of his extensive studies of Scheele's work, Boklund has now published the 44 manuscripts (155 pages) in facsimile, with transcription, an undertaking which certainly required much patience and knowledge. In 47 pages of closely printed notes, Boklund discusses problematic and important passages. He also gives his reasons for the dates he ascribes to these laboratory notes and letter drafts. One group was written between 1765 and 1775, the other between 1779 and 1786. In the introduction (about 100 pages) he discusses Scheele's place in the history of chemistry, particularly with regard to the discovery of oxygen and Lavoisier's indebtedness to him. This is followed by a complete Swedish translation of Scheele's German manuscripts in the *Bruna Boken*. The appendixes contain first publications of some letters and a note on a central register of Scheele's 15,000 to 20,000 experiments. The English summary (4 pages) will be very helpful to those who may have some difficulty with the Swedish and German texts. Many will wish that Boklund's important discussion of this material were made available in English.

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Theoretical Problems

Trends in Social Sciences. Donald P. Ray, Ed. Philosophical Library, New York, 1961. 169 pp. $4.75.

This book is another manifestation of the increasing interest of the American Association for the Advancement of Science in the social sciences—or in the sciences that have, for the moment, come to be called the behavioral sciences. The volume is a collection of papers presented at a symposium on social and economic sciences at the annual meeting of the AAAS in 1958; Donald P. Ray organized the symposium and edited the volume. Ray's orientation, as presented in the introduction, is based on the widespread assumption that the compelling nature of modern social problems, the growing financial support for the social sciences, and the emphasis on an interdisciplinary approach are likely ingredients to speed the maturity of the scientific aspects of social inquiry. As representatives, he chose social sciences scholars who had served as fellows at Ralph Tyler's Center for Advanced Study in the Behavioral Sciences.

In markedly varying vocabularies, Kenneth E. Boulding, the economist, Harold D. Lasswell, the political scientist, and Edward A. Shils, the sociologist, present three substantive essays that are essentially critiques of current efforts, rather than expressions of confidence in current trends. All three are eminent scholars interested in the relationship between social science and public policy. Boulding sketches briefly the Keynesian revolution and points to the rapid transformation of economics from the 1920's to the 1950's. He describes the present period as one of "hesitation" because economics can no longer be limited to the variables of prices, outputs, and inputs. Instead, he believes that diffusion of theory from other disciplines and the techniques of "systems simulation" are essential aspects of the frontiers of economics. Harold Lasswell finds the frame of reference of current political science too constricted for its tasks. Therefore, he offers one designed to orient political science to the problem of the realization of human dignity in the world community. Edward Shils focuses on "macrosociology" as the essential problematic issue of research sociology. Macrosociology "is not the study of presumably self-contained bits and pieces of society . . . it is the study of the large society which embraces particular institutions." According to Shils, macrosociology has been neglected, with the result that sociologists are not able to contribute to the understanding of consensus and dissensus in modern society.

John W. Tukey, a mathematician sympathetic to the work of social scientists (a rare trait), contributes an outstanding essay, "Statistical and quantitative methodology," which identifies some of the problems common to the various behavioral sciences. His essay is important because he seeks to close the gap between statistical manipulations and the philosophy of science as the subject is taught in the universities today. The concluding essays deal with trends in interdisciplinary research. Ralph Tyler describes experiences at the Center for Advanced Study in the Behavioral Sciences, and Harry Albert reports on "the funding of social science research," a topic which seems indispensable for any volume on trends in social science.

The volume is by no means a compendium or high-level textbook for scholars or professionals in other fields who are interested in the substantive findings of social science. Instead, it is an analysis of the persistent theoretical problems that remain to be solved in the development of a more unified and adequate social science.

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Psychological Testing

The Measurement of Abilities. Phillip E. Vernon. Philosophical Library, New York, 1961. viii + 276 pp. $7.50.

Intelligence and Attainment Tests. Phillip E. Vernon. Philosophical Library, New York, 1961. 207 pp. $7.50.

