Vignette: Innocents' Advisory

A few years ago I was part of a panel of researchers who were asked to describe our "work in progress" on gender in science and technology at one of the regular meetings of the MIT women faculty. I noticed that some of the assistant professors in science appeared to disapprove of what they were hearing. Eventually one stood up and said that the issues we wanted to investigate simply did not exist in the scientific community, that by the objective nature of the enterprise, issues of gender, which were issues of bias, simply did not exist. . . . Several of her friends nodded in agreement. . . .

As I hesitated in order to formulate a direct but polite response . . . a senior, influential, and powerful science professor intervened. She said that the junior faculty did not yet see gender as an issue in their work because they had not yet gotten to the career stage at which they would be defining fully independent research projects requiring their own command of significant resources. At that moment, she said, these women would realize that gender was an issue in science.

—*Sharon Traweek*, in *Science as Practice and Culture* (Andrew Pickering, Ed.; University of Chicago Press)

Clovis: Origins and Adaptations is the first book-length treatment of the Clovis phenomenon. With some exceptions, the 20 chapters are not overtly theoretical, and most largely synthesize early archeological evidence for various areas of the Americas and discuss how that evidence bears on the issues posed in the volume title. The book makes it clear that there is little consensus on these issues. For example, with regard to origins, some contributors argue there are no good precursors of Clovis in Alaska. Yet Ted Goebel *et al.* in a detailed analytical and comparative study argue that the "Nenana Complex" of Alaska is contemporary with and perhaps earlier than Clovis, is technologically identical except for the absence of fluted bifaces, and thus could be a Clovis precursor. Similarly, although some authors accept the long-held stereotype of Clovis and related peoples as primarily hunters, others argue for a more general, broader subsistence strategy or take a position somewhere between the two extremes.

Although some chapters deal with assemblages that in this reviewer's opinion postdate, and thus are of little relevance to, Clovis, and some of the information and ideas have been published elsewhere, the volume provides a detailed compendium of knowledge essential to our eventual understanding of the Clovis phenomenon. The volume also serves to isolate and make explicit several problems with past approaches to Clovis that have impeded progress. Perhaps the most basic problem, emphasized by contributors such as Willig, Lepper, Meltzer, and Bonnichsen, is a lack of attention to carefully documenting variation in "Clovis" and, consequently, substantial difficulties in giving the term a precise definition. Although there is a real need for innovative theoretical approaches, we must overcome the largely impressionistic, normative, and monolithic characterizations of Clovis that have been used in the past. A good beginning would be detailed attribute-based characterizations and comparisons of fluted-point assemblages. Until this is done, we cannot measure in a precise way the relationships between assemblages or meaningfully address questions concerning the sequence and processes by which fluted points and associated technologies spread throughout large areas of the Americas.

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Auditory Developments

The Neurobiology of Hearing. The Central Auditory System. RICHARD A. ALTSCHULER, RICHARD P. BOBBIN, BEN M. CLOPTON, and DOUGLAS W. HOFFMAN, Eds. Raven, New York, 1991. xvi, 491 pp., illus. $150. Neurobiology of Hearing Series.

Almost all animals localize sound sources in their immediate environment, mostly by comparing inputs from the two ears. Studies of binaural processing not only provide information about sound source location but often reveal fundamental characteristics of the processing of sensory signals. Similar lessons have been learned from studies of how animals use vocal signals to communicate, although we know much less about perception of such complex signals in the central auditory system.

This second volume in the Neurobiology of Hearing Series comprises 18 chapters that examine the anatomy, physiology, and pharmacology of central auditory processing in mammals. The first two chapters provide an overview of the ascending and descending auditory pathways, and subsequent chapters examine physiology, anatomy, and pharmacology at different levels of the central auditory system. The final chapters offer a more general look at sound localization and at development. Most of the chapters are of high quality, and the book summarizes many significant increases in our understanding of auditory function.

Although we now know a great deal about the structure and function of the components of the central auditory system, including their connections and synaptic relationships, our understanding of the processing of complex auditory signals is still in its infancy. Indeed, many of the processes by which we encode and translate complex stimuli remain a mystery to researchers in all areas of sensory neurobiology. In this volume, Sachs, in a chapter on the neural processing of complex sounds in the cochlear nucleus, makes the point that the field might do well to focus on both the cellular and the systems level. At the cellular level, we strive to understand the mechanisms of signal processing in individual auditory nuclei. This may be achieved by measuring the structure, electrical properties, and connections of individual cells in order to construct models of their signal-processing function. This approach permits analysis of the components of the neural machinery responsible for auditory signal processing. The individual chapters on the cochlear nuclei, superior olive, auditory midbrain, thalamus, and cortex provide clear and thoughtful summaries of what we know about the cellular neurobiology of the central auditory nuclei.

Part of the effort should certainly focus on such mechanistic issues, but there is also reason to study stimulus representation at the systems level and to shift part of the focus to the processing of complex stimuli. This would move the field in the direction of higher auditory function, which is obviously important to anyone who has considered the problems of speech perception, for example. Unfortunately, the emphasis on the cellular basis of coding mechanisms has not yielded a good understanding of responses to complex stimuli. A number of

chapters in this book discuss the best approaches to successful analysis of higher auditory function. These arguments underscore the book's most significant omission. Major advances in our understanding of the processing of complex sounds have come from studies on bats, but this work is not described in any detail in the book. Bats emit biosonar pulses and listen to the echoes for orientation and for hunting insects. These pulses and echoes have been used as behaviorally relevant stimuli to identify the algorithms underlying the perception of complex stimuli. For example, neurons in the auditory periphery encode stimulus frequency, amplitude, and time. In their work on the bat forebrain, however, Suga and his co-workers have described the systematic mapping not only of such simple aspects of the stimulus but also of behaviorally relevant stimulus parameters such as echo delay, which the bat uses to determine target distance. Thus studies on bats have shown that the central auditory system computes and encodes behaviorally relevant complex stimuli. The same neuroethological principles may be applied to the analysis of complex sounds in other mammals.

