quite informative. Although there is excessive repetition, specifically regarding the effects of radiation on the hematopoietic system, some of it is advantageous and unavoidable when different authors are discussing closely related topics. However, chapter 10 (on acute radiation effects) seems superfluous because the topic is very well discussed in chapter 11 (on total body irradiation injury). The latter is an excellent chapter in which Mathé reviews his experience not only with radiation injury but with transplantation of bone marrow, including the associated problem of the secondary syndrome in man.

The editor's expressed goal is to describe the present state of knowledge of the field of nuclear hematology for experimental and clinical workers in various disciplines. This is accomplished in part with the material concerning radiation effects in man and animals. However, owing to the variable quality of the first nine chapters, the book does not attain the editor's goal and will not serve as an adequate source of information for those interested in clinical or investigative use of radioisotopes in hematology.

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Memoirs of an Early Scientific Industrialist

Inventor and Entrepreneur, Recollections of Werner von Siemens (Lund Humphries, London, 1966. 314 pp. Illus. 54s.) first appeared in 1892, the year of the author's death, and in the year following in an English translation. In 1956 it was reprinted in a German edition that was greatly enhanced in beauty and scholarly utility through illustrations and annotations, and now this new version has appeared in English. Siemens was born into an unusually talented family, at a time when Germany stood on the threshold of political unification, industrial expansion, and scientific supremacy. His memoirs reflect vividly the mentality and circumstances which made Germany a major power and which harnessed science to industry throughout the Western world.

As a young man he hitched his wagon to the Prussian state, entering its army to obtain schooling as an engineer. Though he later resigned his commission to enter business, he continued reverently to serve the state in many capacities, including that of delegate to the Prussian Diet. Late in life, after German unification, he induced the authorities, through the gift of a valuable Berlin property, to establish Germany's first government-supported institute for fundamental research, the Physico-Technical Imperial Institute. Through this gift he expressed his intense devotion to both the Fatherland and pure science.

Siemens always fancied himself a scientist, and indeed took active part in scientific societies, but his greatest achievements lay in engineering. Unlike his contemporary, Edison, Siemens was a genuine electrical and mechanical engineer whose numerous inventions were rooted in a thorough familiarity with mathematics and contemporary physical and chemical theory. The foundation and backbone of his industrial empire was the telegraph, to the perfection of which he was initially assigned by the army. In short order he rendered Wheatstone's dial telegraph practical and subsequently left the army to manufacture this improved device in partnership with Johann Halske, a Berlin instrument-maker. After a second invention, the reliable insulation of wire with gutta-percha, the Siemens-Halske firm became specialists in underground and underwater line-laying. Rapid expansion ensued, thanks in good measure to the remarkable inventive and business skills of several of Siemens' seven younger brothers. Carl von Siemens superintended the construction and later the maintenance of a far-flung telegraph network in Russia. William von Siemens' subsidiary company in London laid over 19,000 kilometers of undersea cables, including four Atlantic crossings in 25 years. And in a joint venture in 1870, the brothers built the Indo-European telegraph linking London and Calcutta.

Meanwhile, in London, William and Friedrich von Siemens were simultaneously building another industrial complex around the regenerative furnace which they perfected, while Werner von Siemens in Berlin continued to spawn successful inventions (some nonelectrical), best known of which is the dynamo in which weak natural magnets were replaced with powerful electromagnets. Large-scale generation of electrical power thus became possible, and the Siemens-Halske Company promptly diversified into all phases of electrical manufacture.

Of all Werner von Siemens' roles—family patriarch, industrialist, patriot, scientist, and engineer—the last is the most unique and historically significant. He certainly belongs in the front rank of those who made the long-delayed promise of the utility of science (first made by Roger Bacon in the Middle Ages) a demonstrated fact by helping prominently to bring into existence an industry never even conceived of in earlier generations. This new industry, born of and nourished by science, called for a new breed of men capable of thinking like professors, fashioning like mechanics, and managing like businessmen.

As with so many recollections written in declining years, those of Werner von Siemens contain serious shortcomings: repetition, imbalance of periods and topics covered, strident assertions of priority, glossing over of failures and conflicts, insufficient technical explanation and documentation, wisdom after the event, and moralizing. Some of these faults are partially overcome by extensive annotation in this latest edition of the recollections, but the appearance of this book only reemphasizes a long-felt need for a full-blown biography of this remarkable man.

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Salmon Migration

Underwater Guideposts: Homing of Salmon (University of Wisconsin Press, Madison, 1966. 167 pp. Illus. $6), by Arthur D. Hasler, is a nicely written summary of recent work on the hypotheses and experiments attempting to account for the homing migration of fishes, particularly salmon. In this book Hasler relates the basis for his own theories concerning the use of odor for locating parent streams during the freshwater phases of salmon migration. These ideas, for which he has received wide recognition, are detailed and an account is given of recent activities at the Limnological Laboratory of the University of Wisconsin, which attempt to explain the mecha-

nism of the open water and marine phases of homing. The book is written in a style that the general public will find exciting and understandable, but the volume also provides sufficient data to serve colleagues working in other scientific disciplines as a general review of the problem. Investigators working in the field of fish migration will refer to the volume, not only because it is a succinct summary of Hasler's theories, but also for the account of the historical development of the reasoning behind his experiments. Particularly intriguing is chapter 8, on sun compass orientation, which presents results of some very interesting experiments during which fish trained in orientation were transferred from Wisconsin to South America.

