contributions to, the theory of adjustment of observations and of statistical inference, and it might have been well to take a quick look at this substantially developed field. Most of Wilks' discussion deals with the problems of precision, sampling, randomization, and the analysis of variance, as applied to chemical analysis or size distributions.

The longest chapter (58 pages), "Biologic problems relating to the composition and diagenesis of sediments," is by Heinz A. Lowenstam. The emphasis is on the chemical and mineralogical composition of marine organisms, as originally deposited and as transformed by later reactions. A large amount of information is presented, clearly of great importance for the history of the oceans and for the interpretation of the sedimentary record. It appears, however, that the large amount of work so far accomplished has chiefly served to unsettle the views of the past, without as yet leading to a satisfactory new synthesis.

FRANCIS BIRCH
Department of Geological Sciences, Harvard University

Methods and Techniques

Treatise on Analytical Chemistry. I. M. Kolthoff and Philip J. Elving, Eds. pt. 1, *Theory and Practice*: vol. 4, sect. D-1, *Magnetic Field Methods of Analysis*; sect. D-2, *Electrical Methods of Analysis.* Charles N. Reilley and others. Interscience (Wiley), New York, 1963. xxvi + 955 pp. Illus. $25.

Modern analytical chemistry is a field in the process of rapid development and expansion. To answer the needs of organic chemists, biochemists, biologists, and others who must apply analytical techniques and keep informed of developments in this field, several series—including one devoted to organic analysis, one on physical methods of analysis, and two treatises on analytical chemistry—are being published, and a very extensive handbook on analytical methods has just appeared. The aim of the treatise that includes the volume under review is "to present a concise, critical, comprehensive and systematic, but not exhaustive, treatment" of analytical chemistry. Few editors would embark on such an undertaking, and only those with the qualifications of Kolthoff and Elving, and their assistants, could be so successful.

This volume is the fourth of part 1, which deals with the theoretical principles and techniques of various analytical methods (part 2, an element-by-element survey of analytical methods, is being published simultaneously). In volume 4 (of part 1) magnetic field methods, including magnetic susceptibility measurements, magnetic resonance methods, mass spectrometry, and ion-scattering methods, are discussed in the first third of the book, and a review of electrical methods of analysis, including potentiometry, polarography, voltammetry, chronopotentiometry, coulometric methods, conductometry, and oscillometry, occupies the remainder. The chapters are uniformly good, and all of the authors are acknowledged authorities in their respective fields. Each chapter presents a clear description of the method under consideration, starting with elementary principles and leading up to the current status of the technique; complete references to the literature are given for those seeking more details. The content of every chapter is excellent, but a few deserve special mention. The two introductory chapters on electrochemical methods, by Reilley and Murray, who also served as editorial assistants for this volume, provide an excellent overall survey, classification, and correlation of these techniques. The chapters by Adams (on voltammetry at electrodes with fixed surfaces) and Shain (on stripping analysis) contain much material not previously reviewed. The lack of any extensive discussion of alternating current and square wave polarography, cyclic voltammetry, rotating disk electrodes, and adsorption and double layer effects in electrode reactions was my only disappointment with the editorial content of this volume, and this may be only a reflection of the time lag between submission of the individual chapters and eventual publication.

A few editorial policies deserve comment. If this volume had been divided into two separate ones, the part on electrical methods would have made an excellent textbook for a course in modern electroanalytical chemistry. But it is hard to ask a student to pay $25 for the present volume and then inform him that somewhat more than one-third of the text will not be used in the course. I still prefer to have the references placed at the bottom of the page, within the text, rather than at the end of the chapter. It is frustrating, especially when reading review chapters such as these, to hunt continually for references at the end of the chapter to determine whether (21) represents a new article or just a well-known monograph. The index, something lacking in previous volumes in this series, is especially welcome. All in all, while there has not been a deficiency of good books about these methods, this volume, as part of a treatise, does represent a good introduction to this portion of modern analytical chemistry.

ALLEN J. BARD
Department of Chemistry, University of Texas, Austin

Techniques and Applications

Thin-Layer Chromatography. James M. Bobbitt. Chapman and Hall, London; Reinhold, New York, 1963. xii + 208 pp. Illus. $8.50.

Thin-Layer Chromatography. Kurt Randerath. Translated by D. D. Libman. Verlag Chemie, Weinheim, Germany; Academic Press, New York, 1963. xiv + 250 pp. Illus. $8.

Both of these books emphasize the practical aspects of thin-layer chromatography, and to that extent they cover largely the same material. Thus, in each case, absorbants, layer preparation, sample application, development, and visualization are discussed. In addition, quantitative and preparative thin-layer chromatography are considered. In both books such general descriptions of techniques are followed by more or less detailed treatments of specific applications.

The appearance of such similar books at almost the same time invites comparison. Bobbitt, in general, employs an informal, almost conversational style. Randerath, on the other hand, makes use of a more conventional textbook style. The two books are actually very similar with respect to general arrangement and subject matter. Randerath employs running references at the bottom of each page,

while Bobbitt provides an alphabetical list of references at the end of the text. I find the running reference style more convenient in reading.

