Books

Mechanics of Solids. Vol. 1 of The Scientific Papers of Sir Geoffrey Ingram Taylor. Edited by G. K. Batchelor. 593 pp. Cambridge U. Press, New York, 1958. $14.50. *Reviewed by J. Washburn, University of California at Berkeley.*

THE series of papers included in this volume forms a remarkably complete and fascinating history of the gradual increase in understanding of the plastic properties of crystalline solids, particularly for the period 1920 to 1940. Although there are forty-one separate research papers presented in chronological order, they form such a continuous story that the reader almost gets a feeling of suspense. Anyone familiar with research in the field of mechanical properties of solids cannot help but feel profound admiration for the author. Careful and imaginative experimental work, combined with equally careful and powerful analysis gives one the feeling of walking up a stairway with hardly ever a backward step.

The most famous paper in the book is "The Mechanism of Plastic Deformation of Crystals", which first appeared in 1934 in the *Proceedings of the Royal Society of London*. The dislocation theory of plastic deformation, originally developed in this paper, has since become a key which has led to clearer understanding of a still growing list of crystal properties. It is interesting to note that twenty-five years after the publication of this paper modern theories of strain hardening are only different from Taylor's in detail. They still depend on the basic idea that the density of dislocations increases with increasing strain and that interactions between their stress fields make dislocation motion increasingly difficult.

Free Radicals as Studied by Electron Spin Resonance. By D. J. E. Ingram. 274 pp. (Butterworths, England) Academic Press Inc., New York, 1958. $9.50. *Reviewed by J. W. Moyer, General Electric Company.*

A PHYSICIST reviewing a book on free radicals is inclined to suspect that the treatment would be largely from the chemical kinetics point of view. I am delighted to report that, in spite of reasonable preoccupation with organic radicals, the author has provided a thoroughly physical description of phenomena, with directions of how to make careful and reliable observations. Short, concise, but essentially complete descriptions of paramagnetic susceptibility theory, spin resonance, and hyperfine interactions are given to provide a basis for understanding the reasons for and the subtleties of the experimental techniques, although we shouldn't seek elsewhere for better theoretical discussions.

The book is organized as a four-chapter summary of theory and basic equipment design considerations, followed by five chapters that treat spin-resonance studies in physics, chemistry, biology, and medicine. Beyond an elementary brief on the properties of free radicals, the theme of the book is on electron spin-resonance techniques applied to identification, concentration measurements, and reaction rate studies for a variety of inorganic and organic molecular fragments, some of which are even in living tissue.

To introduce the experimentalist to the field, excellent descriptions of appropriate apparatus, circuits, and little tricks are presented. For those who do not care to make measurements, this section of the book is uninspiring, but the later chapters, showing electron spin resonance to be an extremely powerful tool, are a stimulating compensation. The point to which the recent work is brought shows clearly that detailed explanations of observations are still needed, particularly in the more complex examples.

Considering the direction of some recent free radicals research, relatively little emphasis has been placed on atomic or low molecular weight species, or on irradiations at very low temperatures. Little mention was discovered on correlation between calorimetric effects and spin-resonance observations, although this may be due to a paucity of good calorimetric data. Another subject not treated is that of spin-resonance effects in inorganic crystals, although this is excused on the basis that free radicals are not involved. Phonon spin-resonance phenomena have been excluded, I suppose, for the same reason.

Within the limitations of the title, however, the author has provided an immensely readable volume, solid in concept, neither condescending nor ostentatious, completely factual, with examples of applications to broad fields in the physical and life sciences. A generous list of references is to be found at the end of each chapter; the index is both by author and subject. Four pages of electron resonance equipment commercially available (in 1958) are included as an Appendix.

Čerenkov Radiation and Its Applications. By J. V. Jelley. 304 pp. (UKAEA) Pergamon Press, London & New York, 1958. $10.00. *Reviewed by Sanborn C. Brown, Massachusetts Institute of Technology.*

THIS volume is really two books of quite different characters, patched together in a way which will startle the reader if he is not prepared for jumping precipitously from theoretical discussions of the phenomena associated with Čerenkov radiation to the details of photomultiplier surfaces to be used in Čerenkov counters. The two books seem almost to be written from different points of view, although the author moves from one to the other in consecutive chapters. The