The second chapter on columns and the third on general apparatus together occupy 35 pages. Since many important statements are justified throughout the book simply by references to the bibliography rather than by detailed argument in the text, the reviewer was left with the feeling that many less consequential details are discussed too fully in these chapters. For example, almost three pages of text are devoted to an outline of the types of thermostats which have been used. A detailed description of column packing materials is left to the final chapter and of detector construction to an appendix.

The fourth, and longest (55 pages), chapter gives examples of applications of the technique to specific analytical problems. The number of examples is large and quite complete, recipe-type instructions are given for column packings and other experimental conditions for many of the separations. All such material appears to be taken directly from the references.

Appendix I comprises 25 pages of tabulated values of relative retention volumes and selectivity coefficients (see below) for various column liquids and sample components. For the more common combinations relative retention volumes are given at two temperatures. A more extensive tabulation of the effect of temperature would be useful. A second appendix, of 20 pages, gives detailed instructions for the construction of filament type katharometers and less complete outlines of the construction and operation of other detectors.

The selectivity coefficient referred to above seeks to give a quantitative measure of the selectivity of a given column in the separation of a pair of substances of differing chemical structure. It is a property of the nature of the stationary phase only (and its temperature, see below) for a given pair of substances. This coefficient, σ, is defined as the ratio of the retention volume (absolute or relative to some standard substance) of some member of a homologous series on a given column liquid to that (referred to the same standard if relative values are used) of some, usually hypothetical, member of some other series which has an identical boiling point; σ is usually evaluated graphically (page 21). Rather useful conclusions are reached on this basis. For example, a non-polar stationary phase sometimes effects a better separation of a sample containing two polar substances of different types than does a polar column liquid.

To this reviewer, the definition of σ appears to be ambiguously stated both in the book and in reference 21 ("in press" at the time the book was printed; presumably *Angew. Chem.*, **71**, 299 (1959)). The column temperature at which retention volumes are taken for the calculation of σ are not specified (in fact it is not specified that the column temperature should be constant for all values required in the calculation). Hence it is not clear whether the "temperature dependence" of σ is a function of the "identical boiling point" chosen for its definition (as it must be for the data shown in figure 8b) or of the column temperature used to obtain the data for its estimation. The concept seems worthy of a more precise treatment; certainly the tabulated values appear to be useful.

To the uninitiated this book gives a more direct route, in German, to a working knowledge of an extremely useful analytical technique than could be obtained by reading the 302 references. The tabulated data in the appendix are sufficiently extensive to suggest that this book also has a place on the shelf of those well acquainted with gas chromatography.

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Researches in Geochemistry. Edited by PHILIP HAUGE ABELSON, Director, Geophysical Laboratory, Carnegie Institution of Washington. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1959. x + 511 pp. 15.5 × 23.5 cm. Price, $11.00.

Professor Robert M. Garrels in his contribution to this book suggests that "The major aim of geology is to recreate the environments of the past." Although such a statement may appear quite restrictive, it nevertheless defines the role of the chemist in earth science studies. The geochemist seeks a description of the conditions, whether equilibrium or not, under which the solids, liquids and gases of the earth have interacted, as well as a balance sheet of the distribution of the elements and their isotopes among the various earth's components.

This book resulted from a seminar series in geochemistry held at the Geophysical Laboratory of the Carnegie Institution of Washington and at the Johns Hopkins University during 1957–1958. Twenty-three contributions emphasize the broad spectrum of geochemical investigations, a spectrum that closely parallels that of chemistry. The applications of such a wide range of chemical disciplines, including solid state, isotopic, organic, inorganic, thermodynamic and kinetic, to natural processes does not permit an adequate review by a single person. At least, however, the directions in which geochemistry is making significant advances can be pointed out from this book, which in a way is a status report.

The accomplishments of geochronologies based upon the decay of natural radioactive species in nature are reviewed in a general article by Tilton and Davis and in more specific coverages of C^{14} by de Vries and H^3 by Libby. The three articles elaborate upon the limitations inherent in the methods as well as promising extensions into geologic domains at present devoid of measurable time parameters.

Invigorating sections of the volume are concerned with the chemistry of the solid state, especially those heterogeneous and homogeneous equilibrium relations among minerals. The carbonate (Goldsmith) and sulfide (Kullerud) phase relationships of the laboratory are extended to interpret the equilibrium (or non-equilibrium) conditions in nature, as functions of temperature. The equations of state of minerals (Clark) subjected to the high pressures encountered beneath the earth's crust, approached either from thermodynamic or statistical mechanical models, provide a point of entry into the structure of the earth's interior. Coupling such information to studies of meteorite composition has led MacDonald, in his section, to propose the earth may have a composition similar to that of chondritic meteorites. The more sophisticated problems of order–disorder relations in crystals provide both an irritation and a stimulation to petrological investigations (Chayes), but the very existence of inhomogeneities may well solve as many old problems as the new ones introduced.

The processes causing the fractionation of the stable isotopes of oxygen and sulfur are treated by Epstein and Ault, respectively. The tremendous power of isotopic variations in unraveling both biochemical and inorganic chemistries in nature is considered thoughtfully with an abundance of examples in igneous and metamorphic petrology, hydrology, paleontology, vulcanology and sedimentation.

A fair portion of the book is centered about sedimentation processes; two articles in particular are impressive. Arrhenius utilizes the minerals accumulating on the ocean floor in studying both global and regional events during the geological history of the earth. Milton and Eugster direct their attention to the general geological conditions during the Eocene in the Green River basin where a large and unique group of mineral assemblages were laid down. Phase rule considerations quite adequately interpret the sediment types and associations.

The ever increasing number of domains into which the geochemists penetrate can be readily established by briefly noting some of the remaining chapters: low temperature and pressure kinetics (Garrels); organic geochemistry (Abelson); petroleum genesis (Hanson); equilibrium compositions of magmatic gas phases (Krauskopf); ore deposition (Barton); hydrothermal investigations of amphiboles (Boyd); and reduction and oxidation processes in metamorphism (Eugster).

Careful editing has given a strong coherence to the widely ranging chapters. The book lacks an index, which is sorely needed. It is difficult to conceive of a geochemist who would not find several of the chapters pertinent to his activities, for the mainstream of geochemical research has been well recorded by the book's distinguished authors.

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