This is an important and timely book with many strong points. It will be a useful reference for any student of the central auditory system. No other book has surveyed the anatomy, physiology, and pharmacology of central auditory nuclei, and these chapters alone make the book worthwhile. The book also shows that even such a simple task as the coding of sound source location has proved to be full of unexpected surprises; people should come away from *The Neurobiology of Hearing* with the sense that auditory neurobiology will continue to illuminate sensory biology.

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Biotic Immigrants

Biogeography of Mediterranean Invasions. R. H. GROVES and F. di CASTRI, Eds. Cambridge University Press, New York, 1992. xvi, 485 pp., illus. $125.

Unlike its predecessors in the series sponsored by the SCOPE (Scientific Committee on Problems of the Environment) program on biological invasions, this volume focuses on one biome: the five regions with Mediterranean-type climates. As a rationale for this focus, Francisco di Castri, one of the book's editors, contends that the amount of species exchange between these regions has been far greater than for other ecosystems. This matter is difficult to assess, especially given the untallied failed immigrations. Perhaps a better justification lies simply in the opportunity these five climatically similar and geographically well-defined regions provide for addressing questions about the traits and circumstances that have led a comparatively small number of species from the world's biota to be naturalized in these widely separated regions. To this goal, the book certainly makes a contribution, although one could reasonably form the impression that definitive answers will not come soon.

The volume consists of 31 chapters that reflect the organizers' desire to achieve comprehensive coverage. Although a laudable goal, particularly in its effect of producing reports on work not well known to English-speaking biologists, it comes at the price of depth on any one topic. Because biological invasions often unfold over decades, older, sometimes obscure literature that reports the circumstances of an immigration takes on an importance that is becoming rarer in science. For the most part the opportunity to evaluate this literature in the light of modern ideas in evolution, ecology, and population biology is not seized. (Exceptions include chapters by Kloot and Rejmanek *et al.* on invasive plants in southern Australia and California, respectively, and Blondel's insightful chapter on bird invasions in the Mediterranean region.)

In general approach the chapters are representative of published work on biological invasions. Whether reporting on the spread of mammals in South Africa (Bigalke and Pepler), European rabbits in central Chile (Jaksic and Fuentes), or invasive plants in the Mediterranean Basin (Le Floc'h), most of the authors bring an "epidemiological" organization to their subject, reporting on the probable mode and timing of the introduction and the range expansion and environmental (and economic) consequences, if any, of the invasion. Unfortunately, many of these chapters do not go much beyond compiling invasion history. (Exceptions include Trabaud's assessment of the role of fire as an agent facilitating plant invasions and Cheylan's overview of mammalian speciation in the Quaternary of the Mediterranean Basin.) Until this pattern of assembling anecdotes is broken, the contributions that the study of biological invasions could make to both fundamental and applied biology will be unnecessarily limited. I don't think we have too few documented invasions to warrant raising broader questions. For example, why have so many plant species from the Mediterranean Basin become naturalized elsewhere? Why has the biota of the Mediterranean Basin been comparatively little altered by invasion by comparison with the four other Mediterranean-like regions?

Generalizations do appear with greater frequency in the overview chapters by the editors. For instance, Groves points out that most of the introduced plant species in Mediterranean regions are European representatives of the four large families Gramineae, Compositae, Cruciferae, and Leguminosae, families that have often contributed the bulk of alien species within temperate biomes. More surprising, however, is Groves's report that the majority of these species were intentionally introduced as forage, as ornamentals, or for medicinal use. Once again, environmental catastrophes have arisen through our own actions. Groves's claim that the rate of plant invasion (as gauged by mean number of new entries per year) is no higher among the five Mediterranean regions than other regions is probably impossible to verify, partly because all such estimates are confounded by the varying extent of commerce. Among his generalizations di Castri cautions that the long-held view that invaders are most likely to be successful when climates of their new and home ranges are similar may be simplistic, echoing the main theme of the chapter by Roy *et al.* on grasses. This contention is certainly plausible, although its evaluation requires more accurate knowledge of the local source of the immigrants than we usually possess.

This book will certainly provide intriguing reading for anyone who is interested in rapidly unfolding biological phenomena. It also serves, however, to illustrate that we have much work ahead of us before we can explain and predict the course of biological invasions in Mediterranean climates or elsewhere.

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Books Received

Air Pollution's Toll on Forests and Crops. James J. MacKenzie and Mohamed T. El'Ashry, Eds. Yale University Press, New Haven, CT, 1992. xii, 376 pp., illus. $45; paper, $20. A World Resources Institute Book. Reprint, 1989 ed.

Algebraic Number Theory. A. Fröhlich and M. J. Taylor. Cambridge University Press, New York, 1992. xiv, 355 pp., illus. $79.95. Studies in Advanced Mathematics, 27.

Andean Magmatism and its Tectonic Setting. Russell S. Harmon and Carlos W. Rapela, Eds. Geological Society of America, Boulder, CO, 1992. vi, 309 pp., illus. Paper, $62. Special Paper, 265.

Andrei Sakharov. Facets of a Life. P. N. Lebedev Physics Institute, I. E. Tamm Theory Department. Editions Frontières, Gif-sur-Yvette Cedex, France, 1992 (U.S. distributor, Nova, Commack, NY). vi, 730