Are sexually selected traits held in equilibrium by opposing natural selection? Are populations perched on adaptive peaks? Is spatial uniformity in selection responsible for the geographic monotony of some species? Selection pressures must be measured to answer these questions, and so Bryan Manly's book will find an attentive audience.

The aim of the book is to summarize statistical methods for analyzing selection. Coverage of topics is broad, ranging from the analysis of ongoing phenotypic selection to estimation of linkage disequilibrium and detection of evolutionary trends. Several chapters treat viability selection acting on discrete polymorphisms and on continuous traits (fertility and sexual selection are barely mentioned). Analysis of clinal variation is discussed as well as tests for parallel clines in two or more species and tests for character displacement. Other chapters treat the analysis of genotypic data, for example, tests for neutrality and selection at two loci.

The book can be recommended on several grounds. The chapters are organized by type of data so that it is often easy to find relevant sections. Numerous examples are used to illustrate statistical approaches and tests. In several contexts Manly illustrates the powerful technique of fitting progressively more complicated models to data. He employs the Rothamsted Experimental Station's general linear modeling program (GLIM), using maximum likelihood ratios to compare fits from successive models, but other statistical packages (such as SAS) could be put to the same use. Manly also illustrates the useful concept of selection surfaces, which permits visualization of multivariate selection, and shows how the surfaces can be computed. Manly pioneered the use of such surfaces; they deserve much wider use.

Manly's book is a compilation rather than a synthesis of the literature. The separate sections stand on their own, but connections between topics are not stressed. For example, the concept of selection opportunity is introduced on three separate occasions, with three different symbols (I_O, I_R, I) used for the same quantity. More important, in the case of continuous traits, no connection is made between statistical measures of selection and the selection coefficients used in equations for evolutionary change. Such a mapping exists, so there is no need for the statistically minded field biologist and the theoretician to speak different languages. Despite such missed opportunities, the book is a fund of useful approaches and examples that will be invaluable to any student of natural selection.

STEVAN J. ARNOLD
*Department of Biology,
University of Chicago, Chicago, IL 60637*

Invertebrate Neural Systems

Model Neural Networks and Behavior. ALLEN I. SELVERSTON, Ed. Plenum, New York, 1985. xxiv, 458 pp., illus. $69.50.

If we are to believe higher neurobiological authority, there are on the order of 10^{12} neurons in our brains, and from this incredible number are carved the neural networks that generate our behavior. Given this daunting quantity, it is little wonder that some neurobiologists have taken to the study of invertebrate animals, with numerically simpler nervous systems, in search of insights into the cellular bases of neural function. This volume surveys the simple ("model") neural networks approach to neurobiology. A major advantage of working with invertebrate neural systems is that it is possible to study neural structure and function by means of unique and identified single neurons. In every chapter of this book it will be seen that this advantage has translated into remarkable advances in our understanding of neural function.

This is a big book, with 28 chapters by 60 authors, including many of the leaders in their fields. The title of the book is misleading; only a third of the chapters deal with neural networks and behavior, and even then the subject is limited to such (albeit important) aspects as locomotion and learning. Omitted are more comparative studies of ethologically oriented behaviors such as navigation and biocommunication. The use of invertebrate neural systems has made a ringing impact on neurochemistry, membrane biophysics, neurogenetics, and especially neural development, and these topics are nicely surveyed here.

The book has something for everyone. This reviewer enjoyed the network analysis of the snail brain by Benjamin, Elliott, and Ferguson because it proceeds from the biophysical properties of neurons right on to feeding behavior of the animal. An essay on central pattern generators in *Tritonia* by Getting and Dekin and one on lobsters by Miller and Selverston are provocative. Historically, rhythmic behaviors have been favorites for the model systems approach. Current studies indicate that the idea that there are simple, fixed circuits hierarchically organized to generate central rhythms is due for revision. The reality seems to be that networks of anatomically connected neurons can be subdivided into different pattern-generating circuits, depending on such factors as the behavioral and neurohormonal context of the animal. Four chapters on insect and molluscan development, by Hildebrand, Bastiani *et al.*, Weisblat and Kristan, and Kater, will bring the reader up to date on developmental neurobiology, especially with respect to studies of axonal growth and regeneration. *Drosophila* has been a model system for geneticists for half a century, and it now promises to illuminate the neurobiological landscape as well, although a chapter on the genetic dissection of potassium channels by Jan and Jan and one on the specificity of neural connectivity by Wyman *et al.* only introduce the reader to the riches of *Drosophila* neurogenetics. The mollusk *Aplysia californica*, like *Drosophila*, has become so celebrated in neurobiology as to nearly transcend its taxonomic status as a "mere" invertebrate. We see in a paper by Abrams that learning in *Aplysia* has become Pavlovian and in one by Scheller and Schaefer that the egg-laying behavior of *Aplysia* can now be examined at the level of gene expression. These brief sketches can only hint at the other treats that await the reader.

The pioneers of invertebrate neurobiology correctly foresaw behavior as being the primary target for the model system approach. Clearly invertebrates are going to be even more important for our understanding of the genetic and developmental controls that operate in the formation of nervous systems. The reader of this nice collection of research essays will learn how the analysis of invertebrate neural systems has provided key insights into major neurobiological problems.

RONALD R. HOY
*Division of Biological Sciences,
Cornell University, Ithaca, NY 14853*

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