

however, been omitted from this edition without explanation, and many (though not all) of the earlier footnotes have been left unchanged from the previous format, to confuse the unwary reader. The new plates are photographic reproductions of the originals, but the "increase in faithfulness of reproduction" over the relithographed plates of the 1870-75 edition is offset by a reduction in legibility. A brief preface primarily repeats material from omitted prefaces of the earlier edition, and an index, badly needed in that earlier edition, has been added, but is too perfunctory to aid in a conceptual analysis of Rumford's work.

Given the difficulty of obtaining a copy of the 1870-75 edition, it is almost invidious to complain of this solution to the problem. Nonetheless, one cannot help mourning what appears to be a lost opportunity. What were, as measured against modern standards for the history of science, defects in the earlier version are not corrected in this reprinting. Previous inconsistencies in the chronological grouping of papers are not improved by the substitution of a consistent topical arrangement which separates chronologically congruent papers on such related topics as light, chemistry, and heat. Many of the papers of the earlier edition were, in effect, entirely new versions artificially created by putting together from Rumford's English, French, or German renderings of his papers those portions thought by the previous editors to be the most mature statements of his position. Even with a complete bibliographical description of sources, republication of such papers does not reliably represent Rumford's work.

What was needed was in fact a completely new edition of all of Rumford's work, edited in compliance with the latest scholarly standards. The editor of this reprinted edition, Sanborn Brown, is noted for his recent studies of the life and work of Rumford. To join this man and this occasion only to reproduce the results of outmoded scholarship is a waste of resources which, moreover, will likely have a long-term effect in forestalling the appearance of any competing edition. Must it now be nearly another century before the substantial and scholarly edition worthy of Rumford can be published?

ROBERT E. SCHOFIELD
*Program in History of Science and
Technology, Case Western Reserve
University, Cleveland, Ohio*

Xenobiotics

The Biochemistry of Foreign Compounds. DENNIS V. PARKE. Pergamon, New York, 1968. x + 274 pp., illus. \$10. International Series of Monographs in Pure and Applied Biology: Biochemistry Division, vol. 5.

This book is in part an updating of R. T. Williams' classic monograph *Detoxication Mechanisms*, which was published in 1959. The latter dealt almost solely with the chemical fate of xenobiotics following their administration to animals. Accordingly, a significant amount of space in Parke's book is allotted to a qualitative and quantitative treatment of the biological fate of drugs, pesticides, food additives, and industrial chemicals. It is not, however, nor was it intended to be, as encyclopedic in this regard as *Detoxication Mechanisms*.

The book offers a somewhat novel and refreshing approach to the problem of biological fate in that it does not limit itself to the chemical forms and relative amounts in which foreign compounds are excreted from the animal body, but attempts to describe the total biological handling of foreign compounds from their entrance into to their departure from animal organisms. Thus, general principles of absorption, penetration across various biomembranes, tissue distribution and localization, and routes of excretion are briefly outlined. The central role of hepatic microsomal enzymes in the chemical alteration of foreign compounds and the physiological factors known to affect their activity each receive a chapter's attention.

The major deficiency of this book is that Parke's desire to be concise exposes him to the dangers of superficiality. For example, the effect of protein binding on the renal clearance of foreign compounds receives only four lines in the text, and, considering the information currently available, the cytological origins and chemical composition of hepatic microsomes and the role of microsomal electron transport and cytochrome P-450 in the mechanism of drug metabolism receive rather scanty attention.

However, for the novice in the field, Parke's book should serve as a useful compendium of information about several related but, for some reason, systematically segregated areas which have heretofore been covered only in scattered review articles.

Investigators working actively in the field might also find the work useful

as a brief review. The latter group, however, should probably be apprised of another recently published work, *Principles of Drug Action*, by A. Goldstein, L. Aronow, and S. M. Kaplan (Harper and Row, New York, 1968, \$18.50). This book, which covers many of the same areas as Parke's, although with a slightly different orientation, is more inclusive, more detailed, and more sophisticated in its analyses and discussions.

THEODORE E. GRAM
*Laboratory of Chemical Pharmacology,
National Heart Institute,
Bethesda, Maryland*

Excited Gas

Active Nitrogen. A. NELSON WRIGHT and CARL A. WINKLER. Academic Press, New York, 1968. xii + 602 pp., illus. \$27.50. Physical Chemistry Series.

It may seem that such an apparently simple and circumscribed topic as the phenomena that occur in pure gaseous nitrogen subsequent to its excitation by an electrical discharge could hardly fill a book of 602 pages; even if the subject of active nitrogen could be clarified by such an exposition, does this specific topic deserve an elaborate clarification? The unfortunate but just answer is—it depends.

An extensive discussion of active nitrogen is justified if this phenomenon is presented as a specific example of the general phenomena of chemiluminescence, chemionization, energy transfer in collisions as well as energy migration within molecules, and the role of internal energy of reactants in a chemical reaction and the relationship of the internal states of products of chemical reactions to the internal states of the reactants.

The book *Active Nitrogen* by Wright and Winkler constitutes the necessary working papers for the preparation of the book envisioned in the previous paragraph. It is a very large and necessary amassing and cataloguing of previous results which will be of great value to researchers. However, the book is noncritical (and consequently nonselective) and seldom embeds observations in a general context. There is very little clarification of the phenomena associated with active nitrogen. More serious, there is little general discussion linking observational material with mechanistic deductions.

