and morphogenesis (comprising almost half the book). As those who have used the *Principles* will expect, the work is lucidly written and well organized. Illustrations are of high quality and in good taste.

I have only minor criticisms: for example, on page 37 it is not at all clear why it follows from the action spectrum of photosynthesis that carotenoids must be involved in the process, and on page 79 possibly too much emphasis is placed on the survival value of bud dormancy. In such a condensation very few of those persons associated with the major advances in a field can be mentioned; in this case it would have been wise to omit names entirely.

I suspect many students will consider careers in experimental botany as a result of using this volume.

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$(C_{10}H_{13}O_3)_x$

The Chemistry of Lignin. Supplement volume. Covering the literature for the years 1949–1958. Fredrich Emil Brauns and Dorothy Alexandra Brauns. Academic Press, New York, 1960. x + 804 pp. Illus. $18.

Some idea of the effort expended on lignin research during the decade covered can be gained by noting that the size of this volume is almost identical to that of the first, which dealt with the entire earlier period beginning with the discovery of lignin in the 1830's. Workers in the lignin field who have long since abandoned attempts to keep abreast of the flood of pertinent literature will find the appearance of this supplement most welcome.

Although readers expecting to encounter progress in proportion to the volume of research may well be disillusioned, some will consider excessively pessimistic the authors' view that little progress has been made toward the elucidation of the structure of lignin. Recent evidence, much of which is admittedly indirect, has at least permitted presentation of a plausible diagram representing the main types of lignin "building stones" and the linkages between them. Such a concept seems to be gaining increasing acceptance, and this is a welcome change from the multitude of often-conflicting theories extant in 1952.

In other areas of lignin research, notably the problem of the lignin-carbohydrate bond (discussed here by J. W. T. Merewether) and the lignification process, very significant advances are reported. In recognition of this, for example, the chapter formerly entitled "Theories on the formation of lignin" now appears as "The biosynthesis of lignin."

Otherwise the plans of the volumes are virtually identical, although there have been considerable shifts of emphasis. The entire spectrum of lignin research has been scanned with such thoroughness and attention to detail that for many purposes reference to the original literature will be unnecessary. Especially gratifying in this respect are the frequent reproductions of tables, figures, and experimental procedures from Japanese, Soviet, and other journals not always readily accessible to American readers. As before, Brauns writes critically, exhibiting a profound knowledge of his subject, and he maintains a disinterested viewpoint even in areas where vigorous controversy has sometimes been in evidence.

The present volume, with its predecessor, can be regarded justifiably as the standard treatise on lignin in the English language, and it merits a place in the library of anyone seriously interested in the field.

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Fatal Genes

Developmental Genetics and Lethal Factors. Ernst Hadorn. Translated by Ursula Mittwoch. Methuen, London; Wiley, New York, 1961. xviii + 355 pp. Illus. $8.50.

Biologists can only be grateful for an English version of this most valuable monograph on lethal factors, although one may wish that the time interval between the appearance of the original German edition (1955) and the appearance of the English translation (1961) had been shorter.

Lethals are defined as "Mendelian units which cause the death of an organism prior to the reproductive stage." They arise by mutation, probably in all organisms from virus to man. Since Ernst Hadorn has contributed perhaps more than any other person to their study, a painstaking and critical review from his pen of the now very extensive pertinent literature (the bibliography alone covers 32 pages) is very useful. Investigations made with lethals in *Drosophila*, mouse, and poultry are considered most fully, but other organisms, including plants and microorganisms, are by no means overlooked. Nor are human lethals neglected, although, of necessity, the coverage is here least comprehensive. A book as large as the present one would be needed to deal with lethal and semilethal hereditary diseases and malformations in man alone.

The bearing of the studies of lethal factors on the problems of developmental genetics is, as indicated by the title of the book, in the center of the author's attention. Brief descriptions of the occurrence of lethals in natural populations, of their economic importance, and of the possibilities of therapy's causing the otherwise lethal genotypes to produce viable individuals are nevertheless included. All in all, this is an indispensable book in any biological library.

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Using Groups in Physics

The Application of Group Theory in Physics. G. Ya. Lyubarskii. Translated from the Russian by Stevan Dedijer. Pergamon, New York, 1960. ix + 380 pp. $10.

This English translation of a Russian work by G. Ya. Lyubarskii is a readable and quite complete discussion of the major applications that group theory finds in theoretical physics. The applications are discussed in sufficient detail to supply an interested reader with a working knowledge of the subject matter.

The book is very much slanted toward applications, and the early chapters, which discuss the general properties of groups and their representations, are quite sketchy. Complete descriptions of the properties and representations of groups of physical interest appear in the later chapters. Included in these discussions are the point groups, permutation groups, and space groups. Two entire chapters are devoted to the rotation groups in two and three dimensions, and another to the properties and