thought to be the clearest cases of dominance hierarchies; there are few cultures in which women comprise more than 3–5 per cent of elected representatives. (2) War and police work are usually all-male affairs, especially where actual fighting is involved. (3) Work is sex linked; men doing the hunting, dangerous and heavier work, while women gather and prepare food. (4) Sport typically consists of male groups in near-aggressive competition with other groups, and of hunting and fishing which reconstruct primitive life. (5) Secret societies, such as fraternities, are usually male, and involve initiation rites, which perhaps convey status and strengthen hierarchical bonds. (6) Aggression is often a joint activity by male groups; attacking the enemy strengthens the internal hierarchy and vice versa.

These ideas are extremely interesting, and they suggest that psychological research which finds small differences in personality between males and females must have been studying the wrong dimensions. Furthermore, the ideas are eminently testable by psychological and sociological methods. The basic ideas are not really new—they can be found in the writings of Michael Chance and other primate ethologists, and of Lorenz—but the detailed application to human societies is new. Nor are any original research findings reported; instead, the author cites widely scattered anthropological and sociological sources, with a preference for the bizarre and off-beat, in the American sociological tradition. He could have made more use of research on interaction in human groups. The book is highly entertaining to read, though it is rather repetitious.

What of the thesis itself? The author rather underplays the extent of cross-cultural variation in sex roles: women engage in more "male" activities in Russia and Israel, fewer in Arab countries; role differentiation in the family is least in American middle-class families, according to Zelditch. Perhaps primate-derived hypotheses fit the most primitive societies best. While the book does not deal with female groups, the very existence of such groups goes against the hypotheses presented. Perhaps it follows that nunneries and girls' schools, given that they exist at all, should be very unstable and full of dissent. Nor does the book explain why many male groups are not concerned with aggression—universities, research groups and many others. The author does not discuss the conventional social psychological account of male bonding —that it is the result of affiliative and related social drives, which have some innate origins, but are more the product of early socialization experiences. The strong emphasis on biological factors leads to some rather surprising recommendations about practical affairs: the author approves of public schools on the somewhat unusual grounds that they are ideal examples of male-bonding; he is in favour of keeping women out of politics, and wants new towns to have pubs (where male bonding can take place). Broadly he supposes that little can be done to change anything but he hopes that better understanding of the biological aspects of human nature may help.

MICHAEL ARGYLE

ORGANOMETALLIC HANDBOOK

Handbook of Organometallic Compounds

Edited by Nobue Hagihara, Makoto Kumada and Rokuro Okawara. Translated from the Japanese. Pp. xviii + 1044. (W. A. Benjamin: New York and Amsterdam, 1969.) n.p.

THIS volume, misleadingly called a handbook, attempts a survey of the organometallic compounds of fifty elements. Of its 1,044 pages, 764 are devoted to some 5,500 compounds of the non-transition elements, and only 167 to 400 compounds of the transition metals (this latter section includes the members of groups Ib and IIb). There is a rather superficial thirty-page glossary of technical terms, and a well-documented subject index. Each chapter dealing with an element or group of elements is introduced by a short, and again superficial, account of bonding, general methods of synthesis and chemical properties of the compounds. A potted account of each selected compound then follows: its empirical and structural formulae; systematic name; preferred method of preparation (given in equation form); physical properties such as melting point, density, solubility data, and occasionally a few infrared or NMR data; selected chemical properties; applications; and one or two references. An average entry per compound would occupy some twelve lines of a half-column page.

Although the editors say, with apparent feeling, that theirs has been a laborious task, it is hard to avoid the impression that some of their labour has been misdirected. Space could have been saved or have been better used by presentation of much material in tabular form, and by omission or severe curtailment of the rather poorly written, lightweight introductory sections and glossary. The editors admit to "some arbitrariness . . . in the selection of compounds"—thus, 100 are listed for antimony and 10 for rhodium, 1,700 for silicon and 27 for chromium. Indeed, the treatment of transition metal compounds is derisory, yet it is surely in this field that the most significant advances are now being made. "Selection was based on the two criteria of fundamental importance and frequency of use"—the selection, on this basis, is remarkably eccentric.

This type of book would have been very useful ten years ago; now it is unlikely to be of much use to either the novice or the specialist in the field. There has been such an extraordinary increase of work in organometallic chemistry, with so many new papers appearing every month, that nothing less than a sort of organometallic "Beilstein" is needed. Alternatively, to be really gloomy about it, a computer ought to be set to work on the task.

W. P. GRIFFITH

STRUCTURE OF LIGNIN

Constitution and Biosynthesis of Lignin

By K. Freudenberg and A. C. Neish. (Molecular Biology, Biochemistry and Biophysics, Vol. 2.) Pp. ix + 129. (Springer-Verlag: Berlin and New York, 1968.) 28 DM; $7.

THE complex structural chemistry of lignin has been extensively investigated over the past fifty years. During the past two decades the picture of the molecular structure of the polymer has emerged. It is composed not as a sequence of regularly repeating monomers joined to one another by a specific type of chemical bond, but by an arbitrary interlinking of a variety of units to give a three-dimensional matrix.

Ideas about the structure of this very insoluble substance were first elucidated by painstaking and difficult chemical investigations. A clearer picture was obtained later when biochemical evidence was available about the method of biological synthesis of the polymer from its precursors.

The unique method by which the biological synthesis of lignin occurs in plants was suggested by Freudenberg and his coworkers. The ideas were based on their long, persistent and skilful studies into its chemistry and by the use of *in vitro* model synthesizing systems. The synthesis is thought to occur by the enzymic dehydrogenation of a mixture of three p-hydroxycinnamyl alcohol derivatives. This oxidation produces free radicals that combine together and grow into the large, complex polymer.

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