Example: Suppose a government seeks to raise the purchasing power of wages by holding back the rate of growth of the money supply as a means to curb inflation. If employers expect success in the attempted moderation of inflation they may resist wage demands comparable to those agreed to in earlier and more inflationary years, and unions with similar expectations about the price level may be less militant about those wage demands. The net result may be wage increases that are more modest; and so the attempt to raise workers' purchasing power may be frustrated, perhaps completely.

In its methods Chicago school research has been characterized by intimate marriage of theoretical and empirical analysis, with perhaps some inclination to avoidance, where possible, of the more esoteric tools of statistical analysis, and explicit disinclination to assign much weight to "realism" in the assumptions that theoretical models employ. For, in the Chicago view, a theory should be tested primarily in terms of the correspondence of the results derived from the models to actual economic behavior, and not on the basis of its premises. Another characteristic of the school's research is its recurrent use of the premise that humans calculate with considerable rationality the course of behavior that best promotes their economic self-interest (broadly interpreted) and act accordingly with some consistency. This maximization assumption has been used to explain phenomena ranging from the behavior of government agencies to the decision on the number of children to be contained in the family. It is perhaps ironic that this premise, which can with some justice be described as "economic determinism," is widely associated with the writings of Marx, who probably never used it, but is instead actually favored by the group of modern economists most generally considered to constitute the center of political conservatism.

But much more than this awaits the reader of Stigler's charming and informative little book. The author manages to make light and pleasant reading of the dismal science and to convey to the reader some feeling for the reasons for his deep affection for the discipline and his pride in its accomplishments. He does this without sacrifice of substance, relying rather on his way with words, his sense of humor, his wide-ranging erudition, and the charm of his personality. The book deserves to be read, and the reader will be pleased to have done so.

WILLIAM J. BAUMOL
Department of Economics, Princeton University, Princeton, NJ 01904, and Department of Economics, New York University, New York, NY 10003

Geologic Collisions

Impact Cratering. A Geological Process. H. J. MELOSH. Clarendon (Oxford University Press), New York, 1989. x, 245 pp., illus. $65. Oxford Monographs on Geology and Geophysics, vol. 11.

When this reviewer began high school seemingly a short while ago, lunar craters were a result of volcanic processes, dinosaurs had died of natural causes, and large holes in the ground were of only casual interest to planetary scientists. Now we view impact cratering as one of the predominant geological processes in the solar system. Impact craters ranging in diameter from a few meters to thousands of kilometers are observed to dominate the surface of the moon and the other bodies of the solar system. The moon itself may have formed from material squirted off Earth during the impact of a Mars-sized body, and many think that dinosaurs were zonked in the aftermath of an extraterrestrial object's hitting Earth. The finite probability of such a collision involving Earth during one's lifetime is a sobering thought.

This recognition of the importance of impact processes in planetary history can be attributed to the robust planetary exploration programs of the United States during the last couple of decades. The understanding of the processes themselves has benefited from defense research into high-energy and high-pressure processes.

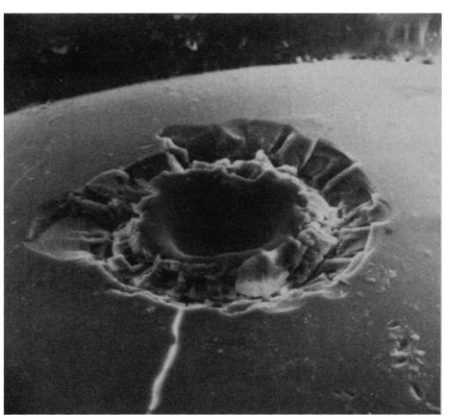
Cratering mechanisms involve extreme ranges in physical processes. Pressures during the initial stages of an impact commonly exceed a million atmospheres. Initial energy densities and temperatures can be higher by several factors of ten than those of conventional explosives and can approach those of nuclear devices. Under these conditions, ordinary rocks behave as fluids. At the other end of the spectrum during the later stages of an impact, the flow producing the final observable crater occurs at pressures comparable to an atmosphere. The sciences of soil and rock mechanics are needed to describe these low-pressure processes.

The literature on these phenomena encompasses a number of sciences including physics, geophysics, astronomy, engineering mechanics, statistics, and geology and is scattered through diverse journals and reports. There has been no single source of current research on impact cratering. Few persons have the breadth of knowledge to describe the entirety of sciences applicable to impact problems. The difficulty this poses to students and researchers is rectified by this important monograph by Melosh.

The book begins with an informative chapter on the history of the study of craters. The next chapter gives an overview of observable morphologies, from the micrometer-sized craters formed from the hypervelocity impact of dust particles to the thousand-kilometer multi-ringed basins on Mars, Mercury, Callisto, and the Moon. These two chapters make interesting reading for both the novice and the expert.

The following chapters present the core of the science of impact cratering. They include summaries of shock-wave propagation, descriptions and details of the contact, excavation, and modification phases, descriptions of the ejecta and the emplacement processes, and summaries of the current understanding of the scaling laws of these processes. The book gives an appropriate mix of descriptive material and quantitative estimates and formulas. Final chapters emphasize the observational aspects of planetary cratering and discuss the role of those observations in understanding the history and evolution of planetary bodies.

