knowledge of these objects. The study of cosmic dust, for instance, is attracting special attention in the present space age. Though not differentiated by Hawkins, cosmic dust consists of particles generally smaller than micrometeorites, as defined by the International Astronomical Union, and an understanding of the identification and analysis of cosmic dust demands some astronomical knowledge of the nature, composition, and motion of interplanetary bodies.

One feature would have increased the value of this little book enormously —a bibliography to help the student who wants to investigate further many of the original discoveries and theories. However, the 27 problems, with some answers, will satisfy many students.

The layman will probably be satisfied by the book in its present compact form. Meteors, comets, meteorites, and micrometeorites will soon be of even more intense interest to all, since these interplanetary bodies, in one form or another, visit the Earth from the realm into which man himself will soon venture.

FRANCES W. WRIGHT
Smithsonian Astrophysical Observatory, Harvard College Observatory, Cambridge, Massachusetts

Mineral Resources

Les Péridotites Serpentinisées en France. Groupe 1, *Péridotites Intracristallines.* pt. 4, *Massif Central Médian: Bassin du Haut-Allier.* F. H. Forestier. Bureau de Recherches Géologiques et Minières, Paris, 1964. 291 pp. Illus. Map.

As part of its broad mineral program in France, the Bureau de Recherches Géologiques et Minières is publishing three series ("suites"), on mineral resources, hydrogeology, and serpentinized peridotites, respectively. Reports on fluorspar and barite have been published. The present paper is one of a series of 12 loose-leaf reports that supplement the author's general review *Les Péridotites Serpentinisées en France* (1962). Ten of the reports are concerned with pre-Hercynian peridotites by districts; one is concerned with Hercynian peridotites of the Massif Central, and one with the "alpine" (Mesozoic and Tertiary) peridotites. Forestier believes, despite recognized objections, that the ultramafites were emplaced as fluid magma, possibly as submarine (ophiolite) flows, before the principal regional metamorphism of their country rocks, and that they were serpentinized at various times.

Fascicule 4, "Massif Central Médian: Bassin du Haut-Allier," is the first of the series on pre-Hercynian peridotites to be published. It describes 83 peridotite occurrences which are indexed by number on a geologic map at 1:300,000 scale and which appear to be closely associated with pyroxenites and amphibolites. Each occurrence is systematically treated under 16 headings that range from name, location, form, and size to nature of the original peridotite, degree of serpentinization and kind of serpentine (antigorite or chrysotile), atmospheric alteration, contact relations with country rocks, acid dikes and features related to them, previous descriptions, and dates of the author's visits. In essence the descriptions are detailed field notes that are illustrated by numerous sketches and sketch maps, and laboratory notes that include thin-section descriptions and a few chemical analyses. Many of the descriptions of mineralogy and rock relations are excellent and would apply equally well to ultramafites in the gneissic terrain of our southern Appalachian region.

The format and scope of the series evoke a mixed response. The loose-leaf format must be expensive; it has the usual drawbacks of large bulk and pages that tear loose, although good paper is used; and it is designed primarily for someone working in the field in France. The method of presentation, although effective for scattered small bodies, is not suitable for complex masses more than a few tens or hundreds of feet across. The descriptions are quite repetitious because most of the masses are small and very similar, and they do not seem to have the economic purpose that justifies the descriptions of individual deposits in the barite and fluorspar series. The publication of several hundred more similar descriptions will have limited scientific value; I hope that the series will also include modern large-scale maps which show the detailed structure and lithology of some larger and less fragmented Hercynian and "alpine" peridotites.

T. P. THAYER
U.S. Geological Survey, Washington, D.C.

Mathematics

A Textbook on Analytical Geometry. Joseph S. Mamelak. Pergamon, London; Macmillan, New York, 1964. viii + 247 pp. Illus. $6.

At a time when combined analytic geometry and calculus courses are much in vogue and when much effort has been turned toward producing elementary mathematics books that are reasonably sound, a book such as this is something of a novelty. It covers the usual topics associated with older books of similar titles, in much the same way, although there is some attempt to introduce significant geometric exercises with physical and engineering overtones.

In general there is no attempt to be rigorous despite the publisher's claim that "new concepts are developed in a rigorous manner." A typical beginning is "choose a straight line which extends indefinitely in both directions." Such words as infinite, direction, and extension are carelessly used. The popular phrases "draw a line" and "a point which moves" are used extensively. One exercise begins as follows: "A basic assumption of synthetic geometry is: figures can be moved in the plane without changing their form."

It is doubtful that the intended users, students of engineering and science, will profit much mathematically from exposure to a geometry course based on this book.

EDWIN HALFAR
Department of Mathematics, University of Nebraska

Laboratory Procedures

Theory and Practice in Experimental Bacteriology. G. G. Meynell and Elinor Meynell. Cambridge University Press, New York, 1965. xii + 274 pp. Illus.

This book of laboratory procedures is divided into seven chapters. The first, "Measurement of bacterial mass and number," includes plating, turbidometric, and chemical methods, with a rather detailed discussion of growth rates. The second chapter, on media, contains a discussion of the inhibitory factors sometimes found in media, as well as consideration of the usual topics. Methods of oxygenation, meth-

ods of providing carbon dioxide, and anaerobic methods are covered in the third chapter. The fourth (on sterilization) and fifth (on microscopic methods) contain considerable discussion that is usually omitted from general laboratory books. Chapter 6, on quantitative aspects (80 pages), covers the statistics of error estimation and experiment design. The last, and very short, chapter provides short descriptions of stock-culture methods, phage techniques, ultraviolet irradiation, centrifugal methods, and buffers, but the descriptions cannot be really useful because so little information is presented.

The methods described are those that are familiar to most workers in microbiological laboratories, and although the section on statistics is somewhat longer than most, the information is very similar to that contained in many laboratory manuals for beginning courses in these fields (without the laboratory experiments, of course). The methods more closely related to biochemistry, which are now widely used in microbiological laboratories (chromatography, isotopes, and the like), are not considered, and while calculation of the curve of dose-response is much discussed, there is little mention of animal assay and its attendant techniques and problems. Thus, this is an updated version of older manuals on procedure, but there is place for such volumes, particularly now that the older manuals are increasingly difficult to obtain.

W. W. UMBREIT
Department of Bacteriology,
Rutgers University

Physics

Electromagnetic Fields and Interactions. vols. 1 and 2. Richard Becker. Fritz Sauter, Ed. vol. 1, *Electromagnetic Theory and Relativity* (xiv + 439 pp.); vol. 2, *Quantum Theory of Atoms and Radiation* (x + 403 pp.). Translated from the German edition by A. W. Knudsen and Ivor de Teissier. Revised by Günther Leibfried and Wilhelm Brenig. Blaisdell (Ginn), New York, 1964. Illus. $9.50 each.

The translation into English of these very successful German textbooks provides a most welcome addition to the literature available for advanced undergraduate and beginning graduate classes. The volumes will be particularly appreciated by those students and teachers who are concerned with emphasizing physical principles rather than the formal problem-solving techniques of applied mathematics.

Volume 1 is devoted to classical macroscopic electromagnetic theory and the special theory of relativity. It replaces the well-known *Classical Theory of Electricity and Magnetism*, by Abraham and Becker, published in English in 1930. The text is developed with CGS units, but the more important formulas are transcribed to MKSA (Giorgi) units for those who perfer them. An appendix gives a useful collection of formulas in both systems together with a conversion table.

The choice of material is standard, but the arrangement is more for the discussion of the physical principles of electromagnetic theory than for the solution of boundary-value problems. A special chapter is devoted to the electrodynamics of slowly-moving media, leading up to the relativistic formulation given by Minkowski. Although in American universities the latter theory is usually considered expendable, it may prove to be of particular interest to students interested in plasma and space physics. I would only question the retention of the Minkowski notation for "imaginary time." This terminological monstrosity should be consigned to a well-deserved oblivion.

A collection of exercises (with solutions) covering the whole volume is given in an appendix.

Volume 2, which presents a treatment of quantum mechanics and radiation theory, is complete in itself and can be used as a text independently of the first volume. The subject matter is largely that of standard wave mechanics, but it has a scope and emphasis that set it apart from the usual textbook fare. This arises from the emphasis placed on the theory of dispersion, no doubt reflecting Becker's long interest in this field. Historically this was the line of thought that led to matrix mechanics and the concept of virtual oscillators. The student thus is introduced to some important ideas concerning f-values of spectral lines and their connection with the Einstein coefficients which often are omitted in texts.

The discussion is carried through a short study of the second quantization procedure for Maxwell's equations and an introduction to the Dirac equation, with particular relation to the problem of spin. In this volume the exercises are placed at the end of the chapters, with solutions in an appendix.

Volume 3 will be devoted to electrical and magnetic phenomena in material media.

I would recommend these volumes to both teachers and students for class use. To the latter I would also recommend them for independent study, because they have few competitors in which the material is so readily accessible.

E. L. HILL
School of Physics,
University of Minnesota

Statistics

Introduction to Probability and Statistics. Henry L. Alder and Edward B. Roessler. Freeman, San Francisco, Calif., ed. 3, 1964. xiv + 313 pp. Illus. $6.

This book was written to serve as a text for a one-semester course in probability and statistics for students in all areas of the natural and social sciences; it requires mathematical knowledge equivalent to 2 years of high school algebra. "The limited level of mathematical preparation required for this book makes it necessary to state some theorems without proof. . . . To avoid mathematical difficulties associated with limiting processes, . . . discussions have been restricted, whenever possible, to the finite case; in particular, all populations are assumed to be finite."

The topics are those usually covered in books written at this level: organization and analysis of data, elementary probability, the binomial, normal, t, F, and χ^2 distributions, sampling, testing hypotheses, regression and correlation, and analysis of variance (one-way classification). In addition, the authors have included a chapter on index numbers and one on time series. The appendix contains a reading list of 21 books, nine tables, and answers to the odd numbered problems.

The major changes since the first edition are the addition to the second edition of material on the F-distribution and analysis of variance and the inclusion, in the third edition, of the Wilcoxon two-sample tests for paired and unpaired data and a section on transformations.