holistic approach that upturns whole systems, environmental and social, is that it allows for continuation of the internal adaptive process. The responses that have already been demonstrated should be more effective if the Malthusian effect were diminished. This is not to deny the great value of this book as making a realistic case for development; rather, it is a suggestion for phasing the priorities among the developmental alternatives that are presented. It is to be hoped that, under circumstances such as those of the hill peoples of Thailand, preservation of options for cultural adaptation is as practical an aim as agricultural improvement.

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Drought

Proceedings of the Symposium on Drought in Botswana. Gaborone, Botswana, June 1978. MADALON T. HINCHEY, Ed. The Botswana Society, Gaborone, and Clark University Press, Worcester, Mass., 1979 (distributor, University Press of New England, Hanover, N.H.). xii, 306 pp., illus. Paper, $15.

It is probably true that no year passes without a serious drought somewhere in the world. Recent droughts—in the Sahel from 1969 to 1974, in the Soviet Union in 1972, in the United States in 1976 and '77, in western Europe in 1976, and in much of the Indian subcontinent at this writing—have been the subject of headlines and television reports. Although this attention may have led some to think that something is happening to the world's climate that makes drought more frequent, documents of governmental agencies and colonial bureaucracies, the literature and the oral traditions of many peoples, and even the relatively short record of instrumented climate observations (100 to 200 years, for most of the globe) indicate that there really is nothing new about these situations. It is true, though, that, with surging world population and wildly inflating costs of the energy that is needed for such amelioration tactics as irrigation and emergency tillage, the impact of drought may become far more serious in the developed as well as the less developed countries than it has been in even the recent past.

The proceedings of the symposium on drought in Botswana are welcome, since they offer information from a wide range of viewpoints to help us understand the impact of drought in a sensitive region. The proceedings are, on the whole, interesting for the number and integration of the disciplines considered relevant to the problem of drought in southern Africa. The book is scholarly and carefully edited.

In the first three sections (Background Papers, Towards a Definition of Drought, Physical Aspects of Drought) we gain some understanding of the physical setting of Botswana, a nation imposed on the Kalahari desert. In the next section, Social Aspects of Drought, the culture of the peoples of Botswana and their traditional techniques for coping with drought—migration, reduction of herd size, and sharing of food supplies, for example—are described by a number of social scientists. This section contains a paper by Campbell on the 1960's drought in Botswana, the primary concern of the symposium. I would have preferred to see this paper at the beginning of the book, since it provides a clear explanation of the chronology and impact of the drought and a systematic description of attempts made to mitigate its effects.

All of the problems and impacts associated with drought in the less developed countries were manifested during the Botswana drought. Human and animal populations had increased from precolonial times and again following recovery from prior 20th-century droughts. Stress on the available forage supplies became great. The tendency of animals to concentrate near available water resulted in overgrazing in certain areas. The level of human nutrition fell seriously below acceptable standards in many areas.

This story has clear parallels in the far better publicized events in Sahelian Africa, as papers by Wetherell, Holt, and Richards and by Rijks make clear. Another parallel to the Sahelian experience is the almost total lack of governmental preparedness to cope with drought. It was not until the fourth or fifth year of the drought that any effective measures were taken to ameliorate the condition of the affected herdsmen and farmers.

Apparently, the government of Botswana does not intend for such a situation to occur again (nor do the nations of the Sahel, which have established a seven-nation intergovernmental agency to develop drought preparedness measures). Thus the book concludes with a consideration of networks and information systems to provide early warnings of drought. The importance of information collected in the districts as well as from meteorological and satellite networks is stressed. Nutritional surveillance as a method of planning the prevention of hunger is also examined.

This volume is one of a number of new reports dealing with recent droughts in the semiarid regions of the world. The lessons to be learned from these reports seem clear: drought is a normal, recurrent phenomenon of the semiarid regions and one for which preparation and advance planning are necessary; whether or not nonreversible desertification is occurring on the margins of the semiarid zones today, overpopulation by humans and animals and overgrazing seriously exacerbate the impact of periodic droughts; if drought preparedness and amelioration efforts are to be effective, an understanding of the workings of tribal and village societies and their traditional modes of coping is essential—though one must not assume that they always cope well.

The book constitutes one of the best and most useful recent reports I have seen on the subject of drought in the developing countries. I also recommend *The Aftermath of the 1972-74 Drought in Nigeria* (G. J. van Apeldoorn, Ed., Federal Department of Water Resources and Center for Social and Economic Research, Ahmadu Bello University, Nigeria, 1978). It, too, contains a wealth of material on local agronomic, pastural, and water resource problems that occur in times of drought. In neither report does the wealth of biological and physical detail obscure equally important information on and analysis of the social and economic impacts of drought.

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Volcanism in Human History

Volcanic Activity and Human Ecology. PAYSON D. SHEETS and DONALD K. GRAYSON, Eds. Academic Press, New York, 1979. xviii, 644 pp., illus. $49.50.

