

### The Terpenes

By Sir John Simonsen and Dr. D. H. R. Barton. Second edition. Vol. 3: The Sesquiterpenes, Diterpenes and their Derivatives. With addenda to Vols. 1 and 2, by Sir John Simonsen and Dr. L. N. Owen. Pp. xi+579. (Cambridge: At the University Press, 1952.) 50s. net.

THE publication of this volume brings to a successful conclusion the arduous task of issuing a second edition of a work that has become a classic in terpene chemistry (see *Nature*, 160, 384; 1947). The vigorous growth of this field of organic chemistry since 1931-32, the date of the original edition, is reflected in the expansion of the second edition from two to three volumes, totalling some seventeen hundred pages. The subject-matter of the original second volume has now been conveniently sub-divided into "Dicyclic Terpenes" (Vol. 2) and "Sesquiterpenes and Diterpenes" (Vol. 3). In the preparation of the new edition Sir John Simonsen has been fortunate in enlisting the general help of Dr. L. N. Owen and Dr. D. H. R. Barton, together with special aid from Prof. W. Cocker in preparing an account of santonin.

The third volume incorporates a review of the important literature up to 1949, and contains some references to 1950; moreover, it includes addenda bringing the matter of the first two volumes up to date. Among the interesting subjects dealt with in this supplement are recent studies on the *isopropenyl-isopropylidene* controversy, and a review of the evidence which shows that irone must now be recognized as 6-methyl-ionone, capable of existing in  $\alpha$ -,  $\beta$ - and  $\gamma$ -forms, each corresponding to several stereoisomeric modifications. That terpene chemistry still has much to offer to the investigator is shown *inter alia* by the current researches of Ruzicka and his collaborators at Zurich and also by the interesting lists given in the work here under review of compounds of various types, the constitutions of which still await elucidation.

The attractive format and the remarkably clear type and formulæ of the first edition have been reproduced in the new publication. From every point of view this is a major work of the first class, which is certain to receive the warm welcome it deserves.

JOHN READ

### Linear Transformations in $n$ -Dimensional Vector Space

An Introduction to the Theory of Hilbert Space. By Prof. H. L. Hamburger and M. E. Grimshaw. Pp. x+195. (Cambridge: At the University Press, 1951.) 25s. net.

THE concept of space of infinitely many dimensions, effectively introduced about fifty years ago by Hilbert in connexion with integral equations, co-ordinates and elucidates many of the problems in mathematics and mathematical physics in which linear operators are involved. Prof. H. L. Hamburger and Miss M. E. Grimshaw have provided a useful prolegomenon to this doctrine; they deal with analogous problems in  $n$ -dimensional linear space, particularly the study of canonical forms of transformations, but they choose, wherever possible, methods which will also serve for Hilbert space. The arguments are crisp but austere, even in this simpler field, and they are mainly algebraic, although Hilbert's variational method for the eigen-values of a Hermitian form is included. Recently obtained inequalities due to Aronszajn indicate an application

to the numerical calculation of eigen-values; and the reduction to canonical form of a pencil of operators is illustrated by a detailed study of the familiar dynamical problem of small oscillations.

The topic is abstract, and the arguments, even when geometrical language is used, demand close attention; but the precision with which these powerful methods operate is worth an effort to acquire. It is to be hoped that the authors will produce a sequel in which the methods are shown at work in Hilbert space.

### The Higher Arithmetic

An Introduction to the Theory of Numbers. By Prof. H. Davenport. Pp. 172. (London: Hutchinson's Scientific Library, 1952.) 8s. 6d. net.

MOST mathematicians, amateur and professional, find the theory of numbers fascinating. Prof. H. Davenport, in his concise, self-contained account, deals with factorization and the primes, congruences, quadratic residues, continued fractions, sums of squares, quadratic forms, and some Diophantine equations. His complete mastery of the field has helped him to give a clear, forward-looking and thoroughly up-to-date exposition. In number theory, results may often be easy to guess but difficult to prove, yet guess-work without proof is almost worthless. Davenport's rigour of demonstration, demanded by the nature of the subject, is always lucid, but it requires the reader's close co-operation, often with pencil and paper; the well-chosen numerical examples, with which the author illuminates practically every step, help to concentrate attention. Little previous knowledge is assumed, but by sticking fairly closely to main themes, the author brings his reader near to the present bounds of knowledge and indicates some of the likely lines for further progress. The novice who wishes to pay his respects to the 'Queen of Mathematics' will be wise to choose Prof. Davenport's presentation.

### Botany

By Prof. Carl L. Wilson. Pp. xi+483. (New York: The Dryden Press, 1952.) 6.10 dollars.

THIS attractive book, intended primarily as an introduction to botany for students in American colleges, succeeds admirably in presenting the elements of the subject in a most agreeable and refreshing manner. The first half of the book follows the normal pattern of botanical text-books by dealing with the structure and physiology of the higher plants. It is noteworthy to find such topics as vegetative reproduction, erosion, food poisoning, hay fever plants, growth substances, viruses and antibiotics introduced in this elementary treatment. The later chapters cover a wide survey of the whole plant kingdom with outline classifications of the various groups and details of significant life-histories. The account of early land plants and their evolution is particularly well written and illustrated.

Each chapter is prefaced with a brief and sometimes historical introduction to the contents and concludes with a useful summary. As may be expected, the examples selected for study are those readily available to American students, and the predominant emphasis is on the vegetation of North America. In spite of this, Prof. Wilson has produced a most stimulating text-book which should be read and enjoyed by students and laymen alike.

There are many photographic illustrations, and special praise must be given to Dr. Hannah Croasdale for the clear and convincing diagrams and figures.