Book Reviews

Unitary principle in physics and biology. Lancelot Law Whyte. New York (10): Henry Holt, 1949. Pp. xxiii + 162. $3.50.

The development of fundamental sciences during the first half of the present century was characterized on one hand by clarification of basic principles underlying physical phenomena (relativity, uncertainty, elementary particles), and on the other by much deeper insight into basic phenomena from the realm of biology (interpretation of genes and viruses as single molecules, etc.) which gives us promise of understanding the phenomena of life on a purely physical basis. This led recently to a much closer collaboration between physicists and biologists, and induced many theoretical physicists (for example, E. Schroedinger) to attempt an extension of the well-developed methods of physical theory into the virgin field of fundamental biology. Although, as could well be expected, the development of the theory of organic matter still represents tremendous difficulties, one can hope that further experimental studies of elementary biological phenomena, and more extensive work on their interpretation in the language of molecular physics, will lead in the future (maybe not so distant) to the complete solution of the ancient riddle of life.

That is why one witnesses with a deep chagrin the appearance of such books as one by Lancelot Law Whyte who claims to be able to turn upside down both physics and biology, and to arrange them into new order on the basis of a newly invented philosophical (in the bad sense of this word) principle of "unitarity."

It is hardly necessary to discuss in any details the contents of this book, which will be quite unacceptable to all physicists (even to those possessing a great sense of humor), and of little help to any biologist. Thus we will give only a few quotations typical for the entire presentation. The "Unitary Principle" from which all laws of physics and biology are to be derived reads:

"Asymmetry tends to disappear, and this tendency is realized in isolable processes." In applying this principle to physical phenomena, the author comes to a number of conclusions which, according to him "*offer a challenge to the theoretical physicists* either to justify them by quantitative confirmation, or to show that they contradict established facts." Here are two examples of such conclusions: "Atom is a stable pattern with one center of (latent) symmetry." "Electronic current (at temperatures not close to absolute zero) is a continued induction, by a chemical source of polarization, of an extended state of polarization (in a conductor) which continually collapses into disordered molecular polarization."

Having revolutionized physics by these and other similar statements, the author turns to biology and defines, for example, a green plant as: ". . . a continuous process of local chirol fields stabilized by hereditary units and supported by stationary structures conforming to an external axis."

Not being a botanist, the reviewer is unable to judge the merits of this definition.

The quotations are sufficient commentary on this book.

GEORGE GAMOW

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Factors of evolution: The theory of stabilizing selection. I. I. Schmalhausen. (Theodosius Dobzhansky, Ed.; I. Dordick, Trans.) Philadelphia: Blakiston, 1949. Pp. xiv + 327. (Illustrated.) $6.00.

Although its dust jacket calls *Factors of evolution* the "first full discussion of new contributions to evolution in more than a decade," it fails to show any advantage of its recency. It was written six years ago, but the bibliography does not cite any non-Russian papers after 1940, and only a few Russian ones. However, a large body of data from the USSR is revealed, and most biologists should find a number of interesting notes on work in their own field.

This book is directed toward establishing the separation of natural selection into a dynamic role and a stabilizing one. Those factors which tend to change the average phenotype of a population are considered dynamic, while those which tend to preserve the population within a narrow range of variation are considered stabilizing. Schmalhausen focuses attention on that group of factors which have the effect of stabilizing the genetic and morphogenetic systems of organisms, and which, together with the elimination of harmful mutants, form the basis of stabilizing selection.

A broad background of work in genetics is used as an introduction to the book, followed by a discussion of natural selection and its consequences, and then a section on the evolution of morphogenetic reactions. The concluding section consists of a discussion of the factors involved in rates of evolution. In each case the facts are selected to fit into the general picture of stabilizing selection, little attempt being made to present a discussion of the whole field of evolution.

The main value of this book will undoubtedly be in the intensive discussion and work it will generate. This is because the number of interesting ideas presented is large, but often the evidence for them is sufficiently meager or the interpretation sufficiently questionable to warrant much further investigation. The publisher's suggestion for using the book as a text, or its use for any general purpose, should find little acceptance. The language is difficult and often obscure. Readers with a general knowledge of taxonomy or genetics will discover many errors and inconsistencies.

It should be noted that Schmalhausen's ideas come from within the framework of Mendelian genetics. Throughout the book the discussion of the roles of en-

vironment and heredity in development are distinctly stated without prejudicing either one. However, the advocacy of Mendelism in this book cost Schmalhausen his position in August of 1948.

