to surmise that the two kinds of efficiency diverged. In neither *Scale or Scope* nor *The Visible Hand* does Chandler offer insight into when such divergence may have occurred in any particular industry, how large the divergence may have been at any particular time, and whether there is evidence from which we can judge whether the costs to the consumer or society were nevertheless minimal in view of the probable costs of possible alternative or modified industrial organization.

In *Scale and Scope* Chandler offers none of the concern he expressed in *The Visible Hand* about the undemocratic and sometimes unproducive power of the megacorporations that have come to dominate the modern political economy. He discusses almost casually the international cartel arrangements that became essential parts of managerial strategy for the MIE. Conspicuously missing is any consideration of how reciprocal arrangements among the cartels may have repressed technological innovation for any period of time; or of how the use of market power in one area will create competitive advantages entirely unrelated to economic efficiency in others; or of the degree to which advantaged access to markets and financing will conceal gross inefficiency in production units. Yes, of course, changes in geopolitics and in technology periodically reopen competition (witness the effects of jet transportation and the telecommunications revolution), but what of the short-term dysfunctional effects in the absence of the goad of competitive markets?

None of this is to gainsay Chandler's brilliant achievements. *Scale and Scope* is a masterly exercise in comparative history. It takes the history of modern industrial capitalism out of the hands of the polemicists who attribute its ascendancy to "robber barons" on the one hand or to the benign workings of the "free market" on the other. Chandler has redefined entrepreneurship to include, perhaps above all, those who fashioned the innovative managerial structures indispensable for coping with the demands of new technology and of vast and expanding market operations. While continuing, as in the earlier book, to cite the imperatives of technology and expanding markets, Chandler now gives greater emphasis to "the critical importance of organizational capabilities." Without appropriate legal, cultural, and human resources the opportunities presented by technology and markets will draw no effective response. It is a lesson today's striving political economies dare not ignore.

RICHARD M. ABRAMS
Department of History, University of California, Berkeley, CA 94720

Cognitive Adaptation

Vision and the Emergence of Meaning. Blind and Sighted Children's Early Language. ANNE DUNLEA. Cambridge University Press, New York, 1990. xvi, 196 pp., illus. $39.50.

Interest in, and theories about, the development of language by young children have proliferated over the past 25 years. Studies of children who are in some way deprived of the normal perceptual experiences ordinarily thought critical to language—such as those born deaf or blind—have been undertaken in an attempt to resolve some of the theoretical debates, as well as to elucidate the development of such children in their own right. *Vision and the Emergence of Meaning* focuses on the early language development of children whose vision is grossly impaired and compares them with normally sighted children. The description it presents contrasts with that of a previously published study with similar goals, Landau and Gleitman's *Language and Experience: Evidence from the Blind Child* (Harvard University Press, 1985). The story Dunlea tells is closer to the traditional view of the blind child as different if not deficient in language acquisition, in contrast to Landau and Gleitman's claims of essential similarity between the language of blind and sighted children.

Dunlea's study reports on six children, four blind and two sighted, between the ages of roughly one and two years. She closely examines the development of vocabulary, construction of propositions (early grammar), and expression of illocutionary force during this period. The picture she presents is of children actively calling on all available cognitive resources to make sense of the world and the language surrounding them. At the same time, she recognizes cognitive deficits that present barriers to the blind child's normal progress in conceptualization and linguistic realization of meaning. In particular, her studies of the children's early vocabularies and their use of words indicate that, although their vocabularies seem similar to those of sighted children along such lines as the proportion of object names, they reveal restricted capacities for generalization and categorization. Additional observations reveal an almost total

lack of the categorization behaviors sighted children engage in during the second year, skills that have been seen as integrally related to language acquisition. Dunlea suggests that "vision seems to be a stimulus for abstracting criterial features necessary to construct categories and for constructing hypotheses about the meaning of words" (p. 161). In contrast to this deficit, the blind children talked about past events to a surprising extent, far more than do sighted children of the same age. Dunlea suggests that this represents an active adaptive strategy for establishing meaning about a shared topic when the usual basis for doing so, shared perception of objects, is not available.

