Book Reviews

Close Views of Islands

Island Biology Illustrated by the Land Birds of Jamaica. DAVID LACK. University of California Press, Berkeley, 1976. xviii, 446 pp., illus. $25. Studies in Ecology, vol. 3.

One of the most influential publications in evolutionary biology was David Lack's classic book on Darwin's finches which appeared in 1947. Therefore, it is fitting that Lack's last work, finished by his wife and friends after his untimely death, should also treat island birds. *Island Biology Illustrated by the Land Birds of Jamaica* is based on fieldwork by Lack and his family and associates from October 1970 through July 1971. Though refinement of the manuscript was cut short by Lack's illness, the volume stands as a coherent statement of his views of the causes behind the structure of island biotas, particularly those of birds.

The book is divided into two major parts. The first develops Lack's theory of island community structure, the basic outlines of which are set forth in the first chapter. Subsequent chapters deal with the Jamaican background, habitats of Jamaican land birds, competition for food, stability of the avifauna, hummingbirds of the West Indies, and geographical replacement of species. These are followed by chapters containing analyses of other islands and habitat islands on the mainland. Part 2 consists of detailed treatments of the ecology and systematics of Jamaican land birds, each chapter devoted to a different family. Lack's views differ from MacArthur and Wilson's influential equilibrium theory in placing much more emphasis upon difficulties of successfully invading communities on ecologically impoverished islands and less on difficulties in reaching islands and high extinction rates due to small population sizes of species on islands.

Lack's argument assumes that birds reach islands much more frequently than is generally supposed but that the immigrants encounter impoverished plant and insect communities, different predators, and different climates, which result in rapid evolution of peculiarly generalized species whose communities, though poor in species, are difficult to invade. Lack further assumes that there is rapid adaptation by species in the very different ecological conditions on islands, especially in highland forests, which are strikingly different from comparable forests on the mainland. Thus, Lack explains the high degree of endemism among birds of island highland forests by very rapid evolutionary rates on the islands rather than by slow evolutionary changes protected from gene flow from the mainland by very low immigration rates, as has been postulated by others.

To support his views Lack assembles evidence on replacement of bird species in different habitats on Jamaica and other West Indian islands, peculiarities in island distribution patterns, and ecological differences in foods and foraging of bird species living in the same habitats, evidences of potentially high immigration rates of birds to West Indian islands, and data suggesting that extinction rates may be very low. Some of this evidence is anecdotal, but part is based on extensive daily field observations of birds in most of the vegetation types of Jamaica. Lack's method of attack involves a "close" view of island communities, an examination of individual species and their ecologies, rather than a "distant" view concentrating primarily upon species lists with little concern for which species are present and how they behave. Nevertheless, most of his data provide only indirect evidence of competition and its effect on ecological divergence and ease of invasion of communities. How much overlap in food, foraging, and habitat utilization is compatible with a conclusion that species are significantly separated ecologically is left unspecified, and most arguments are based upon impressions emerging from field data that are not analyzed in relation to any theory of limiting similarities among species living together. Ecologists will differ about whether this approach is desirable or deficient, depending upon the favor in which they hold emerging theories of limiting similarity, but, in any case, field data are reproduced in great detail in a set of appendices, where they are available for manipulation by more mathematically inclined investigators.

Lack's approach is actually not as different as he supposed it to be from other recent developments in the analysis of island communities. Testing of the MacArthur-Wilson model also requires close views of island communities, attempts to determine immigration and extinction rates empirically, and defaunation of small islands to measure immigration rates under controlled conditions. Lack's major innovation was to stress the importance of resource impoverishment as a selective factor affecting the rate and direction of evolution of species on islands. Surprisingly, however, he fails to explore interactions between birds and plants arriving on islands. Since birds are major dispersal agents for most species of tropical woody plants, they should strongly affect invasion rates of plants to oceanic islands and which species arrive. Passage times of fruit seeds in bird guts are probably short enough that most birds arrive on distant islands with empty guts. Also, birds finding themselves blown over water may react by emptying their guts rapidly, since the low caloric density of gut contents makes them a poor means of carrying energy. If plants with wind-dispersed seeds are more likely to reach islands, the lack of many kinds of fruits may, in turn, affect foraging possibilities for birds. Similarly, impoverishment of plant species may greatly reduce dietary possibilities for herbivorous insects and indirectly constrain foraging opportunities for insectivorous birds. Lack records birds eating fruits on only 63 species of plants from 36 families on Jamaica, whereas a single mainland forest, La Selva, Costa Rica, has 321 species of trees and large shrubs in 65 families, most of which have bird-dispersed fruits. It is interesting that the fauna of Jamaica is relatively rich in seed-eating as compared to fruit-eating birds. There are ten species of pigeons and doves, only one of which is primarily frugivorous, and four species of parrots and five of buntings, all of which are dependent primarily upon seeds. The flower-visiting community is also well represented, including three species of hummingbirds, an orangequit, a bananaquit, and an oriole. Frugivores, on the other hand, are poorly represented, including, in addition to the pigeon, only one solitaire and two tanagers whose diet is more than 50 percent fruit, thus constituting a much lower percentage of frugivorous species than is typical of tropical mainland communities.

Direct data on competition and its role in molding community structure are al-

ways difficult to obtain, and reliance on indirect evidence will continue to be an important part of community analyses. However, a "close" view of island species and their habitats and resource utilizations provides the best means of testing competing theories. Lack was a vigorous proponent of close views, and we can only regret that he is not able to devote his considerable energies and talents to additional studies of island bird communities.

