RUSSIAN APPROACH TO MINERAL PARAGENESIS

Physiochemical Basis of the Analysis of the Paragenesis of Minerals

By D. S. Korzhinskii. Translated from the Russian. Pp. 142. (New York: Consultants Bureau, Inc.; London: Chapman and Hall, Ltd., 1959.) 7.50 dollars; 63*s*. net.

THIS book, which was originally published in Russian in 1957, is an excellent, clearly written, introductory discussion of the application of thermodynamics and the principles of projective geometry to the analysis of the paragenesis of minerals in multi-component heterogeneous natural silicate systems.

The first chapter discusses the thermodynamic principles governing mineral paragenesis and is especially notable in two respects. First, by its consideration of the extensive parameters, that is to say, those such as mass, volume, entropy and enthalpy, the magnitudes of which depend on the size of a system or phase as distinct from the intensive parameters such as temperature, pressure and concentration. These extensive parameters have long been neglected even in classical thermodynamics and this neglect has been carried over into most of the thermodynamic discussions of natural silicate systems. Secondly, and equally notable, is the extension of the phase rule to cover open systems and not just isolated and closed systems, which are now generally recognized to be extremely rare in geological conditions. Apart from his memorable studies of the basement rocks of eastern Siberia, the author is perhaps best known for his views on metasomatism and the significance of 'perfectly mobile' components the chemical potentials, activities and concentrations (not masses) in one of the phases or partial vapour pressures of which are factors of equilibrium of a system. Without such a concept of 'perfectly mobile' components the thermodynamic approach to open systems is impossible. The author is careful to restrict his consideration of components to independent components, but we must hope he will eventually extend his treatment.

The second chapter deals with methods of representing the chemical composition of various systems, especially multi-component ones, with emphasis on the use of projective geometry in graphical methods. Of particular interest is the use of vectors to represent many (for example, seven) component compounds, following Lodochnikov's earlier work. All the constructions are clearly explained and fully illustrated with admirably labelled diagrams.

Chapter 3 concerns the relation between the chemical and mineralogical composition of rocks under constant external conditions, and includes examples of the paragenetic analysis of minerals in multi-component systems, while Chapter 4 considers the dependence of mineralogical composition on external conditions. In this section more examples are given, which include the use of determinants in calculations of reactions in multi-component systems. A short explanation of the routine in using determinants is given.

In the brief final chapter a few general comments emphasize that in most naturally occurring mineral assemblages the problem is to find the conditions under which the minerals crystallized, using the observed or deduced paragenesis, and that the determination of the stable assemblage in each of numerous different, but associated, rocks is important, but frequently difficult to achieve. No mention is made of the vital importance of synthetic laboratory studies.

Examples of the application of the author's approach to particular systems such as the five-component system, CaO-MgO-SiO_2-CO_2-H_2O, and the paragenetic analysis of granitic rocks in relation to the chemical potentials of sodium and potassium, both of which are fully examined, are particularly interesting, and more examples would have been generally welcomed. It is unfortunate that some of the examples do not use co-existing minerals actually analysed and that in the last-mentioned example average chemical compositions of biotites and hornblendes in rather different rocks, and rather poor averages at that, should have been used as the basis for the calculations. Integration of some of the experimentally determined laboratory results available with the natural parageneses could have been profitably included.

Perhaps most important of all, this book directs our attention to the woefully inadequate training in physical chemistry and mathematics of, unfortunately, nearly all geologists. The prevailing emphasis in most universities on laboratory and field studies, to the almost complete exclusion of theoretical geology, especially thermodynamics, has resulted in most geological research becoming a distressingly empirical subject of unco-ordinated fact-finding, and we must welcome this new and fundamental, even if introductory, synthesis. BERNARD E. LEAKE

STEROLS AND TERPENES

Cholesterol

By Prof. David Kritchevsky. Pp. xi+291. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1958.) 78*s*. net.

Ciba Foundation Symposium on the Biosynthesis of Terpenes and Sterols

Edited by G. E. W. Wolstenholme and Maeve O'Connor. Pp. xii+311. (London: J. and A. Churchill, Ltd., 1959.) 45*s*. net.

ACCORDING to a note on the dust cover, Dr. Kritchevsky's book "provides a centralized source of information on the biological function and significance of cholesterol. It covers cholesterol chemistry, biochemistry, and physiology". One must undoubtedly admire the courage of an author who is willing to undertake such a herculean task, especially when a rival work, which appeared almost simultaneously, required 15 co-authors. As a guide to the literature, it is of considerable value, for reference is made to approximately 2,000 publications.

The first chapter, which deals with the chemistry of cholesterol and its derivatives, is only partially successful. In the space of about 50 pages, the reader is led from the first studies of gallstones in the first half of the eighteenth century to total syntheses of steroids at the beginning of the second half of the twentieth century. The result of such compression is likely to be difficult for biologists to understand and of little value to the chemist. For example, the Woodward synthesis is covered in eight lines of text and a flow-sheet. Sarrett's original synthesis of 11-ketoprogesterone is mentioned, but subsequent