ful it will be. Medvedev's account makes it clear that for Soviet agriculture there is no way back. Nor is it obvious to the current leaders, caught as they are in a maze of constraints, which way is forward.

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Archeological Reconstruction

Production and Exchange of Stone Tools. Prehistoric Obsidian in the Aegean. ROBIN TORRENCE. Cambridge University Press, New York, 1986. xiv, 256 pp., illus. $44.50. New Studies in Archaeology.

One goal of archeology today is the development of "middle-range theories" or interpretative methodologies for reconstructing past cultural behavior. The main objective of this volume is the formulation of middle-range theory to link archeological data with specific kinds of economic exchange. The volume is a stimulating piece of research that (i) identifies the behavioral correlates of exchange, (ii) discusses how to recognize and measure this behavior from archeological residues, and (iii) provides a test case using Neolithic and Bronze Age data from the European Aegean.

Most attempts to reconstruct prehistoric exchange networks have focused on consumption levels and the frequency with which items move over space. Though this regional approach has been fairly successful, it presents the problem that different forms of distribution (such as direct barter, gift prestations, balanced reciprocity, and direct procurement) can produce identical distributions of archeological materials. Torrence questions the regional approach and proposes that exchange also be examined from the perspective of how production systems are organized to meet resource demands.

Torrence believes that production provides an indirect measure of the volume of exchange. Levels of craft specialization, technical skill, resource ownership, and division of labor are ways the production systems respond to demand. As exchange increases, societies will adopt more expedient, standardized and cost-efficient means of production. The author uses the production and exchange of stone tools to develop quantitative and qualitative measures that archeologists can use to evaluate levels of economic interaction. Stone tools are an important component of archeological assemblages the world over, and the methodology developed here will be useful to archeologists working in many cultural settings. Mesoamerican archeologists will find the volume particularly useful because the author examines critically many assumptions and approaches used in that area.

The measures for examining exchange from a production perspective are developed in an orderly and scientific way. A review of the literature on reconstructing exchange relationships provides a backdrop against which to contrast the production approach. The behavioral factors linking production to exchange are then developed in a chapter reviewing the ethnographic aspects of stone tool production. The specific methodology for the production approach is developed with reference to Aegean obsidian exchange during the Neolithic and the Bronze Age. The author examines obsidian exchange from three different perspectives. First, the regional perspective is used to examine how efficient procurement networks moved obsidian over space. Second, habitation sites are examined to evaluate whether production was carried out by full- or part-time craft specialists within a commercial economy. Finally, mining and quarrying activities at the Melos obsidian source are examined for what they indicate about the intensity, efficiency, and specialization of commercial exploitation.

The conclusions reached are at variance with traditional interpretations of Aegean obsidian exchange. The author finds little evidence for either commercial or entrepreneurial procurement of obsidian at any level of the economy. Mining at the Melos obsidian quarries appears to have been sporadic and was not monopolized by any particular group. Attempts to measure standardization of production demonstrate that there is little variation in the morphology and efficiency of tools produced in workshops as opposed to domestic locales. Production efficiency as measured by error rates, platform preparation, and tool dimensions in Bronze Age sites is similar to what the author presents for part-time and nonspecialized knappers in New Guinea and Ethiopia. The author concludes that the data do not support the existence of Bronze Age commercial workshops throughout the Aegean. Rather, stone tool procurement, production, and exchange were carried out on the basis of efforts by part-time specialists within a multifaceted economy involving long-distance maritime exchange.

The book provides a useful model for the development of middle-range theory on exchange. It is not surprising that the author used obsidian, which has been the focus of numerous economic studies. The challenge for other archeologists is to achieve the same level of sophistication using ceramic, ground stone, or other artifact categories. Although there will be difficulties, this volume provides a valuable example of how this work might proceed.