All in all, this is a well-written and comprehensive book. Since the field is new, a number of aspects of cratering are not yet



A microcrater 30 μm in diameter on a glass sphere obtained by Apollo 11. "Microcraters are evidently due to high velocity impacts of small particles of cosmic dust or, rarely, to small secondary ejecta particles from larger impacts." [Courtesy D. McKay. From *Impact Cratering*]

Meteor Crater, Arizona. "This crater is thought to have been formed 50,000 years ago by the impact of a 100,000-ton iron meterorite roughly 30 m in diameter which struck at a speed in the vicinity of 20 km/second. The crater's rim-to-rim diameter is approximately 1100 m." [Courtesy D. Roddy. From *Impact Cratering*]

well understood, and of course the author favors his own hypotheses and interpretations. He clearly distinguishes what is generally accepted from what is conjectural and controversial, however, and in the process he flags areas needing more research. Experts might question details in their own areas of expertise, but I doubt that many will disagree about the usefulness and importance of this book.

KEITH A. HOLSAPPLE
Department of Aeronautics and Astronautics, University of Washington, Seattle, WA 98195

Interactions at Sea

Seabirds and Other Marine Vertebrates. Competition, Predation and Other Interactions JOANNA BURGER, Ed. Columbia University Press, New York, 1989. x, 339 pp., illus. $45.

Joanna Burger has assembled an eclectic set of papers that examine a variety of ecological interactions. The value of the book is in its diverse coverage; it is not a tightly integrated collection with a clear theme. Four chapters examine interactions between marine birds and mammals, two the impact of fisheries, and others seabird community structure and the relation between birds, their prey, and predatory fish. An introductory chapter reviews the marine biology of seabirds.

The strongest focus is on interactions of marine birds and mammals. Pierotti offers useful observations of birds foraging in the vicinity of whales and pinnipeds. He shows that bird attendance varies with the species of mammal, that some whales may use birds as cues to the availability of prey, and that when feeding in association with whales, herring gulls (*Larus argentatus*) have a higher success rate in capturing prey than when foraging without cetaceans present. An unfortunate aspect of the chapter is the proliferation of categories of bird aggregations; the reader must keep in mind up to a possible 20 types. Warheit and Lindberg examine how presumed competition between pinnipeds and marine birds since the Miocene has shaped the evolution of seabird communities. Present competition for breeding sites on some islands is documented, but the authors make what seems to be an unwarranted extrapolation that such competition has shaped whole regional avifaunas. Their data are not convincing, and the authors ignore the possibility that changes in seawater temperature could have accounted for the loss of faunal elements. Au and Pitman, expanding on a recent publication, provide an excellent overview of the at-sea ecology of tropical Pacific seabirds and their dependence on tuna for access to prey, a topic also discussed by Hulsman. An interesting finding is the lack of association of seabirds with small dolphins in the absence of tuna. Au and Pitman suggest that both the birds and the mammals cue on the tuna for access to prey and that birds ignore dolphins unaccompanied by tuna. Unfortunately, they had to rely on the number of birds present to indicate the presence of tuna, no independent measure of tuna abundance being available, so the discussion has a degree of circularity.

The contribution of Safina and Burger is an expansion of two recently published papers and as such seems disproportionately long at 79 pages. The authors show that bluefish (*Pomatomus saltatris*), while competing with terns for prey, also were important in increasing the accessibility of prey. Of particular interest is the result that a nonsignificant correlation between tern density and prey density found in the early years of their study became significant with additional sampling in later years. This result suggests that time as well as spatial scales of measurement are important in identifying the extent to which the abundance of seabirds reflects the abundance of prey.

Furness, Hudson, and Ensor examine the interactions between various species of birds as they compete for offal (discarded portions of commercially valuable fish) and discarded fish (unused whole fish) available from boats fishing near the northern British Isles. They find that the importance of offal versus discarded fish differs between bird species and hypothesize that successful dominance for access to offal may have had important consequences for the population size of one or more species of seabird. They show that variations in fish year-class size and in fisheries regulations can affect the population dynamics of these bird species. Jones and DeGange focus on the horrific rates (possibly more than half a million birds annually) of seabird mortality in gill nets in the North Pacific. Of particular concern is the loss of breeding adults from the seabird fauna.

More careful editing might have reduced some of the problems mentioned above, but in toto the book is attractively produced and is a worthwhile addition to the library of those interested in the ecology and conservation of marine birds and mammals. Those seeking examples of interspecific competition and commensualism will also find interesting material in this book.

GEORGE L. HUNT, JR.
Department of Ecology and Evolutionary Biology, University of California, Irvine, CA 92717

Books Received

Advances in Biotechnology of Membrane Ion Transport. Peter Leth Jørgensen and Roberto Verna, Eds. Raven, New York, 1989. xvi, 260 pp., illus. $60. Serono Symposia Publications from Raven Press, vol. 51. From a meeting L'Aquila, Italy, Sept. 1988.

