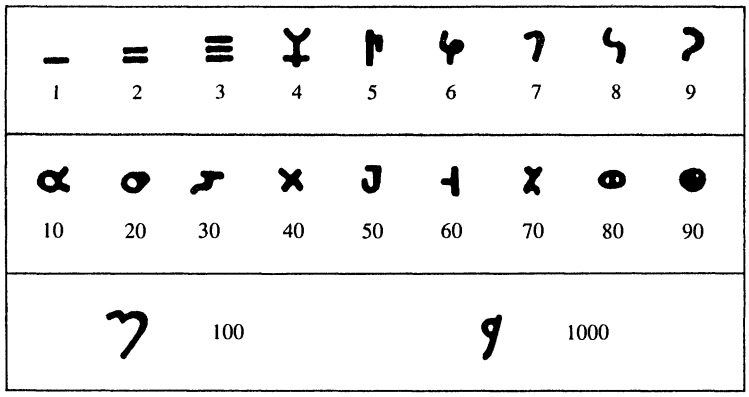

"An early form of Indian numerals in Brâhmî script. Our own number symbols are descended from them." [From *Pi in the Sky*]

Most of this book revolves around making the case for and against the various competing philosophies of mathematics. By and large the case against wins each round. It is very hard to embrace any of these philosophies wholeheartedly. We tend to set our own personal demarcations. But for most of us some parts of mathematics *exist*: natural numbers, triangles, perhaps pi. Some of the more exotic and abstract bits just don't have the same claim to a life of their own. The average mathematician is a mosaic: perhaps two parts Platonist to one part formalist, with a taste for constructive proofs when possible. (We challenge the reader to find a working mathematician of any philosophical stripe who would refuse authorship of a classically valid but nonconstructive proof of the celebrated Riemann hypothesis no matter what axiomatics that proof demanded.)

What keeps this book so readable is the texture: the historical anecdotes; the careful biographical sketches of Goedel, Cantor, Brouwer, Hilbert, and others; the excursions into the bizarre world of undecidability; the speculations on the future; the thought-provoking ripostes. (In answer to Roger Penrose, Barrow suggests that the capacity to encode undecidable statements is a precondition for consciousness of a structure.) Throughout Barrow demonstrates a remarkable scope, a fine sense of how mathematics works, and considerable insight into how it may be evolving. Occasional minor technical infelicities do nothing to mar the success of his project.

Barrow writes, "Today it is not unexpected to find the 'computer' or the 'program' as central paradigms in our attempts to interpret the Universe" and observes that "the concept of experimental mathematics has begun to take on a new and more adventurous complexion." This pervasive use of the computer to attempt to interpret mathematics rather than just the universe is surprisingly new. Mathematicians invented computers and then for several decades proceeded largely to ignore them. It is only recently, with the advent of really successful symbolic manipulation of computer algebra packages, that computers have come of mathematical age—or, more accurately, have entered puberty.

This book is not so much about mathematics as specialist subject as it is about mathematics as universal language. Talking meaningfully about mathematics without talking in mathematics is a difficult and underpracticed art. Barrow's book is a very welcome addition to this literature.

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Books Received

Affect and Accuracy in Recall. Studies of "Flashbulb" Memories. Eugene Winograd and Ulric Neisser, Eds. Cambridge University Press, New York, 1992. x, 315 pp., illus. $44.95. Emory Symposia in Cognition, 4. From a conference, Feb. 1990.

Affine Lie Algebras and Quantum Groups. An Introduction, with Applications in Conformal Field Theory. Jürgen Fuchs. Cambridge University Press, New York, 1992. xiv, 433 pp., illus. $89.95. Cambridge Monographs on Mathematical Physics.

Against Excess. Drug Policy for Results. Mark A R. Kleiman. Basic Books, New York, 1992. xviii, 474 pp. $26.

