Fitch and working at Brookhaven, established CP violation (using the same miserable K mesons that provoked the theta-tau puzzle out of which parity violation emerged).

The last of the discrete symmetries associated with the Lorentz Group has now fallen, and one of the most active interests of particle physicists, these days, is putting the pieces together again. Our intellectual attitudes have evolved a great deal since Lee and Yang challenged parity conservation in 1956-57. At that time, the notion of an approximate symmetry seemed somehow tainted and obscure, and everyone turned, with relief, to CP invariance as the "real" definition of parity.

We are now quite conditioned to the idea of a hierarchy of symmetries, each playing a role on a certain time scale, and each breaking down when the time scale becomes longer or, equivalently, when the interaction becomes weaker. Are any symmetries exactly preserved for arbitrarily long-time scales? Will interactions show up that violate the conservation of even the continuous symmetries of the Lorentz Group, such as momentum and angular momentum? I certainly do not know the answers to these questions. Perhaps we shall find out enough about them so that Gardner can treat them in the next edition of his book. I am sure that he will do so with the same intellectual vitality, enthusiasm, and good humor that characterize the present version of the *Ambidextrous Universe*. His book is a great deal of fun to read, and that is saying a lot.

Jeremy Bernstein is an Associate Professor of physics at New York University and a member of the staff of the **New Yorker** *magazine. His work in physics has been largely in the weak interactions, most recently in connection with charge-parity violation. His contributions to the* **New Yorker** *have been mainly in scientific popularization. He is the author of two books*—The Analytical Engine, *about the evolution of the computer, and* Ascent, *about the evolution of the sport of mountain climbing. Both books are based on material that first appeared in the* **New Yorker**. *He graduated from Harvard in 1951 and received his PhD from the same university in 1955.*

HOW NATURE WORKS

Title Radiation Damage in Crystals

Author Lewis T. Chadderton

Publisher Methuen, London; John Wiley & Sons, Inc., N.Y., 1965

Pages xiv + 202

Price $6.75

Reviewer Paul W. Levy

For 15 or 20 years, numerous Methuen's monographs on physical subjects have been carried in this reviewer's pocket and read whenever there was an opportunity. Almost without exception they have fulfilled a need for information on a subject related to research in progress or for an introduction to a new area of interest. In other words, they provided a survey of a particular subject. Formerly, they were approximately 11 x 17 x 1 cm: a size that made them particularly convenient to carry in almost any pocket. Now, they are much larger (the book discussed here is approximately 15 x 22.5 x 2 cm), and the carrying convenience of these new issues has almost entirely disappeared. Of course, they now contain more information.

Presumably, in the Methuen monograph tradition, Chadderton's *Radiation Damage in Crystals* was designed to provide an introductory survey of the radiation-damage field. To many, radiation damage is simply determining how radiation affects the properties of a particular material; e.g., does reactor irradiation alter the creep properties, the corrosion resistance, etc., of a particular steel? To others including this reviewer, radiation damage relates to the basic physics and chemistry that describe the interaction of radiation with matter. These viewpoints are related. All engineering is the application of basic physical principles. Even if one is concerned only with practical matters, an understanding of the basic science must be helpful and intellectually stimulating.

A surprisingly large number of books on radiation damage have been published. Also surprising is that they all very nearly follow the same format: one or more chapters on principles, followed by from 3 to 20 chapters on experimental results or engineering data. Furthermore, the two main sections of these books are often very poorly correlated. Appended to sections on physical phenomena are a few sentences stating that examples are contained in a specified chapter. Then, one often finds that the indicated section does not refer to the previous discussion. Fortunately, this book is not divided in this way.

