

principles of the subject and shows in a masterly way how they are applied in practice.

The book starts with the axiom that three parameters, for example, hue, saturation and brightness, are needed to specify a colour sensation, and the next stage is to define the standardized concept of objective brightness (now 'luminance'). The international relative-luminosity curve, based on the measurements of Guild and Wright, is then discussed. The meaning of 'white' is illustrated with reference to the standard illuminants of the Commission: *A*, *B* and *C*, and the equal-energy source *E*. Then follows an account of the development of the chromaticity diagram or colour triangle, from the general figure in terms of three primaries to the *RGB* triangle, and that based on the non-spectral primary colours known as *XYZ*, which includes the locus of the spectral colours within its boundary. Three trichromatic coefficients locate a colour point on the appropriate figure; but they are not independent, and the point can equally well be fixed by two quantities, dominant wave-length and purity. If three parameters are essential, then the colour diagram should be three-dimensional, as Helmholtz and, more recently, Schrödinger suggested; and this leads to the idea of the representation of a colour by a point in 'colour space'.

In colour space a given chromaticity is represented by a straight line through the origin, all points on this line differing only in brightness, which is represented by the distance from the origin. Any three lines representing chosen primaries, such as *RGB* or *XYZ*, serve as axes. The brightness of the three primaries which, when mixed, match a given colour, are the co-ordinates of the point representing that colour, which is then completely specified. Rules for the transformation from one set of axes to another are given, consistent with the observation that a colour can be matched in innumerable ways by suitable mixtures of different sets of three primaries.

The law of addition, that the mixture of colours of co-ordinates  $X_1, Y_1, Z_1$  and  $X_2, Y_2, Z_2$  gives the colour  $(X_1 + X_2), (Y_1 + Y_2), (Z_1 + Z_2)$ , is illustrated by numerous worked examples, and the rule for finding the trichromatic coefficients in the corresponding plane diagram from the space co-ordinates is explained. These examples form a valuable part of the book, and after reading on page 98 the calculation of the colour point and trichromatic coefficients for a mercury lamp, the reviewer first realized that the 'space' system is really simple to use in practice.

A chapter on some special sources and colours deals with black-body radiation and the determination of colour temperature, and describes the behaviour of pigments and filters, the effects of which are compared with the boundary colours observed when an illuminated edge is viewed through a prism held to the eye. Practical colorimetry is surveyed briefly in two chapters, in relation to the chromaticity diagram. The chapter on defective colour vision gives the generally accepted account, though this is supplemented with references to recent work. The same might be said of the account of the historical development of colour science, which is intentionally discussed briefly and late in the book, as it does not contribute to the main development of the argument. Then follows a summary of some of the more recent observations on discrimination and adaptation, and the final chapter deals with practical applications in illuminating engineering and methods of colour reproduction.

At the end, fifteen tables of data for colour calculations and eighteen pages of references round off a work which should be a valuable handbook to those specially interested in this field. It can also be recommended to the non-specialist who wishes to become familiar with modern methods of colour measurement. The translation from the Dutch reads faultlessly; the technical terms agree on the whole with the preferences of the Physical Society's Report on Colour Terminology (1948), though some of the newer words do not appear, possibly because they were not available at the time the work was done.

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## STRUCTURAL CHEMISTRY

### Chemismus und Konstitution

Von Dr. Bernd Fiesert. Band 1: Grundlagen und einige Anwendungen der chemischen Elektronentheorie. Pp. ix+387. (Stuttgart: Ferdinand Enke, 1948.) 41.50 M. marks.

THIS interesting book is the first volume of a treatise upon the application of the facts and theories of atomic and molecular structure to chemical problems. A second volume is promised; and the whole will bring up to date, and greatly extend, the same author's earlier monograph, "Tautomerie und Mesomerie". As is appropriate in a first volume, the book deals mainly with questions of structure, and in doing so it follows normal lines. The treatment is descriptive throughout; the author uses no mathematics.

A brief account of atomic structure is followed by the formal electronic theory of chemical bonds, and by a discussion of such topics as ionic and covalent radii, bond energies and angles, polarity (dipole moments), light absorption, conjugation (in which the author follows E. Hückel), the outlines of chemical thermodynamics and kinetics (very brief), acids and bases, intermolecular forces and molecular compounds. In his discussion of 'inductive effects', the author defends the reality of an alternating effect in saturated chains. In the last eighty-six pages of the book, he starts on a systematic treatment of reactions with a discussion of addition, substitution and elimination.

The above bare summary is actually filled in with a wealth of valuable detail drawn from both inorganic and organic chemistry. For example, the long chapter on intermolecular forces and complex compounds discusses hydrogen bonds, Friedel-Crafts catalysts considered as generalized ('Lewis') acids, anion bridges, and  $\pi$ -complexes, as well as the classical inorganic co-ordinate compounds.

Although English-speaking readers will not find much that is unfamiliar to them in the theoretical aspect of the book, and most of its essential content is covered for them by well-known books written in English, it has, particularly for them, a compensating value as a rich source of instances and examples drawn from Continental literature. At the same time, the author has been at pains to include the results of British and American work, even the most recent; and he lists, in his preface, a number of works written in English which were accessible to him. The book is a most useful source of information, and the second volume will be awaited with interest.

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