interested in the question, 'Does drift occur?' not 'Ought it to occur?', or . . . 'Is drift consistent with certain moral principles?' " (p. 246). He also concludes that "it would make little sense to analyze controversies such as the drift one in terms of negotiation closure." To the second statement one could perhaps hold up Martin Rudwick's *The Great Devonian Controversy*, which in my view successfully employs just such a negotiation approach.

A very useful chapter in view of the case studies to follow is Dorothy Nelkin's discussion of controversies and the authority of science. Alasdair MacIntyre's chapter on philosophical causes of scientific disagreement, although the idea of philosophical commitment is a central one, remains rather hanging in the air, dealing as it does specifically with post-Skinnerian and post-Freudian psychology.

In the case studies section of the book, we find at least two divergent viewpoints as to the relationship between scientific or epistemic and other concerns. Robert Schwartz discusses the "judicial deflection of scientific issues" in the case of laetrile. He believes that the result of legal intervention was to force scientists to do necessary research to bring forward arguments needed for a sound-argument closure. Mark MacCarthy, on the other hand, in his analysis of controversies dealing with occupational safety and health, is more skeptical. In fact, he seems to believe in an endless regression to issues that ultimately are normative. He comes to the conclusion that the problem of closure lies with the criteria used by the regulatory agencies, but argues that cost-benefit and other considerations in turn decide whether or not regulatory action will be taken in the face of scientific uncertainty. But such considerations cannot determine whether a regulatory action is actually in the public interest. Therefore, MacCarthy arrives at the conclusion that "the public's best assurance that regulatory officials reflect the public interest is in the ballot box" (p. 527).

For those who are interested in how arguments in specific public-policy–related controversies have proceeded and have led—or failed to lead—to closure, the case studies are a gold mine. But it is by no means easy to relate them to the taxonomies of closure outlined in the first part of the book, and the effort to do so may be undermined by the earlier-mentioned idealization of scientific controversy as basically representing sound argument. It would have been important to consider the possibility that moral and political considerations may affect sound-argument closure in science. I think for instance of the study by William Provine portraying the revision of geneticists' views regarding race-crossing and hereditary mental differences between races between 1930 and 1950 as chiefly a revulsion to Nazi doctrine, not as dependent on new data. In this light, the American Psychiatric Association's decision to settle by vote whether homosexuality should be considered a pathology may not appear particularly surprising (see Irving Bieber's chapter on how the vote was arrived at).

Against existing historical, societal, and moral or political variation in assessments of "good science" or sound argument in science, it appears strangely artificial to discuss closure in science as having norms of its own. This is an exercise that the present book occasionally indulges in. The norm for scientific closure arrived at in Macklin's final chapter is, "There should be no negotiation closure in pure science" (p. 620). This norm is not presented as derived from a belief held by, say, scientists, philosophers, ethicists, politicians, or the general public as to how scientific disagreements *ought* to be settled. Instead it is supposedly derived from descriptive statements. (To be sure, the participants in the Closure Project—the name of the series of seminars between 1978 and 1982 constituting the bulk of the book—did not achieve closure about even descriptive matters, much less about conceptual and normative ones, as Macklin readily admits.)

My overall conclusion is that the project would have benefitted from inclusion of more sociologists of science. I do not believe that necessarily would have helped settle the issues; it would perhaps have muddied them even further. But as it is, the book too often represents scientific discourse as unproblematically guided by "sound argument." This could backfire by reinforcing the very belief in the authority of science that the editors avowedly want to counteract. Thus, I am not satisfied with the way the book has been "brought to closure."

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Plant-Water Relations

Stomatal Function. EDUARDO ZEIGER, G. D. FARQUHAR, and I. R. COWAN, Eds. Stanford University Press, Stanford, CA, 1987. xvi, 503 pp., illus. $65. Based on a meeting, Honolulu, HI, April 1983.

As the principal regulator of leaf-gas exchange, stomata attract considerable interest from plant scientists. Research has focused on mechanisms by which they sense the environment and transduce signals into the actions of opening or closing. *Stomatal Function* is a compendium of 20 papers that grew out of a meeting sponsored by the U.S.–Australia Cooperative Science Program. Although published four years after the meeting, most of the papers include recent literature.

The 20 chapters cover a wide variety of topics, from structure and guard-cell metabolism to whole-canopy transfer processes. Hans Meidner leads off with an account of the history of stomatal research. This is indispensable reading for all students of plant-water relations. The second chapter, by Hubert Ziegler, is a clear and informative discussion of the evolution of stomata. Although most of our understanding of stomata comes from just two or three species, Ziegler conveys the diversity of stomata across the plant kingdom.