The bibliography of 1529 items in-

cludes references up to 1967; articles published before 1945 are covered by earlier reviews and so are not emphasized. At least 300 pages are devoted to tables. For example, tables 4, 5, and 6 list the emissions induced upon mixture of active nitrogen with metallic elements, nonmetallic elements, and metallic compounds listed in the order of increasing atomic weight of the element. These three tables occupy 44 pages. A similar table involving other inorganic compounds occupies 64 pages. The bibliography is 39 pages and the author and subject indexes are 51 pages in length. Of the 602 pages 223 are devoted to exposition and discussion of active nitrogen phenomena.

ROBERT A. YOUNG

*Physics Department,
York University, Toronto, Ontario*

Migration and Homing

Bird Navigation. G. V. T. MATTHEWS. Second edition. Cambridge University Press, New York, 1968. x + 198 pp., illus. Cloth, \$7; paper, \$2.45. Cambridge Monographs in Experimental Biology, No. 3.

This is the fifth review to appear in the last few years for what is (at least at present) a very slowly moving field. It is a thorough review of literature since 1955, but instead of being rigidly critical it is primarily an argument in support of Matthews' sun arc hypothesis. The book nominally covers all aspects of navigation, but it moves swiftly from migration in wild birds to homing in pigeons. Perhaps as a result of this emphasis, Matthews defines navigation in a special way. He uses the term "navigation" for what many of us call orientation ("initiate and maintain directed movement independently of learned landmarks") and demotes "orientation" to what some of us would call a tropism.

New ideas since the first edition (1955) are: (i) nonsense orientation, the taking up of a species-consistent initial heading no matter where released (a phenomenon Matthews has studied in detail, yet is convinced was uniquely lacking in the pigeons he used in his Cambridge studies); (ii) observations that pigeons home well inside 15 miles or outside 30 miles yet poorly in between, which imply that navigation may not be effective within one degree of latitude and longitude; (iii) measurements of sensory discrimination that suggest that birds' eyes have capabilities

ties at least as great as those necessary for the validity of the sun arc hypothesis; (iv) star pattern "navigation," orientation of migratory restlessness along a consistent azimuth relative to certain groups of stars.

In the study of orientation/navigation, it is important at this step to repeat some of the critical experiments, as Emlen has done to confirm part of Sauer's work. Among the observations that need confirmation are the magnetic orientation reported by Merkel and Fromme and the evidence for bicoordinate navigation provided by Matthews' pigeon releases. The reported ability of wild birds to compensate for wind drift and to maintain direction under overcast conflicts with other evidence reported for pigeons, but Matthews treats the conflict lightly.

If, even after rock doves have been subject to intensive selection for homing ability for 150 years, sophisticated statistics are necessary to confirm that the best 20 percent of current stocks are in fact able to "home," I would expect that the ability is of little value to an individual bird subject to natural selection. Perhaps we should run a series of experiments on people, using the same techniques and statistics. My forecast is that some of my commercial fisherman friends, if released beyond 50 miles, would rapidly find their way home, and that I would never hear from some of my academic friends again.

WILLIAM H. DRURY, JR.

*Massachusetts Audubon Society,
Lincoln*

Hydrogen and Oxygen

Chemistry of Dissociated Water Vapor and Related Systems. M. VENUGOPALAN and R. A. JONES. Interscience (Wiley), New York, 1968. xviii + 463 pp., illus. \$19.50. Interscience Monographs on Physical Chemistry.

This work is the first in a projected series of monographs on physical chemistry edited by I. Prigogine. For a book that discusses reactions which range from hydrogen atom recombination to hydrogen superoxide formation, the title is unfortunate, since water is only one component part of the hydrogen-oxygen system. Aside from their intrinsic interest for chemists, studies of reactions in the hydrogen-oxygen system have played a central role in the development of an understanding of

combustion, flames, explosions, and reactions in planetary atmospheres. Complementary investigations by thermal means, electric discharge, photolysis, photosensitization, ionizing radiation, and shock tube methods have yielded a considerable quantity of mechanistic and kinetic data. Therefore this book, which covers information from all of these experimental approaches, is very welcome, particularly since no full book on the subject has appeared since the publication of Hinshelwood and Williamson's *The Reaction between Hydrogen and Oxygen* in 1934.

For a system containing only two atomic species, it is surprising, as is pointed out by P. Harteck in the foreword, that there are over 100 basic reactions. The authors have succeeded in bringing together the important experimental and theoretical studies relative to the reactions and in summarizing the kinetic information. After an introductory chapter, they devote a section to a fine description of experimental methods; accounts of the more sophisticated techniques are accompanied by clear illustrations which are very helpful for acquiring a full understanding of the experiments. The chapters which follow discuss in detail a variety of studies of reactions in the hydrogen-oxygen system. Although there are seven chapters, the sixth chapter is logically the culmination of the work. Here the authors present pertinent quantitative data and rate constants for the reaction of all the atomic, free radical, and molecular species involved. Scientists interested in any aspect of reactions in the hydrogen-oxygen system should find this compendium useful for ready reference.

The major critical judgment exercised by the authors is not so much in their own interpretation of the literature as in their choice of material containing critical evaluation for inclusion. Indeed, the empathy of the authors with some of the selected sources is such that the reader very familiar with the field may have a sense of *déjà vu*; whole passages—in at least one instance a passage three pages long—are taken almost verbatim, without quotation marks or other acknowledgment, from the published works of other authors. This does not detract from the usefulness of the book, as the authors have made wise choices.

DAVID H. VOLMAN

*Department of Chemistry,
University of California, Davis*