Book Reviews

Domestication

Origins of Agriculture. Papers from a conference, 1973. CHARLES A. REED, Ed. Mouton, The Hague, 1978. (U.S. distributor, Beresford Book Service, Chicago). xvi, 1014 pp., illus. $64. World Anthropology.

The attempt to explain the beginnings of domestication has occupied the creative powers of biologists, archeologists, and geographers for more than a century. No lesser authorities than DeCandolle, Darwin, and Vavilov inaugurated the scientific study of anthropogenic plants and animals and their dependence upon humans for their continued existence. In this tome 28 authors who participated in meetings in conjunction with the ninth International Congress of Anthropological and Ethnological Sciences summarize knowledge of early domesticates worldwide and contribute their diverse ideas about the origins of agriculture. As this volume demonstrates vividly, many issues remain unresolved despite considerable progress.

With the exceptions of Carter, who espouses a global diffusion of the idea of domestication from a single Southeast Asian source, and Lathrap, who champions an African origin for New World agriculture, the contributors concur that there were many independent inventions of domestication. They differ, however, in the factors they evoke to explain the change from gathering and hunting to agriculture. Several authors emphasize some form of stress. Increased population pressure on resources is advanced by Cohen but staunchly rejected by Bronson and Caldwell. Wagner argues for environmental changes that produced the conditions necessary for domestication, and Wright supports this idea for the Near East, at least, with evidence that cereal grasses were virtually absent from the area until 11,000 years ago, when an ameliorated climate supported their immigration and they replaced an *Artemisia* steppe. Other forms of need or deprivation are advocated by Carr, Gorman, and Perrot.

In contrast to these prime mover positions other authors present multivariate models. In a noteworthy essay Harris delineates five potential pathways to domestication, with only cereal seed gathering, tuber harvesting, and ungulate herding producing domesticates. Altogether different processes of disequilibrium in an existing system of exploitation resulted in domestication. Bronson is equally concerned with multiple causes, but with a pathway leading to husbandry of a nonstaple plant. He envisions a fine-grained (tropical) ecological context in which a vital utilitarian plant is propagated in order to maintain an adequate supply. From a regional perspective Hassan, Redman, and Reed examine the cultural, biological, social, and intersocietal interactions that preceded domestication in the Near East, and Wing provides a sequence of convincing models describing changes in human-animal interactions in the Central Andes.

Nevertheless, despite the elegance of scientific and philosophical speculation about agricultural origins, the history of the subject is one of discarded theories disproven by phytogeographical, genetic, and primarily archeological evidence. This volume presents compilations of significant research that are indispensable for judging current theories and for demarcating further investigations.

In general in the Old World domestication secured more reliable food resources. Herre and Röhrs recapitulate the distribution and history of domesticated Eurasian animals. Complementing their article, Harlan synthesizes the development of primary cultivated cereals throughout Asia and Africa. (Africa receives a comprehensive review in a separate volume in this series.)

For years Southeast Asia, viewed by Sauer as the homeland of earliest agriculture based on tubers, was unknown archeobiologically. Today the situation has changed and Sauer's original proposition has been challenged. Gorman, assessing evidence for early cultivation from Spirit Cave and Non Nok Tha in Thailand, argues not only that the species are more diverse ecologically than Sauer admitted but that the distribution of wild rice did not exclude tubers and the two plants should be considered as codomesticates. Since the first known domesticated rice comes from this region, possibly by 6500 years ago, the implications of this work are exciting. Of comparable importance are the animal bones, including domesticated cattle with the rice, described in detail by Higham.

In light of this research the agricultural history of China requires reassessment. After evaluating the archeological evidence, radiocarbon dates, and paleographic clues, Ho concedes that the beginning of rice cultivation in China remains unknown, although the practice was possibly autochthonous there and in other areas in Asia. However, the basis of Chinese civilization was a complex of millets and pigs, which apparently were domesticated in northern China independently of either other Asian or Mesopotamian influences.

Early agriculture is better documented for the Near East than for any other geographical center. The authors concur that a technological complex of sickles and grinding slabs (Kraybill) for processing wild wheats and barley enabled establishment of sedentary communities with storage facilities before domestication began by 9000 years ago. They also recognize a difference between the Levant and the Zagros mountains in plants, animals, and early villages. They disagree, however, when the reasons for domestication are examined. In the case of animals, for example, Reed proposes pet keeping, Harris salt management, and Hassan a need for protein, and others suggest crop deprivation unless ungulates were controlled.

Although India is not well researched, Vishnu-Mittre shows that agriculture there started after contact with Southwest Asia 5000 years ago. Furthermore, India was not the center of primary domestication, although several plants became secondary domesticates.

The New World contrasts markedly with the Old. Here plant cultivation was more important than animal husbandry and many of the plants were cultivated for utilitarian purposes and not necessarily for food. The consequences of late Pleistocene climatic changes, according to Wright, were not as compelling as in the Near East. Pickersgill and Heiser demonstrate that many species of plants were domesticated independently on both continents.

Although several authors refer to Mesoamerica, only Beadle discusses the region in the context of the evolution of a particular plant. He presents convincing

evidence for the development of maize from teosinte and the rejection of a wild maize other than teosinte as the ancestral form.

