Book Reviews

Two Approaches to Mathematics

University Mathematics. vols. 1 and 2. Jack R. Britton, R. Ben Kriegh, and Leon W. Rutland. Freeman, San Francisco, Calif., 1965. vol. 1, xiv + 662 pp., $9.50; vol. 2, xii + 650 pp., $9.50.

An Introduction to Modern Mathematics. Nathan J. Fine. Rand McNally, Chicago, 1965. xviii + 509 pp. Illus. $8.50.

The two books being reviewed were designed for two different sets of readers; as one might expect, there are numerous and considerable differences between them, but the nature of these distinctions is occasionally surprising.

University Mathematics was "written with students in engineering and the sciences in mind" (from the preface) and is intended to provide the basis for the first 2 years of college mathematics for such students. All of the usual analytic geometry-calculus material is here—and then some. The first seven chapters of volume 1 include topics from elementary algebra and trigonometry that are frequently omitted from college courses, whereas the last two chapters of volume 2 are about, respectively, Laplace transforms and probability; and early in volume 2 there appear several chapters on linear algebra with applications to two- and three-dimensional geometry. Vectors are introduced in chapter 4 of volume 1, and several chapters of volume 2 deal with vectors and vector functions.

There are numerous good features. The notation and point of view are up to date, the exposition is straightforward and clear, and the authors have been successful in their attempts to provide a large amount of motivation (see, for example, the discussion of vector product and the preliminary material on the Laplace transform)—frequently a new concept is introduced by means of an example. The use of neighborhoods adds clarity to the treatment of limits. The section on integration by substitution is well done.

There are also some causes for displeasure, mainly lapses of rigor. For example, in chapter 12 of volume 1, after some preliminary discussion about the problem of defining area, area under a curve is simply calculated by an integral without being defined. Similarly, the concept of volume goes undefined. The continuity of a differentiable function is used, without reference, before the statement and proof of this property. In deriving the expression for the derivative of the inverse sine function, it is implicitly assumed that this derivative exists. The definitions of the double and triple integrals are not precise. And the absolute value signs are omitted from the Jacobian in the theorem on page 314 of volume 2.

Clearly, the authors intended to be moderate in their approach to rigor. For example, some of the basic theorems on continuous functions are stated without proof, and so are a number of other theorems throughout the book. In my opinion, the text would be stronger if the fine motivation were accompanied by greater rigor.

Fine's book is of a different breed. It is, to quote from the preface, " . . . for social science and liberal arts students. It is also suitable for advanced high-school students and prospective teachers. . . . For terminal students, the text is designed to give an insight into the nature of mathematics, plus an acquaintance with some of the major achievements in the field." Such a book is one of the most difficult of mathematics books to write: the decisions that have to be made with respect to the topics covered, and the placing of emphases, force the author to commit himself to a small portion of a broad spectrum of tastes and prejudices.

The selection of topics in *Modern Mathematics* is easily within one standard deviation of the mean: logic, sets, axiom systems (concentrating on Boolean algebra, a good choice), the real numbers, linear algebra, analytic geometry, calculus, and probability. The clear, intuitive discussion of logic and sets in the first two chapters is by no means window dressing: the ideas and notation introduced are used heavily throughout the book. The same is true of the use of axiom systems; for example, the first chapter on calculus begins with axioms for a ring of sets and a measure defined thereon.

With regard to emphasis, Fine has taken a firm stand in favor of rigor. He does not talk down to the student, and, except for the chapter on linear algebra, almost all theorems are proven. The novel proof of the integrability of a continuous function has as a by-product the uniform continuity (not mentioned in *University Mathematics*), boundedness, and attainment of maximum of a function continuous on a closed interval. A prominent feature of the view of mathematics that Fine gives his reader is the dependence of mathematics on logic and the precision of language and argument required.

There are, however, some curious omissions, not necessarily dictated by the approach discussed above. In the chapter, "Measure, area, and integration," there is a long, careful discussion of area and measure of area, with theorems on the area of parallelograms and rectangles, as a preliminary to the integral. But after the integral is introduced almost nothing is done about applying it to problems of area or anything else. Instead, a number of abstract properties of the integral are derived. Also, the derivative is introduced in terms of approximating a function at a point; its enormous utility as a measure of instantaneous rate of change is touched on only tangentially.

The authors of *University Mathematics* give the instructor many opportunities to "tighten up" the presentation; Fine has left considerable room for the teacher of his book to add motivation.

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Prehistory

Southwestern Archaeology. John C. McGregor. University of Illinois Press, Urbana, ed. 2, 1965. x + 511 pp. Illus. $9.50.

Southwestern Archaeology is a revised edition of McGregor's 1941 publication of the same title. This is the best available reference book on the

prehistory of the southwestern United States; the illustrations, drawings, maps, and comprehensive bibliographies add to the merits of the work. Because it includes full descriptions of the "cultures" of the Southwest as well as new discoveries and developments, this book will be welcomed by all readers.

