

readable account of crystallization and devitrification and a survey of glass types and nucleating agents for controlled crystallization. The basic requirement is the introduction of submicroscopic catalyst particles into the glass at a temperature below that at which major crystalline phases could grow quickly, and to disperse the catalyst through the glass so that there are a great number of nucleating centres. One of the important catalysts used by Stookey was titania: McMillan has made a particular study of the use of metallic phosphates.

The glass-ceramic process itself begins with conventional melting and shaping of the glass. It must then be brought to, and held at, a temperature plateau, some 50° C above the annealing temperature, to nucleate, and then brought slowly to a crystal growth plateau which will be some 50° C below the temperature at which the predominant crystal phase is likely to redissolve. Apart from the obvious change in appearance produced by this heat treatment, there is a small (~1 per cent linear) dimensional change, a marked increase in strength and a change in thermal expansion which can be manoeuvred to meet particular requirements.

The mechanical and electrical properties are discussed at some length: strengths up to 50,000 lb./in.² are reported, with a notional breaking strain of 2-3 × 10⁻³—at least twice that of ordinary glasses and ceramics. Electrically, especially from the point of view of dielectric loss, there is not much to choose between glasses, ceramics and glass-ceramics, but the last can show higher electric strength. Among possible applications, one, in the field of cooking ware, is probably well known to the public, but more importantly there are a number of possibilities in the electrical field, perhaps, very interestingly, in micro-miniaturization.

Little or nothing is said in the book about the economics of the new technology: how far glass-ceramics will invade the chosen field of other materials will depend very largely on this aspect. The book, which is modestly priced by present standards, is the first in a series of monographs on non-metallic solids, a series which is manifestly away to a good start and which, one hopes, will sustain this early promise. N. F. ASTBURY

NEW RESOLUTIONS FOR BIOCHEMISTS

New Biochemical Separations

Edited by Dr. A. T. James and Dr. L. J. Morris. Pp. ix + 424. (Princeton, N.J.: D. Van Nostrand Company, Inc.; London: D. Van Nostrand Company, Ltd., 1964.) 83s.

IN recent years there have been a number of significant developments in the methods which are used for the separation and isolation of naturally occurring compounds. The aim of *New Biochemical Separations* is "to provide up-to-date explanations of the most modern refinements in separation techniques and to include experimental data of their application to biochemical problems". The various methods are described by different authors who are experts in their particular fields and who have, in most cases, been responsible for the developments in the technique they describe. Gas-liquid chromatography, thin-layer chromatography and gel-filtration receive particular attention since they have developed most rapidly recently. This volume is not therefore a complete manual of separation techniques, but it is an important contemporary complement to more catholic text-books such as *Chromatography* by Lederer and Lederer and *Separation Methods in Biochemistry* by Morris and Morris.

The first five chapters deal with the application of gas-liquid chromatography to the separation of radioactive

compounds, steroids, alkaloids, carbohydrates, coenzyme A esters, bile acids and amino-acids. In some cases it is helpful or even necessary to convert the sample into more volatile derivatives by esterification, trifluoroacetylation, or silylation before chromatography. Adequate details or literature sources are given for these preliminary steps. It is emphasized that the chromatographic procedure and the nature of the derivative should be varied where possible in order to achieve the maximum degree of separation and certainty of identification.

The use of cross-linked dextran gels for the fractionation of amino-acids, peptides, proteins and polysaccharides is described in two chapters. Thin-layer chromatography has been used for the separation of amino-acids and their *N*-2,4-dinitrophenyl derivatives; full descriptions of the methods are given. The separation of 1-dimethylamino-naphthalene-5-sulphonyl derivatives of amino-acids by thin-layer chromatography (*Experientia*, 20, 559; 1964) may well prove more popular eventually in view of its high sensitivity. The separation of alkaloids by conventional paper chromatography as well as thin-layer chromatography is described in detail and illustrated by numerous tables of *R_F* values. Although reversed-phase paper chromatography and chromatography on alumina- or silica-impregnated paper have been useful for the separation of hydrophobic compounds, it seems that thin-layer chromatography is proving to be a more powerful tool. This trend is reflected by the inclusion of chapters on the separation of steroids, triterpenoids and bile acids by this method.

The remainder of the book is devoted to the use of various techniques for the separation of lipids especially those containing polar groups. Progress in the lipid field has been inhibited by the paucity of analytical methods. The present accounts of the use of thin-layer chromatography, chromatography on paper impregnated with silicic acid, and counter-current distribution are important, therefore, in view of the increasing interest in the lipid field.

This book is well produced and remarkably free from errors. Contributions from German authors have been translated into English. Literature references up to 1963 are to be found in most chapters. It is to be hoped that further editions will appear from time to time in order to focus attention on present-day trends in an important aspect of biochemistry. D. T. ELMORE

POISONS IN INDUSTRY AND RESEARCH

The Halogenated Hydrocarbons of Industrial and Toxicological Importance

By Dr. W. F. Von Oettingen. (Elsevier Monographs on Toxic Agents.) Pp. x + 300. (Amsterdam, London and New York: Elsevier Publishing Company, 1964.) 60s.

THE study of toxic compounds is now in an exciting phase. New techniques, biochemical and electron microscopic, are bringing a mass of new information and new ideas are springing up. Because carbon tetrachloride has been studied for such a long time, the application of the new techniques to the lesion following this poison yields results which can be laid against existing knowledge more profitably than for any other toxin. Inhibition of protein synthesis which occurs *in vivo* can be reproduced *in vitro* and shown to be due to a failure of ribosomal function; this can be seen by the electron microscopist as detachment of granules from membranes of the endoplasmic reticulum.

Furthermore, it is becoming clear that there are general reactions to injury at the cellular level which may occur whatever the toxic agent (degranulation of the endoplasmic reticulum is an example). An advancing under-