tions (both photos and outline drawings) are quite good throughout. The weak point of the book is its index, which is inadequate even to relocate items you have already read.

This is followed by a lot of detail on underwater breathing apparatus, diver dress, and tools for special purposes. Then back to power sources for submersibles, with useful tables and charts on battery capacity.

After a once over very lightly, on all-about-the-ocean, there are final chapters on physiology in mixed gases and man's reactions under cold and stress. As I indicated before, if you can go to the book with a question relating to modern diving or small submarine design, you will have a better than even chance of getting an answer or a good reference.

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Radiation and Polymers

The Radiation Chemistry of Macromolecules. MALCOLM DOLE, Ed. Two volumes. Vol. 1, xiv, 370 pp., illus., $23; vol. 2, xviii, 406 pp., illus., $25. Academic Press, New York, 1972–73.

The effect of ionizing radiation on polymers and related compounds has been a subject of considerable interest and study for more than 25 years. Much of the early interest arose from the use of polymers as insulating and structural materials in nuclear reactors and related facilities. What doses can polymers sustain before they no longer fulfill their structural functions? What dose rates give rise to charge carrier concentrations which distort significantly the capacitor and insulation functions of a polymer? What is the yield of volatile degradation products and infusible gels?

The early work of Charlesby, Dole, and others soon led industry to investigate whether the effects of radiation on polymers could be the basis of practical improvements. These efforts have proved to be well justified. At this writing, the value of the annual production of packaging and insulating materials crosslinked by radiation is about $200 million.

Another area of importance is the effect of ionizing radiation on macromolecules involved in biological phenomena. The problems associated with radiation hazards and radiation therapy have led to expanded efforts in the radiation chemistry of nucleic acids, proteins, and polysaccharides.

Despite the practical and fundamental value of the radiation chemistry of polymers there have not been many definitive, comprehensive books in the field. The two most durable works are *Atomic Radiation and Polymers* by A. Charlesby (Pergamon, 1960) and *Radiation Chemistry of Polymeric Systems* by A. Chapiro (High Polymers, vol. 15; Interscience, 1962). The former emphasizes the effect of radiation on polymers; the latter is more concerned with the polymerization reactions initiated by ionizing radiation. Both are still quite useful, but much of the information is out of date and much is missing. Thus Malcolm Dole's *The Radiation Chemistry of Macromolecules* is welcome. As the title indicates, the emphasis in coverage is similar to that of Charlesby's book. The first volume is devoted mainly to "Fundamental Processes and Theory"; it also contains a large section on polyethylene. The second volume is mainly a collection of short chapters on various classes of polymers plus a longer one on biochemical compounds. Twenty authors contributed the 30 chapters that make up the two volumes.

The strength of the work is the coverage. Almost every aspect of the field is touched upon. With the literature references, the work is complete if not self-contained.

The weaknesses are those usually encountered in a work involving many authors, each with his individual style and his special point of view. For example, Mandelkern's excellent chapter on the radiation chemistry of linear polyethylene emphasizes his support of the "switchboard" model of the polyethylene crystal and his vigorous rejection of the "regular" chain folded model; only the well-informed reader would be aware that most of the recent works on polymer physics favor modified versions of the latter. Mandelkern also provides strong evidence that main chain scission does not occur in the crystalline region of the macromolecule. He may be surprised to learn that on p. 246 his data are used by Saito to fit a model in which the yield of the scission reaction is half that of the crosslinking reaction. Saito's fine chapter on the statistical theories of crosslinking does not seem to have had a big impact on his co-authors. The Inokuti modification of the Saito equation provides the most effective description of the formation for molecules undergoing simultaneous scission and crosslinking. However, Graessley in his chapter on polyvinyl acetate and Geymer in his chapter on polypropylene get G values for crosslinking and scission from data on sol fraction versus dose by means of simple Charlesby-Pinner plots; they mention the work of Saito only in passing. A small disappointment is the failure of the authors to discuss the hydrogen atom problem. The only reference is a line in Dole's chapter on free radicals in irradiated polyethylene to the effect that "there is no evidence that atomic hydrogen is produced . . . and reacts with free radicals." This important and interesting difference between solid and liquid alkanes is worthy of more extended treatment.

These minor criticisms should be taken in the proper perspective. The work is filled with reliable information on the theories, techniques, and principal results which have arisen from the authors' work on the radiation chemistry of polymers. The material is well organized, well presented, and well illustrated. Dole and his colleagues can be assured that their two volumes will serve as a valuable reference work for many years.

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Books Received

The Abortion Controversy. Betty Sarvis and Hyman Rodman. Columbia University Press, New York, 1973. xvi, 222 pp. $8.95.

Actinomycetales. Characteristics and Practical Importance. Proceedings of a symposium, Loughborough, England, July 1972. G. Sykes and F. A. Skinner, Eds. Academic Press, New York, 1973. xvi, 340 pp., illus. $14.75.

Administrative Services and Facilities for Hospitals. A Planning Guide. U.S. Health Services and Mental Health Administration, Rockville, Md., 1973. viii, 104 pp., illus. Paper, $1.50. Health Facilities Series.

Advances in Electronics and Electron Physics. Vol. 32. L. Marton, Ed. Academic Press, New York, 1973. x, 400 pp., illus. $24.

Advances in Linear Free Energy Relationships. N. B. Chapman and J. Shorter, Eds. Plenum, New York, 1972. xiv, 486 pp., illus. $28.

Aesthetics and Psychobiology. D. E. Berlyne. Appleton-Century-Crofts (Meredith),

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