

other survivors of the little band of young men who created modern physics in the heroic years from 1925 to 1930 and a larger number of survivors from the less heroic years that came later. Everybody was invited to talk, on a not too technical level, about any subject not altogether unrelated to the life and work of Dirac. The talks were recorded, collected, and edited with a light hand by Jagdish Mehra. This book is the result. It has no unifying theme and very little structure. It is, in part, a collection of expository essays describing the present state of knowledge in various areas of science. It is also, in part, a mine of anecdotal history and personal reminiscence. It is also, in part, a gallery of self-portraits drawn by some of the most colorful characters of our century.

Mehra availed himself of the editor's privilege to include an 87-page monograph by himself entitled "Einstein, Hilbert, and the theory of gravitation." This is a substantial historical study, outlining the sequence of events that led the mathematician Hilbert to devote several years of his life to the elaboration of Einstein's theory of gravitation and to discover independently several of Einstein's main results. One of the striking features of this story is the intense personal respect that Einstein and Hilbert maintained toward each other, in spite of their sharp differences of viewpoint and their often overlapping discoveries. In those days, it appears, scientists were not only giants, but also gentlemen.

One of the contributions that will probably be of greatest interest to the unspecialized reader is "The origin of biological information," a 40-page essay by Manfred Eigen. This is a fragmentary but illuminating discussion of the difficulties that arise in trying to understand in Darwinian terms the prebiological phases of evolution. Eigen raises many questions and answers none. Because he is here talking in an informal and tentative manner, his statement is more convincing than the dogmatic article on the origin of life he published a few years ago in *Naturwissenschaften*. The problems of reconstructing possible pathways of prebiotic evolution in the absence of any kind of fossil evidence are indeed formidable. Successful attack on these problems will require, on the one hand, the boldness to imagine and create new concepts describing the organization of not-yet-living populations of molecules

and, on the other hand, the humility to learn the hard way, by laborious experiment, which molecular pathways are consistent with the stubborn facts of chemistry. We are still at the very beginning of the quest for understanding of the origin of life. We do not yet have even a rough picture of the nature of the obstacles that prebiotic evolution has had to overcome. We do not have a well-defined set of criteria by which to judge whether any given theory of the origin of life is adequate. And yet, the origin of life is clearly destined to be one of the great themes in the science of the coming decades. It is a unifying theme, which will require the concerted effort of chemists, biologists, geologists, paleontologists, and perhaps even physicists, for its elucidation. Eigen has performed a valuable service in calling the attention of a new generation of physical scientists to the existence of this challenge. He has begun to ask some of the right questions. It is too soon to expect any answers.

Another chapter that may be recommended to the general reader is "From relativity to mutability," by John Wheeler. Wheeler, one of the greatest physicists now living, is also famous as a gifted teacher. He writes as he teaches, with exuberance and a ceaseless flow of poetic imagery. He leaves the students, even those who can grasp little of the technical substance of his argument, with a vivid impression of what it is like to be a creative scientist. His style of writing is so personal that everything he writes is a self-portrait. Recently he published an article entitled "From Mendeleev's atom to the collapsing star," which inspired some anonymous joker to circulate in samizdat a parody called "Rasputin and the transmogrification of science." The parody was so good that many of us suspected it could only have been written by Wheeler himself. Wheeler's chapter in this book might also have been written as a self-parody. It is Wheeler at his best, a man in love with science and intoxicated with the mystery of the universe.

The final section of the book is a record of the talks and unprepared remarks at the symposium banquet. Here are to be found some splendid "Dirac stories," told by people who know Dirac personally and have no need to invent or embellish. A "Dirac story" has always a special flavor that arises from Dirac's uniquely logical mind. The book ends with this one told by Eugene Wigner: "Once Polanyi, Dirac and I had a

luncheon together and we discussed questions of science, society and all those things. All the time Dirac did not say a word. So when we went out I told Paul, 'Paul, why don't you speak up?' . . . 'There are always more people,' he said, 'willing to speak, than willing to listen.'"

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Issues and Public Policies in Educational Technology. Advisory Committee on Issues in Educational Technology, Commission on Education, National Academy

(Continued on page 1188)

HUMAN AND ECOLOGIC EFFECTS OF NUCLEAR POWER PLANTS

by Leonard A. Sagan, *Palo Alto, California*. Introduction by Rolf Eliassen. (15 Contributors) A rapidly developing and justifiable concern is expressed over the environment which has clearly suffered from past and present technology. To some, the advent of nuclear power presents still another affront to the environment whereas others view this new source of energy as possessing a decided environmental advantage over the alternatives. It seems beyond dispute that reactor technology and its ecologic effects exceed the detailed understanding of even many experts. Compounding this difficulty, the interested layman is also faced with an inaccessible and fragmented literature. This book is meant to provide both a comprehensive introduction for the interested layman and useful reference for the technical expert. Although the book is directed toward an exposition of human and ecologic effects of nuclear power plants, more than half of the book is dedicated to a description of reactors and the uranium fuel cycle. '74, 560 pp. (7 x 10), 138 il., 86 tables, \$34.50

CURRENT TECHNIQUES FOR ANTIOTBIOTIC SUSCEPTIBILITY TESTING

by Albert Balows, *U.S. Dept. of Health, Education, and Welfare, Atlanta*. (16 Contributors) This book clarifies prevailing misconceptions of disc diffusion and dilution techniques for *in vitro* antibiotic susceptibility tests are detailed to provide laboratories with the guidance needed to make the workload more manageable. A compilation of authoritative and technically up-to-date methods that are used in the clinical laboratory, this book provides current thinking on the Kirby-Bauer disc method and the recently endorsed modifications, the agar dilution method and microtube dilution method for minimal inhibitory concentration determinations, the clinical significance of the MIC determination, susceptibility testing of anaerobes, the movement toward standardization of methods, and the future impact of automation on susceptibility. '74, 170 pp. (6 3/4 x 9 3/4), 26 il., 62 tables, \$13.75

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(Continued from page 1162)

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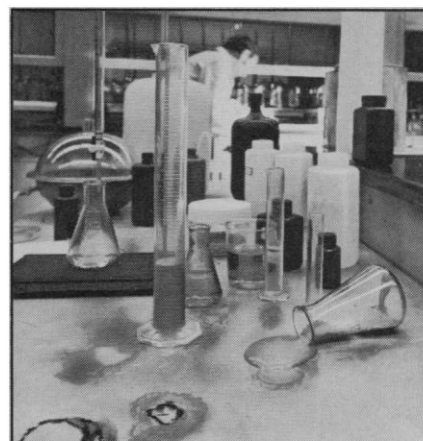
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Subatomic Physics. Hans Frauenfelder



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