

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 Burroughs'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

liquid surfaces"; "Properties of monolayers"; "Reactions at liquid interfaces"; "Diffusion through interfaces"; and "Disperse systems and adhesion." As might be anticipated from authors who are well known for their outstanding work in colloid and surface chemistry, the material is soundly developed and written with authority, and the literature is well covered. The book, moreover, is unusually good as monographs in colloid chemistry go, in that the authors have taken pains to provide a fuller thermodynamic treatment than is commonly given.

Biologists and biophysicists will find much to interest them in chapters 4, 5, 6, and 7, which deal with phenomena that are characteristic of many biological systems, particularly of those in which diffusion across interfaces is important. Chemical engineers will find much that is of value in the chapters dealing with electrical effects, aerosols, emulsions, foaming, and friction.

References to the literature are collected at the end of each chapter, and the indexing is of a high quality. The line drawings used as illustrations are clean and attractive, but there are a few half-tones that leave something to be desired in crispness. I do not know whether this is due to the method of reproduction or to the quality of the original photographs.

The price of the book, \$14, is certainly high; regrettably, this is characteristic of most monographs these days. Despite its price I strongly recommend it to those readers who are interested in surface chemistry.

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Miscellaneous Publications

(Inquiries concerning these publications should be addressed, not to Science, but to the publisher or agency sponsoring the publication.)

Australia. Commonwealth Scientific and Industrial Research Organization. **Bulletin**, No. 283, "The ecosystem of the coastal lowlands ("Wallum") of southern Queensland," J. E. Coaldrake, 148 pp., map. **Research Review** (for the year ending 30 June 1960), 418 pp. CSIRO, Melbourne, 1961.

Belgium. Institut Royal Météorologique **Publications**, Series B, No. 33, "Un Hygromètre de grande sensibilité," S. de Backer. The Institute, Brussels, 1961. 10 pp.

Canada. Dominion Observatories, Victoria. **Publications of the Dominion Astrophysical Observatory**, vol. 11, No. 16, "Curve of growth of C_2 absorption bands applied to the problem of the C^{12}/C^{13}

abundance ratio," John L. Climenhaga, pp. 307-337, \$0.25; No. 17, "The light-ratio and secondary spectrum of the eclipsing binary zeta *Aurigae*," E. K. Lee and K. O. Wright, pp. 339-351; No. 18, "Some spectroscopic observations of the supergiants 67 *Ophiuchi*, 55 *Cygni* and x^2 *Orionis*," Anne B. Underhill, pp. 353-361. Department of Mines and Technical Surveys, Ottawa, Canada, 1960.

Canada, National Research Council and Medical Research Council. NRC No. 6390. **Report on University Support, 1960-61**. Natl. Research Council, Ottawa, Canada, 1961. 123 pp. \$0.50. Total research support by the councils at Canadian universities, \$10,477,031 (an increase of \$1.11 million over the previous year); direct support for science and engineering, \$7,169,402 (82 percent for research grants to approximately 800 university staff members and the remainder for more than 800 graduate scholarships and fellowships. Medical research awards totaled \$2,307,467 (300 research grants and support of 52 medical research fellows and 20 research associates). Indirect support (publication of scientific journals, contributions to scientific organizations and conferences, and administration of the program), \$1,000,162.

Department of Scientific and Industrial Research, National Chemical Laboratory. **Report, 1960**. Her Majesty's Stationery Office, London, 1961 (order from British Information Service, New York). 70 pp. \$0.85.