GORDON H. ORIANS
Institute for Environmental Studies, University of Washington, Seattle

Metastatic Mechanisms

Fundamental Aspects of Metastasis. Papers from a symposium, Buffalo, N.Y., July 1975. LEONARD WEISS, Ed. North-Holland, Amsterdam, and Elsevier, New York, 1976. xx, 444 pp., illus. $53.95.

In the past, metastasis has not received the same amount of attention as other aspects of cancer research, but interest in this phenomenon is increasing. This book, although it is not, as its editor acknowledges, comprehensive in scope, serves two worthwhile purposes: it is an excellent source of references to the literature, and it clearly illustrates the lack of understanding of metastasis at the biochemical level.

Although the process of metastasis can be defined and broken down into a series of steps, suitable biological systems do not appear to be available to allow the systematic characterization of any one step in molecular terms. The book presents fascinating observations on cell deformability, cell locomotory behavior, cell-tissue interactions, interactions of circulating cells with the endothelium, and other such phenomena, but the analysis always stops short of a molecular characterization of the phenomenon under investigation. An enormous amount of information on cell surface changes during malignant transformation is given in two chapters, but the relationship between any of these alterations and the metastatic potential of the cell remains to be demonstrated. Nor is it at all obvious how such phenomena could be characterized in molecular terms or how such relationships could be demonstrated with the techniques currently available.

The development of biological systems suitable for experimental manipulation and biochemical analysis is perhaps the most important need in this field. In light of this need, two of the more interesting chapters are those by Fidler and by Nicolson on the derivation and properties of a series of melanoma cell lines that vary in their ability to colonize the lung when they are injected into the tail vein of a mouse. These preliminary studies are provocative and stimulating.

Perhaps the main problem in work on metastasis is that all the proper questions have not yet been asked, and until they are the answers will not be forthcoming. This book makes a valuable contribution by pointing out current deficiencies, and it may thus serve to stimulate further interest and thought in the experimental study of metastasis.

DANIEL B. RIFKIN
Department of Chemical Biology, Rockefeller University, New York City

Cellular Neurobiology

Cell Biology of Brain. W. E. WATSON. Chapman and Hall, London, and Halsted (Wiley), New York, 1976. xii, 528 pp., illus. $35.

Among the most impressive developments in neurobiology in the past decade has been the growth in our knowledge of what may be termed the cell biology of neural tissue. Although the morphology and functional properties of neurons and glial cells have always been of interest, until comparatively recently most neuroanatomists and neurophysiologists were so preoccupied with the connections of specific populations of neurons or with their electrical properties that they tended to lose sight of the fact that both neurons and glia share many of the features of other animal cells. Moreover, the structural complexity of the central nervous system seemed to deter all but the most ignorant or headstrong investigators from trying to apply molecular or cell biological approaches to the nervous sytem. Fortunately, several technical developments, including the identification of simpler models for study (especially in invertebrates), the development of successful methods for nerve tissue culture, improvements in microchemistry, and the perfection of intracellular labeling methods, have served to change all this, and a new era in neurobiology has been opened. So rapid and wide-ranging have been the developments in this area that it has been difficult to keep abreast, and the need for a broad-based review has become increasingly apparent. To a considerable extent this need is met by Watson's *Cell Biology of Brain*.

The breadth of the coverage of this volume can perhaps best be indicated by its chapter headings: "Brain as an epithelium," "The neuron as a cell," "Membranes," "Chemical transducers," "Excitation-metabolism coupling," "Plasticity," "Responses to injury," "Neurotrophism," and "Genetics of the nervous system." The coverage varies somewhat in both quality and comprehensiveness, and many chapters read like annotated bibliographies, every statement being documented by from one to 28 citations from the literature. This makes for rather difficult, and at times irritating, reading; the following example is taken not quite at random:

> In studying oxidative enzymes best agreement is obtained between measurement of mitochondria and of cristae (2352) on the one hand, and subjective histochemical assessment on the other. Both show high oxidative capacity in the choroid plexus (2162, 2357), less in ependyma (961, 962, 1292, 2094, 2162, 2232, 2772, 2910), and in neurons (962, 2056, 2057, 2162, 2910), and least in other glia (962, 2056, 2057, 3036).

At times one has the feeling that the author is using the literature in much the way drunken men tend to use lamp posts—not so much for illumination as for support. In other sections, where the author has allowed himself to address the subject directly without constantly shuffling through a stack of reference cards, the book reads more smoothly and is generally more interesting. At the same time one must admire the thoroughness with which the literature is reviewed. The bibliography, which comprises almost 200 pages and includes more than 3200 references, is likely to be one of the most useful features of the book, especially since it covers the literature through 1974.

It is easy in a work of this scope to identify weaknesses or errors of detail or emphasis. The book is in fact reasonably free of factual errors, and even typographical errors are surprisingly infrequent for a first printing. However, the illustrations are atrocious. Most are grossly simplified line diagrams, amateurish in execution and often wholly uninformative.

Despite this deficiency, Watson is really too modest in suggesting that the book is intended principally for honors and graduate students. All of us who work and teach in his field are likely to remain in his debt for a long time

W. M. COWAN
Department of Anatomy, School of Medicine, Washington University, St. Louis, Missouri