Through the course of earth and human history volcanoes have been of great significance both as a biological and human hazard and as a resource. As specific features, volcanoes only occupy a limited part of the earth, but landscapes of volcanic origin occupy some 2 percent of the total continental surfaces and 4 percent of North America, Africa, and Asia. These surfaces range in age from Mesozoic to Holocene and are pri-

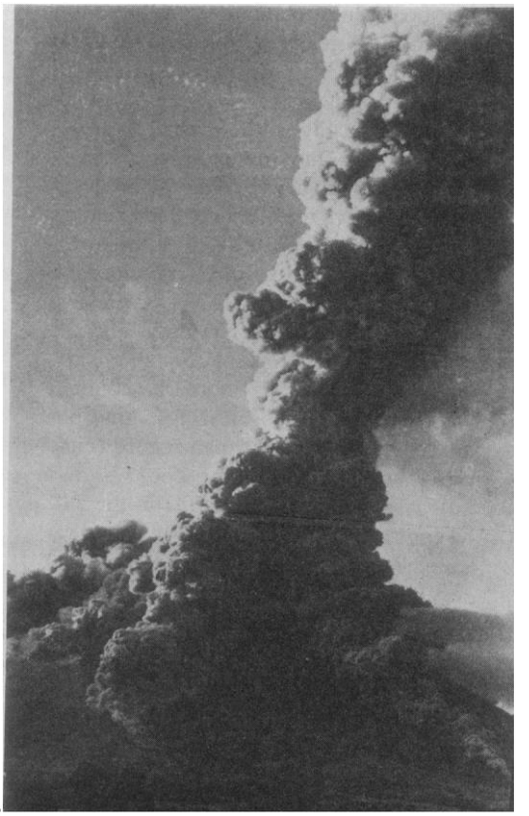
marily a result of extensive basaltic fissure flows erupting between widely spaced shield volcanoes, similar to the main island of Hawaii. On the other hand, explosive craters of the Vesuvius type are associated with great injections of pyroclastic debris into the atmosphere, in part raining down on surrounding lands in the form of incandescent ash, as occurred at Mount Pelée in 1902; in part, too, explosive volcanism has supplied masses of silt-sized tuff, thickly mantling hillslopes or finding their way into more distant sedimentary basins by water transport, as in the East African Rift.

This volume provides a wide-ranging compendium of singular interest for a wide audience. Introductory chapters on volcanic activity by Fred Bullard and on the stratigraphic study of Pleistocene tephra by Lawrence Kittleman are followed by a welcome chapter on the commonly fertile soils that develop on many volcanic rocks (F. C. Ugolini and R. J. Zasoski) and then by a series of chapters that painstakingly review the catastrophic impact of eruptions in historical times, such as those of Iceland (S. Thorarinsson), the Cascade Mountains (D. R. Crandell, D. R. Mullineaux, and C. D. Miller), Hawaii (D. Hodge, V. Sharp, and M. Marts), and Paricutín, Mexico (J. D. Rees; M. L. Nolan). Rees's study deals more comprehensively with biotic implications, and R. A. Warrick provides a general overview of volcanic hazards.

The remainder of the book (ten chapters) is devoted to equally valuable geoarcheological assessments of the significance of prehistoric volcanism in Alaska (W. B. Workman and D. E. Dumond), Washington and Oregon (E. Blinman, P. J. Mehringer, Jr., J. C. Sheppard; D. K. Grayson), central Arizona (P. J. Pilles, Jr.; R. H. Hevly, R. E. Kelly, G. A. Anderson, S. J. Olsen), Mesoamerica (P. D. Sheets), Santorini or Thera (C. Renfrew), and Mount Vesuvius (W. F. Jashemki), closing with a general evaluation by the editors of volcanic disasters and the archeological record. Grayson and Sheets reiterate the prevalent theme of the volume, namely, volcanism as a source of natural disasters and hazards. But, as the detailed examinations show, the socioeconomic networks of the prehistoric populations spanned areas not affected by volcanic catastrophes, and migrants appear to have maintained their cultural and adaptive traditions as refugees, ultimately reoccupying their old areas with negligible long-term impact.

In some instances, such as the Ilopango eruption in El Salvador during the 3rd century A.D. or sporadic eruptions in interior Alaska and the Yukon Territory, the effects of volcanic catastrophes may have been more fundamental, perhaps in terminating centers of civilization or small, dispersed populations, more probably in transforming exchange networks or forcing migrations, and possibly having major and long-term social repercussions. But the best-studied case, that of Santorini and the demise of the Minoan civilization, argues for great caution. Renfrew shows that related ashfalls

"Cerén [El Salvador] farmhouse, looking southwest. Note the Preclassic soil horizon, with an occasional artifact, buried by the white volcanic ash from Ilopango. House and fields indicate at least partial recovery of soils and human population from the Ilopango disaster. Floor and columns were made of adobe, wet-laid and then fired, and wingwalls were made of wattle and daub. The bottom of the doorway is visible in the center. The hole through the left wingwall may have been caused by the hot tephra degassing itself after it fell, creating a gas vent. The gas vent exposed the floor of the pantry. . . . The air-fall layers of tephra from the Laguna Caldera eruption are 4 m deep above the floor." [From P. D. Sheets's chapter in *Volcanic Activity and Human Ecology*; courtesy of C. Zier]