The book is organized for the general reader, almost half of it being devoted to the stream phase of salmon homing—for example, a discussion of the laboratory experiments and field tests of the various hypotheses. A shorter section discusses the open water and oceanic phases of salmon migration, phases that Hasler's group has only recently begun studying. Some of this portion of the book is based on the work of other West Coast investigators. The book closes with a summary of other or alternative types of mechanisms that could account for fish homing and, finally, a statement of Hasler's complete hypothesis. Although almost all of the scientific terms are defined, a notable exception is the term and concept of *imprinting*. The chapter on sun orientation is the most technical but, even here, Hasler has done a remarkable job of simplifying a complex phenomenon. In essence, the volume is a summary of the evidence for Hasler's hypothesis of salmon migration. The weight of the evidence, as might be expected, varies with the state of the knowledge of the various phases of the homing process. Hasler recognizes these limitations and suggests many lines for profitable investigation. The volume is well illustrated with line drawings and photographs, and it is remarkably free from errors. A bibliography of some 119 references and a three-page index terminate the volume.

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Russian Monograph in Translation

Organic Chemistry (Gordon and Breach, New York; Noordhoff, Groningen, 1965. 568 pp., $16), by B. Pavlov and A. Terentyev, is a 1965 issue in translation, but the book itself is much older. The translation is presumably based on a revised and enlarged edition of the original Pavlov text, which was prepared by Terentyev and first printed in 1958, with a second edition in 1960. The volume reviewed here was translated from the Russian by Boris Belitzky.

Even with allowance for these dates, however, Western readers who compare this volume with modern organic textbooks will find that it seems quite old-fashioned. The general choice of topics seems sound and the coverage of the field reasonably extensive, but the approach is one that we would class "traditional," with the emphasis placed on the study of organic compounds on the basis of the nature of functional groups.

The change in organic chemistry, beginning about 1930 with the growing influence of concepts of chemical kinetics and molecular structure, to the systematic consideration of the types of transformations organic chemicals undergo and thus to the field of reaction mechanisms, finds little reflection here. The introductory material emphasizes theories of structure, but says nothing of reaction rates or mechanisms. The "lariat" system of notation to show the groups apparently involved in reaction is frequently used. The existence of free radicals is mentioned, but their role in such reactions as polymerization is not discussed. The only reference to Diels-Alder reactions is a brief mention of diene synthesis. The transition-state is not discussed.

The approach to structure has the same flavor of times past. The text notes that optical and electrical properties may give information on strengths of bonds, distances between atoms, and the like, but the author notes that one can only "touch upon" these topics. Thus, there is brief mention of dipole moments, molecular refraction, and the rotation of polarized light, but no discussion, for example, of infrared spectra.

The concepts of σ and π bonds are discussed briefly, but there is little about modern molecular orbital theory in the considerations of structure. In opening the section on aromatic compounds, for example, the formula chosen to illustrate the benzene nucleus or benzene ring is the Kekule structure. The oscillatory hypothesis is mentioned, along with conjugated systems, but the concept of delocalized electrons is not discussed.

Many topics that seem familiar today—ferrocene, carbonium irons, and hydroboration, for example—are not included, but for such specific topics it is hard to evaluate the influence of the time element.

As a book from Russia, there are points of interest—the presentation of the Butlerov theory of structure, for example. But even in this aspect many possibly interesting comparisons are lost because we lack information on the background and purpose of the original Russian editions.

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New Books

Economics and the Social Sciences

The Arctic Frontier. R. St. J. Macdonald, Ed. Univ. of Toronto Press, Toronto, Canada, 1966. 321 pp. Illus. $7.50. Eleven papers: "The Arctic setting" by Moira Dunbar; "Resources and communication in the Arctic" by Michael Marsden; "The administration of northern peoples: The USSR" by Terence Armstrong; "The administration of northern peoples: Canada and Alaska" by Margaret Lantis; "The administration of northern peoples: America's Eskimos—pawns of history" by Diamond Jenness; "Administrative and constitutional changes in Arctic territories: Canada" by F. B. Fingland; "Administrative and constitutional changes in Arctic territories: The USSR" by Neil C. Field; "Sovereignty in the north: The Canadian aspect of an international problem" by Gordon W. Smith; "The strategic significance of the Canadian Arctic" by R. J. Sutherland; "International scientific relations in the Arctic" by G. W. Rowley; and "The international implications of Arctic exploitation" by George W. Rogers.

Abstraction and Concept Formation. An interpretative investigation into a group of psychological frames of reference. Anatol Pikas. Harvard Univ. Press, Cambridge, Mass., 1966. 319 pp. $7.

Brief Separations. Christoph M. Heinicke and Ilse J. Westheimer. International Universities Press, New York, 1965. 367 pp. Illus. $8.50. This is a report of the work of the Child Development Research Unit of the Tavistock In-

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