South America, on the other hand, receives extensive coverage from Lathrap, MacNeish, Pickersgill and Heiser, Wing, and Cohen. Controversy follows Lathrap's imagined shipwrecked African fishermen who putatively brought the bottle gourd, cotton, and garden horticulture to Amazonia. According to Lathrap the dissemination of these plants to the Andes and Mesoamerica formed the basis of all subsequent domestication in the New World.

This source for American agriculture is rejected by other authorities. In this volume MacNeish details his recent research in Ayacucho, Peru. His conclusions are that climatic disequilibrium in an environment with habitat and seasonal diversity encouraged domestication independently in many localities. Clearly Wing's analysis of faunal evidence for llama and guinea pig domestication supports a local pattern of changing animal utilization and management. Most damaging to the Lathrap thesis is Pickersgill and Heiser's belief that the bottle gourd and cotton, admittedly with a genetic ancestry in Africa, were dispersed by natural agents other than humans and that the distribution of the progenitors of most domesticates in South America remains unknown. Finally, Pickersgill and Heiser regard the Andean root crop complex as a local derivation associated with other high-altitude crops and thus independent in origin from manioc and tropical tubers.

Aside from the dog and the turkey, indigenous domesticates north of Mexico were exclusively plants. Since Yarnell wrote his contribution to the volume, he has worked with evidence indicating that squash and gourd cultivars were introduced into the eastern United States from Mexico prior to the domestication of the native sumpweed and sunflower. In all, his presentation is an excellent statement of prehistoric relations between Indian populations and plants. The failure of Native Americans to domesticate animals is discussed without resolution by Carr.

The volume bears evidence of the difficulty of editing a work of such magnitude. An inverted map (p. 772) and a sideways photo (accompanying Vishnu-Mittre's paper, plate 4) are annoying, but several other errors are misleading for the nonspecialist: "metal template" (p. 342) should read "mental template"; the Indian Iron Age began in 1000 B.C. (not b.p.); 5 percent (not 55 percent) of the plants were cultivated forms by 7000 years ago in Tehuacán, Mexico; and the Balsas (not Batas) River possibly was the ancestral home of early teosinte-corn. These errors highlight a more serious problem. The scope of the book is so broad that no editor could determine the accuracy of each presentation. If the papers had been refereed by specialists, the unfortunate publication of questionable archeological "facts" might have been avoided.

Unlike the contributors, whose papers were completed in 1973, Reed wrote his summary chapter with the benefit of hindsight and more recent publications through 1976, and the reader is advised to read it in conjunction with individual essays. Unfortunately, by presenting a historical overview Reed missed an opportunity to relate major theoretical perspectives to data. In addition, although some of the papers are cross-referenced, the more controversial statements and disagreements of interpretation are not resolved and are often left unacknowledged in his summary.

Origins of Agriculture is an excellent reference. The theoretical ideas are poignant, the regional syntheses are invaluable, and the book is an exceptional testament to the accomplishments of truly interdisciplinary research. It is evident that in the past century the stages of domestication of major plants and animals have been discovered, but why agriculture began and how it spread are matters for continuing investigation.

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Ecology of Tropical Trees

Tropical Trees as Living Systems. Proceedings of a symposium, Petersham, Mass., Apr. 1976. P. B. TOMLINSON and MARTIN H. ZIMMERMAN, Eds. Cambridge University Press, New York, 1978. xviii, 676 pp., illus. $49.95.

The contemporary ecological knowledge about tropical trees presented in this book resembles the tropical rain forest itself: there are gaps, fast-growing components, and occasional tangles.

The book, the proceedings of a symposium held at Harvard Forest, deals with the individual tree as an integrated living system and with its interaction with other trees in tropical vegetation. The 28 contributors were chosen with the aim of crossing the unnatural and unnecessary barriers that often divide the biologists of temperate and tropical countries. The result is an authoritative synthesis of our understanding of the organization and growth of trees in the tropics, with some useful guidelines for future research. Unevenness in treatment is inevitable in such a collection, but it is no longer possible for any one author to encompass such a wide and changing field—the efforts of Richards, Walter, Whitmore, and others to do so notwithstanding.

The book covers a variety of interconnected subjects: origins and variation, reproduction and demography, architecture and construction, morphology, organizational control, and community interactions. The tropical tree is consequently viewed in many ways—for instance, as a photosynthetic device consisting of assimilating units (leaves) arranged on one or more woody, self-supporting axes and as the smallest segment in a mosaic of successional stages. Well-edited discussions follow each paper.

The perspectives of continuing research projects are always borne in mind, so that the reader gains a picture of research trajectories ranging from root to seed and from simple to sophisticated. Thus Tatuo Kira offers a brilliantly concise summary of integrated ecosystem research done as part of the International Biological Program in 1970–74 at Pasoh Forest, West Malaysia, which deals specifically with the dynamics of organic matter.

F. S. P. Ng discusses the strategies of tree establishment and the longevity of seeds, reaching the somewhat surprising conclusion that dormancy is not particularly characteristic of pioneer or nomad species in the humid tropics. The mainstream of evolution has favored large seeds and seedlings with rapid and epigeal germination, so that in dense humid forests efficiency in dispersal and efficiency in species survival are two different things.

P. S. Ashton points out that, despite the alarming rate of expansion of secondary forests in the tropics, very little quantitative work on woody seral succession is being done. He then details some simple observational studies of crown characteristics at pioneer, building, and mature stages that show the adaptive significance of architectural models. There is in fact much preoccupation in the book with architecture and construction, and the stage is set by a lucid description by P. B. Tomlinson of