for the somatic segregation of traits. The chromosomal investigations of Sutton, Wilson, Cannon, and particularly Boveri, which soon followed, revealed that Mendel's laws could be "understood in terms of the behavior of the chromosomes during the formation of the germ cells. Hybrid research and cytology were thus united" (p. 290).

This is a standard and convincing thesis. It may, however, be tailored too snugly to the famous triple rediscovery of Mendel. We need to give more flesh to the story, to understand the work of Nägeli, Hertwig, Weismann, and Boveri—to mention only the most obvious—in more depth and in their own rights. We must be wary of historical hindsight, for the studies of Sutton, Wilson, and Boveri did not immediately convert all Mendelians to the chromosome theory. Finally, we might follow the lead of William Provine, who recently (*The Origins of Theoretical Population Genetics*, University of Chicago Press, 1971) has broadened the historical question to include the conflict between discontinuities of sudden variations and the continuity of evolution. The emergence of neo-Darwinism, in fact, may also have played a significant role in forming classical Mendelian genetics.

We are fortunate to have this translation and revision of Stubbe's *History of Genetics*. It will be an important guide for those who wish to understand the origin of modern genetics. The book is nicely produced and contains many fine photographic reproductions.

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Nucleotides

Regulation of Purine Biosynthesis. J. FRANK HENDERSON. American Chemical Society, Washington, D.C., 1972. xvi, 304 pp., illus. $12.95. ACS Monograph 170.

This mongraph draws together for the first time the information widely scattered through the literature on the effects of metabolites and drugs on the rate of formation of inosin monophosphate by synthesis de novo in bacterial and animal cells.

The organization of the book is well thought out. After brief chapters on purines in nature, the pathway of purine synthesis de novo, and the properties of individual enzymes, a long chapter is devoted to the effects of the concentration of substrates such as phosphoribosyl pyrophosphate, glutamine, aspartate, and glycine and of the H_4-folate coenzymes on the process. The treatment is very thorough, with the reactions responsible for the formation of these substrates also receiving careful consideration. This information should be of particular value for the design of drugs that influence purine synthesis by competing with the substrate of one of the intermediary reactions.

Another lengthy chapter brings together the information on the inhibition of purine biosynthesis by its end products. Here, one weakness of the book becomes manifest: its failure to include a consideration of the reactions responsible for the formation of adenosine monophosphate and guanine monophosphate. It is important to keep in mind that the levels of AMP and GMP depend on the generation of these compounds from the IMP which arose by synthesis de novo and from the adenine and guanine provided in the diet or derived from the degradation of AMP and GMP. Without a consideration of these reactions and of their control, a thorough understanding of the regulation of synthesis de novo of purines by feedback inhibition is impossible. I am sorry that, perhaps because of exigencies of space, the book appears to define purine biosynthesis as synthesis of IMP.

A brief chapter on the regulation of enzyme amount and genetic regulation brings together the rather scanty information on these important matters. Another brief chapter deals with branches of the pathway leading to thiamine and to histidine. Here again, failure to consider the control of the interconversion of IMP, AMP, and GMP interferes with the treatment of the subject.

Two interesting chapters, on inhibition and stimulation by drugs and on pathological abnormalities of purine biosynthesis, conclude the book. They provide an excellent account of our present understanding of the basic defects in Lesh-Nyhan syndrome and gout and of the use of drugs affecting purine biosynthesis. In conclusion, the book will be found very useful by investigators dealing with the many biological processes in which purine nucleotides participate.

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Submersion Technology

Man beneath the Sea. A Review of Underwater Ocean Engineering. WALTER PENZIAS and M. W. GOODMAN. Wiley-Interscience, New York, 1973. xvi, 832 pp., illus., + loose tables. $32.50.

This is not a book intended for light reading, even by diving and submarine buffs. This reviewer plowed bravely into many chapters and found a great deal of information readably presented and yet not attracting me to read much deeper. This is mainly a reference book, or perhaps a text. As the authors say, it is "addressed generally to men with technical training who study and work in the ocean—ocean engineers." They produced it because they needed information on transporting man beneath the sea.

Senator Claiborne Pell's foreword describes the book as "an exploration of ocean engineering systems required by man for systematic residence beneath the water." It is primarily a Westinghouse effort, supported by that company's files and with the flavor of that group's opinions about what undersea projects are worthwhile and how they should be carried out.

The book opens with a review of the technical history of diving, full of fascinating fragments from diving history recounted—or merely alluded to—so briefly as to be tantalizing but not satisfying. This is followed by a review of design concepts for diving systems and descriptions of several saturation diving systems.

Chapter 5, by far the longest in the book, deals with manned submersibles, with a page apiece on dozens of varieties including some that did not work very well and numerous Soviet and Japanese versions. A number of instructive types were missed, however, including the fascinating undersea dredge developed by Ocean Science and Engineering, Inc. Communications, navigation, and sonar, subjects on which as much national effort has been spent as on everything else in the book, are decidedly short-suited—no doubt for security or proprietary reasons.

Gas storage and life support systems are well covered in the next two chapters, as are pressure vessels, hatches, and underwater electrical connectors. This is where the book is at its best. It tells you things you'd like to know (if you are going to design a small submersible) and gives references to many of the main papers on individual items. In fact, the reference lists and illustra-

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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