The first section deals with methods, techniques, classification, and dating. The remainder of the book is concerned with a chronological and geographical treatment of the appearance and evolution of the various southwestern subcultures through some ten thousand years.

McGregor clearly sets forth his aims, methods, and definitions. Of particular interest are his definitions of *archeology* and *culture*. To him, *archeology* is the interpretation of the interrelationships of three kinds of phenomena: events, time, and space; and *culture* is all the material and nonmaterial traits of the people, or the ideas in the collective mind of the people. Throughout, the emphasis is on converting prehistory to history and placing past events in a chronological order. To perform this task, the archeologist studies "things"—houses, pottery, axes, and projectile points. In essence, the archeologist digs up artifacts, regards them as being comparable and unrelated, and makes up a list of "traits."

Increasingly, archeologists are becoming aware that merely listing culture traits and arranging these in time and space makes little contribution to anthropology and the finding of cultural laws and regularities. We now focus on cultural processes and are bent not only on describing complete fossil cultural systems in time and space but also on explaining change and stability in these systems. Thus, the emphasis is shifting from questions of "where" and "when" to questions of "how" and "why." Artifacts must be regarded as physical manifestations of cultural systems with their distributions at a site being structured (nonrandom) and reflecting patterned behavior and the loci of this behavior. True, we cannot dig up a "social" system, as such. But we can dig up the artifacts that are the physical manifestations of social systems, and, by comparing the differential distributions of the artifacts with the differential distributions of artifacts in extant social systems, explicate the extinct "social" system.

McGregor started work on this revision several years ago. Were he to start now from scratch, I think he would construct a radically different text. As it stands, his book marks the end of an era in archeology, for archeology is in the midst of a scientific revolution. When we go beyond taxonomy and inventories of material traits, then archeology will cease being a "tool-course"—and become anthropology.

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Primates as Experimental Animals

The Baboon in Medical Research. Proceedings of a symposium (San Antonio, Tex.), November 1963. Harold Vagtborg, Ed. Published for the Southwest Foundation for Research and Education by the University of Texas Press, Austin, 1965. xii + 643 pp. Illus. $12.50.

The explosive increase of scientific interest in primates during the past several years has been a wonder to behold. Seven primate centers have been established, the International Primatological Society has been formed, and several new journals have been launched. Sufficient experience is at hand to reveal the characteristic attributes of various primate species, not only as they disport themselves in their native habitat or in semirestricted laboratory conditions but also in the data they provide and in the way they adapt to laboratory investigations of major biomedical problems.

As the various laboratories develop special interests in specific health problems, they tend also to identify a few species that they find especially useful for their work. The roles of the rhesus macaque in polio research and of *Cebus* in nutrition studies are noteworthy. Some laboratories even concentrate on one or, at most, a few closely related species. A notable example of this is the almost exclusive use of baboons at the Southwest Foundation for Research and Education (SFRE) in San Antonio, Texas. This laboratory has pioneered the use of the East African baboon in medical research and has the largest captive colony in existence. The book jacket notes that, with the exception of the great apes and man, baboons are the largest primates both readily available and easily maintainable in captivity. They are used in investigating problems related to heart disease, circulatory troubles, cancer, infectious diseases, and mental health. SFRE believes that baboons should be more widely used.

In the fall of 1963 SFRE sponsored a symposium which it hoped would bring together many scientists who use primates, particularly baboons, and who would summarize the currently available information about baboons. In addition, the Foundation wished to present summaries of the experimental work conducted at, or in collaboration with the scientists on the staff of, SFRE in order to illustrate how the Foundation, through its organizations in San Antonio and near Nairobi, Kenya, could assist scientists who wish to work with the East African baboon.

This book is a summary of the proceedings of the symposium. It presents 46 papers on taxonomy, habitat and ecology, social behavior and maintenance, morphology, physiology, biochemistry, pathology, and experimental medicine. More than half of the studies reported directly involved the participation of either the San Antonio or the Darajani colony of SFRE.

A salient feature of the book is what is doubtless a verbatim account of the discussion that followed the papers. These discussions vary widely in substance, generality, and relevance to the main papers. Some comments are merely questions that seek clarification of a particular detail while others are informal presentations of "a few slides that I happen to have in my pocket."

This is the first of a series of symposia (the next one will be held in early November 1965) and others are scheduled at intervals of two or three years. It is likely that in the future the editor of the proceedings volumes will be somewhat more restrictive about publishing the commentaries in order to tighten the presentation and to assure their generality. He is also likely to be somewhat more persuasive with the authors in an attempt to reduce the time lag between the symposia and the publication of the proceedings.

This volume should be valuable as