Part 2 addresses the most important recent findings on the control of the migration of primordial germ cells toward the gonads. Excellent papers by Heasman and Wylie, England, and Snow and Monk carefully detail and analyze recent progress on the roles of the cytoskeleton, the extracellular matrix, and chemotaxis in the migratory process. Evidence has accumulated that sulfated glycosamines, fibronectin, and collagen type I play important roles in guiding primordial germ cells to the gonads. These informative and timely papers are valuable sources of references.

Part 3 reviews our current knowledge concerning the embryonic origin of teratocarcinoma cells and the nature of the cell surface molecules as evidenced by serological and cellular immune responses. Although these papers tend to be descriptive, they do include new insights and show in particular how monoclonal antibodies have expanded our knowledge of germ cell tumors.

In recent years there has emerged a large body of evidence that the differentiation of the germ cell is directly controlled by information supplied by somatic cells. Parts 4 and 5 of this book feature seven formidable papers that critically review this evidence. These papers bring together a wide spectrum of knowledge on subjects ranging from a self-fertilizing hermaphrodite (*Cenorhabditis elegans*) to germ cell development in humans. This part of the book is particularly strong, and the questions and problems confronted in it are intriguing and thought-provoking. Although the papers are written from a developmental point of view, researchers interested in aspects of intragonadal regulatory mechanisms will find them interesting and rewarding.

Part 6 reviews our knowledge of gene expression in oocytes in relation to embryonic development. Papers by Dreyer *et al.* on the fate of oocyte nuclear proteins during development, by Woodland *et al.* on the strategy of histone gene expression, and by De Robertis *et al.* on the control of nucleocytoplasmic transport of macromolecules are well written and provide excellent overviews of the authors' research.

Overall, I found this to be a stimulating and provocative book whose quality is impressive. In the past two decades, a vast amount of new information has accumulated on the biology of the germ cell, and it is useful to have work on the female germ line brought together in one up-to-date volume. The book, however, is by no means complete. The subject is enormous, and the editors have limited themselves to a relatively unified portion of it that reflects their own research interests. Regardless of its limitations, the book will be of interest to a wide range of researchers in endocrinology, developmental biology, oncology, and cell biology.

G. F. ERICKSON
Department of Reproductive Medicine, University of California at San Diego, La Jolla 92093

Volcanoes and the Maya

Archeology and Volcanism in Central America. The Zapotitán Valley of El Salvador. PAYSON D. SHEETS, Ed. University of Texas Press, Austin, 1984. x, 307 pp., illus. $35. The Texas Pan American Series.

Questions about the impact of volcanic eruptions on human society were central to the University of Colorado's "Protoclassic Project" when, in 1975, its investigators began their study of regional prehistory in highland El Salvador. Indeed, one of the fundamental accomplishments of the project has been to document the local chronology of Holocene volcanism. The resulting geological sequence dates five sizable eruptions, beginning with one estimated between 800 and 600 B.C., followed by others at about A.D. 260, 590, 800 to 1300, and, most recently, a historically witnessed episode in 1658.

As a point of embarcation for the archeological research, Sheets and his associates ran a 100-kilometer-long survey transect across the western half of El Salvador. The results of this initial reconnaissance hinted at the particularly catastrophic effects of the flare-up of A.D. 260, identified as emanating from Mount Ilopango, on what was shown to be a densely populated area of Protoclassic Maya settlement. Thus inspired, the investigators turned their attention toward human ecology as it was affected by the deep and widespread ash deposition following the eruption. The designated locus of this effort was an environmentally diverse 546-square-kilometer area in the intermontane Zapotitán basin, lying barely 30 kilometers west of Ilopango, where geological sampling, a settlement pattern survey, and excavation at two archeological sites were carried out over a half-year field season in 1978 and two short periods in 1979 and 1980.

Most of the book under review is devoted to 11 papers reporting on the field and laboratory results of these interdisciplinary activities. In addition, Sheets includes introductory and concluding chapters that provide a background to the project, highlight the reports of his colleagues, and detail his research conclusions to date. A couple of short appendixes dealing with the analyses of recovered faunal and palynological remains round out the contributions.

Considering that only an 82-square-kilometer surface area of the valley was sampled in the course of survey, that subsurface investigation was limited to the digging of test pits at one archeological site and partial excavation of a domestic compound at another, and that as a consequence the quantity of archeological material analyzed was relatively modest, the project has achieved about as much in terms of archeological inference as could be expected of it. For the most part, the fieldwork that was carried out seems good, and some of the laboratory analyses, which include studies of soil and tephra deposits, ceramic remains, lithic artifacts, obsidian trace-element content and hydration, pollen, and fauna, are quite informative, small-scale though they may be. Out of all these, the well-documented region-wide stratigraphic linkage of geological and cultural history will likely prove one of the more widely referred to products of the investigation. Excavations at a Late Classic household complex at the Cerén site add some interesting and well-preserved if not terribly exciting evidence about highland Maya village life and material culture. I do find it curious why, with subsistence and human ecology central to the avowed research objectives of the project, excavation fill was left unscreened and no mention is made of any flotation to recover smaller organic remains. Many of the other deficiencies in data acquisition and analysis are acknowledged by the investigators, whose reports are peppered with extenuations related to inadequate sampling fractions and the restricted scale of excavations, all understandable given the time constraints and the deep volcanic overburden.

