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 make-up 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*]

spruce, is the oldest pollen recognized, and an analysis shows that the peat in the main northern and western parts of the swamp is entirely a product of freshwater plant growth. The peat formation was once surmised to have resulted from ponding due to beaver activity, but that view is now rejected. (In fact, the beaver does not now occur there.) Instead, sea-level changes, profoundly affecting the water table, may have been responsible.

Charles Handley prepared an annotated list of mammals after exploring past, sometimes anecdotal, reports and making necessary corrections of previous identifications. He believes that the cottontail rabbit is more numerous than previously, owing to drier terrain, related to drainage changes. The marsh rabbit, here in the extreme northeastern part of its range, is not abundant. The white-tailed deer and black bear, both hunted actively, are the largest wild animals of the swamp. It is recorded (p. 299) that between 1763 and 1768 George Washington visited the swamp at least five times and "found a glorious paradise abounding in wild fowl and game."

James Matta reports on aquatic insects; he, too, evaluated earlier records, and he personally made more than 100 individual collections from the swamp. In his paper 155 aquatic insect species are enumerated, with information on preferred habitat, distribution elsewhere, and seasonal appearance. They represent seven orders and 34 families. All records are carefully documented. An editorial note on p. 220 states that 27 species, including many Odonata, have been added by Matta since the manuscript was received for the volume; in view of the rich insect fauna, further collecting may yield additional species.

In addition to the several census-type papers on fauna and flora, several special papers deal with a simulated model involving a population of white-footed mice, the ecology of two dominant tick species that occur in the swamp, and two inadequately known species of ferns.

To summarize, this is a very substantial, useful book that will be valuable for several generations to come as a source of information. The editor and contributors merit hearty commendation. Biologists interested in further field studies should contact the office of the Dismal Swamp National Wildlife Refuge, Suffolk, Virginia 23508.

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Preservation Efforts

Survival or Extinction. The Practical Rôle of Botanic Gardens in the Conservation of Rare and Threatened Plants. Proceedings of a conference, Kew, England, Sept. 1978. HUGH SYNGE and HARRY TOWNSEND, Eds. Bentham-Moxon Trust, Royal Botanic Gardens, Kew, 1979. x, 250 pp., illus. Paper, $17.

The adoption of the Convention of International Trade in Endangered Species of Wild Fauna and Flora on 3 March 1973 and its later ratification provided the needed stimulus for many countries to take notice of the conservation problem and even adopt their own laws regarding threatened and endangered species. Initially, many of the signatories to this convention were unable to identify the endangered elements in their own floras so as to develop lists of species eligible for protection. Many workshops and conferences soon followed. The early conferences and the publications stemming from them were dominated by two themes: the rapid destruction of tropical rain forest and the lack of data regarding threatened and endangered species. Now, conference proceedings are citing examples of successful projects and progress along many fronts. Documented accounts of the disappearance of the rain forest continue, however, leaving little grounds for optimism. As a series, the conference proceedings published since 1973 constitute a valuable record of the mobilization and multifarious efforts under way to save or prolong the existence of some of the plant genetic resources, yet they are also a record of the continued extirpation of plant species.

The theme of the conference from which the present volume results was the role botanical gardens can play in the conservation effort. The 34 papers it contains deal mainly with projects and programs involving European flora, although papers concerning Mexico and portions of Asia, Africa, and South America are included. Noticeably absent are papers relating to projects in the United States and Canada, despite the large number of botanical gardens in the two countries. This may be due to the failure of North American botanical garden personnel to participate in the conference or it may reflect the low level of activity in North American gardens prior to 1978. I suspect both answers have some validity.

Thompson's paper on the preservation of plant resources in gene banks within botanical gardens should be compulsory reading for all botanical garden administrators. Too often such administrators refer to their gardens as living gene banks, but, as Thompson states, the gardens "fulfill virtually none of the functions of a gene bank, nor in their traditional form could they." Botanical gardens can serve important functions in the study and evaluation of species, in increasing the numbers of individuals, and in the reintroduction of stocks into the wild. The problems of maintaining whole plants in living collections are compared with the problems of maintaining the plants or populations in seed banks or in vitro cultures. Seed banks are considered the best means because the cost is lower and there are fewer problems in maintaining the materials.

The activities of the botanical gardens in the U.S.S.R. are summarized by Gogina. Especially interesting is information concerning the formation by the Council of Botanical Gardens of a special committee for threatened plants in 1974 and how the council and committee are coordinating the efforts of 115 gardens throughout the Soviet Union. Individual papers on the threatened flora of Kazakhstan and on the Tibilsi Botanical Garden in Soviet Georgia provide further insight into the direction and scope of their activities.

This collection of papers is superior to other such efforts. It represents an important stage in the documenting of the battle to preserve the world's botanical diversity. The editors have provided a set of consistently good papers, and *Survival or Extinction* is an important reference for anyone working with rare or threatened plant species.

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Books Received

American Sign Language and Sign Systems. Ronnie Bring Wilbur. University Park Press, Baltimore, 1979. xvi, 312 pp., illus. $24.50. Perspectives in Audiology Series.

Applied Medical Geography. Gerald F. Pyle. Winston, Washington, D.C., and Halsted (Wiley), New York, 1979. xiv, 282 pp., illus. $19.75. Scripta Series in Geography.

Behavioral Sex Differences in Nonhuman Primates. G. Mitchell. Van Nostrand Reinhold, New York, 1979. xviii, 516 pp. + plates. $27.50.

Carcinoembryonic Proteins. Recent Progress. Papers from a meeting, Copenhagen, Aug. 1977. Bent Nørgaard-Pedersen and Nils H. Axelsen, Eds. Published for the Scandinavian Society for Immunology by Blackwell,

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