Methods and Techniques

New Biochemical Separations. A. T. James and L. J. Morris, Eds. Van Nostrand, New York, 1964. ix + 424 pp. Illus. $12.50.

Most biochemists are now well aware of the value to their research work of efficient separation methods, and they are often quite ready to discard established procedures for better ones. However, many of us are either unable or unwilling to keep abreast of the large volume of pertinent literature in this field. Review articles serve to bring us up to date, and *New Biochemical Separations* represents a collection of such reviews.

The value of this collection lies in the quality of the contributors, who are, in general, very competent research workers and experienced authors. The book contains review articles on gas-liquid chromatography of radioactive compounds (by A. T. James), of steroids, alkaloids, and sugars (by E. C. Horning and W. J. A. VandenHeuvel), of coenzyme A esters (by M. G. Horning), of bile acids (by J. Sjövall), and of amino acids (by A. Karmen and H. A. Saroff); on gel filtration of proteins, peptides, and amino acids (by B. Gelotte) and of polysaccharides (by K. Granath); on thin-layer chromatography of protein hydrolyzates and amino acids (by M. Brenner, A. Niederwieser, and G. Pataki), of steroids (by R. Tschesche, G. Wulff, and K. H. Richert), of triterpenoids (by R. Tschesche, I. Duphorn, and G. Snatzke), and of bile acids (by A. F. Hofmann); on the separation of plant phospholipids and glycolipids (by B. W. Nichols), of lipids by counter-current distribution (by F. D. Collins), and by chromatography on silicic acid-impregnated paper (by G. V. Marinetti); on the chromatography of alkaloids (by D. Waldi); and on the use of impregnated adsorbents (by L. J. Morris) and of hydroxyapatite in thin-layer chromatography (by A. F. Hofmann).

Each chapter contains a list of references, some of which are as recent as 1964. The editorial work (by A. T. James and L. J. Morris), the translations (by E. L. Short), and the printing and binding are of the highest caliber. The book is profusely illustrated and thoroughly indexed. My only criticism is that the editors have not presented an organized and comprehensive picture of a given type of separation method or of a given class of substances. Although they have made some attempt at unification by occasionally referring to other chapters, the book is no more than a collection of good review articles. Any biochemist who wishes to try one of the applications treated in the volume will be well advised to consult the pertinent chapter, for he will find explicit experimental details and gain valuable insights from the experiences of its authors. However, it is difficult for me to see much value in this book for "students whose courses of study (all too infrequently alas) cover modern separation techniques," as the editors suggest.

ERICH HEFTMANN
Division of Biology,
California Institute of Technology

Surface Chemistry

On Physical Adsorption. Sydney Ross and James P. Olivier. Interscience (Wiley), New York, 1964. xxvi + 401 pp. Illus. $15.

The stepwise isotherms for argon and krypton on graphitized carbon blacks, which were reported about 10 years ago, convinced even its most loyal supporters of the inadequacies of the Brunauer-Emmett-Teller model of physical adsorption. G. D. Halsey, Jr., and others had previously stated that stepwise isotherms should be expected for surfaces with uniform adsorptive potentials; the usual isotherms without steps are the result of surfaces with a wide distribution of adsorptive energies.

On Physical Adsorption summarizes the research conducted during the last decade by Ross and his co-workers at Rensselaer Polytechnic Institute, and carries the work of J. H. DeBoer, T. L. Hill, and G. D. Halsey, Jr., to a logical conclusion. The book is concerned primarily with the effect of heterogeneity on the first adsorbed layer.

In the first chapter the authors introduce general concepts of adsorption and mobile and localized adsorbed layers and show that the equations for adsorption isotherms may be expressed by a term K, which is independent of surface coverage, times a second term that is a function of coverage. Chapter 2 contains a very useful account of methods for determining adsorption isotherms and heats of adsorption, and chapter 3 a careful definition of the different heats of adsorption.

The development of the theme of the book begins in earnest in the fourth chapter. Complications of the adsorption process by heterogeneity are introduced, and the authors demonstrate that useful analytic determinations of the distribution of adsorptive potentials can not be obtained. On this basis, the distribution of adsorptive potentials is approximated by a Gaussian function, and model isotherms are computed (and, in an appendix, tabulated for mobile adsorbed layers) for a wide range of adsorption and distribution parameters. The experimental isotherm is matched to one of the calculated curves. From the parameters of the model isotherms, experimental isotherms, varying from conventional to stepwise types, can be predicted accurately at several temperatures, and heat of adsorption data can be calculated precisely. The monolayer capacity, usually slightly larger than V_m or point B values, is also obtained, and reasonable values for kinetic-molecular behavior of the adsorbate can be calculated. For all of the data considered, the mobile-layer rather than the localized-layer model provided a more consistent interpretation. The Gaussian distribution hypothesis is not adequate for all adsorbents; however, these exceptions can usually be resolved as a composite of two Gaussian distributions.

The authors are fully aware of the limitations and hazards of curve matching, especially for adsorption data where the shape of the isotherm and its changes with temperature contain only limited diagnostically valuable information. The present approach derives about as much information as can be obtained from the isotherm and its temperature dependence. Independent methods for determining the nature of the adsorbed molecule are needed. On the practical side, Ross and Olivier's procedures provide a means of characterizing surfaces with respect to surface area and the distribution of adsorptive potentials.

On Physical Adsorption is highly recommended to the serious student of surface chemistry.

ROBERT B. ANDERSON
Pittsburgh Coal Research Center,
Bureau of Mines,
U.S. Department of the Interior,
Pittsburgh, Pennsylvania