

for independence and helped to propel the colonies along their revolutionary course: "Americans had gone to war to determine their own technological as well as their own political destiny" (p. 214). This assertion is a gross exaggeration, and not merely because, as York acknowledges, very few Americans understood or cared about technology before, during, or after the Revolution. A more fundamental problem is the apparent conflation of programs to promote manufacturing and those intended to encourage invention. York provides a solid account of the latter and presents impressive evidence of the activities of a small number of energetic men. But he overstates his case. Insofar as a coherent program for the promotion of manufacturing existed, it was one advocated by, and in large measure confined to, Hamilton and his coterie. Although York correctly observes that their program embraced the application of best-practice technology and even the stimulation of invention, he fails to recognize that this was a comparatively minor feature of the program, which laid greater stress upon technological mimesis.

Notwithstanding these problems, *Mechanical Metamorphosis* has some important things to say to students of technological change and economic history. The book's sixth chapter, "Limits to innovation: the Pennsylvania rifle," presents a superb account of an instance when institutional resistance to an invention—rifled weapons to replace smooth-bore muskets—frustrated its adoption. Most of this case study has appeared in article form, but its inclusion here will make it accessible to a wider audience. Readers will also appreciate York's treatment of the patent systems of the American colonies and the United States under the Articles of Confederation and the Constitution. The importance to industrial development and technological change of the development of a coherent procedure for protecting the proprietary rights of inventors emerges fairly clearly in York's discussion of the efforts of sorely tried American inventors such as Oliver Evans and John Fitch to profit from their work. York is at his best when discussing the work and vision of specific inventors in the context of a largely indifferent and occasionally hostile society. His thesis that a "mechanical metamorphosis"—even if only a conceptual one—had occurred among anything more than a minuscule group of Americans by 1790 is not convincing and detracts from a study that has a number of worthwhile things to say.

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The Psychology of Music

The Musical Mind. The Cognitive Psychology of Music. JOHN A. SLOBODA. Clarendon (Oxford University Press), New York, 1985. x, 291 pp., illus., \$36. Oxford Psychology Series, no. 5.

The Musical Mind is a welcome addition to the literature on the cognitive processes involved in musical skills. Sloboda is both a musician and a psychologist, and the principal value of the book lies in his careful and informative discussions of musical phenomena from the point of view of cognitive psychology. The book is distinguished by its emphasis on processes involved in the production of music—composition, improvisation, and performance. Sloboda uses composers' sketchbooks (especially those of Beethoven) as well as his own experiences as a composer in discussing the planning processes that go into composing a work. And he provides a good psychological analysis of the differences between composition and improvisation.

Parallels between language and music are emphasized throughout. Sloboda provides a broad overview of the features that are common to music and language, such as categorical perception and aspects of the structural organization of temporal units. He even raises the possibility of systematic reference to extramusical events. Sloboda suggests that music evolved together with language as a social communication system. He rejects the view that music evolved out of elaborations of mating calls, noting that most primate vocalizations involve wider categories of social communication more closely connected with group cohesion than with mating. There is every reason to believe that music was preserved in early human society because of its contributions to communication and cohesion, though Sloboda points out that music has since been elaborated in the peculiarly human ways that arise from "some specifically human tendency to create and notice organized patterns, hierarchies, and sequences" (p. 266).

Sloboda is appropriately cautious in presenting the principal results of recent research on the information processing of melodic patterns, and his discussion of the subject is lucid and informative. The perception of music is introduced by way of a discussion of the Gestalt principles of figural pattern organization in perception—the grouping of notes into melodies on the basis of similarity, proximity, and continuity. Here a puzzle confronts us: why are we so good at perceiving hidden figures we know are there? In the "find six lions in the jungle" type of hidden-figures problem familiar to schoolchildren the lions are not seen sponta-

neously but pop out when one searches for them. Musical analogs of the hidden-figures problem pose a similar puzzle: how can we focus attention on a pattern that has no distinguishing features of an obvious physical sort?

Tonal scales for the organization of pitch are virtually universal in the world's musical systems. Such scales define fixed sets of pitch intervals to be used in melodies, define hierarchies of importance for pitches, and establish dynamic tendencies of attraction and repulsion among them. Evidence that scale frameworks are important to perception and to memory for melodies and that they play an essential role in the comprehension of melody is reviewed here. Sloboda rightly emphasizes the contributions of several factors to the understanding of melody: tonal frameworks, melodic contours, rhythmic patterns, and the complex interactions among them. His treatment of the development of musical information-processing capacities during childhood is especially good and quite accessible to the nonspecialist.

