as Linderberg, Öhrn, Cederbaum, Von Niessen, and Altick who have helped develop Green's function and other many-body techniques. Although most of the contributions deal with excited electronic states of isolated small molecules, Michl gives a nice overview of the role of excited states in organic photochemistry and several authors (Collins, Economou, Kunz, Ladik, and Koutecký) describe how modern theory contributes to understanding excited states of extended systems (polymers and solids).

I especially liked the chapter by Von Niessen, Cederbaum, and Domcke because of its clear and comprehensive treatment of how Green's function methods have been used to study ionization processes and their accompanying vibrational structure. The series of chapters by Peyerimhoff *et al.* on the application of modern multiconfigurational configuration-interaction techniques to molecular excited states is also a high point of the book. These authors show clearly how modern theory has been able to aid in the understanding of ambiguous experimental data. The chapters by Siegbahn, Öhrn, Von Niessen, Cederbaum and Domcke, Beck and Nicolaides, and Altick add up to a nice overview of the photoionization process from both experimental and theoretical perspectives.

On the whole, the chapters included in the book are interesting state-of-the-art descriptions of quantum chemical research on the electronic structure of excited atoms, molecules, polymers, and solids. The quality and excitement of the book could have been improved if the editors had included several chapters dealing with the nuclear-motion dynamics on excited-state potential energy surfaces. Future meetings of this kind should include a better balance between electronic structure and dynamics.

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Chemical Carcinogens

Polycyclic Hydrocarbons and Cancer. HARRY V. GELBOIN and PAUL O. P. TS'O, Eds. In two volumes. Vol. 1, Environment, Chemistry, and Metabolism. xxiv, 408 pp., illus. $37.50. Vol. 2, Molecular and Cell Biology. xxii, 452 pp., illus. $42. Academic Press, New York, 1978.

Polycyclic aromatic hydrocarbons are released into the atmosphere during the incomplete combustion of organic matter, and that includes all the fossil fuels. They are therefore ubiquitous environmental contaminants. As chemical carcinogens, the hydrocarbons possess a certain class distinction, since compounds of this type were the first pure chemicals to be shown, by Sir Ernest Kennaway and his colleagues in the 1930's, to induce cancer in experimental animals. The current concern over the environmental impact of the polycyclic aromatic hydrocarbons can be more readily appreciated if it is borne in mind that, while the amounts of just one of these compounds, benzo[*a*]pyrene, that are released into the atmosphere over the United States are measured in hundreds of tons per annum, the quantities of this substance that have to be applied to initiate the process of tumor formation in mouse skin are commonly considered in millionths of a gram.

The two volumes under review provide what is probably the most compact coverage available of the problems posed to scientists and to society by the carcinogenic polycyclic hydrocarbons in terms of their environmental distribution, chemistry and metabolism, and biological and biomedical effects. The book, which is well organized and includes contributions from most of the prominent research teams, is divided into 15 sections that are arranged in a logical sequence; in each section, a group of research reports is preceded by a more general paper that is intended to serve as an introduction for the uninitiated. Many of these review papers are excellent, and those dealing with synthesis, with metabolism, with microsomal monooxygenases, with DNA repair, and with mammalian cell mutagenesis can be especially recommended. The literature cited often extends to work that was published during 1977. The text contains much about benzo[*a*]pyrene and comparatively little about the rest of the potpourri of polycyclics that are made freely available to so many. There are sound reasons for this bias, however, since benzo[*a*]pyrene has been very much more intensively investigated than any other hydrocarbon. Much of the recent progress has followed from the discovery, in 1974, of the diol epoxides and of the crucial role that this type of metabolite seems to play in, for example, hydrocarbon-induced mutagenesis and carcinogenesis. Prior to 1974, dihydrodiols were generally regarded as true detoxication products that could, because they were more polar than the parent hydrocarbons, be more readily excreted by many species. It then became apparent that some dihydrodiols can be converted, by a Machiavellian quirk of metabolism, into diol epoxides, a novel type of reactive metabolite that is formed when one atom of oxygen is added enzymically across the isolated olefinic double bond adjacent to a non-K-region dihydrodiol grouping. The synthesis, properties, and formation of such diol epoxides are fully covered in the book. Indeed, so much recent work has been concerned with these vicinal diol epoxides rather than with the once-fashionable free radicals and simple epoxides that the symposium from which these volumes originated is referred to in a summary as "the diol epoxide meeting." The book also contains a useful section devoted to the bay-region hypothesis, which is a refinement of the general diol epoxide mechanism of activation and which does provide a rational basis for the activity of some carcinogenic polycyclic hydrocarbons even if it fails to explain why others are inactive.

On the minus side, the volumes lack an in-depth appraisal of the roles played by enzymes such as epoxide hydratase and the glutathione transferases in the activation and detoxication of the hydrocarbons that would have balanced the detailed treatment accorded to the microsomal monooxygenases. Presumably the editors failed to persuade their contributors to adopt a standard nomenclature for the different stereoisomeric forms of the benzo[*a*]pyrene diol epoxides; the average reader of the book will have to be forgiven if he or she does not immediately realize that the substance that is called diol epoxide I in one laboratory is the same compound that is known as diol epoxide 2 in another, and this quite unnecessary confusion brings no credit to anyone involved with its propagation. One obvious gap in the coverage concerns tumor promotion, which may play an important part in the etiology of hydrocarbon-initiated cancers of several sites in humans and which is only dealt with here in a commendable chapter on tobacco carcinogenesis. Tumor promotion has recently been considered in detail, however, in other books. One or two contributions could have benefited from closer scrutiny at the proofreading stage or from additional editorial attention, but these are really only minor criticisms of what forms an otherwise excellent addition to the literature on carcinogenesis in general and the polycyclic hydrocarbons in particular.

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