Smirnov's Treatise Abridged

Linear Algebra and Group Theory. V. I. Smirnov. Revised, edited, and adapted by Richard A. Silverman. McGraw-Hill, New York, 1961. x + 464 pp. Illus. $12.50.

This book represents a selection of material from V. I. Smirnov's encyclopedic six-volume *Course in Higher Mathematics*. The first part of the book deals with linear equations and determinants and gives a good treatment of simultaneous linear equations using determinants. Part 2 gives a fairly exhaustive treatment of matrix theory, using extensively the results of determinants and linear equations from the first part. The material given includes the reductions to the various canonical forms; eigenvalues; orthogonal, unitary, and Hermitian matrices; covariance, contravariance, and tensor algebra. Numerous applications are discussed, including linear differential equations, Jacobians, and small oscillations.

Part 3 is on group theory and is the most valuable part of the book, for the material in the first two parts is fairly standard and easily available from many sources, while the material on group theory is not readily accessible to the American student. The various notions of group theory are introduced, but the author is primarily interested in the classical groups, particularly the rotation and Lorentz groups. The material includes representations (including the connection of representations of the rotation group with Laplace's equation), infinitesimal transformations, and invariant integration.

The topics chosen for emphasis are those that are of importance in applied mathematics and theoretical physics, and the style is such that the theoretical physicist or engineer will feel at home reading this book. One must also agree with the editor that, despite this, there is nothing in the volume the pure mathematician can ignore.

I do differ with Smirnov in taste about the presentation of linear algebra and matrix theory: The author, like most Russian textbook writers, prefers a treatment that is very concrete and computational, intimately bound up with coordinates and making intensive use of determinants. The linear algebra and geometric interpretations seem to come in by the side door, and the reader must look to other books for the chaste elegance of the abstract approach to linear algebra with its geometric flavor and largely coordinate-free treatment. It is possible to overdo the abstract approach, however, and Smirnov's handling of tensor algebra is refreshingly simple.

Silverman is to be congratulated not only for the smoothly reading translation but also for the exercises he and a number of collaborators have collected and constructed for the English edition of this volume. They are excellent and range from elementary ones that illustrate points in the text to sophisticated ones that explore areas beyond those considered in the text.

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To the Western Sea

The Natural History of the Lewis and Clark Expedition. Raymond Darwin Burroughs, Ed. Michigan State University Press, East Lansing, 1961. xii + 340 pp. $7.50.

Lewis and Clark's contribution to American natural history, judged "slight" by some commentators, in the words of Elliott Coues brought about our "first acquaintance with a large number of species." No experienced scientist was attached to the expedition, but Lewis exerted himself in observing and collecting natural history objects. The loss of some collections during the journey and the subsequent destruction of others (in P. T. Barnum's museum! and elsewhere) can only be regretted. In this volume Burroughs has prepared a card catalog in book form of the vertebrate populations encountered, from bears and buffaloes down to *Bufo*. The Lewis and Clark *zoological* record (the "natural history" of the book's title is blind in its botanical eye) is listed chronologically, with each quotation geographically localized for each species. These quotations are laced together with Burrough's commentary and with useful reports from explorers of the period: Bradbury (but not Nuttall), Prince Maximilian—consistently misspelled—and Townsend (but not James, or Say, or Drummond via Richardson). Burroughs also provides a 50-page introduction which amounts to a condensed diary of the expedition; a quantitative summary of the "game killed"; appendixes of archival materials relating to the expedition; chapter notes; and an index. It is unfortunate that the vernacular names used by Lewis and Clark, such as lark-woodpecker, are not indexed. Warning: parentheses replace square brackets in quotations from Thwaites and others. Many notable zoological studies—for example, Harry Harris's work on the California condor and Samuel Rhoads's annotated edition of Ord's *North American Zoology*—have been overlooked.

The crowded stage of natural history in Jeffersonian America, now reasonably well documented, is only partially unfolded in this book. There were Lewis's death, General Clark's involvement in Missouri Territory, the bankruptcy of the Philadelphia bookseller, and Professor Barton's procrastination. Jefferson's frustration over the delayed publication of the expedition's scientific results was matched only by the public's clamor to learn of the discoveries. Meanwhile, Alexander Wilson published the "new" birds and Rafinesque described three mammals without benefit of specimens. Professional conflicts broke out between George Ord and Richard Harlan, and veiled silence separated Harlan and Godman. Aside from incidental mention, Barton, Godman, Harlan, Ord, and Rafinesque are hardly noticed, though they were all players filling key roles in the thrilling drama of Lewis and Clark's crossing to the Western Sea.

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Interdisciplinary Approach

Interfacial Phenomena. J. T. Davies and E. K. Rideal. Academic Press, New York, 1961. xiii + 474 pp. Illus. $14.

This is a well-written monograph, which presents a modern treatment of a fairly wide range of phenomena associated with interfaces of interest to chemists, chemical engineers, physicists, and biologists. It is organized in the form of eight rather long chapters entitled "The physics of surfaces"; "Electrostatic phenomena"; "Electrokinetic phenomena"; "Adsorption at