HERMAN SLATIS

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From Euclid to Eddington: A study of conceptions of the external world. (The Tarner Lectures, 1947.) Edmund Whittaker. New York: Cambridge Univ. Press, 1949. Pp. ix + 212. $4.00.

Although the title suggests a systematic history of cosmological speculations, and the subtitle hints at a philosophy of science, the present book (containing the substance of the Tarner Lectures for 1947) is in fact neither. Its aim is to outline the development of some of the chief theoretical principles of modern physics, especially those which contribute to the systematic unification of physical knowledge and have a bearing on larger cosmological questions. The volume is thus addressed to readers concerned with the state of current theory; and Whittaker employs historical materials primarily to introduce modern notions and to make evident what is novel in them. His exposition is divided into five parts, dealing in sequence with basic ideas in the analysis of space and time, with the fundamental concepts of classical physics, with the notions underlying general relativity, with the concepts of quantum theory, and finally with Eddington's cosmological views.

Whittaker writes with his customary clarity, though he does assume more than mere literacy on the part of his audience; and he makes excellent use of his unusual mastery of the history of science to illuminate recent attempts at a unified conception of the physical world by showing the relevance of earlier efforts in this direction. Moreover, he expounds the remarkable achievements of modern theoretical physics with contagious admiration and enthusiasm; and his reasonably intelligible account of Eddington's fascinating but not widely known contributions to physical cosmology constitutes a specially useful service to the general reader.

However, the book has little to offer to anyone interested in the philosophical and logical analysis of modern theoretical formulations. Whittaker is indeed often on the verge of interesting methodological reflections, as in his brief comment on electrons as not being "particles in the old sense," or in his over-all remark on the use of alternative models in interpreting the formalism of quantum theory. He also tantalizes his readers by such asides as that recent work on the unified field theory, while marking important contributions to pure mathematics, does not possess much physical significance. It is also evident that Whittaker does not subscribe to the positivist-pragmatist account of the function of physical theory, as is clear from his somewhat negative evalution of Newtonian gravitational theory because of the latter's silence on the origin and mode of transmission of gravitational influences. But none of these essentially incidental observations are adequately developed, and in consequence the reader is never permitted to inspect the intellectual center from which Whittaker surveys and evaluates the fundamental ideas of modern physics.

ERNEST NAGEL

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Atmospheric electricity. J. Alan Chalmers. New York (11): Oxford Univ. Press; Oxford, Engl: Clarendon Press, 1949. Pp. 175. (Illustrated.) $3.75.

The appearance of a new book on atmospheric electricity is most welcome. The textbooks of Chauveau, Mache and Schweidler, Benndorf, Benndorf and Hess, *et al.*, are all more or less obsolete and for English readers only the short monograph of Schonland (1932) and three chapters in Fleming's *Terrestrial magnetism* (1939) by Gish, Torreson, and Schonland were available until now.

Chalmers' book is well written and up to date. One can immediately see that the author has worked a great deal (with Whipple) in this field.

It is especially commendable that the new ideas on the mean lifetime of ions and the equilibrium between small and large ions (Nolan, Whipple, Schweidler) are fully presented and that the thunderstorm phenomena are described in modern form, taking into account the results of the altielectrograph recordings.

The author mentions in the preface that he purposely omitted a chapter on cosmic rays (as, for instance, given in Schonland's book) and I agree with him that a full presentation of these phenomena is not necessary for the explanation of atmospheric-electric phenomena. I wish, however, that the importance of ionization by cosmic rays had been stressed in the discussion of the ionization balance of the lower atmosphere, especially over the oceans. Also, I think, the treatment of the main problem of atmospheric electricity (maintenance of the earth's negative charge), although excellent, is perhaps incomplete, since the reader does not get any information with regard to the transfer of charges from the upper part of the thunderstorm regions to the ionosphere.

I also should have wished to see a quantitative treatment of the role of the various ionizing agencies in the atmosphere: contribution of the alpha, beta and gamma rays from the radioactive products in the atmosphere, their distribution with altitude (W. Schmidt's theory of mass exchange) and contribution of ionization by cosmic rays in the free atmosphere in the troposphere and the stratosphere.

In all other respects, Chalmers' book is a very fine, modern text, which deserves full recognition as a standard monograph and wide distribution among geophysicists and specialists in the field of atmospheric electricity.

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