The Measurement of Abilities is a 1955 revision of a 1939 book, whereas *Intelligence and Attainment Tests* first appeared in 1961. The author (professor of educational psychology, University of London, Institute of Education) addresses primarily students of psychological testing, teachers, and others who use tests. Despite considerable overlap, the first devotes more space to elementary statistics; the second offers more on methods and results of mental testing. The presentation of statistics, necessarily somewhat superficial, at times seems outmoded as to notation, terminology, computational techniques, or concepts. Nonetheless, wisdom is manifest throughout, and notably in sections on the establishment and interpretation of school marks.

Some readers will not be enlightened by Vernons strivings to retain a Spearman-type "general factor" and to reconcile it with preferences of others who identify more specific mental abilities. A more sophisticated audience may deplore the repeated suggestion that other types of test scores be converted into I.Q.-like indices, despite recognition of faults of the original ratio I.Q. Vernon's addiction to the normal curve of error, as representing the true state of affairs in nature, also may mislead the unwary.

Some specific matters treated are indigenous to the British educational system and general culture. For this reason alone, neither book appears ideal for use as a textbook in the United States. Nor would the lay read-

er develop optimal insight into current testing practices here. The avid student, however, can discern a multitude of useful ideas and much to incite his thought.

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Overview

Systems. Research and design. Proceedings of the first systems symposium at Case Institute of Technology. Donald P. Eckman, Ed. Wiley, New York, 1961. v + 310 pp. Illus. $8.50.

It is characteristic of the emerging systems movement that, in a volume concerned with the subject, wide variations in content, viewpoint, and quality are reflected in the 14 chapters—each a symposium paper—of this book. One major worry of systems researchers and designers is that so many specialists can say something to which workers in the systems field should listen. As Simon Ramo implies in his foreword, retreat to simpler, unidisciplinary words is no solution. More inclusive and complex systems develop by default, if not by plan, so we had best face up to the whole tough task as well as we can. Fortunately, there is a new enthusiasm for the job, and there are some new tools to be used. These papers exhibit some of each.

Chapter 1, perhaps intentionally, since it was the banquet address, is more entertaining than enlightening. Chapter 2, a good charter for a broad field of systems research, places needed emphasis on a "thorough understanding of the scientific method in its most general sense." Chapter 3 puts responsibility for the choice of objectives in systems studies where it belongs and, entertainingly as well as wisely, argues against overextension of the purely mathematical viewpoint. Chapter 4 takes perhaps too ambitious a view of operations research. Chapter 5 suggests how something might be gained if computer programers and designers talked to each other more. Chapter 6 brings unfamiliar and possibly important concepts to a discussion of the binary decision process. Chapter 7 discusses man–computer systems, in a sketchy way. Chapter 8 is an informative account of the uses of human engineering. Chapter 9 makes the point that new forms of mathematics are valuable and perhaps essential in dealing with a new field, in this case group performance. Chapter 10 properly advocates, but inadequately illustrates, a broad systems view in dealing with the evolution of complex systems. Chapter 11 makes the highly questionable contention that "molectronics" is a prime solution to the reliability problem. Chapters 12 and 13 deal in an instructive way with the mature interdisciplinary field of process control. Chapter 14 gives one-sided emphasis to analytic minimization techniques.

I await with interest the published proceedings of future Case Institute symposia on systems.

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An Evaluation of Theories

Mechanisms in Radiobiology. vol. 1, *General Principles*. Maurice Errera and Arne Forssberg, Eds. Academic Press, New York, 1961. 534 pp. Illus. $16.