Dunlea notes further that the blind children are not delayed in making further progress in language. Her most interesting claim is that there is a "remarkable tendency for the blind children to progress from one 'stage' of language to another, even though they apparently have not mastered the preceding stage or completed the developmental tasks typically associated with the earlier stage" (p. 161). Two important assumptions are being made here: (i) there is not a single biologically determined universal course of language acquisition; (ii) there is nonetheless a biological imperative to make progress in acquiring language.

Thus Dunlea takes a position that is both biogenetic in its implication that language acquisition has its own maturational imperative and interactionist in its emphasis on adaptive strategies that take constructive advantage of whatever environmental experiences are offered. The earlier report by Landau and Gleitman could be similarly characterized, but the two actually reveal quite different views of the child's mind and hence of cognitive development. Landau and Gleitman emphasize universal constraints on what can be natural lexical concepts for humans, and on this basis find strong similarities between the blind and sighted child. In contrast, Dunlea considers the similarities—at least in the early period reviewed in her book—to be largely superficial, while at the underlying meaning level the blind child's language reflects the effects of visual deprivation that the child actively strives to compensate for by adaptive communicative strategies. The evidence presented here for both a biogenetic language program and adaptive cognitive strategies provides a welcome new perspective on the contentious theoretical issues that have recently divided the field of language acquisition.

KATHERINE NELSON
Department of Psychology, City University of New York Graduate Center, New York, NY 10036

Some Other Books of Interest

Analogies Between Analogies. The Mathematical Reports of S. M. Ulam and His Los Alamos Collaborators. A. R. BEDNAREK and FRANÇOISE ULAM, Eds. University of California Press, Berkeley, 1990. xviii, 565 pp., illus. $60. Los Alamos Series in Basic and Applied Sciences, 10.

There now exist several books, perhaps most notably his 1976 autobiography, *Adventures of a Mathematician*, concerned with the life and work of the late Stanislaw Ulam. Two in particular have focused on Ulam's activities at Los Alamos National Laboratory, with which he was affiliated for the last 40 years of his life. The first, *From Cardinals to Chaos* (reviewed in *Science* **246**, 132 [1989]), included personal memoirs by various associates and was produced in a format embellished for a general readership. The present work, in the format of a technical monograph, brings together those of Ulam's contributions to the laboratory's Reports series that are not currently classified. The volume contains 21 papers in all, preceded by a foreword by Bednarek and some "sketchy remarks" on the collection prepared by Ulam himself. Beginning with "Theory of multiplicative processes" (written with D. Hawkins) and ending with "Speculations about the mechanisms of recognition and discrimination," the papers span the years 1944 to 1982. Among the five singly authored papers is Ulam's preface to his translation of the famed "Scottish Book" (see *Science* **218**, 88 [1982]). Authorship of the remaining papers is variously shared with some dozen others (including John von Neumann and Enrico Fermi), who are more fully identified in the foreword. A list of Ulam's publications from 1929 onward, a brief vita, and an index conclude the work.—**K.L.**

Computing Before Computers. WILLIAM ASPRAY, Ed. Iowa State University Press, Ames, 1990. x, 266 pp., illus. $27.95.

In this volume five authors "offer . . . a concise survey of computing technology prior to the development of the modern computer," circa 1945, with attention also to the broader context of the technology. Specialists in the study of computer history, the authors "have tried to wear [their] scholarship lightly" for the benefit of the general reader. In the opening chapter, Michael R. Williams traces some two millennia of "early calculation," from the Roman numeral system and the abacus to the time of the First World War. Chapter 2 is an account by Allan G. Bromley of difference and analytical engines, focused on the work of Charles Babbage. In the next chapters logic machines are discussed by William Aspray and punched-card machines by Martin Campbell-Kelly, and Bromley gives an account of analog computing devices. The treatment concludes with chapters on relay and electronic calculators by Paul E. Cerruzzi. Each chapter includes illustrations showing key machines and their inventors and suggestions for further reading. An "epilog" by Aspray stresses the continuity both in the technology of computing and in the organizations that produced and used it, and an index is provided.—**K.L.**

Books Received

The Abusing Family. Blair Justice and Rita Justice. 2nd ed. Plenum, New York, 1990. xiv, 297 pp., illus. $22.95.