Bridging the Gap. Philosophy, Mathematics, and Physics. Lectures on the Foundations of Science. Giovanna Corsi, Maria Luisa Dalla Chiara, and Gian Carlo Ghirardi, Eds. Kluwer, Norwell, MA, 1993. xii, 320 pp., illus. $112. Boston Studies in the Philosophy of Science, vol. 140. From a school, Trieste, Italy, Oct. 1989.

Brown-Séquard. A Visionary of Science. Michael J. Aminoff. Raven, New York, 1993. xii, 211 pp., illus. $68.

The Buried Past. An Archaeological History of Philadelphia. John L. Cotter, Daniel G. Roberts, and Michael Parrington. University of Pennsylvania Press, Philadelphia, 1992. xxvi, 524 pp., illus. $39.95.

Car Trouble. Steve Nadis and James J. MacKenzie with Laura Ost. Beacon, Boston, 1993. xviii, 229 pp., illus. $27.50; paper, $12. World Resources Institute Guides to the Environment.

Carbon-Carbon Materials and Composites. John D. Buckley and Dan D. Edie, Eds. Noyes, Park Ridge, NJ, 1993. xiv, 281 pp., illus. $54.

Development or Destruction. The Conversion of Tropical Forest to Pasture in Latin America. Theodore E. Downing *et al.*, Eds. Published in cooperation with the United States Man and the Biosphere Program by Westview, Boulder, CO, 1992. xvi, 405 pp., illus. Paper, $49.50. Westview Special Studies in Social, Political, and Economic Development. From a workshop, Oaxaca, Mexico, Oct. 1988.

Dibenzanthracenes and Environmental Carcinogenesis. W. F. Karcher. Cambridge University Press, New York, 1992. x, 271 pp., illus. $120. Cambridge Monographs on Cancer Research.

The Evolution of Progress. The End of Economic Growth and the Beginning of Human Transformation. C. Owen Paepke. Random House, New York, 1993. xxxii, 383 pp., illus. $25.

The Evolution of Useful Things. Henry Petroski. Knopf, New York, 1992. xii, 289 pp., illus. $24.

Experimental Economics. Douglas D. Davis and Charles A. Holt. Princeton University Press, Princeton, NJ, 1993. xii, 572 pp., illus. $39.50.

Fundamentals of Crystallography. C. Giacovazzo, Ed. Oxford University Press, New York, 1992. xvi, 654 pp., illus. $125; paper, $65. International Union of Crystallography Texts on Crystallography, 2. Revision of *Introduzione alla Eristallografia Moderna*.

Fundamentals of Two-Fluid Dynamics. Daniel D. Joseph and Yuriko Y. Renardy. Springer-Verlag, New York, 1993. 2 vols. Part 1, Mathematical Theory and Applications. xvi, 443 pp., illus., + plates. Part 2, Lubricated Transport, Drops and Miscible Liquids. xvi, 445 pp., illus., + plates. Each vol., $89. Interdisciplinary Applied Mathematics, vols. 3 and 4.

Gas Microbubbles. Their Role in Anesthesiology, EM Histology, Physiology, Pharmacology and Toxicology. D. R. VanDeripe. NicNat Judy Press, O'Fallon, MO, 1992. viii, 102 pp., illus. Spiral bound, $19.

Genetics. A Molecular Approach. T. A. Brown. 2nd ed. Chapman and Hall, New York, 1992. xxii, 467 pp., illus. Paper, $29.95.

Human Minds. An Exploration. Margaret Donaldson. Allen Lane (Penguin), New York, 1992. vi, 314 pp., illus. $25.

Hydrocyclones. Analysis and Applications. L. Svarovsky and M. T. Thew, Eds. Kluwer, Norwell, MA, 1992. xviii, 413 pp., illus. $200. Fluid Mechanics and Its Applications, vol. 12. From a conference, Southampton, U.K., Sept. 1992.

