ness of judgment, and only an occasional touch of hyperbole appears. Referring to the role of the history of language, of culture, and of politics in the development of numeration, he writes, "There are few things in this world in which these branches of research meet each other in such an exciting and fertile manner as the concept of number." Politics does not loom large in the account, but the affinity of language as evidenced by number words is the leitmotif of the first portion of the volume. It is pointed out that there is no special stress in Latin on grouping by 20's, a characteristic strongly rooted in northern Europe—in Iceland, Denmark, and England. A vigesimal terminology appeared, probably under Norman influence, in northern France, whence it spread southward; but in the 17th and 18th centuries it virtually disappeared, leaving behind only the word "quatre-vingt." The author is fascinated by the origins of words, and he calls attention, for example, to the relation of "diploma" to two, of "trivial" to three, of "squadron" to four, of "semester" to six, and of "noon" to nine. He speculates that the word "abacus" comes from the Greek for "a table without legs," rather than from the Semitic word for "dust."

The second portion of the volume, on symbols and calculations, is the more substantial of the two parts, yet we are reminded that "a people's formal written numerals do not weigh as heavily in the scales of culture as spoken numbers do. The written numerals are usually foreign imports; only seldom, as in the case of Egyptian and Chinese, do they grow out of the same native soil as the spoken numbers." As a result, language and symbolism sometimes were sharply divergent. The Mayan number system, based on 20, made use linguistically of a decimal interruption, whereas in symbolic representations the interruption of gradation was quinary. The longest section of the book (pp. 297–388) concerns the counting board, and here it is pointed out that operations on the abacus were based in thought on number words, symbols being used only in recording the numerical results. It is quite likely that our own numerals, adopted from the Hindus by way of the Arabs, originated in India as an indigenous invention suggested by the abacus. One cannot, however, rule out the possibility that the origin of our system was influenced by the Greco-Babylonian sexagesimal positional principle, including Ptolemy's symbol for zero. Incidentally, it appears that this zero symbol was not the Greek letter omicron, as Menninger too categorically indicates; nor is it accurate to say, as the author does, that "prior to the advent of the Arabs the Persians wrote in cuneiform characters." Minor lapses, inevitable in a work of this size and scope, are exceptionally few, and the book should be in the library of everyone for whom English is the primary language and for whom the origin of number words and symbols holds appeal. The account, unencumbered by scholarly apparatus, is nonetheless commendably accurate, as well as exceptionally easy to read with profit.

CARL B. BOYER
Mathematics Department,
Brooklyn College,
Brooklyn, New York

Chinese Accomplishments

The Grand Titration. Science and Society in East and West. JOSEPH NEEDHAM. Allen and Unwin, London, 1969. 352 pp. + plates. 63 s.

This book is a collection of essays, thrown off at various times between 1944 and 1964, all of them previously published, some in more than one version. Repetition and overlap are the natural result, and the essays add very little to Needham's major work *Science and Civilisation in China.*

As in the case of his important study, Needham is right in the main thrust of this work: to bring to Western attention the richness and complexity of Chinese accomplishments in science and technology. Many interesting examples and assertions abound in these pages. For beginners, who might be overawed by his multivolumed main work, these essays may serve as a useful introduction to the facts.

But in another sense, Needham seems altogether wrongheaded. His title borrows from the language of chemistry to suggest how he wants to "titrate" Chinese against European accomplishments by discovering who deserves credit for first discovering or inventing scientific ideas or techniques. The trouble with such an agonistic approach is the difficulty of establishing real equivalences. When, for example, Needham suggests that ancient Taoist authors adumbrated "the idea of natural selection in passages which point out the 'advantage of being useless' " (p. 250), he is surely talking nonsense. The fact is that the Chinese and English languages have such different thought systems built into their terminology and grammar that translation of abstract texts is supremely difficult. It simply will not do to clothe Chinese thought in English terms—"natural selection"—and then triumphantly point out how clever the Chinese were to anticipate Darwin by 2000 years.

Needham's other hobby horse, how capitalism unleashed modern science in western Europe, while "bureaucratism" first stimulated and then checked scientific and technological advance in China, shows interesting signs of evolution across the years, from a naive Marxist determinism in 1944 to a much more tolerant recognition of the limited autonomy of ideas, as suggested by his treatment of "Time and Eastern man" and "Human law and the laws of nature."

WILLIAM H. MCNEILL
Department of History,
University of Chicago,
Chicago, Illinois

Books Received

Absorption of Gases. V. M. Ramm. Translated from the Russian edition (Moscow, 1966) by R. Kondor. D. Slutzkin, Transl. Ed. Israel Program for Scientific Translations, Jerusalem, 1968 (U.S. distributor, Davey, Hartford, Conn.). viii + 648 pp., illus. $20.

Addison-Wesley Series on Organization Development. Six volumes. Organization Development: Its Nature, Origins, and Prospects. Warren G. Bennis. viii + 88 pp., illus.; Organization Development: Strategies and Models. Richard Beckhard. viii + 120 pp.; Building a Dynamic Corporation through Grid Organization Development. Robert R. Blake and Jane Srygley Mouton. viii + 120 pp., illus.; Developing Organizations: Diagnosis and Action. Paul R. Lawrence and Jay W. Lorsch. x + 102 pp., illus.; Interpersonal Peacemaking: Confrontations and Third-Party Consultation. Richard E. Walton. viii + 152 pp., illus.; Process Consultation: Its Role in Organization Development. Edgar H. Schein. x + 150 pp. Addison-Wesley, Reading, Mass., 1969. Paper, $3.50 per volume; the set, boxed, $17.50.

Adhesion of Dust and Powder. Anatolii D. Zimon. Translated from the Russian. Morton Corn, Transl. Ed. Plenum, New York, 1969. xii + 428 pp., illus. $32.50.

(Continued on page 403)