The largest section of the book contains predictable chapters on energetics, metabolism, ion transport, and responses to light, carbon dioxide, and humidity. These chapters are an appropriate blending of individual ideas and relevant literature. They provide a scientific foundation on which to build the next level of experiments.

An indication of the recent explosion of interest in plant growth regulators is the inclusion of three separate chapters on this subject: "Action of abscisic acid on guard cells," "Cytokinins and stomata," and "Auxins and stomata." Although these chapters are not well coordinated with one another (for example, the auxin chapter has a wealth of information on abscisic acid), they document the view that stomata are not passive respondents to the environment and to leaf-water potentials but that stomatal aperture is coordinated in part by chemical messages from other parts of the plant.

The remaining chapters are more whole-plant–oriented than are the first two-thirds of the book. For example, responses to drought, diurnal variations, crassulacean acid metabolism, and leaf-age effects are discussed and successfully integrated with the physiological and biochemical responses described earlier. These chapters provide a framework for the interpretation of data and the construction of hypotheses.

The description of canopy transfer processes in chapter 18 relies heavily on partial differential equations and jargon that will be difficult for many physiologists to follow. The final chapter, "Calculations related to gas exchange," includes the equations necessary to understand the process of gas exchange and the related measurement procedures and at the same time describes the assumptions, pitfalls, and limitations of these measurements. This chapter will be useful not only for those making such mea-

surements but also for those reading and evaluating the data of others.

For those directly or indirectly active in plant-water relations, this volume will be useful as a current guide to research and a reference for years to come.

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Landform Studies from Space

Geomorphology from Space. A Global Overview of Regional Landforms. NICHOLAS M. SHORT and ROBERT W. BLAIR, JR., Eds. National Aeronautics and Space Administration, Washington, DC, 1986 (available from Government Printing Office, Washington, DC). xx, 717 pp., illus. $41. NASA Special Publication 486.

This atlas of images of earth from space has as its core 237 "plates," each of which consists of a space image (some occupying two pages) with three or four informative and enhancing aerial and ground photographs. Commentaries, or extended captions, draw attention to information contained in the primary images. The texts are generally excellent and germane to the plates. The space images are dominantly Landsat black-and-white, but there are some color composites as well as photographs taken by astronauts with hand-held cameras. A few radar and thermal images are also used. Image reproduction is of excellent quality throughout.

The book contains 12 chapters by various authorities on geomorphology. A general introduction on regional landforms analysis is followed by nine thematic groups of plates, each with a brief introduction on that type of landform. Victor Baker argues for a return to research in regional landforms analysis using the new imagery, and Everett, Morisawa, and Short emphasize tectonic studies utilizing regional landforms as a main data source. Discussions of volcanic, fluvial, deltaic, coastal, karst, eolian, glacial, and planetary landforms follow, all utilizing a regional approach made possible by satellite and aerial views. The classical drainage patterns (dendritic, trellis, and so forth) take on a spectacular regional aspect when viewed on large-area, small-scale images.

The remaining two chapters, by Robert S. Hayden and others, treat geomorphological mapping and global geomorphology. Well-established methods of geomorphological mapping are easily adapted to regional studies and could lead to new understanding of climatically controlled processes and terrain sensitivity, for example. In the chapter on global geomorphology, the importance of including the physiography of the sea floor in regional studies is brought out, and some directions for new research, in the form of questions, are given.

The book concludes with two appendixes, one dealing with remote sensing principles applied to space imagery, the other giving sources of the illustrations and data. A useful index completes the volume.

No radical or new concepts are developed, but the book emphasizes a new perspective for landform studies. It is clearly the editors' and authors' hope that this emphasis on regional analysis will lead to new ideas and perhaps revitalize the physiographic studies now generally fallen into disfavor in geomorphology.

