Book Reviews

Industry and Technical Progress. Factors governing the speed of application of science. C. F. Carter and B. R. Williams. Oxford University Press, London, 1957 (order from Oxford University Press, New York). viii + 244 pp. $4.

One of the most difficult of man's tasks is keeping a perspective on the "present" —remembering how much the present depends on the past and how little the future will resemble the present. C. F. Carter and B. R. Williams have tried to develop some of this perspective with regard to the role of science and scientific personnel in British industry.

In this task, the authors seem to have steered a wise course. Rather than supply answers, they have tried to present the major problems of effective utilization of science and scientific personnel, in the circumstances and current traditions of British industry, in the context of that industry's present economic, social, and political environment. In presenting these problems in this frame of reference, they also expose the fallacies of many simple panaceas which are proposed from time to time.

As in most problems of this size, it turns out that an evolution, rather than answers, seems to be required for substantial improvements—an evolution involving large segments of a country's human resources: management, scientists, teachers, government employees, and so on. Members of each of these segments must learn more about the problems and about the roles they can play in the segments. *Industry and Technical Progress* can serve this required orientation function quite well.

I find one major disquieting over-all note in the book. It seems tacitly to assume that the way to technical progress will be through profit motives of industry. This assumption seems closely akin to the largely discredited "theories of the firm," based solely on economic concepts, for describing the activities of companies. It appears, more and more, that economic concepts alone are not adequate in considering industrial companies and that consideration of elements of political and social behavior is also required. And, with regard to technical progress, man's simple but God-given scientific curiosity would seem much too important a factor to be overlooked. I would put it to the authors that the driving force behind individuals in large company research organizations is still simple curiosity—and that technical innovations result to a much greater extent out of this curiosity than out of commercial pressures.

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Principles of Engineering Geology and Geotechnics. Geology, soil, and rock mechanics, and other earth sciences used in civil engineering. Dimitri P. Krynine and William R. Judd. McGraw-Hill, New York, 1957. xiii + 730 pp. Illus. $10.

The appearance of an engineering text with the word *geotechnics* in its title is a healthy sign of the steady development of earth studies by engineers. Much as professional engineers dislike the word *technology* (and its derivatives) when applied to their work, they have generally welcomed the use of *geotechnics*, in view of its obvious advantages. It has a direct French equivalent (*"Geotechnique"* having already been adopted as the name of an international journal in this field); it has a useful parallel in the word *geophysics*; and it is succinctly descriptive of the study of the engineering uses to which the materials that constitute the earth's crust are put. It is this field that is treated in the volume under review.

The volume is a veritable storehouse of information, indicative of the senior author's lifetime of experience and of the use by the junior author of some of the accumulated corporate experience of the U.S. Bureau of Reclamation, where he serves as engineering geologist on the staff of the chief engineer. The book is well illustrated and well indexed, being up to the usual high standard of McGraw-Hill volumes from the standpoint of production.

Readers of *Science* will want to know the audience for whom this volume is intended. A detailed study of its contents, made in an attempt to determine this, leads to somewhat puzzling results. The book is far too large and diffuse to serve as a college textbook. As the authors themselves state, "case histories have been used only for the elucidation of principles," and this is therefore not a collection of case histories of the type that can be so valuable an aid to the practicing, as also to the embryo, engineer. And as a reference book it has the unfortunate feature of merely directing the reader to another reference on all too many important topics.

So much work has clearly gone into the preparation of the book that one regrets being unable to give it unqualified praise. With the mounting volume of technical literature, however, such a collection of undigested material—useful though the lists of individual references are—is not as helpful as it might be. The arrangement of the book is a fair indication of the additional attention in assembling and pruning of contents that it so clearly needs. Seven of the 19 chapters, for example, deal successively with "Subsurface Exploration," "Maps and Airphotos," "Rock as a Construction Material," "Tunnels," "Frost and Permafrost," "Shore-line Engineering and River Improvement," and "Elements of Sedimentation Engineering [sic]." If there is order or logic in this arrangement, it has escaped my attention.

As a useful guide to current American literature in the field of geotechnics, the book can be highly commended. At the same time, it can serve as a telling example of the fact that, in order to be fully effective, a good book requires something more than the collection between two covers of a vast quantity of factual information, useful and interesting though this may be.

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Medical Radiation Biology. Friedrich Ellinger. Thomas, Springfield, Ill.; Blackwell, London; Ryerson, Toronto, 1957. xxxiv + 945 pp. Illus. $20.

Medical radiation biology is defined by the author as comprising clinical radiation biology and experimental radiation therapy. However, this book can in no sense be described as a text on radiation therapy. It is rather a book in which the author intends to compile "the rationale on which the role of radiation as a health hazard and as a therapeutic agent is based."

The book, with some 4600 references

occupying one-fourth of the 950 pages, is divided into four parts: (i) fundamental radiation biology; (ii) biology of ionizing radiations; (iii) biology of ultraviolet radiation; and (iv) photobiology. There are numerous textual references to the bibliography, but the usefulness of the volume as a reference work is limited by the absence of an index.

A comprehensive review of the gross and microscopic effects of radiation on each organ system is presented. This extensive pathophysiologic discussion is amply documented by carefully selected references to articles published in the English, French, and German languages.

For one author to attempt a review and critical summary of the extensive fields outlined above is indeed an ambitious project. Certainly the treatment of specialized subjects will not satisfy the expert in the field. The book's usefulness must therefore lie in its attempt to serve as an introduction to radiobiology and as a link between fields in radiobiology.

