algae, fungi, and higher plants. Again, the presentation is rather formal and classical, with no reference to the interesting results obtained during the last ten years in the hormonal control of formation of antheridia in ferns or the developmental physiology of the myxomycetes, which the last author purposely leaves outside the scope of his presentation.

On the whole, the treatise is an updated version of older treatises; there are some gaps with respect to the newest developments of plant biology, but this science is so vast now that it is impossible to encompass it all nowadays. The usefulness of volumes 2 and 3 as reference manuals is reduced by the fact that only books, and not original articles, are cited.

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The Premier Geosyncline

Studies of Appalachian Geology: Northern and Maritime. E-AN ZEN, WALTER S. WHITE, JARVIS B. HADLEY, and JAMES B. THOMPSON, JR., Eds. Interscience (Wiley), New York, 1968. xviii, 480 pp., illus. $29.50.

Studies of Appalachian Geology: Central and Southern. GEORGE W. FISHER, F. J. PETTIJOHN, J. C. REED, JR., and KENNETH N. WEAVER, Eds. Interscience (Wiley), New York, 1970. xx, 460 pp. + plates. $29.50.

"The Appalachian Chain," as P. B. King writes in the epilogue of the second of these two volumes, "is the most elegant on earth, so regularly arranged that its belts of formations and structures persist virtually from one end to the other—from its first appearance from beneath the sea in Newfoundland,