

the regulators themselves in their papers. Because of this, I would have found editorial comment on each of the cases helpful—pointing out any discrepancies among the authors' scientific data, for example, or showing how the regulators refer indirectly to technical information.

Scientists who read this book will also find implicit in it lessons on their role in policy-making. As neutral information sources they maintain credibility and avoid the discomforts of involvement in political controversy, but they also run the risk that decision-makers will simply not make use of as much of the information as they could. Most of the scientific papers do make guarded policy suggestions, although several of these emphasize the need for more or better research. For example, Huelke and O'Day implicitly argue for a demonstration airbag program when they say that there is no substitute for experience when attempting to evaluate restraint systems. Grobstein responds to the difficulties of assessing data on weak carcinogens such as saccharin by suggesting that scientists (and policy-makers) should develop strategies to reduce the overall carcinogenic burden.

The substance of the five cases is presented in a way that is accessible to a wide audience; together the papers provide the reader with both the basis and the stimulus for considering the more difficult questions about the role that technical information can and should play in policy-making. If it encourages some scientists or economists to present data in a way that is germane to decision-makers and stimulates some policy-makers to consider more fully the importance of technical information to their social purposes the book will achieve at least part of its purpose.

SUSAN G. HADDEN

Lyndon B. Johnson School of Public Affairs, University of Texas, Austin 78712

Intertidal Ecology

The Ecology of a Salt Marsh. L. R. POMEROY and R. G. WIEGERT, Eds. Springer-Verlag, New York, 1981. xiv, 274 pp., illus. \$29.80. Ecological Studies, vol. 38.

Sapelo Island, Georgia, is the site of one of the earliest attempts to understand an ecosystem, dating back to the mid-1950's. Over the years many different approaches and disciplines have been applied to resolving questions



"The salt marshes of Sapelo Island, with the Duplin River in the foreground." [From *The Ecology of a Salt Marsh*]

about the ecology of salt marshes. This book deals principally with the work done at Sapelo Island but also covers research done elsewhere on the eastern coast of North America.

The book refreshingly starts without a self-conscious effort to justify the study of salt marshes. After an overview chapter there are reviews of research on water and sediments, primary producers, aquatic consumers, grazers and predators, aerobic and anaerobic microorganisms, nitrogen and phosphorus cycles, and models of the Sapelo Island marsh. Most of the chapters have the format of a literature review at an advanced level, and they are written in a dense style. The reader will have to go to the original sources for details. The lack of full development of many topics is awkward, especially where major references are still "in prep."

The most successful chapters are those on the grazers and the anaerobic microorganisms. The chapter on grazers is the easiest to read and includes enough interesting details of natural history (for instance, that marsh flies and ants lap up sugars released by leaves damaged by the feeding of phloem feeders and grasshoppers) to provide a sense of the marsh as a living system, while also conveying what is known of the more abstract ecological topics. The chapter on anaerobics appropriately includes some general information about the processes involved. It then discusses some of the important anaerobic processes occurring in the Sapelo and other salt marshes. Both these chapters point out how preliminary our

understanding is, even in this relatively well-studied ecosystem.

In the chapter on primary production the section dealing with grass production has a curiously static quality, even though rates of processes are repeatedly mentioned. A more dynamic view might have been provided by discussing the course of events that determine the cycle of primary production over a growing season, with an explanation of the succession of factors that control growth during different parts of the season.

The chapter on modeling is a narrative of the various stages of development of work on models. It is long on introduction and descriptions and short on new ideas generated by the model, despite considerable effort. Although the model probably helped frame questions for the research, this chapter does not add much. The final chapter of synthesis is interesting, but the authors could have profitably allowed themselves more time and space for integrating results from earlier chapters and attempting a broader synthesis.

This book does not provide novel theory, although there are a number of subjects in it that could be the basis for development of theoretical work, such as exchanges between adjoining ecosystems or couplings between nutrient cycles and dynamics of competition and predation. The authors point out controversial subjects concerning which there are still major contributions to be made, including export and import of materials, hydrology of tidal and interstitial water, the geochemistry of anaerobic process-

es, the nature of decomposition processes, and the nutrition and role of detritus feeders. There are many discrepancies in the results of studies of these subjects owing to differences in techniques or to geographical variation among salt marshes. More critical assessment of the discrepancies could have been included in most of the chapters.

Although this could have been a longer book, it is a good summary of progress achieved so far on Sapelo Island with a thorough survey of the literature on research done in other locations. It will be useful to the advanced student intending to do research in coastal environments as a source of information on what has been done.

IVAN VALIELA

*Boston University Marine Program,
Marine Biological Laboratory,
Woods Hole, Massachusetts 02543*

Movement of Animals

Vertebrate Locomotion. Proceedings of a symposium, London, March 1980. M. H. DAY, Ed. Published for the Zoological Society of London by Academic Press, New York, 1981. xviii, 472 pp., illus. \$89.50. Symposia of the Zoological Society of London, No. 48.