In Chadderton's book the emphasis is entirely on physical phenomenology, and it is arranged in a completely laudable manner. First discussed are the various defects that are usually found in inorganic and metallic crystals. Next considered, in logical progression, are the various processes whereby defects are produced by radiation. This begins with the collision of an energetic particle and a lattice atom—the recoil atom. It is continued in what may be described as the history of the interaction of this recoil with the atoms (and electrons) in the crystal lattice: how it and the secondary recoils lose energy and how they or the recoil chains are channeled by the periodic lattice structure. Finally, this history is terminated by a description of where the defects produced are ultimately located in the crystal. This entire process is summarized graphically in an easily read chapter called "Computer Simulation of the Radiation Damage Process". In a sense, radiation damage results from innumerable collisions between the atoms of the bombarded crystals. Thus, the crucial point is the interaction between colliding atoms. An entire chapter is devoted to this interaction. It should be particularly appealing to anyone who possesses even a slight interest in un-

derstanding "how nature works". The book also includes a description of how particles lose energy as they pass through matter and a few related topics such as the application of the field-ion microscope to damage investigations.

To put it explicitly, this book is highly recommended. It is well written, it is short, and the information it contains can be efficiently assimilated. It should be particularly useful for anyone, from undergraduate to experienced researcher, who is learning about radiation effects for the first time. It is also recommended to persons who have been doing radiation work, particularly of an applied or engineering nature, and have an incomplete or old-fashioned understanding of the basic physical phenomena.

Paul W. Levy, a former nuclear physicist turned solid-state physicist, is a staff member of the Physics Department of Brookhaven National Laboratory, where, since 1952, he has been engaged in basic radiation-damage studies on a large variety of inorganic nonmetallic materials including insulators and explosives. His BS degree was obtained from the University of Chicago in 1943 and his PhD degree from Carnegie Institute of Technology in 1954.

A BROAD SUBJECT

Title Mechanics of Solids and Strength of Materials

Authors F. Warnock and P. P. Benham

Publisher Sir Isaac Pitman & Sons, Ltd., 1965

Pages xix + 595 + XVI plates

Price 50 shillings

Reviewer Joseph Marin

This text by Warnock and Benham is different from most texts on the subject as it combines both the subjects of stress analysis and material behavior.

The material is presented in a thorough manner. However, in view of the broad coverage of the subject, only summaries of information on some subjects could be included. For curricula where a condensed version of both strength of materials and mechanical properties of materials is indicated, this text should prove useful.

Joseph Marin has just been appointed Professor of Materials Science in the Department of Materials Science and Chemistry of the US Naval Postgraduate School at Monterey, California. Prior to this he was Head of the Engineering Mechanics Department of Pennsylvania State University. He has been teaching engineering mechanics and materials since 1930 and has conducted about 50 sponsored research projects, written over 150 technical papers and 80 final technical reports in this area, and developed about 20 new types of materials testing machines. He is the author of five books on materials and stress analysis and a member of numerous technical societies and committees. His undergraduate work was done at the University of British Columbia, and his PhD degree was obtained from the University of Michigan in 1935.

FIRST OF A NEW SERIES

Title Progress in Nuclear Techniques and Instrumentation, Vol. 1

Editor F. J. M. Farley

Publisher John Wiley & Sons, Inc., 1965

Pages viii + 398

Price $17.50

Reviewer E. Alfred Burrill

The scope of this new "progress series" is indeed ambitious, as expressed by the editor in the preface to the first volume: "We shall range over all aspects of experimental technique that can be useful, both in the study of nuclei themselves, and in high-energy particle physics . . . Our policy will be to present techniques which are new, but have, nevertheless, reached sufficient maturity to be passing into current experimental use". The selection of the six review papers in the first volume indicates that the editor has not yet been deflected from his goals; the subjects cover moderate-energy cyclotrons, polarized-ion sources and polarized targets, particle detection by nuclear emulsions and by spark chambers, and data handling.

It is difficult to review a compilation of this type, because it is essentially a bound version of six individually conceived and executed monographs with no common denominator or connection except the title of the book and its preface. However, a few general comments can be made before reviewing each chapter. I am pleased to see that each contribution has its own date. For those who do not follow these rapidly progressing fields, the point in time at which the review was made is of importance. On the other hand, it is unfortunate that the individual dates (January to June 1964) are about a year earlier than the release date of the book. A lot of progress has been made in these fields during the past year. All publishers will, I am sure, sympathize with my wistful desire to have "instant publication".

As would be expected, the styles, approaches, and scope of the six chapters are diverse. All contributions are well organized within themselves, with extensive bibliographies. A few comments on each work follow: