molecular geometry and stereochemistry.

The book should be useful to structural, physical, and organic chemists as a general reference. Classification by subject of the entries in the bibliography would have facilitated its use for this purpose. Workers in the biological sciences will find little information directly applicable to their fields, even though the title might imply otherwise.

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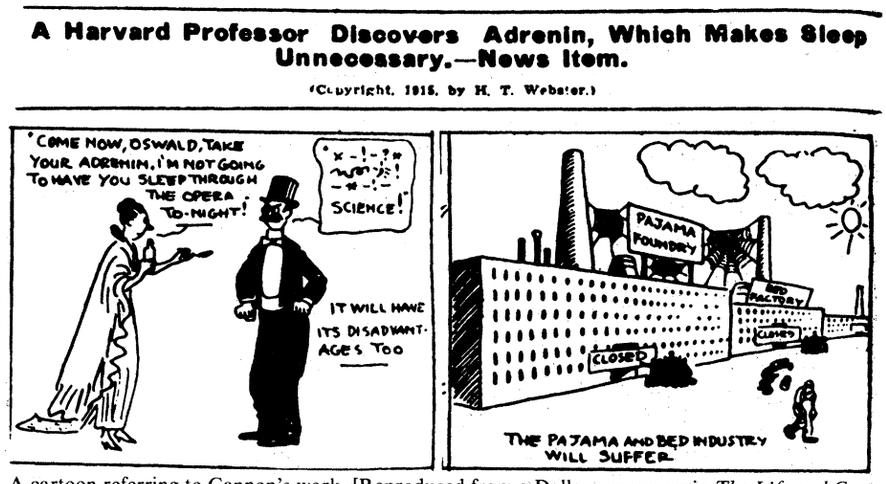
Centennial in Physiology

The Life and Contributions of Walter Bradford Cannon, 1871-1945. His influence on the Development of Physiology in the Twentieth Century. Papers from a symposium, Brooklyn, N.Y., May 1972. CHANDLER MCC. BROOKS, KIYOMI KOIZUMI, and JAMES O. PINKSTON, Eds. State University of New York Downstate Medical Center, Brooklyn, 1975 (distributor, State University of New York Press, Albany). xxii, 264 pp., illus. $20.

This volume is the proceedings of a symposium held at the centennial of the birth of Walter B. Cannon, summarizing his influence on the development of physiology in the 20th century. Three types of material are presented: summaries of important discoveries made by Cannon, reviews of current knowledge of some topics the study of which he initiated, and reminiscences and evaluation of him as a person. A list of Cannon's publications from 1897 to 1945 is appended.

A striking characteristic of Cannon's career was his logical transition from one research topic to another. He pioneered in the development of diagnostic roentgenography (radiation he received on his hands ultimately caused his death). He used x-rays to solve questions of esophageal and gastrointestinal motility, and for this he compared many species. He then spent years on the autonomic nervous system and demonstrated humoral transmission at sympathetic endings; his postulate of two types of "sympathin" was later modified but was empirically correct. During World War I he devoted himself to studies of shock. His next logical step was to study the central nervous basis for emotions, and in doing so he opened a large and continuing area of research. Related to this was analysis of thirst and hunger. Cannon was persistently holistic in his approach, and this culminated in enunciation of the principles of homeostasis, a concept that now



A cartoon referring to Cannon's work. [Reproduced from a Dallas newspaper in *The Life and Contributions of Walter Bradford Cannon, 1871–1945*]

permeates much of biological theory. He emphasized the role of sympathetic nerves and the adrenal medulla in responses to stress well before the role of steroids was suggested. His wide-ranging curiosity, industry, and research drive are clearly illustrated in numerous chapters in this book. He was a master at taking advantage of an unexpected turn of an experiment—serendipity. It is suggested that the reason he did not win the Nobel Prize may have been the diversity of his contributions.

The accounts of Cannon's contributions to roentgenology, to gastroenterology, and to the study of chemical transmission by sympathetic nerves are valuable contributions to the history of physiology. Some of the accounts of the present status of research, for example, on autonomic function, central representation of emotions, and the stress syndrome, diverge from the central theme of the book and seem somewhat forced. Even the final summary on "heroes in this age" is more Gerard than Cannon.

For many physiologists who, like myself, spent time in Cannon's department, the most interesting parts of the book are the accounts of Cannon as a man, as a leader of American science, as an international figure in physiology and medicine, and as a mentor. Chapters by Hallowell Davis, Bradford Cannon, and the editors reveal Walter Cannon's liberal character, his willingness to battle for good causes (exemplified by his continued opposition to the antivivisectionists), his leadership qualities. I experienced nostalgia in reading accounts of research done in the '20's and '30's and wished for more insight into how Cannon managed to maintain such quality in his staff. He insisted that medical students have a rigorous background in basic science before entering the clinics. His dogged emphasis on the international unity of science is well illustrated by his friendship with Pavlov, by his support of Spanish physiologists during the revolution, by his willingness to speak bluntly of matters of principle at international congresses. One must agree with Gerard in doubting that the next generation of physiologists will have such heroes as Walter Cannon.

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Radiation Chemistry

EPR of Free Radicals in Radiation Chemistry. S. YA. PSHEZHETSKII, A. G. KOTOV, V. K. MILINCHUK, V. A. ROGINSKII, and V. I. TUPIKOV. Translated from the Russian edition (Moscow, 1972) by P. Shelnitz. T. Pick, Transl. Ed. Halsted (Wiley), New York, and Israel Program for Scientific Translations, Jerusalem, 1974. viii, 446 pp., illus. $45.75.

Both neutral and charged free radicals are pervasive and important intermediates in the action of ionizing radiation on matter. Electron paramagnetic resonance (EPR) is generally the technique of choice for detecting, identifying, and monitoring them. Reactive free radicals can be most conveniently studied after stabilization in solid matrices. The spectra of radicals stabilized in single crystals can often be analyzed in considerable detail to obtain both isotropic and anisotropic hyperfine constants, to deduce the radical structure, and to identify radical-matrix interactions. In polycrystalline, amorphous, or glassy solids, however, the anisotropic information is partially or wholly lost and only gross isotropic features of the spectra are readily discernible. Nevertheless, analysis of spectra in such disordered media is of great value because single-crystal systems can-

not always be studied and some fundamental intermediates, such as trapped excess electrons, are most readily trapped in glassy solids.

This book deals comprehensively with free radicals formed by ionizing radiation, principally in disordered organic solids. It is thus a useful catalog of data in a wide variety of organic systems. The book covers references only through July 1971, but it still is quite useful because the EPR spectra produced in various organic solid systems are often still incompletely interpreted. The bulk of the book is composed of chapters on small atomic and polyatomic radicals, alkane, alkene, alkyne, and aromatic hydrocarbons, a variety of monofunctional organics, and a few binary mixtures, with a good survey of polymeric radicals produced by ionizing radiation. In addition, one chapter summarizes the basic principles of EPR, and specific radical-formation mechanisms involving ionizing radiation and radical decay mechanisms and kinetic characteristics are discussed in separate chapters.

One of the distinctive features of radical formation by ionizing radiation is spatial nonuniformity. This feature largely reflects the inhomogeneous nature of radiolytic energy deposition, but it also depends upon specific chemical reactions involving radiolytic intermediates. It has been studied by measuring local concentrations of radicals in the vicinity of a radical site and comparing these with sample average concentrations. Local concentrations have been determined by dipolar broadening in a few cases and more generally by absolute or relative measurements of spin-spin relaxation times. It is commendable that this important aspect of the subject is treated in this book but unfortunate that the various experimental methods for determining local concentration, which are probably unfamiliar to the average reader, are not discussed in detail or compared and evaluated. The tabulation of data on local concentration measurements seems incomplete, and the Russian work of Tsvetkov and co-workers utilizing the electron spin echo method to study inhomogeneous spatial distributions is largely neglected.

The treatment of radical decay phenomenology is rather comprehensive, although no generalized theoretical understanding of the decay of radicals produced in disordered solids by ionizing radiation has yet been reached. Useful tables give the temperatures at which radical decay appears to be most rapid in a variety of organic matrices together with some information on matrix transition temperatures for various types of internal motion. In nonpolymeric systems there is generally one temperature region in which most of the radicals decay rather rapidly, whereas in polymeric systems there may often be several such regions. Much of the work on these regions has been done in Russia, and the literature coverage seems quite good. A related question concerns the kinetics of the radical decay. In only a few cases are the kinetics simple first or second order. Usually as the temperature is raised a stepwise decay occurs that can be interpreted as a superposition of a number of independent first-order decay processes.

Overall, this book is a useful compendium of data and references, and the coverage of the Russian literature is comprehensive. There is a useful index of formulas both of compounds that have been irradiated and of radicals that have been produced. This is a book to which researchers in the field should have access.

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Mendelian Genetics of Plants

Genetics of Flowering Plants. VERNE GRANT. Columbia University Press, New York, 1975. xiv, 514 pp., illus. $20.

The second half of the 20th century opened with the discovery that nucleic acids, rather than proteins, are the genetic substance. Soon thereafter, the physical structure of DNA was determined and the field of molecular genetics was born. During the next 15 years molecular geneticists worked out the basic mechanisms of gene action and gene control, discoveries that stand among the most important in biology. One of the keys to their success was the choice of the simple bacteria and viruses as experimental organisms. This had the unfortunate consequence, however, that genetic research, especially the nonmolecular aspects, on the more complex eukaryotic diploid organisms, both plants and animals, was somewhat neglected. Higher organisms present problems of genic and chromosomal organization and of development that cannot be solved solely with insights derived from viruses and bacteria. Furthermore, evolutionists, population geneticists, and population biologists are interested not so much in gene action as in the inheritance of phenotypic characters.

Higher plants are the best experimental material for the investigation of certain genetic phenomena, such as cytoplasmic inheritance or chromosome structure and behavior, and they present unique problems of their own, such as self-incompatibility in hermaphrodite species and polyploidy. The genetics of flowering plants has not been covered comprehensively since Sansome and Philp's *Recent Advances in Plant Genetics* was published in 1939. It also has been slowly crowded out of general genetics textbooks. Whereas, for example, in Sturtevant and Beadle's text of 1937 a third of the space was devoted to the genetics of plants, recent textbooks devote less than a tenth to plants, and that mostly to corn and *Neurospora*. Consequently, the arrival of a work devoted entirely to the genetics of plants will be welcomed by a great variety of plant scientists.

Verne Grant has done a fine job in updating the knowledge of the genetics of flowering plants. The approach of the book is didactic. It starts with a discussion of genes and genetic phenomena related to single genes and works up to functional gene systems, then to chromosomes, and finally to the function of the entire genetic system. Each chapter consists of a description of the phenomena under discussion, the experimental evidence, and a brief theoretical interpretation. A big effort is made to link simple factors with more complex phenomena. Although the book is not intended to be a review of the literature, the most important genetic papers are discussed in detail. Old and new experiments, from Mendel's classic pea experiments on, are blended adroitly, so that the reader acquires a fine sense of the historical development of the field, its ideas, and its personalities as well as a clear impression of its present state and its major problems.

This is not a textbook, and it will be incomprehensible for a total neophyte. However, it does not assume genetic expertise. It will be particularly useful to biologists working in evolution and ecology who want to become acquainted or reacquainted with some or all aspects of plant genetics.

The emphasis of the book is entirely on Mendelian genetics. This is probably the weakest point of the book. For a generation of biologists brought up in the belief that genetics is the most unifying biological subdiscipline, Grant's stated belief that classical—or neoclassical—genetics and molecular genetics are two entirely different fields of endeavor within biology will sound surprising.

Cost considerations in these days of inflation played no doubt the dominant role in the selection of typography and paper. It is nevertheless to be mourned that the publishers could not have come up with a better-made tome.

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