Vertebrate Locomotion is the proceedings of a symposium celebrating the tercentenary of the first edition of Borelli's *De Motu Animalium*. It should not be confused with a 1961 symposium of the Zoological Society with the same title.

The current volume is divided into four sections covering swimming (five papers), flight (three papers), walking and running (five papers), and primate arborealism (four papers). Most of the contributions are comparative summaries, although a few are detailed analyses of locomotion in a single species. In the latter category, Videler examines swimming in cod, Batty uses the new technique of silhouette cinematography to observe locomotion in tiny, transparent plaice larvae, and Blake presents an exceedingly complicated mathematical model for paddling propulsion based on analysis of an individual angelfish.

The 1961 symposium began with a chapter on general principles of locomotion by Sir James Gray. One of the problems of the current effort is that it lacks such a unifying force. Each paper addresses its assigned topic without much reference to the others. The most obvious example of this is in the primate section. Fleagle *et al.* present a functionally based argument that vertical climb-

ing is a biomechanical link between brachiation and human-type bipedality and that so-called brachiators (which often spend much more time in vertical climbing than in brachiating) are thus preadapted for bipedality. Their electromyographic studies show that many of the large shoulder muscles of apes are actually more active during vertical climbing than during brachiation, and kinematic and force-plate analyses indicate that during vertical climbing ape hindlimb movement is more like that of humans than any other primate. Rollinson and Martin examine primate locomotion by means of gait analysis and allometric regressions of limb elements. They conclude that the allometric differences between living apes and humans are so large that "evolution of human bipedalism from any ancestral form with definite brachiating characteristics is highly unlikely" (p. 413). Neither set of authors addresses the arguments of the other.

Several of the papers concern locomotor physiology. Johnston reviews the structure, physiological characterization, innervation, and metabolic biochemistry of fish muscle, a topic that connects nicely with Roberts's summary of motor control by fish nervous systems. Much of Goldspink's paper on energy conservation in locomotion has been published in at least three other symposium volumes. Armstrong, on the other hand, presents an interesting and timely review of fiber-type distribution and recruitment in mammalian muscle.

Perhaps the paper that best combines physiological and morphological concerns is Alexander's study on the economy of tetrapod gaits. Comparing the calculated power requirements of animals using different gaits with actual force-plate records, he is able to show why turtles use a gait that at first would appear to offer low stability and why mammals switch gaits at the speeds they do. Although some of these data have been presented elsewhere, much of the analysis is new. Other integrative papers include those by Rewcastle (evolution of stance and gait in tetrapods), Rayner (flight adaptations), and Lanyon (locomotor loading of limb bones).

The current *Vertebrate Locomotion* attempts to answer many of the same kinds of questions as the earlier symposium in a somewhat more thorough manner. Perhaps not surprisingly, the major difference is in techniques, with the earlier dissections and relatively slow cinematography now supplemented by more powerful mathematical analysis, faster films, including x-ray cinematography,

and such new tools as electromyography and microwave Doppler radar. The 1961 symposium presented several papers that have been quite influential; those interested in vertebrate locomotion will find its 1981 descendant equally informative.

JAMES L. EDWARDS

*Department of Zoology,
Michigan State University,
East Lansing 48824*

An Excitatory Amino Acid

Glutamate. Transmitter in the Central Nervous System. P. J. ROBERTS, J. STORM-MATHISEN, and G. A. R. JOHNSTON, Eds. Wiley-Interscience, New York, 1981. xii, 226 pp., illus., + plates. \$41.50.

Can one have too much information about a neurotransmitter? This question is prompted by the latest of several books published in recent years dealing with glutamate and related amino acids. The book arose from a symposium organized at the September 1979 International Society for Neurochemistry meeting in Jerusalem. In contrast to earlier volumes, it is more than just a summary of papers presented at the symposium, and it includes some thorough and well-written reviews—for example, Cotman and Nadler on biochemical and pharmacological evidence that glutamate and aspartate are transmitters in the hippocampus and Abdul-Ghani, Coutinho-Netto, and Bradford on studies of the release of glutamate *in vivo*. The latter is an important topic because the release of glutamate is an essential aspect of glutamate-mediated transmission, about which there is a marked dearth of reliable information.

Glutamate uptake is far better understood, for it has been studied since the pioneering work of Krebs and his collaborators more than 30 years ago. But does the presence of even high-affinity uptake provide incontrovertible enough evidence that glutamate is a transmitter to justify devoting two papers to the topic, as is done in the book? According to the paper by G. A. R. Johnston, carriers of high-affinity uptake of excitatory amino acids are only poorly selective and blockers of uptake appear to have no effect on synaptic potentials. Moreover, as was first proposed by Quastel and by van den Berg, glutamate appears to be taken up principally by glia, being there transformed to glutamine, which, having minimal excitatory actions, can be safely released into the extracellular medium