Immunopharmacology in Autoimmune Diseases and Transplantation. Hans Erik Rugstad, Liv Endresen, and Øystein Førre, Eds. Plenum, New York, 1992. xxvi, 420 pp., illus. $95.

Isolation, Migration and Health. D. F. Roberts, N. Fujiki, and K. Torizuka, Eds. Cambridge University Press, New York, 1992. xii, 267 pp., illus. $69.95. Society for the Study of Human Biology Symposium Series, 33. From a symposium, Fukui, Japan, July 1990.

Japanese/English English/Japanese Glossary of Scientific and Technical Terms. Louise Watanabe Tung. Wiley, New York, 1993. xxii, 1146 pp. $79.95.

Jet Cutting Technology. A. Lichtarowicz. Kluwer, Norwell, MA, 1992. xiv, 633 pp., illus. $286. Fluid Mechanics and Its Applications, vol. 13. From a conference, St. Andrews, Scotland, Sept. 1992.

Laminar Flow Analysis. David F. Rogers. Cambridge University Press, New York, 1992. xiv, 422 pp., illus. $120.

Letter Bomb. Nuclear Holocaust and the Exploding Word. Peter Schwenger. Johns Hopkins University Press, Baltimore, 1992. xviii, 163 pp., illus. $38.50; paper, $12.95. Parallax.

Man and the Biosphere. Toward a Coevolutionary Political Economy. Kenneth M. Stokes. Sharpe, Armonk, NY, 1992. xii, 324 pp., illus. $49.90.

Managing Risks in the Public Interest. N. C. Lind, J. S. Nathwani, and E. Siddall. Institute for Risk

Research, Waterloo, Ontario, Canada, 1991. x, 242 pp., illus. Paper, $40.

Marine Hydrothermal Systems and the Origin of Life. Report of SCOR Working Group 91. N. G. Holm, Ed. Kluwer, Norwell, MA, 1992. iv, 242 pp., illus. $133. Reprinted from *Origins of Life and Evolution of the Biosphere*, vol. 22 (1992).

Numerical Recipes in C. The Art of Scientific Computing. William H. Press *et al.* 2nd ed. Cambridge University Press, New York, 1992. xxvi, 994 pp., illus. $49.95.

Numerical Recipes in FORTRAN. The Art of Scientific Computing. William H. Press *et al.* 2nd ed. Cambridge University Press, New York, 1992. xxvi, 963 pp., illus. $49.95.

Optical Microscopy. Emerging Methods and Applications. Brian Herman and John J. Lemasters. Academic Press, San Diego, CA, 1993. xiv, 441 pp., illus., + plates. $79.95.

Optical Mineralogy. Principles and Practice. C. D. Gribble and A. J. Hall. Chapman and Hall, New York, 1993. xvi, 303 pp., illus., + plates. $99.95; paper, $42.50.

Problems of the Hegelian Dialectic. Dialectic Reconstructed as a Logic of Human Reality. Menahem Rosen. Kluwer, Norwell, MA, 1992. xx, 262 pp. $104. Synthese Library, vol. 225.

Proceedings of the 14th International Radiocarbon Conference. (Tucson, AZ, May 1991.) Austin Long *et al.*, Eds. Department of Geosciences, University of Arizona, Tucson, 1992. xvi, 663 pp., illus. Paper, $65. Published as *Radiocarbon*, vol. 34, no. 3.

Proceedings of the Twelfth International Conference on Soil Mechanics and Foundation Engineering. (Rio de Janeiro, Aug. 1989.) Balkema, Brookfield, VT, 1992. Vol. 4, xii pp + pp 2121–2764, illus. $125. Vol. 5, xxxii pp + pp 2765–3390, illus. $125.

The Professionalization of Psychology in Nazi Germany. Ulfried Geuter. Cambridge University Press, New York, 1992. xxii, 335 pp., illus. $54.95. Cambridge Studies in the History of Psychology. Translated from the German edition (Frankfurt, 1984) by Richard J. Holmes.

