

the "insider" in mind. Rather does not give enough scientific detail to make a convincing portrait of the intellectual dilemmas of the day, and when he gives particulars he fails to do so in a way that would guarantee the understanding and attention of the nonspecialist. The history of pathology need not itself be bone dry.

Finally, the author takes no pains to place the investigators and their ideas in a social context. He draws some contrasts between English, French, and German work, but there the context abruptly ends. We learn nothing about the institutions that formed the settings for the scientists' work; in most cases we are not even informed where on the national scene an investigator lived. We are presented with names disembodied from careers, medical theories stripped of most of their factual and philosophical garments, and important debates shorn from the personalities, journals, and institutions that gave them life.

I believe that the history of ideas of cancer can and should be an exciting segment of the intellectual and cultural world; so it is with regret that I find this book deficient in these respects.

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A Messenian Site

Excavations at Nichoria in Southwest Greece. Vol. 1, Site, Environs, and Techniques. GEORGE RAPP, JR., and S. E. ASCHENBRENNER, Eds. University of Minnesota Press, Minneapolis, 1978. xxviii, 340 pp., illus. + maps. \$29.75.

Nichoria is located on a ridge in the southwestern Peloponnese, 2 kilometers from the modern seacoast in the northwestern corner of the Gulf of Messenia. The site was inhabited more or less continuously from the Final Neolithic about 6000 years ago until Byzantine times in the 13th century. Thus it spans the Helladic (Mycenean) and Dark Ages.

The Minnesota Messenia Expedition excavated at Nichoria from 1969 through 1975. The project was designed as a multidisciplinary one from the beginning, and this volume is the first of four reporting its findings. It is, as the subtitle suggests, primarily concerned with paleoenvironmental studies, and it attempts "to lay out the natural science/ecological base for the systematic and chronological volumes to follow" (p. 266).

The book contains 15 chapters. Some are almost entirely concerned with the methods employed for a specific aspect of the project; others are a mixture of methodology, data, and interpretations.

As a multidisciplinary project, the Expedition brought together a large number of individuals (75 over eight seasons) and, in addition, used a number of investigatory techniques that are more normally associated with projects in prehistoric archeology. Nichoria is not, strictly speaking, a prehistoric site. It is this aspect that interests me the most, and I shall touch briefly on several pertinent points. I do not intend a thorough discussion of the data or their interpretations, for these are far too diverse for one individual to evaluate.

Both the editors and the contributors have been scrupulous to present every scrap of information they consider pertinent to an evaluation of their procedures. Though it is therefore possible for anyone to check, recheck, and question these data and interpretations of them, some discrimination would have been welcome. At times the book is a hodgepodge of important data mixed with trivial information, and the latter frequently masks the former. Figure 15-1, a schematic diagram of how to lift a mineralized artifact, is only one example of unnecessary information.

But let me emphasize that there is a great deal in this volume that is both interesting and important. Chapter 2, on the Holocene environmental history of the region, is a good fine-grained study of changing paleogeography and paleoenvironments. In particular, it documents changes in both alluvial regimes and sea levels that affected both harbors and shipping and thus the economy of Nichoria.

Chapter 5, concerned with present vegetation and with paleobotanical remains, is a substantial contribution to our knowledge of both modern and prehistoric ecology in the Mediterranean region. It also provides interesting data on the use made of plants. The authors demonstrate that gathering of wood for fuel by the people of Nichoria did not have an extensive effect on the local vegetation. I find this both curious and interesting in view of the statements that are frequently made about other areas of the Mediterranean region.

In chapter 6 the excavated faunal remains are discussed. Though the samples from which trends were discerned were small, the data are certainly useful in suggesting changes in the proportion of species and age of death of these species at different periods during the occu-

pation of the site. This in turn allows the authors to suggest changes in the economic pattern, at least as far as animals are concerned. I would have liked to see tables of measurements included, especially as some of the samples of identifiable bone are small. And I question the usefulness of including here 15 photographic plates that are of poor quality, have poor (in some cases inaccurate) captions, and contain no scale.

Chapter 7, on settlements and circulation in the Nichoria area, attempts to place Nichoria in the context of other known sites and physiographic features. It is a good example of both the advantages and the pitfalls of such regional analysis. I find it both useful and stimulating, but it lacks the clarity and sophistication of similar studies that have been done elsewhere—especially those of Flannery and his associates in Oaxaca.

The remainder of the book is either beyond my competence to review (for example, the two chapters on metallurgy) or is not, in my opinion, particularly useful. Many of these chapters would have been better included in later volumes or as appendixes. It will, for example, be difficult to recall the description of the various excavation areas in chapter 8 when one is reading later volumes. And while I am sympathetic to the inclusion of chapters on lithology and archeological geology, the latter, especially, seems poorly integrated with information in other chapters.

In their "retrospect," Rapp and Aschenbrenner quote from Butzer's sometimes pessimistic assessment of the success of the ecological approach to archeology. One of Butzer's main points concerned the difficulty of integrating, in a truly *interdisciplinary* manner, the myriad specialists and techniques that are now a common (and I hope welcome) part of any archeological project. Rapp and Aschenbrenner are quite specific that this was a *multidisciplinary* investigation, and I think the difference shows. For one thing, I am far from convinced that the excavation methods warranted the use of some of the sophisticated analytical methods employed. Lack of uniformity in sampling is critical here. The authors recognize the problem in their retrospect, but I would have preferred them to do so initially.

Perhaps I ask too much, but all through this book I kept looking for something that would tie it all together. I hope that will come later; it certainly should. For the moment, this report remains a rather undigested (and undigestible) mass of facts, some of use, some not.