Affirmative Action in Perspective. Fletcher A. Blanchard and Faye J. Crosby. Springer-Verlag, New York, 1989. xii, 211 pp. Paper, $39. Recent Research in Psychology.

AIDS and Ethics. James M. Humber and Robert F. Almeder, Eds. Humana, Clifton, NJ, 1989. x, 171 pp. $35. Biomedical Ethics Reviews 1988.

Air Pollution and Conservation. Safeguarding Our Architectural Heritage. Jan Rosvall and Stig Aleby, Eds. Elsevier, New York, 1988. x, 427 pp., illus. $147.25. Reprinted from *Durability of Building Materials*, vol. 5, nos. 3–4. From a symposium, Rome, Oct. 1986.

Algebraic Analysis. Masaki Kashiwara and Takahiro Kawai, Eds. Academic Press, San Diego, CA, 1989. 2 vols. xliv, 950 pp., illus. Each vol., $59.95.

Analytical Groundwater Modeling. Flow and Contaminant Migration. William C. Walton. Lewis, Chelsea, MI, 1989. xii, 173 pp. + floppy disks. $68.

Biocatalysis in Agricultural Biotechnology. John R. Whitaker and Philip E. Sonnet, Eds. American Chemical Society, Washington, DC, 1989. x, 397 pp., illus. $84.95. ACS Symposium Series, vol. 389. From a symposium, Toronto, Ontario, June 1988.

Biological and Synthetic Membranes. D. Allan Butterfield, Ed. Liss, New York, 1989. xxii, 520 pp., illus. $96. Progress in Clinical and Biological Research, vol. 292. From a symposium, Lexington, KY, Oct. 1988.

Channelized Rivers. Perspectives for Environmental Management. Andrew Brookes. Wiley-Interscience, New York, 1989. xvi, 326 pp., illus. $79.95.

Chemical Demonstrations. A Handbook for Teachers of Chemistry. Vol. 3. Bassam Z. Shakhashiri. University of Wisconsin Press, Madison, 1989. xx, 401 pp., illus. $25.

The Chemistry of Organic Silicon Compounds. Pt. 2. Saul Patai and Zvi Rappoport, Eds. Wiley, New York, 1989. xvi pp. + pp. 893–1668, illus. $382. The Chemistry of Functional Groups.

Chimpanzee Politics. Power and Sex among Apes. Frans de Waal. Johns Hopkins University Press, Baltimore, 1989. 227 pp., illus. Paper, $12.95. Reprint, 1982 ed.

The Cities of Ancient Mexico. Reconstructing a Lost World. Jeremy A. Sabloff. Thames and Hudson, New York, 1989. 224 pp., illus. $19.95.

Data Book on the Viscosity of Liquids. D. S. Viswanath and G. Natarajan. Hemisphere, New York, 1989. viii, 990 pp. $175.

Developmental Biology of the Axolotl. John B. Armstrong and George M. Malacinski, Eds. Oxford University Press, New York, 1989. xii, 320 pp., illus. $65.

Experimental and Conceptual Plant Pathology. R. S. Singh *et al.*, Eds. Gordon and Breach, New York, 1988. 3 vols. Vol. 1, Techniques. xvi pp. + pp. 1–136, illus., + index. $50. Vol. 2, Pathogenesis and Host-Parasite Specificity. xvi pp. + pp. 137–476, illus., + index. $88. Vol. 3, Defense. xvi, pp. + pp. 457–599, illus., + index. $50.

The Extragalactic Distance Scale. Sidney van den Bergh and Christopher J. Pritchet, Eds. Astronomical Society of the Pacific, San Francisco, CA, 1988. (distributor, BYU Print Services, Provo, UT). xiv, 385 pp., illus. $32. Astronomical Society of the Pacific Conference Series, vol. 4. From a symposium, Victoria, B.C., June-July 1988.

The Fabric of Mind. Richard Bergland. Penguin, New York, 1989. x, 202 pp., illus. Paper, $9.95. Reprint, 1985 ed.

Grassland Structure and Function. California Annual Grassland. L. F. Huennecke and H. A. Mooney, Eds. Kluwer, Norwell, MA, 1989. x, 220 pp., illus. $105. Tasks for Vegetation Science, vol. 20.

Homology of Analytic Sheaves and Duality Theorems. V. D. Golovin. Consultants Bureau (Plenum), New York, 1989. viii, 210 pp. $75. Contemporary Soviet Mathematics. Translated from the Russian by Normal Stein.

Hormones, Thermogenesis, and Obesity. Henry Lardy and Fredrick Stratman, Eds. Elsevier, New York, 1989. xvi, 527 pp., illus. $110. From a symposium, Madison, WI, June 1988.

Human Development and Health. K. Hurrelmann. Springer-Verlag, New York, 1989. x, 139 pp. $49.

Hydrogeology. William Back, Joseph S. Rosenhein, and Paul R. Seaber, Eds. Geological Society of America,