Book Reviews

Optics. Bruno Rossi. Addison-Wesley, Reading, Mass., 1957. 510 pp. Illus. $8.50.

This is a textbook for the advanced undergraduate student. A familiarity with the calculus is assumed, and some simple differential equations are developed and solved.

By basing the book on the wave model of light, Rossi has achieved a high degree of logical unity and consistency. Huygens' principle is discussed in unusually great detail in the first chapter, where it is shown that rectilinear propagation follows logically from a consideration of light waves as pulses of short duration. With this foundation, the subject of geometric optics is developed in the second chapter. The wave model is extended from pulses to sinusoidal waves in the third and fourth chapters, which deal with interference and diffraction. The transverse nature of the waves is introduced in the sixth chapter, to account for polarization and double refraction. In the seventh chapter, light waves are identified as electromagnetic waves, and Maxwell's theory is developed. The optical properties of matter are interpreted in the eighth chapter, by considering interactions between electromagnetic waves and atomic oscillators. This theory is entirely classical, with no discussion of the quantum-mechanical treatment and its results. The final chapter reveals the limitations of classical theory and illustrates the complementary character of waves and particles in the theory of light.

The strength of this book is its logical and rigorous development of the consequences of the classical wave model of light. A weakness, as a textbook, is its beginning with a chapter that will be difficult for the student. Another obvious weakness is that there is no recognition of quantum theory until the very end of the book.

The problems that are associated with each chapter are an important extension of the text material. They often disclose practical applications of the preceding theory; for example, low-reflectance films and interference filters are not discussed in the text but are assigned as problems. Such topics are often not listed in the index.

Some conspicuous omissions are Abbe's sine law, the theory of stops, aberrations of optical systems, a criticism of the Fresnel-Kirchhoff theory of diffraction, and radiation theory. On the other hand, noteworthy inclusions are Abbe's theory of image formation, the phase-contrast microscope, a very good treatment of mechanical waves, and a development of the electromagnetic field of a moving charge. Chapter 9, on light quanta, is excellent.

The many line drawings are well done, but the halftones are flat and muddy. There are very few errors. The book is a very well-written and scholarly work and is an important addition to optical literature.

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Advances in Food Research. vol. VII. E. M. Mrak and G. F. Stewart, Eds. Academic Press, New York, 1957. 404 pp. Illus. $8.50.

Volume VII of *Advances in Food Research* contains seven articles, each concerned with a facet of research in food processing.

Three of the contributions deal with specific food products. Fish spoilage and preservation is discussed by Yukio Tomiyasu and Buhei Zenitani. The authors render a service in that much of the material reviewed in the section is Japanese and, according to the editors, has not been generally available outside of Japan. Under the title "Gelatin," Bernard Idson and Emory Braswell describe the technology of gelatin manufacture, the chemical and physical properties of gelatin and collagen, and some applications of gelatin in the food, pharmaceutical, and industrial fields. C. Nieman presents, in a similar article, the technology of licorice manufacture and the chemistry and pharmacology of licorice and some of its components.

Three of the articles are concerned with problems that are encountered in food processing and marketing in general. The discussion of "Water relations of food spoilage microorganisms," by W. J. Scott, reviews some basic physical and biological concepts of these relations, the information on water requirements for growth of the organisms, and applications of knowledge of the relations in food preservation. Walter A. Mercer and Ira I. Somers describe the use of chlorine in sanitation of food-processing plants. The history of the use of chlorine, the technology of application, and the effects of chlorine in plant sanitation are discussed. Jean F. Caul's article, "The profile method of flavor analysis," recounts the development of this method of analyzing and classifying flavor. The selection and training of panels and their procedure in developing "flavor profiles" are described.

The seventh article, "Freeze-drying of food products," by J. C. Harper and A. L. Tappel, describes in detail the status of development and the fundamentals of the freeze-drying process. The authors discuss methods and equipment used in freeze-drying as well as present and prospective applications of the process. The process is, essentially, still in the research stage of development. Areas in which additional research is needed are listed.

Each of the articles includes an extensive bibliography, and the volume contains author and subject indexes.

The purpose of a work of this kind is, of course, to bring together information for the use, primarily, of persons in the specified field of endeavor. If the information available is adequately reviewed and is set forth in usable form, as it seems to be in the present case, the objective of the volume has been attained. The reader, however, might wish for improvement in literary style in some of the articles in this volume. At the least, such improvement would add to the pleasure with which the material is read. In some cases, the ease and perhaps the accuracy with which the information is transmitted to the reader would be enhanced.

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Science and Economic Development: New Patterns of Living. Richard L. Meirer. Technology Press, Cambridge; Wiley, New York; Chapman and Hall, London, 1956. 266 pp. $6.

Although the present world scene is overshadowed by political tensions and their economic and strategic concomitants, much greater concern should be felt about the ever-widening gap between the rapid progress of contemporary sci-

ence and the almost stationary status of social and educational institutions. This is especially true in the underdeveloped countries of the world, which will soon find themselves confronted with patterns of life to which they will be able to adjust only by a slow process of undisturbed development.

Most writers dealing with this grave problem of our time approach it from one of two diametrically opposite angles: they picture, in extravagant terms, the enormous possibilities which modern science and technology offer for the material benefit of mankind, with scant attention to man himself, or they envision economic and social utopias which are more the product of wishful thinking than of a realistic appraisal of technologic opportunities and social possibilities.