No book of this size could cover all of the current work in the psychology of music. *The Musical Mind* focuses on cognitive processes and is not concerned with sensory phenomena underlying the cognition of music. Within the cognitive domain, the book omits consideration of the results of multidimensional scaling studies of pitch, rhythm, timbre, and harmony. An acquaintance with the basic materials of music and with European music notation is assumed. The best passages in the book occur when Sloboda finds an illuminating musical example to illustrate a psychological point, and the examples are given in notation. The discussions of psychological phenomena do not require a specialized background and should be accessible to the general reader. *The Musical Mind* is a lucid and useful introduction to the aspects of the field that it covers.

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Some Other Books of Interest

Haldane. The Life and Work of J. B. S. Haldane with Special Reference to India. KRISHNA R. DRONAMRAJU. Aberdeen University Press, Aberdeen, 1985. xvi, 211 pp. £14.95.

The geneticist J. B. S. Haldane spent the last years of his life (1957–1964) in India. Here Krishna Dronamraju, an associate of Haldane's during those years, presents a memoir to supplement the collection of

essays *Haldane and Modern Biology* published under his editorship in 1968. (That collection, along with a biography of Haldane by Ronald W. Clark, was reviewed in *Science* 164, 679 [1969].) The present work, which includes some quite detailed information about Haldane's habits and activities, is arranged around the general themes of his personal and scientific background, his contributions to science, his writings of a more general character, his travels, visitors, and associates, his resignation from the Indian Statistical Institute and activities thereafter, and his "philosophies." An appendix presents some excerpts from Haldane's popular writings, and a bibliography of his scientific writings and name and subject indexes are also included.—K.L.

Economic and Medicinal Plant Research. Vol. I. H. WAGNER, HIROSHI HIKINO, and NORMAN R. FARNSWORTH, Eds. Academic Press, Orlando, FL, 1985. xxi, 295 pp., illus. \$69.50; paper, \$39.95.

In this volume a group of authors representing the Program for Collaborative Research in the Pharmaceutical Sciences at the University of Illinois at Chicago, the Institut für Pharmazeutische Biologie at the University of Munich, and several Japanese institutions present a collection of papers intended to identify and review "areas of research in natural plant products that are of immediate or projected importance from a practical point of view." The six contributions, which draw on both Western and non-Western literature, deal with stevioside (derived from the leaves of *Stevia rebaudiana*, a New World species belonging to the Compositae) as a sweetening agent, nine Oriental medicinal plants, gossypol as a male contraceptive, immunostimulants derived from fungi and higher plants, and Siberian and Korean ginseng. The volume has a ten-page subject index.—K.L.

The Evolutionary Process. A Critical Review of Evolutionary Theory. VERNE GRANT. Columbia University Press, New York, 1985. xxi, 499 pp., illus. \$40.

In this book the author of *Origin of Adaptations* (1963) and *Organismic Evolution* (1977; see *Science* 197, 1272) presents what he describes as his third generalized treatment of organic evolution. The volume consists of eight main sections, dealing (after an introduction) with the general topics of microevolution, natural selection, acquired characters, speciation, macroevolution (basic processes and special aspects), and human evolution. "The focus throughout," Grant notes, "is on evolution in whole

organisms . . . , rather than on molecular changes or mathematical models." General principles are emphasized, and the author expects the book will be readable to "a spectrum of readers ranging from advanced biology students to professional workers in evolutionary biology and bordering fields."—K.L.

Books Received

Asymmetric Synthesis. Vol. 5, Chiral Catalysis. James D. Morrison, Ed. Academic Press, Orlando, FL, 1985. xiv, 391 pp., illus. \$85.

Atherosclerosis Reviews. Vol. 13, Arachidonic Acid Metabolism. Ruth Johnson Hegyeli, Ed. Raven, New York, 1985. xvi, 166 pp., illus. \$45. From a symposium, Houston, TX, Sept. 1985.

Basic Cloning Techniques. A Manual of Experimental Procedures. R. H. Pritchard and I. B. Holland, Eds. Blackwell Scientific, Palo Alto, CA, 1985. x, 193 pp., illus. Paper, \$27.

The Beauty of Doing Mathematics. Three Public Dialogues. Serge Lang. Springer-Verlag, New York, 1985. xii, 127 pp., illus. Paper, \$19.80. Translated from the French edition (Berlin, 1984).

Behavioral Epidemiology and Disease Prevention. Robert M. Kaplan and Michael H. Cricqui, Eds. Plenum, New York, 1985. x, 450 pp., illus. \$69.50. NATO Advanced Science Institute Series A, vol. 84. From an institute, Lake Como, Italy, April 1983.