The most controversial thesis these data address has to do with the role of migration in the development of Classic Maya civilization. Along with a number of other Mesoamerican prehistorians, Sheets had argued previously that the florescence of lowland Maya culture was not the result of indigenous development, as is commonly accepted, but rather was sparked by the mass move-

ment into the Yucatán Penninsula of refugees from the culturally precocious but volcano-ravaged lands of El Salvador and Honduras. Migrationism in the explanation of culture history is carried a giant step further in the present study, where the focus is on a hypothesis that, after a 150- to-200-year occupational hiatus following the Ilopango eruption, rapid repopulation of the El Salvador highlands resulted from the organized reverse incursion of Maya groups from the lowlands.

In support of this hypothesis, various authors in the volume point to the seeming lack of human remains in the Valley during the Protoclassic–Early Classic periods, followed by the sudden appearance of sophisticated lowland-related pottery and stone tools at sites dated to the beginning of the Late Classic. The suggestion is that such findings reflect the expansion into the southeastern highlands of Chortí migrants from Copán and other lowland Maya centers, as these people sought to reestablish obsidian and other long-distance commodity procurement networks after the collapse of Teotihuacán. The hard evidence to date from the Zapotitán Valley for a lowland Chortí recolonization is painfully meager—mainly an interpretation of rapid reoccupation at the one partially excavated Late Classic domestic complex, which apparently was inhabited by high-status individuals, judging from their lowland-like elite material culture and their ability to procure exotic trade goods such as polychrome pottery and obsidian.

Mass migration is difficult enough to document archeologically under the best of circumstances, and in this case there are simply not yet sufficient data to test the hypothesis convincingly. Even if it could be shown that widespread abandonment of the highlands ensued after the Ilopango eruption, leaving few or no remnant groups, it would be uncertain whether an economically motivated Chortí takeover was responsible for resettlement. An alternative suggested by Hummer, another project member, is that the Late Classic recovery can be explained as part of a gradual, population-pressure–induced expansion of outlying lowland Maya agriculturalists. Thwarting a solution to this question is the limited extent of the project's surface survey (not to mention the dearth of similar surveys in adjacent areas) and thus an inability to demonstrate adequately the extent of the post-Ilopango highland abandonment and the sequence of reoccupation. One wonders if a more encompassing survey would be very meaningful even if implemented, considering the deep ash layers from subsequent eruptions that cap any hypothesis-disconfirming Early and Middle Classic sites.

Finally, I think little was gained by the study through its appeal to "hazard theory," defined as a subarea of human ecology dealing with the ways people adjust to natural disasters. The attempt to "exploit the methods, approaches, and generalizations derived from that research" added few new insights into the Late Classic prehistory of the highlands beyond the commonsense recognition that people faced with agricultural collapse in their burned-out, ash-covered homeland might have moved on and that they, or others, would likely have reoccupied the area when conditions ameliorated. Moreover, the use of "hazard theory," with its emphasis on behavioral responses such as "loss absorption, loss acceptance, loss reduction, and radical action," seems singularly inappropriate to an explanation of recolonization by peoples disassociated from the disaster by as much as 200 years, peoples perhaps lacking an appreciation of the recurrent potential of volcanism and therefore unconscious of the true risks attendant on highland living.

What is most needed in the study of this intriguing question is not a new behavioral model but simply many more archeological data showing the full spatial and temporal extent of highland, lowland, and intermediate cultures in the centuries following the Ilopango eruption that we may test hypotheses already extant. The research of Sheets and his collaborators has significantly advanced this objective, and it is apparent from the 1979–80 geophysical reconnaissance at the Cerén site reported by Loker in the present volume that there is important evidence still waiting to be recovered. In this we have yet another reason to hope for more tranquil times ahead in El Salvador, politically as well as geologically.

ROBERT N. ZEITLIN
Department of Anthropology,
Brandeis University,
Waltham, Massachusetts 02254

Books Received

Accidental Exposure to Dioxins. Human Health Aspects. Frederick Coulston and Francesco Pocchiari, Eds. Academic Press, Orlando, Fla., 1983. xiv, 295 pp., illus. $24.50. Ecotoxicology and Environmental Quality Series. From a forum, Bethesda, Md., Oct. 1981.

Bridge to the Future. A Centennial Celebration of the Brooklyn Bridge. Margaret Latimer, Brooke Hindle, and Melvin Kranzberg. New York Academy of Sciences, New York, 1984. xiv, 355 pp., illus. Paper, $75. Annals of the New York Academy of Sciences, vol. 424. From a symposium, New York, May 1983.

The Cannabinoids. Chemical, Pharmacologic, and Therapeutic Aspects. Stig Agurell, William L. Dewey, and Robert E. Willette, Eds. Academic Press, Orlando, Fla., 1984. xxii, 909 pp., illus. $88. From a meeting, Louisville, Ky., Aug. 1982.

