

. . . Catastrophe

suited to the contemporary challenge of providing abstract models for biological and behavioral phenomena. That part of geometry to which catastrophe theory belongs, called topology, provided mechanisms for inferring global and long-range properties from local, short-range structure. It is a synthetic enterprise that capitalizes on intuition and perception as much as on deduction and inference. The geometric nature of catastrophe theory is worth a thousand abstract symbols to those who build models rather than prove theorems.

Not everyone who has worked with catastrophe theory, however, thinks that it has lived up to its claims. Hector J. Sussman of Rutgers University observes, for instance, that Thom's theorem is a description of all possible ways in which discontinuities can arise in equilibrium surfaces rather than an assertion of certain specific ways in which they must occur in special situations. Thus, he argues, catastrophe models cannot be empirically verified. Conclusions drawn from catastrophe theory models are, Sussman claims, frequently wrong, and if not wrong, then tautological. (A research news article on criticisms of catastrophe theory by Sussman and others is appearing in the April 15 *SCIENCE*.)

Amazingly, Sussman's views are not too different from those of Thom: "Many people, eager to find for catastrophe theory an experimental confirmation, may embark into precarious quantitative modeling where explicit observable interpretations are given. . . . Needless to say, many (if not all) of these interpretations will break down." Whereas Zeeman and his colleagues have stressed the need for empirical verification, much of Thom's work borders on speculation, being suggestive rather than precise, informal rather than rigorous. Speculation is, according to Thom, "the virtual catastrophe in which knowledge is initiated."

Catastrophe theory is one of the most controversial elements in the contemporary world of higher mathematics. As a mathematical theory, it is above reproach. It is powerful, elegant and deep. Moreover, it provides interesting and useful models for the scientist to explore in his attempts at understanding nature. It does not, however, predict how nature must behave in the same way that, for instance, Newton's laws stipulate the orbits of the planets. "In no case," argues Thom, "has mathematics any right to dictate anything to reality." The most catastrophe theory seems capable of doing at this time is to tell the scientists what forms ("empirical morphologies") he has a right to expect. □

Readers interested in an up-to-date bibliography on catastrophe theory and its applications can obtain one by writing to Dr. Lynn Steen, Department of Mathematics, St. Olaf College, Northfield, Minn. 55057.

APRIL 2, 1977

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CURRENT MEDICAL DIAGNOSIS AND TREATMENT 1977—Marcus A. Krupp, M.D. and Milton J. Chatton, M.D.—Lange Medical Pubns., 1977, 16th rev. ed., 1,066 p., illus., tables, paper, \$16. Intended to serve the practicing physician as a useful desk reference on widely accepted technics currently available for diagnosis and treatment.

EATING DANGEROUSLY: The Hazards of Allergies—Richard Mackarness, M.D.—Harbrace, 1977, 180 p., tables, \$6.95. Discusses symptoms and causes of allergic reactions, and how they can be alleviated by identifying and eliminating culprit foods from our diets.

LOVEJOY'S COLLEGE GUIDE—Clarence E. Lovejoy—S&S, 1976, 13th ed., 423 p., paper, \$5.95. Revised and expanded reference, covers more than 3,600 American colleges and universities.

MEMORY AND MIND—Norman Malcolm—Cornell U Pr, 1977, 277 p., \$12.50. Philosopher critically examines accounts of the mental mechanisms of memory, as well as the theories which attempt to explain the phenomena of memory by neural processes in the brain.

THE METRIC SYSTEM MADE SIMPLE—Albert F. Kemp and Thomas J. Richards—Doubleday, 1977, 150 p., illus., \$2.50. Explanations are followed by exercises, glossary, conversion and equivalents tables.

NATIONAL FACULTY DIRECTORY, 1977—Gale, 1977, 7th ed., 2407 p., 2 vols., \$98. Alphabetical listing, with addresses, of about 449,000 faculty members at nearly 3,000 universities and colleges in the U.S. and Canada.

NEW GUIDE TO THE MOON—Patrick Moore—Norton, 1977, 320 p., 16 plates, drawings, \$10.95. A lively description of the moon, its geography, geology and move-

ments, enriched by the recent discoveries. For readers who want to travel there by telescope, spaceship or imagination.

ON STONEHENGE—Fred Hoyle—W H Freeman, 1977, 168 p., photographs, drawings, tables, \$9.75; paper, \$6.50. In this discussion of Stonehenge, its science and the people who created it, astronomer reviews in detail the case on which he rests his assessment of the intellectual capacity of neolithic man. Mathematics of astronomical alignment are concentrated in appendix.

PEOPLES OF THE SEA—Immanuel Velikovsky—Doubleday, 1977, 280 p., 16 p., 16 plates, maps, \$10. Concluding volume of the author's controversial reconstruction of ancient history. This speculative discussion moves the 20th and 21st Egyptian dynasties to the age of the Persian domination over Egypt, a displacement of some eight centuries from conventional chronology.

SCIENCE POLICIES FOR THE DECADE AHEAD: The Second Franklin Conference, Oct. 28-29, 1975—H. Guyford Stever, Chmn.—Franklin Inst. Pr, 1976, 117 p., paper, \$6.95. The conference discussed the national, international and humanistic implications of U.S. science policies.

TAKE CHARGE: A Personal Guide to Behavior Modification—William H. Redd and William Sleator—Random, 1977, 183 p., \$7.95. Written to help the general public understand the application of this controversial new behavior theory to everyday practical problems.

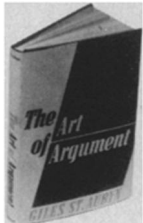
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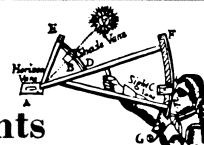


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