than what is required of the average, graduate student in biochemistry. It offers, however, the most comprehensive coverage on the topic of glycosylation at this point, and thus is a necessary volume for any serious student of glycoconjugates. As is now usual, the price of the book may not be too acceptable for most research workers laboring under the current, funding climate.

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Oxidation in Organic Chemistry: Part D, edited by WALTER S. TRAHANOVSKY, Academic Press, New York, 1982. xi + 354 pages + Subject Index, $74.00.

This is the fourth part of a treatise on oxidation in organic chemistry [Part A, K. B. Wiberg (Ed.) (1965); Part B, W. S. Trahanovsky (Ed.) (1973); Part C, W S. Trahanovsky (Ed.) (1978)], and the reviewer is as gratified with Part D as he was delighted with Part C [*Carbohydr. Res.*, 74 (1979) c9–c11]. Here again, the Editor and the contributors to Part D are to be congratulated on maintaining the high standard of the earlier volumes. The book consists of four contributed chapters, and all of the authors are authorities in the field. The oxidation reactions covered may be limited to special classes of organic compounds; however, many of them can be applicable to carbohydrates and other structurally related compounds (*e.g.*, oxidation with lead tetraacetate; phase-transfer-assisted, permanganate oxidations; and oxidative couplings).

A chapter by G. M. Rubottom (which takes up over one-third of the book, with 496 references through the year 1979) presents all of the important facets of the classical reagent lead tetraacetate (discovered in 1851, and employed in 1920) as applied to organic synthesis. The text discusses the reaction of lead tetraacetate [$Pb(OAc)_4$] with hydroxyl groups, including those in alcohols, 1,2-diols, enols, and phenols. The use of the reagent for glycol cleavage in structural determination and in the degradation of sugars can be supplemented by earlier, published work [C. T. Bishop, *Methods Carbohydr. Chem.*, 6 (1972) 350–352; P. S. O'Colla, *ibid.*, 5 (1965) 382–392; A. S. Perlin, *Adv. Carbohydr. Chem.*, 14 (1959) 9–61]. The reaction of mono- and di-carboxylic acids with lead tetraacetate has been treated in detail; the probable mechanism is stepwise, and involves a carbonium ion (R^+) as an intermediate generated from a free radical ($R\cdot$) following decomposition of the original, organolead adduct; the formation of alkanes, alkenes, or acetates is expected from these reactions. $Pb(OAc)_4$ has been used for the oxidation of aliphatic and aromatic amines, amides, hydrazines, and azomethines. The reagent also has wide application for hydroxylation (*e.g.*, *via* acetoxylation) of saturated and aromatic hydrocarbons and alkenes. The oxidant has been used in reactions with organometallics (for the preparation of primary alkyl acetates) or for the preparation of free cyclobutadiene from cyclobutadieneiron tricarbonyl and *p*-benzoquinone *via* [4 + 2] cycloaddition.

A chapter by D. G. Lee is a welcome addition to his recent book (*The Oxidation of Organic Compounds by Permanganate Ion and Hexavalent Chromium*, Open Court, La Salle, Illinois, 1980) on two classical oxidants; it discusses the synthetic applications of a new reagent, quaternary ammonium permanganate, usually prepared by the reaction of a quaternary ammonium halide in an organic solvent with aqueous permanganate (the phase transfer is from the latter). The most important phase-transfer-assisted permanganate oxidations include: (*i*) terminal alkenes→carboxylic acids; nonterminal alkenes→*cis*-diols (basic conditions), or cleavage products (acidic conditions), (*ii*) alkynes→diones, or acids, (*iii*) phenol→coupling products, (*iv*) aliphatic ethers→esters; the reagent has also been used for the oxidation of polycyclic aromatic hydrocarbons to give quinones, and for the oxidation of sulfur compounds and substituted amines. The text includes 26 Tables of numerous examples of the practical application of the reagent; the author has succeeded in providing a concise, yet clear, description of the present state of the art of organic oxidation with a modified permanganate ion.

P. Dhingra has written an attractive chapter that deals with intramolecular, oxidative coupling of aromatic substrates, including phenols; the topic is of great importance in natural-products chemistry and in the biosynthetic pathway to many heterocyclic products, including alkaloids and antibiotics. The classical coupling-reagents of phenols with a number of one-electron oxidants, such as $K_3Fe(CN)_6$, $FeCl_3$, Ag_2CO_3, or the two-electron oxidant MnO_2 are currently being replaced by new reagents that reportedly give consistently high yields of intramolecularly coupled products. Those which have proved particularly useful are vanadium oxytrifluoride (VOF_3), vanadium oxytrichloride ($VOCl_3$), managanese tris(acetylacetonate), thallium trifluoroacetate, ferric chloride-*N*,*N*-dimethylformamide, and lead tetraacetate. These reagents have been used to couple a wide variety of mono-, di-, and non-phenolic substrates. As stated by the author, the purpose of this chapter is to show how our understanding of biosynthetic pathways to complex alkaloids has led to the development of a number of coupling methods, and to demonstrate the utility of the recently developed methods in the syntheses of complex, natural products. This chapter will thus prove indispensable to those involved in the synthesis of natural products. The literature through August 1980 is covered.

A chapter by R. Hayatsu, R. G. Scott, and R. E. Winans is a sincere attempt to provide detailed information concerning the origin, transformation, and structure of the organic macromolecules in coal. Despite the fact that coal has been our major source of energy for a hundred years, its structure is still a riddle to organic and analytical chemists. The macromolecular, organic material in coal is essentially a complex mixture of various types of such rather simple compounds as benzenes, phenols, naphthalenes, cycloalkanes, tetralins, furans, thiophenes, pyridines, and carbazoles. In the structure of coal as generally envisaged, these compounds are tied together by such bridge linkages as methylene chains, alicyclics, ethers, sulfides, and disulfides. Hence, a complex mixture of different types of compounds will require selective oxidation wherein some portions might be decomposed, or might not be oxidized at all. In this chapter, emphasis is laid on selective, oxidative-degradation procedures as tools for the characterization of the structure of coal. For comparison, oxidations of lignin, humic acid, and kerogen materials structurally related to coal are discussed. In addition to the oxidants commonly used, such as nitric acid, permanganate, chromic acid, hydrogen peroxide, hypohalite, and oxygen, selective application of perchloric acid, cupric oxide, nitrobenzene, and ozone is also described. Some analytical methods for characterization of the oxidation products of coal are surveyed. The book concludes with a Subject Index, but no Author Index is provided; instead, a list of 44 monographs in this series is included.

Because of its high overall standard, this book should be useful to synthetic organic chemists, biologists, biochemists, and chemists involved in natural products and coal research. It is highly recommended that a copy be in the chemical library; however, for a personal copy, the price seems rather high.

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