This volume, the first of a two-volume series, provides the basic information needed to understand the effects of radiation on embryonic and adult organisms, the topic to be presented in volume 2. Following a detailed presentation of the physical and chemical aspects of radiation effects and of biochemical lesions in vivo and in vitro, the discussion considers the principles and mechanisms underlying the effects on free-living cells and cell parts, cytological effects, and radiation genetics. Each of the seven chapters presents a well-organized, fluently written evaluation of the presently accepted theories and hypotheses in qualitative and quantitative radiation biology. One chapter even leads somewhat into practical applications—inducing mutations as a method in plant breeding, a sector sometimes classified under "beneficial effects" of radiation. In addition to perfect coverage of the different problems discussed, each chapter brings a well-selected, nevertheless voluminous, bibliography; therefore, the volume will be an important source of information for scientists who are working in radiation biology and its allied fields.

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New Books

Mathematics, Physical Sciences, and Engineering

Advances in Quantum Electronics. J. R. Singer, Ed. Columbia Univ. Press, New York, 1961. 658 pp. Illus. $15.

Analytical Foundations of Physical Statistics. vol. 2. A. I. Khinchin. Hindustan Publishing Corp., Delhi, India, 1961 (order from Gordon and Breach, New York). 64 pp. Illus. $4.50.

Direct Methods in Crystallography. M. M. Woolfson. Oxford Univ. Press, London, 1961. 144 pp. Illus. $4.80.

Electric Machinery. A. E. Fitzgerald and Charles Kingsley, Jr. McGraw-Hill, New York, ed. 2, 1961. 580 pp. Illus. $10.75.

Electronics in Everyday Things. William C. Vergara. Harper, New York, 1961. 235 pp. Illus. $3.95.

Experiments in Transport Phenomena. E. J. Crosby. Wiley, New York, 1961. 200 pp. Illus. $3.95.

Fluid Mechanics. Richard H. F. Pao. Wiley, New York, 1961. 515 pp. Illus. $7.50.

Fundamentals of Scientific Mathematics. George E. Owen. Johns Hopkins Press, Baltimore, Md., 1961. 284 pp. Illus. $5.

Ground Support Systems for Missiles and Space Vehicles. Kenneth Brown and Peter Weiser, Eds. McGraw-Hill, New York, 1961. 509 pp. Illus. $15.

Industrial Dynamics. Jay W. Forrester. Massachusetts Inst. of Technology Press, Cambridge; Wiley, New York, 1961. 479 pp. Illus. $18.

Introduction to Feedback Systems. L. Dale Harris. Wiley, New York, 1961. 374 pp. Illus. $10.50.

An Introduction to Magneto-Fluid Mechanics. V. C. A. Ferraro and C. Plumpton. Oxford Univ. Press, New York, 1961. 181 pp. Illus. $4.

Kinematics of Nuclear Reactions. A. M. Baldin, V. I. Goldanskii, and I. L. Rozental. Translated by Ronald F. Peierls. Oxford Univ. Press, New York, 1961. 234 pp. Illus. $6.10.

Larousse Encyclopedia of the Earth. Leon Bertin. Prometheus Press, New York, 1961. 419 pp. Illus. $15.

Larousse Encyclopedia of Geography. Pierre Deffontaines, Ed. Prometheus Press, New York, 1961. 450 pp. + maps. Illus. $17.50.

Linear Vacuum-Tube and Transistor Circuits. A unified treatment of linear active circuits. Alfred J. Cote, Jr., and J. Barry Oakes. McGraw-Hill, New York, 1961. 437 pp. Illus. $10.75.

Lueger Lexicon der Technik. vol. 1, *Grundlagen des Maschinebaus*. Alfred Ehrhardt and Herman Franke. Deutsche Verlags-Anstalt, Stuttgart, Germany, 1961. 708 pp. Illus. DM. 135.

Notes on Molecular Orbital Calculations. John D. Roberts. Benjamin, New York, 1961. 165 pp. Illus. $4.95.

Nouveau Traité de Chimie Minérale. vol. 13, pts. 1 and 2. Paul Pascal, Ed. Masson, Paris, 1960. 2185 pp. Illus. Paper, NF. 310; cloth, NF. 330.

La Poussière Cosmique. A. Dauvillier. Masson, Paris, 1961. 212 pp. Illus. NF. 25.