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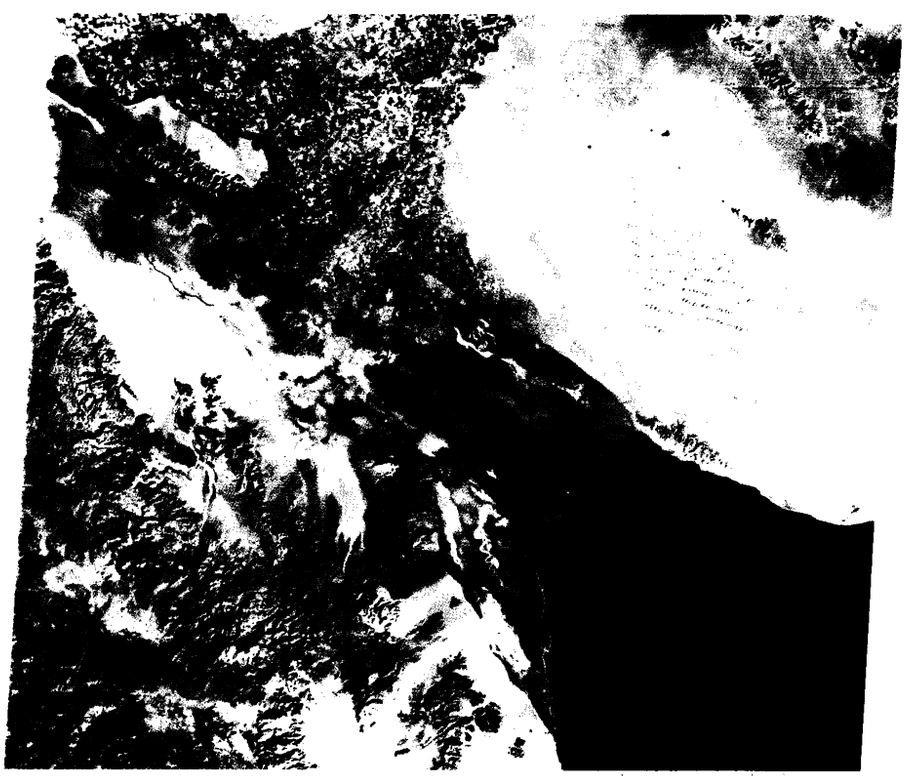

"This Landsat-2 view shows the northern end of the Gulf of California where the Colorado River passes into Mexico and forms a prominent delta at its mouth. The Sierra de Juárez, in Baja California (lower left), exemplifies tectonic landforms. Star, linear, and crescentic dunes are evident in the sand sheets that make up the Gran Desierto of the Sonoran Desert of Northwest Mexico." [From *Geomorphology from Space*]

Books Received

Advances in Nuclear Astrophysics. E. Vangioni-Flam *et al.*, Eds. Editions Frontières, Gif sur Yvette, France, 1986. xii, 611 pp., illus. $59. From a workshop, Paris, July 1986.

Agricultural Insect Pests of Temperate Regions and Their Control. Dennis S. Hill. Cambridge University Press, New York, 1987. viii, 659 pp., illus. $95.

Algorithmics. The Spirit of Computing. David Harel. Addison-Wesley, Reading, MA, 1987. xiv, 425 pp., illus. Paper, $22.95.

Amino Acids in Health and Disease. New Perspectives. Seymour Kaufman, Ed. Liss, New York, 1987. xvi, 619 pp., illus. $98. UCLA Symposia on Molecular and Cell Biology, vol. 55. From a symposium, Keystone, CO, May–June 1986.

Antarctic Science. D. W. H. Walton, Ed. Cambridge University Press, New York, 1987. viii, 280 pp., illus. $39.50.

Application of Distribution Coefficients to Radiological Assessment Models. T. H. Sibley and C. Myttenaere, Eds. Elsevier Applied Science, New York, 1986. xiv, 430 pp., illus. $69.25. From a seminar, Louvain-la-Neuve, Belgium, Oct. 1985.

Applications of the Monte Carlo Method in Statistical Physics. K. Binder, Ed. 2nd ed. Springer-Verlag, New York, 1987. xiv, 341 pp., illus. Paper, $35. Topics in Current Physics, 36.

Archaebacteria '85. Otto Kandler and Wolfram Zillig, Eds. Fischer, New York, 1987 (distributor, VCH, New York). viii, 434 pp., illus. $95. From a workshop, Munich, F.R.G., June 1985.

The Archaeology of Ancient China. Kwang-chih Chang. 4th ed. Yale University Press, New Haven, CT, 1987. xxvi, 450 pp., illus. $50; paper, $17.95.

The Archaeology of Western Iran. Settlement and Society from Prehistory to the Islamic Conquest. Frank Hole, Ed. Smithsonian Institution Press, Washington, DC, 1987. 332 pp., illus. $49.95. Smithsonian Series in Archaeological Inquiry.

The Biology of Perch and Related Fish. John Craig. Croom Helm, London, and Timber Press, Portland, OR, 1987. xviii, 333 pp., illus. $42.50.

BIOTEC 1. Microbial Genetic Engineering and Enzyme Technology. C. P. Hollenberg and H. Sahm, Eds. Fischer, Stuttgart, 1987 (U.S. distributor, VCH, Deerfield Beach, FL). viii, 142 pp., illus. Paper, $32.50. From a conference, Düsseldorf, F.R.G., 1985.

Cellular and Humoral Immunological Components of Cerebrospinal Fluid in Multiple Sclerosis. A. Lowenthal and J. Raus, Eds. Plenum, New York, 1987. xii, 525 pp., illus. $89.50. NATO Advanced