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The Role of GABA

Neurotrophic Activity of GABA During Development. DIANNA A. REDBURN and ARNE SCHOUSBOE, Eds. Liss, New York, 1987. xii, 277 pp., illus. $66. Neurology and Neurobiology, vol. 32. Based on a symposium, Mexico City, July 1986.

The development of the vertebrate central nervous system is an exceedingly complex process. It involves many cell cycles, terminal division, and cellular differentiation or death, as well as cell migration and sustained maintenance of the phenotype in the context of intricate neuronal and glial circuits. Elucidation of the cellular and molecular bases underlying this dynamic period of growth has attracted an increasing number of neurobiologists and will continue to engage many generations of scientists.

This book is a brief and relatively eclectic collection of papers derived from a meeting on the neurotransmitter gamma-aminobutyric acid (GABA) and its trophic role in the vertebrate CNS. The material is arranged in nine chapters by 19 investigators, most of whom have studied the possibility that GABA not only acts as a transmitter mediating rapid forms of intercellular communication at central synapses in the adult but also has potential functions during the development and differentiation of the CNS. Some of the chapters are extensive attempts to review the vast literature relevant to GABA in CNS tissue, whereas others are revised versions of previously published observations with descriptions of new or confirmatory experiments added. Most of the contributions necessarily conclude on speculative notes since real understanding in this area is limited. Enough has been discovered to warrant this initial report.

The detection of GABA-containing cell bodies and fiber tracts in various regions of the embryonic and early postnatal CNS, the presence of specific binding and uptake reactions involving GABA and GABAmimetics with embryonic CNS membranes and cells, and the pharmacological effects of GABA and GABAmimetics on the cellular properties of cultured embryonic neurons, all of which are covered in this book, support the premise that GABA plays a role, as yet undefined, in CNS development. This volume is not only a quite readable account of

the emerging evidence but also a useful source book, with about a quarter of the text devoted to hundreds of bibliographic citations. Although precise resolution of the roles played by GABA during CNS development and full understanding of the underlying cellular and molecular mechanisms demand considerably more detailed and systematic scientific effort, the multidisciplinary data reviewed in this book represent a clear commencement to the enterprise. The advent of specific probes for genomic sequences that encode glutamic acid decarboxylase, the enzyme considered rate-limiting in GABA synthesis, and for sequences that encode specific GABA-receptor epitopes should help to reveal more exactly when and where GABAergic circuits evolve in the developing CNS. Demonstration of physiologically elaborated signals mediated by GABA at synaptic and extrasynaptic sites on differentiating neurons and on various glial elements during development will require innovative strategies.

The value of this book lies in its concise and convincing identification of a worthwhile area for investigation. It could serve as a starting point for graduate and postdoctoral students, as well as for career neuroscientists in search of a new and potentially exciting line of investigation.

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Plant Ecology

Seed Dispersal. DAVID R. MURRAY, Ed. Academic Press, Orlando, FL, 1987. xiv, 322 pp., illus. $49.95.

When John Harper pointed out that one of the advantages to the study of the population biology of plants is that they sit there and wait to be counted he obviously was not thinking about seed dispersal. To the plant demographer, tracing the fates of dispersing seeds seems a difficult task in all but the simplest systems of abiotic dispersal. Historically such measurements have not been standard concerns of students of plant dispersal, who have been largely systematists preoccupied with biogeographic issues. Thus we now have a wide knowledge of the dispersal-associated structures of fruits and seeds and a considerable lore of events of dispersal and seed survival in seawater or in the guts or fur of various animals, but dispersal ecologists are only beginning to examine the seed shadows generated by different dispersal agents, the fates of seeds during and following the different forms of transport, and the consequences of all this for the ecology and evolution of the organisms concerned. This book, along with a recent symposium volume (A. Estrada and T. H. Fleming, Eds., *Frugivores and Seed Dispersal,* Junk, 1986), is indicative of a growing interest in the ecology of seeds. It reviews much of the literature and thus gives us a useful reflection of the state of dispersal ecology. The book should provide a valuable introduction and orientation for graduate students and other researchers interested in exploring this literature.