Alkaline Rocks. C. Leelanandam, Ed. Geological Society of India, Bangalore, 1989. viii, 311 pp., illus. $45.

The Almanac of Science and Technology. What's New and What's Known. Richard Golob and Eric Brus, Eds. Harcourt Brace Jovanovich, Boston, 1990. xiv, 530 pp., illus. $59.95; paper, $29.95. Prepared by World Information Systems.

Almanac of Soviet Manned Space Flight. Dennis Newkirk. Gulf, Houston, 1990. xvi, 391 pp., illus. $29.95.

America's Struggle for Leadership in Technology. Jean-Claude Derian. MIT Press, Cambridge, MA, 1990. xiv, 309 pp., illus. $29.95. Translated from the French edition (Paris, 1988) by Severen Schaeffer.

Animal Experimentation. The Consensus Changes. Gill Langley, Ed. xii, 268 pp., illus. $45; paper, $15.95.

Arkansas Mammals. Their Natural History, Classification, and Distribution. John A. Sealander and Gary A. Heidt. 2nd ed. University of Arkansas Press, Fayetteville, 1990. xvi, 308 pp., illus. $50; paper, $30.

Atomic Photoeffect. M. Ya. Amusia. K. T. Taylor, translation editor. Plenum, New York, 1990. xii, 317 pp., illus. $89.50. Physics of Atoms and Molecules. Translated from the Russian manuscript (1984).

Autocrine and Paracrine Mechanisms in Reproductive Endocrinology. Lewis C. Krey, Bela J. Gulyas, and John A. McCracken, Eds. Plenum, New York, 1989. x, 209 pp., illus. $65. Reproductive Biology. From a workshop, Shrewsbury, MA, Oct. 1988.

Beginning to Read. Thinking and Learning about Print. Marilyn Jager Adams. MIT Press, Cambridge, MA, 1990. x, 494 pp., illus. $29.95.

Bioorganic Photochemistry. Vol. 1, Photochemistry and the Nucleic Acids. Harry Morrison, Ed. Wiley-Interscience, New York, 1990. x, 437 pp., illus. $59.95.

Boojums All the Way Through. Communicating Science in a Prosaic Age. N. David Mermin. Cambridge University Press, New York, 1990. xxii, 309 pp., illus. Paper, $16.95.

Brainstem Control of Wakefulness and Sleep. Mircea Steriade and Robert W. McCarley. Plenum, New York, 1990. xvi, 499 pp., illus. $85.

Breaking the Boundaries. A One-World Approach to Planning Education. Bishwapriya Sanyal, Ed. Plenum, New York, 1990. x, 267 pp., illus. $50. Urban Innovation Abroad.

Bridge from Nowhere. A Story of Space, Motion, and the Structure of Matter. William Day. House of Talos, East Lansing, MI, 1989. xiv, 288 pp., illus. Paper, $19.95.

Ceramic Hardness. I. J. McColm. Plenum, New York, 1990. xii, 324 pp., illus. $65.

Chemical Applications on Group Theory. F. Albert Cotton. 3rd ed. Wiley-Interscience, New York, 1990. xvi, 461 pp., illus., + appendix. $49.95.

Children in a Changing Health System. Assessments and Proposals for Reform. Mark J. Schlesinger and Leon Eisenberg, Eds. Johns Hopkins University Press, Baltimore, 1990. xx, 372 pp. $55. Johns Hopkins Series in Contemporary Medicine and Public Health.

Cognitive Foundations of Musical Pitch. Carol L. Krumhansl. Oxford University Press, New York, 1990. x, 307 pp., illus. $60. Oxford Psychology Series, no. 17.