dence for its toxicity and for the role of superoxide dismutase in providing protection against it. One of the more fascinating aspects of the biology of oxygen radicals is the accumulating evidence that they are necessary intermediates in the utilization of oxygen. Several of the papers deal with the beneficial and perhaps obligatory roles of oxygen radicals in such processes as prostaglandin synthesis, vitamin-K-dependent synthesis of prothrombin, and the bacteriocidal action of phagocytic cells. The fact that many of the papers are reviews rather than limited discussions of a few experimental data make the book especially useful.

This is not to say that only well-established findings are presented in the book. The question whether hydroxyl radicals are generated in vivo appears, on the evidence of the paper by Willson, still to be unanswered. The relative roles of superoxide and hydrogen peroxide in the bacteriocidal action of phagocytes are discussed at length in several papers. Though the book does present differences in points of view, it also contains many superb discussion sections in which the participants attempt to reach as much accord as possible. The book serves the useful purpose of bringing together in one place a variety of approaches to the study of oxygen metabolism, and it is strongly recommended to all who are engaged in research in this field.

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Environmental Carcinogens

Polycyclic Aromatic Hydrocarbons in the Aquatic Environment. JERRY M. NEFF. Applied Science Publishers, London, 1979. xii, 262 pp., illus. $42.

Polycyclic aromatic hydrocarbons (PAH), although structurally quite dull, are biologically interesting because some of them cause cancer when applied to the skin of animals, including humans. Although their structures were not known, their effect was first observed over 200 years ago when it was correctly suggested that scrotal cancer among London's chimney sweeps was due to exposure to soot and its associated organic compounds. It was not until the 1930's that the structure of one of the most carcinogenic PAH, benzo[*a*]pyrene, was elucidated.

Like soot, PAH are produced by the combustion of a great variety of fuels under fuel-rich conditions. Therefore, until recently almost all studies of their environmental occurrence focused on the emissions of combustion sources and their dispersion in the atmosphere. Within the last several years, however, there has been a realization that they can come from sources other than combustion and can reside in environmental compartments other than the atmosphere. This book is a review of much of this recent information, with emphasis on PAH in water, sediment, and the associated biota.

We learn that PAH have several sources. These include direct and indirect biosynthesis, fossil fuels, and natural and anthropogenic combustion. PAH move from these sources to the aquatic environment by a variety of transport mechanisms, and Neff has estimated the magnitude of the inputs of PAH by these mechanisms. He concludes that the input of benzo[*a*]pyrene is 100 metric tons a year from land runoff, 500 metric tons a year from atmospheric fallout and rainout, and 80 metric tons a year from other sources (such as petroleum spillage and biosynthesis). These input rates are nothing more than gross estimates, but they indicate that airborne transport is an important mechanism for the introduction of PAH into the aquatic environment.

Neff points out that the fates of PAH are dependent on their physical distribution and on their chemical transformations. Their distribution in sediment as a function of depth is a historical record that indicates that their major source (at the locations studied) is the anthropogenic combustion of fossil fuels. Information on their chemical transformations suggests that "PAH may persist indefinitely in oxygen-poor water basins or in anoxic sediments." Clearly, PAH can serve as conservative markers of human activity.

The effects of PAH on aquatic organisms have not been throughly studied. We do know that many aquatic organisms accumulate PAH; the extent of this effect is dependent on species, temperature, and salinity. In addition, PAH may induce tumors in fish.

Neff has been exhaustive but not critical in gathering data. The book contains 89 separate tables, many of which are undigested data presented with excessive significant figures. Long sections of the book consist of abstracts of paper after paper. A reader's ability to comprehend this great bulk of information is limited by the lack of chapter or subchapter summaries. A three-page summary does appear at the end of the book, however, and it is excellent. The book has been carefully prepared; the literature coverage seems to be complete through 1977 and spotty for 1978. Assembling the existing data on PAH in the aquatic environment is a truly useful endeavor, and it has been done well. Marshaling these facts into a unified picture would have been even more useful.

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Neurophysiology

Sensory Mechanisms of the Spinal Cord. W. D. WILLIS and R. E. COGGESHALL. Plenum, New York, 1978, x, 486 pp., illus. $35.

This book has appeared at a most opportune time. The last 10 to 15 years have been a period of rapid and exciting advances in our knowledge of spinal cord mechanisms concerned with somesthesis. During this time the microelectrode, which has continued to be the most useful research tool, has allowed the functional organization of the dorsal horn to be clarified; the more recent trend toward working with identifiable neuronal systems has paid off handsomely in understanding of ascending systems taking origin in the cord (spinocervical, spinothalamic, and spinoreticular paths) and of control of access to these pathways by segmental and descending systems; many new techniques have appeared, including a number for tracing anatomical pathways and for injecting dye intracellularly, and these, combined with a second flowering of silver staining and degeneration methods, have allowed a new understanding of structural-functional relationships; finally, the great interest in pain mechanisms has focused attention on the dorsal regions of the spinal gray matter where the first central operations on nociceptive information take place. The book is the first to treat the subject in detail, and it provides a comprehensive and up-to-date account together with an extensive bibliography up to early 1978.

The authors adopt a most successful approach to the many complex problems thrown up by modern work. Each subject is developed clearly and concisely. Initially, helpful definitions are given, and these are followed by descriptions of the peripheral apparatus (receptors and afferent fibers), the structure and func-