"Mayon Volcano, Philippines, showing *nuclées ardentes* in the eruption on April 24, 1968. In the lower right is the tower of the church of Cagsaua, which was destroyed by mudflows in the 1814 eruption, killing several hundred people who had sought refuge in the church." [From F. M. Bullard's chapter in *Volcanic Activity and Human Ecology*. Photo by SIX-SIS Studio, Legaspi City, Albay, Philippines; courtesy Philippine Commission of Volcanology]

even on eastern Crete were minimal and that there is no evidence for destructive tsunamis or related earthquakes; in fact, the exact timing of the two explosions of Santorini between 1500 and 1450 B.C. remains controversial, and neither event can be directly linked with either the destruction of Knossos or the less-than-dramatic decline of Minoan Crete. The economic and demographic losses associated with the eruption of Vesuvius in A.D. 79 and Krakatoa in 1883 were very real and they did have significant short-term impacts, but they did not shake the foundations of Roman or Javanese society. These local impacts also need to be considered in wider, even global contexts, as in the case of the widespread crop failure of 1816 in Europe and North America resulting from stratospheric dust generated by the explosion of Tambora volcano in 1815.

It is important to remember that the majority of natural disasters are relatively brief and localized and that most societies are buffered from their impacts by technology, social organization, and exchange networks. Only a concatenation of undermining factors can generate the systemic momentum necessary to produce fundamental structural changes. In any event, natural disasters remain only one of many potent agencies and can rank as no more than one of several in any particular transformation.

It is regrettable that this otherwise excellent volume chose to emphasize the negative consequences of volcanism. Many lavas and tuffs provide soils of exceptional and sustained productivity, and volcanic peaks in otherwise semiarid environments favor intensified rainfall on their windward slopes, thus contributing beneficially to the overall hydrology. Volcanic mountains in the humid tropics offer diverse ecological opportunities and have traditionally been centers of population because of these opportunities. Scientifically, volcanic rocks have been of inestimable value in preserving unique biotic records for study, and the singular fossilization of Pompeii, Herculaneum, and Akrotiri should be counted among archeology's blessings. Last but not least, the East African record (curiously not treated in this book) shows how water-disseminated tuffs in the Rift basins have been in no small measure responsible for the preservation of critical segments of the history of human evolution.

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A Legendary Wetland

The Great Dismal Swamp. Proceedings of a symposium, March 1974. PAUL W. KIRK, JR., Ed. Published for the Old Dominion University Research Foundation by the University Press of Virginia, Charlottesville, 1979. xiv, 428 pp., illus. $20.

This book is composed of 20 in-depth reports on the physical character, relation to human history, and biotic makeup of the Dismal Swamp area, which straddles the boundary between Virginia and North Carolina. Nearly 50,000 acres make up the Dismal Swamp National Wildlife Refuge, following a gift in the early 1970's from the Union Camp Corporation (mainly a paper company) to the Nature Conservancy. The swamp, a northern part of a great southeastern wetlands area, extends from the Suffolk Escarpment eastward across a section of Miocene marl, called the Yorktown Formation, nearly to the Atlantic coast. The swamp is centered about Lake Drummond, some 12 kilometers southeast of Suffolk, Virginia; the lake is bordered on the east by Highway 17, extending along the Dismal Swamp Feeder Canal, running southward from Portsmouth, Virginia. This area of swampland is best known to the general public for its early reputation as a land of mystery, dangerous wild beasts, and abundant legend, fueled by poets and by Harriet Beecher Stowe's 1856 novel *Dred, a Tale of the Dismal Swamp*, set in a framework of the Civil War. As early as the late 1770's, a plantation was established within the western margin of the swamp, followed by an industry based on shingles and lumber (chiefly from cypress and white cedar trees), with the construction of a network of sandy roads paralleling drainage canals. A feeder canal connects 3.7-kilometer-wide Lake Drummond to the Intracoastal waterway.

Several books about the area, typified by Hubert J. Davis's 1962 *The Great Dismal Swamp*, have been published, but most of them concentrate more on legends and fanciful stories than on factual information. For this reason, the book here reviewed is welcome. It is the result of a symposium held in Norfolk, Virginia, under the auspices of Old Dominion University. The editor and seven contributors are on the staff of the university's department of biological sciences.

The chapters detailing the physical nature and hydrology of the swamp and those reporting on the flora and fauna are well written and reflect careful fieldwork and other research. It is believed that the swamp itself is no less than 80,000 years old, though some features may be younger. Much of the terrain is underlain 3 to 18 feet deep with peat, which has resulted in many fires, especially one that burned extensively to a depth of 6 feet in 1930. Coniferous pollen, mainly pine and

"Tupelo gum (*Nyssa aquatica*) community type; a habitat of the Prothonotary Warbler." [From B. Meanley's paper in *The Great Dismal Swamp*]