Bobbitt's discussion of preparative techniques and the transfer of thin-layer experience to columns is much like Randerath's, except that Bobbitt interjects many details that are suggestive of personal experience. Randerath seems to be quoting the literature, while Bobbitt seems to be relating his own observations. Randerath discusses, in a descriptive way, the theory of thin-layer chromatography, while Bobbitt does not.

On the other hand, Randerath contributes personal experience by devoting almost ten pages to a description of the techniques and applications of ion exchange thin-layer chromatography, while Bobbitt does little more than mention this subject. Randerath's discussion covers the separation of purines, pyrimidines, and nucleotides and includes a treatment of the quantitative determination of the latter. He also describes the available ion exchange cellulosic materials and certain important details of their preparation.

In discussing means of visualizing spots on thin-layer chromatograms, Bobbitt very effectively employs a comprehensive table and thereby compresses a large amount of information into a small space. By contrast, Randerath's descriptive treatment of this material must be considered fragmentary.

The contrasting ways in which Randerath makes use of description and Bobbitt of tables are most clearly shown in the large sections devoted to specific applications. Bobbitt employs a series of tables, including references. Randerath, on the other hand, following headings similar to Bobbitt's, employs a descriptive technique that often provides more information but necessarily does not cover as much ground. Both methods have their advantages. The tabular method gets a vast amount of information into a small space, but it suffers from the limited space available for headings. For example, Bobbitt's table on steroids includes several categories called "Miscellaneous steroids," which leave the reader with an excessively large number of suggestive references. Randerath, on the other hand, does not cover quite as much material but does manage to discuss selected aspects in greater detail. Clearly both approaches have their advantages, and for this reason these books supplement rather than duplicate each other in their treatment of specific applications of thin-layer chromatography.

The timing of these books is very good. Much detailed information has accumulated, and most important classes of compounds and materials have been investigated. Novel techniques will be introduced and new systems studied, but both of these books are essentially up to date and reasonably comprehensive.

WILLIAM A. STRUCK
Upjohn Company,
Kalamazoo, Michigan

Mathematics

Elementary Theory of Analytic Functions of One or Several Complex Variables. Henri Cartan. Translated from the French edition. Hermann, Paris; Addison-Wesley, Reading, Mass., 1963. 228 pp. Illus. $10.75.

This is a very attractive book for mathematicians, especially for those who are sympathetic with Bourbaki and familiar with his terminology. It presents the essentials of its topic elegantly, accurately, and concisely, using modern ideas and methods very effectively. It is not, at least at present, for the casual reader who wants to look up a reference or refresh his memory. The subject matter is standard—how could it be otherwise!—but the words are unfamiliar, and no concessions are made to the uninitiated. In many cases the new terminology is really justified, since it lets a result appear as simply a special case of a familiar theorem in, say, general topology or algebra; in other cases there seems to be no obvious reason for the change. The subject is treated almost entirely as an end in itself; there are no indications that it can be used outside of pure mathematics and hardly any that it can be used anywhere else in pure mathematics.

Whereas most introductory texts begin with differentiable (holomorphic) functions, Cartan approaches the subject via power series: first he does everything possible with formal power series, then fixes attention on the convergent ones. Integrals come next. The index of a closed path with respect to a point is first defined by integration; this allows the author to handle the topological problems easily before he comes to Cauchy's theorem. Next come analytic functions in more than one variable (unusual material for an introductory text) done very briefly, the author's intention being to illuminate the theory of harmonic functions and to prepare the necessary material for discussing analytic differential equations. After this we meet sequences of analytic functions and conformal mapping. The proof of the "Riemann mapping theorem" (a phrase not used in the book) is remarkably concise and transparent. Riemann surfaces are introduced via one-dimensional abstract complex manifolds (these are Riemann surfaces in the classical sense); Cartan prefers to save the name "Riemann surface" for a complex manifold endowed with a holomorphic mapping. Next we have an accurate discussion of analytic continuation, which would hardly be possible in a more conventional text. The book ends with proofs of the existence and fundamental properties of analytic solutions of analytic differential equations.

R. P. BOAS, JR.
Department of Mathematics,
Northwestern University

The Chemistry of Carbenes

Divalent Carbon. Jack Hine. Ronald, New York, 1964. vi + 206 pp. Illus. $7.

This book is written in the well-known style of its author, Jack Hine, a pioneer in the chemistry of carbenes. It is divided into eight chapters, arranged in a logical order; the chapters begin with the simplest carbene, methylene, and proceed, with discussion of the more complex methylenes, in a way that is easy to follow.

Hine, who is primarily a physical organic chemist, places more emphasis on reaction mechanisms and pays less attention to the usefulness of methylenes in chemical synthesis. He also points out some of the unsolved problems of carbene chemistry and suggests how they can be solved, thus making the book useful to the researcher.

Although the author states in the preface that he includes "all the relevant literature available" to him by July 1962, several works are omitted.