Biochemistry and Biology of DNA Methylation. Giulio L. Cantoni and Aharon Razin, Eds. Liss, New York, 1985. xvi, 324 pp., illus. \$52. Progress in Clinical and Biological Research, vol. 198. From a conference, Bethesda, MD, April 1985.

Crying. The Mystery of Tears. William H. Frey II with Muriel Langsteth. Winston, Minneapolis, 1985. vi, 174 pp. Paper, \$8.95.

Crystal Structure Analysis. A Primer. Jenny Pickworth Glusker and Kenneth N. Trueblood, 2nd ed. Oxford University Press, New York, 1985. xviii, 269 pp., illus. \$37.50; paper, \$18.95.

Current Issues in Clinical Psychology. Vol. 2. Eric Karas, Ed. Plenum, New York, 1985. xii, 370 pp. \$49.50. From a meeting, Merseyside, England, Sept. 1982.

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The Development of a Medicine. R. B. Smith. Stockton, New York, 1985. xiv, 166 pp., illus. \$60.

Discrete Geometry and Convexity. Jacob E. Goodman *et al.*, Eds. New York Academy of Sciences, New York, 1985. xii, 392 pp., illus. Paper, \$90. Annals of the New York Academy of Sciences, vol. 440. From a conference, New York, April 1982.

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Dwellers in the Land. The Bioregional Vision. Kirkpatrick Sale. Sierra Club Books, San Francisco, 1985. x, 217 pp., illus. \$14.95.

The Hitch-Hiker's Guide to Artificial Intelligence. AppleSoft Basic Version. Richard Forsyth and Chris Naylor. Methuen, New York, 1985. x, 262 pp., illus. Paper, \$17.95.

Hommes Supérieurs, Hommes Inférieurs? La Controverse sur l'Hérédité de l'Intelligence. Gérard Lemaire and Benjamin Matalon. Colin, Paris, 1985. iv, 292 pp. Paper, F.115.

Hormones. The Messengers of Life. Lawrence Crapo. Freeman, New York, 1985. xii, 194 pp., illus. \$19.95; paper, \$11.95. Reprint.

Images of Biologically Active Structures in the Immune System. Their Use in Biology and Medicine. H. Koprowski and F. Melchers, Eds. Springer-Verlag, New York, 1985. xii, 142 pp., illus. \$33.50. Current Topics in Microbiology and Immunology 119.

Imaging Saturn. The Voyager Flights to Saturn. Henry S. F. Cooper, Jr. Holt, Rinehart and Winston, New York, 1985. xiv, 210 pp., illus. Paper, \$9.95. Reprint, 1983 ed.

Immune Recognition of Protein Antigens. W. Graeme Laver and Gillian M. Air, Eds. Cold Spring

Harbor Laboratory, Cold Spring Harbor, NY, 1985. x, 197 pp., illus. Paper, \$30. Current Communications in Molecular Biology. From a symposium, Cold Spring Harbor, NY, March 1985.

Immunobiology of Proteins and Peptides—III. Viral and Bacterial Antigens. M. Zouhair Atassi and Howard L. Bachrach, Eds. Plenum, New York, 1985. viii, 280 pp., illus. \$45. Advances in Experimental Medicine and Biology, vol. 185. From a symposium, Tahoe City, CA, June 1984.

Metal Ions in Neurology and Psychiatry. Sabit Gabay, Joseph Harris, and Beng Ho, Eds. Liss, New York, 1985. xiv, 409 pp., illus. \$94. Neurology and Neurobiology.

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Metric Spaces. Iteration and Application. Victor Bryant. Cambridge University Press, New York, 1985. vi, 105 pp., illus. \$29.95; paper, \$9.95.

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The Papers of Joseph Henry. Vol. 5, January 1841–December 1843, The Princeton Years. Nathan Reinhold *et al.*, Eds. Smithsonian Institution Press, Washington, DC, 1985. xxxviii, 506 pp., illus. \$45.

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The Scientific Foundations of Psychiatry. Michael Shepherd, Ed. Cambridge University Press, New York, 1985. xiv, 359 pp., illus. \$59.50; paper, \$24.95. Handbook of Psychiatry, vol. 5.

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Spectroscopy of Molecular Excitons. V. L. Broude, E. I. Rashba, and E. F. Sheka. Springer-Verlag, New York, 1985. xii, 271 pp., illus. \$48. Springer Series in Chemical Physics, vol. 16.

Spines of Form. Glimpses of Evolution. Victor B. Scheffer. Harcourt Brace Jovanovich, New York, 1985. viii, 152 pp., illus. Paper, \$7.95. A Harvest/HBJ Book. Reprint, 1983 ed.