It is sad to be less than totally enthusiastic, because this is a lavishly produced book. The illustrations and most of the photographic plates are of high quality, the two maps and two sets of profiles in the end pocket are very informative, and there are few typographical errors. But I have the feeling this could all have been done less lavishly and conveyed just as much information—perhaps even more had the book been edited with a harsher hand.

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A Readily Identifiable Neuron

Neurobiology of the Mauthner Cell. DONALD S. FABER and HENRI KORN, Eds. Raven, New York, 1978. xii, 290 pp., illus. \$25.

Cellular neurobiology depends upon the investigator's being able to resolve the structure and activity of single neurons. If it is also possible to identify homologous neurons in different animals, a qualitative improvement in rigor occurs. Identifiable neurons are common in higher invertebrates, but what about vertebrates? It turns out that in most species of fish and in many Amphibia the brainstem contains a large neuron so distinctive in shape and location that it can be identified reliably in every normal individual. Named after its discoverer, who described its axon in 1859, the Mauthner cell (M-cell) has become "the most studied neuron." This book is an extensive review of what has been learned, and I recommend that neurobiologists read it.

In goldfish, the M-cell is a command neuron that mediates the fastest forms of startle responses, in which a strong flip causes the fish to yaw abruptly. An early notion that M-cells mediate swimming is wrong—the cells are silent during swimming. Eaton and Bombardieri summarize the evidence for the behavioral function of the Mauthner neuron in goldfish and zebrafish. Zottoli discusses the occurrence and structure of the M-cell across species. The cell has been recognized in over 100 fish and amphibian families, but its features vary considerably, so it provides an ideal object for comparative studies.

In the longest chapter, Faber and Korn review the physiology of the M-cell. The chapter is often dense, resembling too closely the style of primary papers. It is rewarding even so, for the

work is elegant and important. The demonstration of neural interactions via non-synaptic field effects is of special interest, and good progress has been made in relating structure to function, with regard to both field effects and synaptic actions. Structural studies are dealt with in detail by Nakajima and Kohno, who document six kinds of synapses upon the M-cell. They also discuss the remarkable "axon cap," a dense structure of nerve fibers and glia, whose properties help mediate the electrical field effects.

Kimmel and Model review M-cell development, a subject of renewed interest now that physiological studies complement anatomical ones. The M-cell develops early, responding first to tactile and then to acoustic stimuli. Inhibition seems to come last, but not much is certain yet. A chapter by Rovainen reminds us of the great usefulness of lampreys, which, of all the vertebrates, come closest to invertebrates in having many identifiable neurons. This brings us back to the question we started with: How likely is it that other vertebrate neurons will be found that, like the M-cell, can be identified in individuals? In the opening chapter, Bullock takes a useful approach to this question by defining an "equivalence class" as sets of neurons that, as a class, can be identified in different individuals. Bullock estimates that most neurons of vertebrates will fall into classes with sizes of from 30 to 100 neurons. Though uniquely identifiable neurons are predicted to be rare, this is still a remarkable estimate of heterogeneity, yielding over 10^7 equivalence classes for the human brain.

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A Neurotransmitter

Acetylcholine Synthesis in Neurons. S. TUČEK. Chapman and Hall, London, and Halsted (Wiley), New York, 1978. xiv, 260 pp., illus. \$37.50.

Some 20 endogenous chemicals are known or suspected to be neurotransmitters in the higher animal phyla, and anyone who thought of ranking them in hierarchical order would probably feel obliged to put acetylcholine close to the top of the list. Besides its ancient phylogeny, its widespread distribution, and its multiplicity of actions, it has two further distinctions: it was the first neurotransmitter to be isolated from nervous tissue

and the first to have its transmitter role established. The further analysis of that role, in the 1930's and 1940's, gave medical scientists a basis for understanding the action of some familiar drugs, like atropine, physostigmine, and nicotine, and some awesome poisons, like curare, botulinum toxin, and the synthetic organophosphorus "nerve gases." Other successes promptly followed, with the introduction of the neuromuscular blocking agents that revolutionized surgical anesthesia and the ganglion-blockers that pointed the way to effective medical treatment of hypertension. With all of this 30 or more years in the past, it may seem surprising that there is anything important still to be learned about acetylcholine's biosynthesis, especially since the process involves only one enzyme, choline acetyltransferase, characterized by Nachmansohn and Machado in 1943, and two apparently abundant substrates, the parent base choline, a normal constituent of all the body fluids, and acetyl coenzyme A, a product of the mitochondria in every cell.

In fact our understanding of the process is far from complete, as Tuček's book makes clear. The enzyme itself has not been obtained in pure form, and its histochemical localization is still in the rudimentary stage. We have some information, but not enough, about the axonal delivery system that carries it from the neuronal soma, where it is made, to the nerve terminals, where it is put to work. The enzyme's *in vivo* activity is coupled somehow to need, for it works faster when the transmitter is being discharged, but the nature of the coupling is unclear; substrate supply, product removal, and allosteric action tied to transmembrane ion movements are all plausible mechanisms, but which is the important one? The mystery remains too of how acetyl coenzyme A, supposedly locked behind mitochondrial membranes, can escape to reach the enzyme in the cytosol.

Tuček knows as much as anyone about these problems. Within the limits indicated by its title, his book presents the relevant facts and theories as fully (over 1000 references, with a few from 1978), as clearly, and as critically as anyone could wish; his own speculations are kept to a judicious minimum. The book's limitations are deliberate. Tuček does not concern himself, except tangentially, with the processes involved in the storage and release of acetylcholine; consequently he has little to say about the morphological and biophysical studies that focus on those topics rather than on the synthesis of the transmitter. I think his choice was wise. I found the book