Protocols in Molecular Neurobiology. Alan Longstaff and Patricia Revest, Eds. Humana, Totowa, NJ, 1992. xviii, 373 pp., illus. Spiral bound, $49.50. Methods in Molecular Biology, 13.

The Quantum Labyrinth. Dick J. Hoekzema. Kluwer, Norwell, MA, 1993. xvi, 277 pp., illus. $130. Fundamental Theories of Physics.

Quantum Measurement. Vladimir B. Braginsky and Farid Ya. Khalili. Kip S. Thorne, Ed. Cambridge University Press, New York, 1992. xviii, 193 pp., illus. $39.95.

Quantum Mechanics and Experience. David Z. Albert. Harvard University Press, Cambridge, MA, 1992. xii, 206 pp., illus. $27.95.

The Role of Neurotransmitters in Brain Injury. Mordecai Y.-T. Globus and W. Dalton Dietrich, Eds. Plenum, New York, 1992. xiv, 378 pp., illus. $85. From a symposium, Key West, FL, June 1991.

The Roles of Amino Acid Chelates in Animal Nutrition. H. DeWayne Ashmead, Ed. Noyes, Park Ridge, NJ, 1993. xxii, 479 pp., illus. $64.

Scaling Physiological Processes. Leaf to Globe. James R. Ehleringer and Christopher B. Field, Eds. Academic Press, San Diego, CA, 1993. xvi, 388 pp., illus., + plates. $69.95. Physiological Ecology.

Science Across Cultures. An Annotated Bibliography of Books on Non-Western Science, Technology and Medicine. Helaine Selin. Garland, New York, 1992. 431 pp. $64. Garland Reference Library of the Humanities, vol. 1597.

Science and Football II. T. Reilly, J. Clarys, and A. Stibbe, Eds. Chapman and Hall, New York, 1993. xx, 480 pp., illus. $120. From a congress, Eindhoven, The Netherlands, May 1991.

Science at the Frontier. Vol. 1. Addison Greenwood. National Academy Press, Washington, DC, 1992. viii, 277 pp., illus. $24.95. Based on a symposium, 1989.

Toxicomanies et Formes de la Vie Quotidienne. Huit Essais de Sociologie Compréhensive et Simmelienne de la Toxicomanie. Claude Macquet. Mardaga, Liège, Belgium, 1992. 236 pp. 947 BF. Psychologie et Sciences Humaines.

Tractatus Simplex de Cortice Peruuiano. A Plain Treatise on the Peruvian Bark. ("The Stanitz Manuscript"). Saul Jarcho. Countway Library of Medicine, Boston, 1992 (distributor, Science History Publications/USA, Canton, MA). viii, 116 pp., illus. $19.95.

Ultrafast Fiber Switching Devices and Systems. Mohammed N. Islam. Cambridge University Press, New York, 1992. xiv, 210 pp., illus. $49.95. Cambridge Studies in Modern Optics, 12.

The Unfinished Universe. Louise B. Young. Oxford University Press, New York, 1993. 240 pp., illus. Paper, $10.95. Reprint, 1986 ed.

Victim. Caught in the Environmental Web. Bruce G. Siminoff. Glenbridge, Lakewood, CO, 1993. xviii, 264 pp. $19.95.

Volcanoes of North America. United States and Canada. Charles A. Wood and Jürgen Kienle, Eds. Cambridge University Press, New York, 1992. viii, 354 pp., illus. Paper, $29.95. Reprint, 1990 ed.

A Wandering Natural Products Chemist. Koji Nakanishi. American Chemical Society, Washington, DC, 1991. xxiv, 230 pp., illus. $24.95. Profiles, Pathways, and Dreams.

Ways of the World. A History of the World's Roads and of the Vehicles That Used Them. M. G. Lay. Rutgers University Press, New Brunswick, NJ, 1992. xxii, 401 pp., illus. $50.