Books

Titanium. No. 4 of Metallurgy of the Rarer Metals. By A. D. McQuillan and M. K. McQuillan. 466 pp. (Butterworths, England) Academic Press Inc., New York, 1956. $10.00. *Reviewed by J. G. Castle, Jr., Westinghouse Research Laboratories.*

The McQuillans begin with the fascinating story of producing and working titanium. After an excusably brief, but quite thorough treatment of the physical, thermal, and electrical properties of pure titanium metal, they devote the middle half of the book to the alloying of titanium by presenting the constitutional diagrams for many binary systems and the results of phase transformation studies of a number of titanium-rich alloys. Next the mechanical properties of titanium and titanium-rich alloys are well described. The final chapters cover the chemical properties of titanium insofar as gas-reactions and corrosion effects are concerned, with a 10-page finale on preparation technique for metallographic specimens.

Much of the information is first hand for the authors. And they have put together a pleasant mixture of industrial technology and laboratory materials studies, with emphasis throughout on the "basic properties of titanium metal and its alloys" and support by extensive references to original works.

Their presentation should serve ably both as a needed collection for today and a lasting record of reference information on titanium. In this opinion, there is agreement from M. A. Hunter, *Science* **123** 1085 (1956).

Visible and Near-Visible Light. Vol. III of Radiation Biology. Edited by Alexander Hollaender. 765 pp. McGraw-Hill Book Co., Inc., New York, 1956. $10.00. *Reviewed by Joseph G. Hoffman, Roswell Park Memorial Institute.*

Fifteen chapters by twenty-one authors make this a valuable review of photobiology. The first three chapters discuss physics, and the remaining twelve chapters present a comprehensive account of how living matter responds to light. I know of no other text that pulls together from the widely scattered literature such an array of facts and figures bearing on this single subject. It is a fitting third and concluding volume to the monumental series called *Radiation Biology.*

The editor's prefatory statement that the basic information in this volume is of greatest importance deserves emphasis. Biologists and chemists will find in it valuable material, and biophysicists, especially, will come to regard it an essential source book. For example, the first three chapters are entitled: "Energy Exchange in Photoreactions", "Electronic Structure and Excitation of Polyenes and Porphyrins", and "Generation, Control, and Measurement of Visible and Near-visible Radiant Energy". They comprise an excellent discussion of the theory and practice of radiation measurements in and about the optical range.

Following the physical fundamentals, there are four chapters on photosynthesis and chlorophyll. Titles indicate the coverage: "Energy Efficiency in Photosynthesis", "The Mechanism of Photosynthesis", "The Absorption, Action and Fluorescence Spectra of Photosynthetic Pigments in Living Cells and Solutions", and "Chlorophyll Formation and Accumulation in Plants". These constitute a review of the basic material about photosynthesis, but they also contain much fascinating subject matter for the general reader.

The remaining eight chapters describe more special aspects of photobiology, some of which will deservedly become more widely known through this book. Chapter titles are: "Nitrate Reduction", "Phototropism", Photoperiodism". In the one about "Seed Germination" are typical examples of factual material having a bearing on our understanding of living processes. Tobacco seeds, for example, are so sensitive to light that 0.01 sec. exposure to sunlight, or 15 min. of strong moonlight, stimulates germination. And in the chapter on "Viscosity, Permeability, and Protoplasmic Streaming" the change of electrostatic potential of illuminated plant parts relative to the nonilluminated parts is a story too long to recount here. There is also the remarkable story about how light starts streaming of protoplasm in cells. These brief allusions are inadequate to indicate the wealth of experimental data presented. The last three chapters are equally exciting. They are: "Electrical Phenomena in Vision", "Invertebrate Photoreceptors", and "Photodynamic Action and Its Pathological Effects". The volume is a must for the library of most basic scientists. It has author and subject indices, is thoroughly documented, and generously illustrated.

The Direction of Time. By Hans Reichenbach. Edited by Maria Reichenbach. 280 pp. The U. of California Press, Berkeley and Los Angeles, Calif., 1956. $5.50. *Reviewed by P. Morrison, Cornell University.*

The most general and powerful branch of physics has always seemed to me to be thermodynamics. This is to be taken in its broadest terms: now it appears as the allegory of quantum statistics, again as the modern avatar, the theory of information. But always it remains the discipline through which the nature of being and becoming, of process and state, of knowledge and chaos are to be explained. If ever physics became natural philosophy, it was when Boltzmann, Gibbs, Ehrenfest, Tolman took up the mantles of the Abderan and the Peripatetic. In this book is yet another proof of this view.

Fancy talk, that. But it is inspired by a kind of