Perhaps the status of dispersal ecology is best understood by comparison with floral and pollination biology. Pollination biology has grown rapidly in the last 15 years under the impetus of increased interest in experimental plant population ecology and application to plants of insights from ecological and evolutionary theory. The theoretical developments have included use of selection thinking and of ideas derived from cost-of-sex arguments, Fisher's sex-ratio theory, and Bateman's principle of resource limitation for female function and mate limitation for male function. Seed and fruit ecology is undergoing a similar growth but at a slower rate and perhaps with a delayed onset. Some of the more exciting experimental developments have been attempts to document the advantages acquired by parents and offspring through dispersal. Also, theoretical insights are beginning to emerge that, combined with the new experimental approaches, could spur a period of rapid advance in dispersal ecology similar to that in pollination ecology. One theoretical effort that has had an organizing effect on some aspects of dispersal ecology is the application of foraging theory to dispersal by vertebrates (reviewed here by Howe). Theoretical developments from a more plant-centered point of view may be beginning to have an impact as well. For example, theoretical studies of the last 10 years have shown that, in addition to playing a role in gene flow, seed dispersal has three main population dynamic functions: escaping or hedging against environmental variability, escaping the effects of crowding, and escaping the effects of sib competition. The first two of these functions correspond roughly to Howe's colonization and escape hypotheses (functionally, his directed dispersal hypothesis must be a special case of one of the above, when the suitable habitat is rare and is readily discriminated). Little empirical work has been done to document or distinguish among these functions (especially the last).

The present volume perhaps represents a transitional stage in the history of dispersal ecology. Much of it consists of descriptive natural history, yet at least some of the authors seem to be grappling with the issues of putting dispersal ecology on a firm theoretical foundation while calling for integrated studies of the costs and benefits of the various means of dispersal.

The book contains seven chapters, four of which are devoted to dispersal vectors (wind and autodispersal, water, fruit-eating birds and mammals, and seed-eating rodents), one to dispersal in relation to fire, one to syndromes in Australian *Acacia,* and one to the evolutionary history of dispersal as revealed by the fossil record. The approaches taken by the contributors vary. For example, Burrows's chapter on aerial motion treats the physics of seed dispersal from first principles, coming to a number of useful and interesting conclusions about the dispersal potential of some broad categories of seed morphologies but not attempting to review the literature on actual distributions and distances attained. Murray's chapter on water dispersal focuses almost completely on dispersal by ocean currents, taking a systematic-biogeographic approach. O'Dowd and Gill's chapter on dispersal syndromes in *Acacia* is interesting in its approach to defining dispersal syndromes with a principal-components analysis of fruit traits calibrated with ecological observations of dispersal biology. The next two chapters provide broad overviews of dispersal by vertebrates, placing their observations in what for lack of a better phrase I will call a modern ecological framework. Howe summarizes a considerable literature in terms of questions of general ecological and evolutionary interest, such as optimal foraging theory, diffuse coevolution, and coexistence mechanisms. The chapter by Price and Jenkins is a useful compilation of a literature on rodent foraging behavior that may be unfamiliar to many botanists interested in the fates of seeds. The authors present a "fate diagram" that outlines in detail the potential destinies of seeds in relation to rodents. Tiffney's contribution places the dispersal ecology of extant plants in a macroevolutionary perspective. He suggests that complex modern animal dispersal syndromes became established for the first time around the Cretaceous-Tertiary boundary, 70 million years ago, though fleshy fruits associated with reptile dispersal were abundant as early as the Pennsylvanian. The Australo-Malaysian flavor of a number of the chapters is refreshing, with serotenous-fruited proteaceous shrubs replacing the Northern Hemisphere pine-coned counterparts and with discussions of, for example, arillate acacias.

As for mechanical features of the book, the lack of titles of articles in the bibliography is annoying and impairs the book's usefulness as a guide to the vast and scat-