While both groups fail to give an integrated picture of the impact of modern science and technology on the social, psychological, and moral behavior of man as an individuum and a part of the community, R. L. Meirer draws from his large fund of knowledge in both the natural and the social sciences to give us a refreshing and provocative appraisal of the most probable course of events, considering both technologic and social factors. As a scholar trained in the exact sciences, he starts, naturally enough, with a sound attempt to quantify material human needs and world resources. He does not ignore spiritual requirements but does not complicate the picture by irrational and imponderable factors. Some agreement exists among scientists concerning an adequate level of living, and human needs can be expressed quantitatively in terms of nutrients, water, fiber, energy, and construction material. Estimates can be made of the availability of the world's renewable resources under conservative application of present agricultural, forestry, and fishery practices, and the probable reserves of nonrenewable resources will permit some extrapolations, provided that some minor resources such as uranium or titanium do not suddenly become major ones.

Where we reach the field of conjecture—namely, in the application of very recent discoveries in the physical and biological sciences to more efficient resource management—we find the book at its best, for it is always scientifically exact, technically sound, and directed toward a world as it is and not as it ought to be. Whether the author speaks about the protein problem, which he correctly considers the most fundamental in human nutrition, or of opportunities for expanding the protein supply by better utilization of marine resources, pisciculture in fresh waters, or growing of algae and other microorganisms, he always remains within the domain of proved scientific facts and technical experience. In one respect only could he have enlarged his exposition of maximal resource exploitation—that is, in the field of wild terrestrial vegetation, of which man uses only about 0.2 percent. There is no reason why the vast catabolism of organic matter, through bacterial and fungal decomposition (especially in the rain-soaked forests of the tropics and subtropics), could not be channeled toward an orderly degradation into useful products without impairing the cycle of nutrient metabolism in nature.

In the chapter on new fuels, the author deals lucidly with the utilization of solar energy, biological photosynthesis, nonbiological photosynthesis, and water- and wind-power as well as with utilization of atomic energy. He estimates the fossil fuel supply at 3×10^{19} calories. The yield of other energy sources, especially that of the "big unknown," atomic energy, cannot even be conjectured. There is no question that energy requirements for food, transportation, thermal comfort, and industry, especially in some newer metal-reduction processes, will increase rapidly, but so also will man's efficiency in utilizing energy.

In the most fascinating chapter of the book, Meirer tries to appraise the impact of this enormous expansion of human knowledge and productive capacity on the structure of society and the patterns of living. True scientist that he is, he meets this difficult problem objectively, without political bias or preconceived opinions. He realizes that the economically underdeveloped countries are not only suffering from overpopulation, or rather underemployment, but are continuously caught in a vicious economic cycle. Because of the low income-level, the people have a tendency to consume all their earnings and are unable to save. This naturally inhibits formation of domestic capital. Since low income is largely due to shortage of capital, the economy remains depressed. This lack of capital is the main factor in the ever-widening gap between scientific discoveries and their application. Only by way of international cooperation between the capital-rich and the capital-poor nations can satisfactory development of the world be brought about, and eventual disaster averted. However, such cooperation should be administered so as to leave the greatest possible freedom of self-expression and development of spiritual values to less advanced peoples.

All in all, this is an excellent book, written by a man who, as a chemist and physicist (University of California) and as an economist (Manchester School of Economic and Social Studies), is on good speaking terms with both natural and social scientists. While the former have lately become concerned with the consequences of their scientific research and discoveries, the latter are paying more and more attention to the dynamics of social and economic developments (especially in the less developed areas of the world), brought about by the progress and the application of science and technology. To both, the book is highly recommended.

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The Organization of the Cerebral Cortex. D. A. Sholl. Methuen, London; Wiley, New York, 1956. 125 pp. Illus. $4.25.

The Organization of the Cerebral Cortex is a summary of some interesting anatomical studies on the cerebral cortex. The point of view is that of quantitative cytological neuroanatomy. D. A. Sholl has some interesting data, from extensive silver preparations, on the distribution and extent of dendritic branchings. He attempts to relate these data to a theory of cortical activity based on connectivity and critical thresholds for excitation.

This theory has succeeded in mimicking one kind of cortical activity—that is, the slow spread of certain spontaneous figures of electric activity under deep Nembutal anesthesia. Such kinds of cortical activity may be confined to states of anesthesia, sleep, toxicity, and epileptic seizures. However, it may be that such mechanisms exist, operate, and are masked in the case of unanesthetized cortex that is bombarded by nonsynchronized activities.

The illustrations are excellent, and the bibliography is useful.

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Structure Reports for 1940–1941. vol. 8. A. J. C. Wilson, Ed. Published for the International Union of Crystallography. Oosthoek, Utrecht, Netherlands, 1956. 383 pp. Fl. 80.

The publication of *Structure Reports for 1940–1941* completes the coverage of all essential molecular structure information for solids, liquids, and gases obtained during the period 1913–50 and published in *Structurbericht,* volumes 1–7 (1913–39), and *Structure Reports,* volumes 8–13 (1940–50). The data for 1952 are now being assembled, and those for 1951 are presumably in press. This