inalization" and less injury to the victims of law enforcement worth the price (to society and to the victims) of more drug-related traffic deaths and injuries? Consumers Union usually does a good job of presenting a cost-versus-benefit analysis when advising consumers on buying automobiles or frozen chicken dinners. When presenting its recommendations for solving the "drug problem" it offers a less satisfactory accounting. Would the costs of providing adequate treatment facilities for the increased numbers of victims of drug use and the social and economic maintenance for them compare favorably with the benefits of moderate drug use which a larger number of people would enjoy under the Consumers Union plan? Would the recommended new laws "legalizing the cultivation, processing and orderly marketing of marijuana" cause as many but different problems as now exist under the current policy? There is much in the book to indicate that Brecher and Consumers Union are aware of the error of thinking that any single measure such as a change in the law will be a panacea for the marijuana problem or any of the other drug problems. They do recommend that the tax proceeds from the marijuana sales be devoted to "drug research, drug education, and other measures specifically designed to minimize the damage done by alcohol, nicotine, marijuana, heroin and other drugs." It is unfortunate that they did not make explicit in the recommendations section the possible hidden costs of their suggested changes, and estimates of likelihood of success.

In judging the value of this book, however, it would be a mistake to focus on the relatively brief set of conclusions and recommendations. The preceding 531 pages provide an informed, dispassionate, and readable account of the history, sociology, and pharmacology of a group of drugs not usually discussed in one volume. It is a book that could be profitably read by everyone, scientist or not, since we all are affected by the drugs discussed. Most of us are or have been users of at least some of them. Brecher is a skillful writer and a good reporter. The paperbound edition to be published in September at $3.95 will be the bargain of the year.

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Stubbe's Kurze Geschichte

History of Genetics. From Prehistoric Times to the Rediscovery of Mendel's Laws. HANS STUBBE. Translated from the second German edition (Jena, 1965) by T. R. W. Waters. M.I.T. Press, Cambridge, Mass., 1973. xii, 356 pp., illus. $14.95.

Since its original publication in 1963 Stubbe's *Kurze Geschichte der Genetik* has been useful to specialists in the history of genetics. It contained a substantial amount of information on studies of mutations, variations, and cytology between 1859 and the "rediscovery" of Mendel in 1900 which was not to be found in H. F. Roberts's older yet still valuable *Plant Hybridization before Mendel* (reprinted by Hafner, 1965), and in its chronological sweep it dovetailed nicely with L. C. Dunn's *A Short History of Genetics* (McGraw-Hill, 1965). Now T. R. W. Waters has made Stubbe's story and wealth of historical material accessible to a wider audience.

The author commits a little over a third of the text to a recounting of pre-19th-century theories of heredity. This proportion is entirely appropriate. These chapters, however, are uneven; they vary in degree of analysis, and they suffer the usual fate of surveys which must cover 2000 years in a few leaps. Stubbe includes an informative account of the work and theories of heredity of Aristotle, the Hippocratics, Maupertuis, Linnaeus, and Kölreuter, but he gives short shrift to St. Augustine, Harvey, Bonnet, and Spallanzani. He makes no effort to relate 16th- and 17th-century ideas about heredity to the Scientific Revolution; he avoids coming to grips with *emboîtement*—that bugbear of many whiggishly inclined historians of biology—and he fails to place the preformation-epigenesis debate of the 18th century within the appropriate context of a mechanical philosophy and a deistic faith. These chapters fall far short not only in detail but in historical sophistication of Jacques Roger's *Les Sciences de la vie dans la pensée française du XVIII^e siècle* (Colin, 1963). This work was, of course, not available to Stubbe for his first edition, but ten years later he still appears to be unaware of the reorientation which Roger has given to the history of 16th- through 18th-century theories of generation.

The remaining two-thirds of the text concentrates appropriately enough on the 19th century; here Stubbe covers a number of subjects in depth and with real understanding. In the lengthiest of these five chapters he examines the plant hybridizers from T. A. Knight to W. O. Focke and skillfully contrasts Mendel's experiments with those of his contemporaries. Here Stubbe is clearly abreast of some of the most recent historical studies on Mendel, those of Weiling, Orel, Gaisinovich, and Olby. Since much of this historical sleuthing is unfamiliar to Anglo-American circles, its inclusion is of real service. Subchapters on Darwin's theory of pangenesis, Galton's views on congenital malformations, and Haeckel's theory of perigenesis give unusual breadth to this chapter.

The chapter ". . . on sudden variations . . ." is perhaps the most interesting of all. Stubbe's own genetic research has focused on gene mutations. In his capacity as professor at the University of Halle and as director of the Institut für Kulturpflanzenforschung der Deutschen Akademie der Wissenschaft he critically examined Lysenkoist claims. His *Genmutation: I, Allgemeiner Teil* (*Handbuch der Vererbungswissenschaft*, vol. 2; Borntraeger, 1938) put him in the position to review 19th-century knowledge of sport variations; much of this research is carried over into his *History of Genetics*. For 25 pages, in fact, Stubbe parades forth observations on mutations and sudden variations in man, animals, and plants made from Darwin's time to the turn of the century. At this point the author forgets to keep his historical story in view, but by the end of the recitation an attentive reader will be convinced that de Vries's mutation theory provided an alluring and wholly plausible explanation for genetic change and the evolution of species.

In a parallel chapter Stubbe then traces developments in cytology concurrent with the above-mentioned observations on mutations. This chapter has been expanded since the first edition, but the outline and message remain the same: that the microscopical revelations about cell multiplication and nuclear division of the 1870's, '80's, and '90's prepared biologists for the rediscovery of Mendel's work and the establishment of classical genetics. In the final two chapters Stubbe examines the segregation principle suggested in a limited context by Haacke, von Guaita, and others and given generality and a statistical foundation by de Vries, Correns, and Tschermak. These three co-discoverers of Mendel's work, as did Mendel earlier, envisioned a segregation of germinal material to account

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-