Geological Survey Bulletin, No. 1032-F, "Petrograph and origin of xenotime and monazite concentrations, Central City district, Colorado," E. J. Young and P. K. Sims, pp. 273-299, 1961, \$0.20. No. 1071-I, "Surficial geology of the Kingston quadrangle, Rhode Island," Clifford A. Kaye, pp. 341-396 + maps, 1960. No. 1081-D, "Stratigraphy and structure of the House Rock Valley area, Coconino County, Arizona," John D. Wells, pp. 117-157 + maps, 1960, \$0.75. No. 1081-E, "Geology of the Lloyd Quadrangle, Bearpaw Mountains, Blaine County, Montana," Robert George Schmidt, W. T. Pecora, Bruce Bryant, and W. G. Ernst, pp. 159-188 + maps, 1961. No. 1081-F, "Geology of the southern part of the Lemhi Range, Idaho," Clyde P. Ross, pp. 189-260 + maps, 1961. No. 1084-I, "A spectrochemical method for the semiquantitative analysis of rocks, minerals, and ores," A. T. Myers, R. G. Havens, and P. J. Dunton, pp. 207-229, 1961, \$0.15. No. 1089-B, "Geology of the Rogers Lake and Kramer quadrangles, California," T. W. Dibblee, Jr., pp. 73-139 + maps, 1960, \$1.25. No. 1098-B, "Geochemical prospecting abstracts, January 1955-June 1957," Ellen L. Markward, pp. 57-160, 1961, \$0.35. No. 1100, "Uranium and other metals in crude oils," C. A. Horr, A. T. Myers, P. J. Dunton, and Harold J. Hyden, pp. 1-99 + plates, 1961, \$1. No. 1102, "Stratigraphy and refractory clayrocks of the Dakota group along the northern front range, Colorado," Karl M. Waage, pp. 1-154 + maps, 1961. No. 1115, "Bibliography of North American geology, 1958," Ruth Reece King, pp. 1-592, 1961, \$2. No. 1116-D, "Geophysical abstracts 183,

October-December 1960," James W. Clarke, Dorothy B. Vitaliano, Virginia S. Neuschel, pp. 457-636, 1961, \$0.40. No. 1121-C, "Eolian deposits of the Matanuska Valley agricultural area, Alaska," Frank W. Trainer, pp. c-1 to c-34, 1961 (order from Supt. of Documents, GPO, Washington 25).

India, National Institute of Sciences, **Proceedings**, vol. 26, "Silver jubilee number." The Institute, New Delhi, 1961. 351 pp. Rs. 25

National Science Foundation. NSF 61-34. **Scientific Manpower, 1960**. Papers of the ninth conference. Supt. of Documents, GPO, Washington, D. C., 1961. 52 pp. \$0.40. Fifth report in an annual series. Contents: papers of the annual conference held during the annual meeting (1960) of the American Assoc. for the Adv. of Science and papers from the symposium on the Sociology and Psychology of Scientists.

New Zealand, Victoria University of Wellington. **Zoology Publication**, No. 27, "Deep-water eels from Cook Strait, New Zealand." P. H. J. Castle. The University, Wellington, 1961. 30 pp.

Pan American Sanitary Bureau. **Annual Report of the Director, 1960**. Official Documents No. 38. Pan American Health Organization, WHO, Washington, D.C., 1961. 155 pp.

Pan American Union, Organization of American States. **Studies and Monographs**, No. 1, "The teaching of economics in Latin America." OAS Washington, D.C., 1961. 111 pp. \$0.50. Report of a cooperative study made in 1960 by Howard S. Ellis (representing UNESCO), Benjamin Cornejo (ECLA), and Luis Escobar Cerda (OAS).

U.S. Office of Education. OE-50002-59, **Statistics of Land-Grant Colleges and Universities** (year ended 30 June 1959), George Lind, 150 pp., \$1; OE-84016, **Research in industrial education** (summaries of studies 1956-1959), Merle E. Strong, 148 pp., \$0.60; OE-14057, **Studies in Comparative Education**, "Education in Afghanistan," Abul H. K. Sassani, 55 pp., \$0.40; OE-34010, **Cooperative Research Monograph**, No. 6, "Teaching by machine," Lawrence M. Stolurow, 173 pp., \$0.65. Superintendent of Documents, GPO, Washington, D.C., 1961.

World Health Organization. **Public Health Papers**, No. 8, "The role of immunization in communicable diseases control," M. V. M. Zhdanov *et al.* (5 papers), 118 pp., \$1.25; No. 9, "Teaching of psychiatry and mental health," M. Bleuler *et al.* (12 papers), 186 pp., \$2; No. 10, "Control of soil-transmitted helminths," Paul C. Beaver, 44 pp., \$0.60. **Technical Report Series**, No. 220, "Evaluation of the carcinogenic hazards of food additives (fifth report, Joint FAO/WHO Expert Committee on Food Additives), 36 pp., \$0.60; No. 221, "Scientific meeting on the rehabilitation in leprosy," held at Vellore, Madras State, India, 21-29 November 1960, 37 pp., \$0.60; No. 223, "Programme development in the mental health field" (tenth report, Expert Committee on Mental Health), 55 pp., \$0.60. WHO, Geneva, Switzerland, 1961 (order from Columbia Univ. Press, New York).