Dual Addiction. Pharmacological Issues in the Treatment of Concomitant Alcoholism and Drug Abuse. Mary Jeanne Kreek and Barry Stimmel, Eds. Haworth, New York, 1984. viii, 120 pp., illus. $22.95. Also published in *Advances in Alcohol and Substance Abuse*, vol. 3, No. 4.

Earthfire. The Eruption of Mount St. Helens. Charles Rosenfeld and Robert Cooke. MIT Press, Cambridge, Mass., 1984. xiv, 155 pp., illus. Paper, $9.95. Reprint, 1982 edition.

Future Survey Annual 1983. A Guide to the Recent Literature of Trends, Forecasts, and Policy Proposals. Michael Marien and Lane Jennings, Eds. World Future Society, Bethesda, Md., 1984. xiv, 240 pp. Paper, $25.

Ganglioside Structure, Function, and Biomedical Potential. Robert W. Ledeen *et al.*, Eds. Plenum, New York, 1984. xii, 649 pp., illus. $89.50. Advances in Experimental Medicine and Biology, vol. 174. From a symposium, Parksville, British Columbia, July 1983.

Hydroxyanisole. Recent Advances in Anti-Melanoma Therapy. P. A. Riley, Ed. IRL Press, Washington, D.C., 1984. viii, 248 pp., illus. Paper, $38. From a symposium, London, Sept. 1982.

Icosanoids and Cancer. Hélène Thaler-Dao, André Crastes de Paulet, and Rodolfo Paoletti, Eds. Raven, New York, 1984. xx, 289 pp., illus. $50.50. From a symposium, Ile de Bendor, Sept. 1983.

Lymphokines. A Forum for Immunoregulatory Cell Products. Vol. 8. Edgar Pick, Ed. Academic Press, Orlando, Fla., 1983. xx, 452 pp., illus. $57.

Mammalian Cell Culture. The Use of Serum-Free Hormone-Supplemented Media. Jennie P. Mather, Ed. Plenum, New York, 1984. xviii, 284 pp., illus. $39.50.

Management Operations of the National Cancer Institute That Influence the Governance of Science. Vincent T. DeVita, Jr., and Louis M. Carrese, Eds. National Cancer Institute, Bethesda, Md., 1984 (available from the Superintendent of Documents, Washington, D.C.). x, 139 pp. $9. National Cancer Institute Monograph 64.

Nutritional Surveillance. John B. Mason *et al.* World Health Organization, Geneva, 1984 (U.S. distributor, WHO Publications Centre USA, Albany, N.Y.). 194 pp., illus. Paper, $10.50.

Observing the Universe. Nigel Henbest, Ed. Basil Blackwell, New York, and *New Scientist*, London, 1984. xvi, 288 pp., illus. $19.95; paper, $8.95. *New Scientist* Guides.

Psychosocial Stress. Trends in Theory and Research. Howard B. Kaplan, Ed. Academic Press, Orlando, Fla., 1983. xvi, 346 pp. $36. From a conference, Mexico City, Aug. 1982.

The Quantum Theory of Unimolecular Reactions. H. O. Pritchard. Cambridge University Press, New York, 1984. xvi, 175 pp., illus. $49.50.

The Role of Extracellular Matrix in Development. Robert L. Trelstad, Ed. Liss, New York, 1984. xviii, 643 pp., illus. $76. From a symposium, Irvine, Calif., June 1983.

Salinity Tolerance in Plants. Strategies for Crop Improvement. Richard C. Staples and Gary H. Toenniessen, Eds. Wiley-Interscience, New York, 1984. xviii, 443 pp., illus. $49.95. From a conference, Bellagio, Italy.

Terra Non Firma. Understanding and Preparing for Earthquakes. James M. Gere and Haresh C. Shah. Freeman, New York, 1984. xii, 203 pp., illus. $19.95; paper, $11.95. Originally published in Portable Stanford Series.

The Light-Hearted Astronomer. Ken Fulton. AstroMedia, Milwaukee, 1984. viii, 115 pp. Paper, $6.95.

Theory of Natural Selection and Population Growth. Lev R. Ginzburg. Benjamin/Cummings, Menlo Park, Calif., 1983. xvi, 160 pp., illus. $21.95. Series in Evolution Biology, Institute of Ecology, University of California, Davis.

Thesaurus of Rock and Soil Mechanics Terms. Compiled by J. P. Jenkins and A. M. Smith. Pergamon, New York, 1984. x, 62 pp. Paper, $15.

Tilapiine Fishes of the Genera *Sarotherodon*, *Oreochromis* and *Danakilia*. Ethelwynn Trewavas. British Museum (Natural History), London, and Comstock (Cornell University Press), Ithaca, N.Y., 1984. xii, 583 pp., illus. $95.

Time, Space and Things. B. K. Ridley. 2nd ed. Cambridge University Press, New York, 1984. x, 182 pp., illus. $29.95; paper, $9.95.