Surgeons and internists, not to mention radiotherapists, will pause at the sentence, "for the general public radiation therapy and treatment of cancer are almost synonymous." In the discussion of the radioactive iodine (I^{131}) therapy for hyperthyroidism, there are several errors, not the least of which are two errors in the formula to be used for calculation of the number of millicuries of radioactive iodine required to deliver a certain radiation dose to the thyroid.

In summary, this volume by a mature and forthright clinician and investigator may be useful to the experienced radiologist who wishes a survey, simply presented, of the field of radiobiology. It is not recommended for those uninitiated in the fundamentals of radiation physics or radiobiology, or both.

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Parthenogenesis and Polyploidy in Mammalian Development. Cambridge Monographs in Experimental Biology No. 7. R. A. Beatty. Cambridge University Press, New York, 1957. xi + 132 pp. Illus. $3.

R. A. Beatty of the department of animal genetics of the University of Edinburgh has given us a very complete and critical account of parthenogenesis and heteroploidy in mammals. He is uniquely qualified for this task, for several reasons: together with M. Fischberg, now at Oxford, he has made a thorough investigation of spontaneous and induced heteroploidy in eggs and embryos of mice; in 1954 he published [*Intern. Rev. Cytol.* **3** (1954)] a lucid review under the title "How many chromosomes in mammalian somatic cells?", which summed up our knowledge of the real and, in some cases, spurious inconstancy of somatic chromosome numbers; last, but not least, he is probably the only mammalian cytologist who has had the enterprise to count his own chromosomes, in dividing cells of a hair follicle (I believe he found 48—or was it 46?).

The author places the primary emphasis on the "cytological variables" which furnish the known or surmised mechanisms of origin of the various observed or theoretically expected chromosome numbers. The principal variables are the suppression of the first or second meiotic division in the egg, or of the first cleavage mitosis, either with or without fertilization of the egg (amphimictic versus apomictic routes). In consideration of the various possible combinations of these variables, the material is classified in chapters 3, 4, and 5 under the headings "The eight apomictic routes in the major group," "The eight amphimictic routes in the major group," and "A minor group of routes of development." This treatment is logical but tends to make the organization of the material unnecessarily complicated, since the actual route which gave rise to some abnormal chromosome numbers is often not known with certainty. It might have been preferable to classify the various cases first according to chromosome number and then to subdivide these primary categories into secondary classes on the basis of the known or probable mode of origin.

A few omissions or inaccuracies should be mentioned. The paper by Ursula Jahn (1952) on colchicine-induced tetraploidy in *Rana esculenta* (which appears to be connected with gigantism, in contrast to all other observations on polyploid amphibia) is not mentioned; the study by A. A. Humphries (1956) on the occurrence of abnormal meiotic divisions in untreated coelomic or oviducal eggs of *Triturus viridescens*, which demonstrates the probable origins of spontaneous polyploids in this species, probably appeared too late to be considered. The term "poikiloploidy" mentioned on page 6 was first used by Levy (1920) to designate the occurrence of different abnormal chromosome numbers within the same embryo. The statement (page 9) that, "in amphibians, an *inverse* proportion exists between cell or nuclear volume and the number of chromosome sets" is obviously wrong, as is the assertion that the number of heterochromatic spots, important in determining the number of chromosome sets in tissues of some insects, has been used for the same purpose in amphibians by Fankhauser and Humphrey (1943); we used the number of nucleoli exclusively.

In chapter 6 Beatty discusses some general aspects of parthenogenesis and polyploidy in mammals. These include (i) the debated role of polyploidy in mammalian evolution; (ii) the question of whether polyploid mammalian fetuses are viable (so far no polyploid mouse embryos have ever been found after midterm); (iii) the question of whether spontaneously parthenogenetic mammals ever come to term and could be identified (which the author thinks highly improbable); (iv) some specific genetic aspects of parthenogenesis and polyploidy, such as gene dosage; (v) sex determination and fertility in polyploids; and (vi) their size and growth rate.

Beatty's book will be an important guide for all those who are interested in developmental genetics and the cytology of mammals and will stimulate many new experiments in this fascinating and relatively new field.

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The Fascination of Numbers. W. J. Reichmann. Essential Books, Fair Lawn, N.J., 1957. 176 pp. $4.

The theory of numbers is a many-sided mathematical theory, but first and foremost it is concerned with the properties of the integers 1, 2, 3, 4. . . . It is a fascinating theory; it has some problems which are so easy to formulate that an intelligent youngster in the eighth grade can fully understand them but so difficult to solve that the united effort of the greatest mathematicians of the last three centuries was unable to master them. The integers may have a singular attraction for an exceptionally gifted youngster and open his mind to science. Therefore, it is to be deplored that divisibility, prime numbers, and similar topics are almost completely neglected by our high schools (they are taught in the corresponding European schools). Under these circumstances a good popular book dealing with these topics would be highly welcome.

The present book deals with such topics, but, unfortunately, in my opinion, it does not fulfill the great promise of the subject matter. The sequence in which the topics are treated seems almost random. The difference between inductive evidence and strict proof is nowhere emphasized; both are often omitted without warning, but the worst of it is that neither is really neatly presented. Little previous knowledge is asked from the reader, and that is right; but there are a few pages, some right in the middle of the book, where the reader is sud-