ceiving principal attention are the central terminations of large-diameter primary afferent fibers that originate from the mechanoreceptors of mammalian skin and muscle and systems of spinal neurons that send their processes rostrally to the brain, principally conveying sensory information from the skin. Although much of the work has been described in widely circulated scientific journals, the book brings the ensemble together and adds a number of additional pictures of stained neurons. Considerable space is devoted to light-microscope descriptions of the central terminations of large-diameter myelinated primary afferent fibers from skin mechanoreceptors, one of the group's most important contributions. That different cutaneous mechanoreceptors have their central terminations concentrated in zones and with arrangements more or less distinctive for each type of sense organ may not surprise all readers, but prior to the studies of Brown and his colleagues these facts had not been documented. Brown's inclusion of chapters on central connections of the large-diameter afferent fibers of muscle is understandable given the applicability of the HRP technique and the wealth of physiological information available about the sense organs they serve; however, there was more previous knowledge about the central projections of muscle than those of cutaneous afferent fibers.

Brown's attention to the two ascending somatosensory systems, the spinocervical and the postsynaptic dorsal column pathways, is fitting, since both of these systems receive excitation from cutaneous primary fibers that the Edinburgh group has studied physiologically. In fact, the first experiments using intracellular HRP done by Brown's laboratory were on neurons of the spinocervical projection. These ascending systems of the spinal cord are prominent in the cat. Their functional significance for human beings and other primates is still uncertain.

The 176 illustrations convincingly document the complexity of neuronal structure as represented by the extensive arborizations of the central terminal of primary afferent fibers and of the dendrites of spinal neurons. The observations are a testimony to the potency of approaches that combine functional analysis by electrophysiological recording with equivalently detailed determination of morphology. The data show that the intimate anatomy of neurons is more complicated than had been appreciated from the Golgi technique, which apparently does not provide as complete a demarcation of fine processes as is demonstrated by the intracellular HRP. The book discusses more than the results obtained by Brown and his colleagues, although, as the preface states, that is its principal purpose. There is a relatively extensive but selective discussion of the literature on the spinal cord and an excellent bibliography that of itself might be worth a library's purchase. However, the volume is not and does not pretend to be a treatise on spinal cord function and should not be used as a balanced source for an understanding of the structure or general principles of organization of the mammalian central nervous system. Because the book presents a highly personal view, one should be careful in recommending it to students or neophytes. The degree of emphasis given to contributions made by others may not do justice; demurrals could arise from certain quarters in Sweden. Moreover, there are notable omissions. There is a lack of electron microscopic material except for one figure in the addendum. In addition, there is remarkably little physiology for a book written by a physiologist. Finally, the addendum, which provides some useful information on methods, does not treat the valuable variations used by other investigators.

The book is a splendid tribute to the order and the complexity of the circuitry in the central nervous system of mammals and a pointed warning to those who would ignore the highly specific arrangements in bringing forth theories of neural functioning. It also brings attention to the work of a fine scientist and his colleagues in a fashion that might well be used by others.

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Plasma Physics

Relation between Laboratory and Space Plasmas. Proceedings of a workshop, Tokyo, April 1980. HIROSHI KIKUCHI, Ed. Reidel, Boston, 1981 (distributor, Kluwer Boston, Hingham, Mass.). xii, 418 pp., illus. $58. Astrophysics and Space Science Library, vol. 84.

Space plasma physics deals with phenomena involving an extremely large range of parameters, and it is not surprising that laboratory simulation of, for example, the magnetopause, bow shock, and micropulsations is difficult if not impossible. Scaling laws prohibit the accurate mapping of all important characteristic quantities of space in the laboratory. The interaction between space and laboratory plasma physics has thus been only marginally fruitful.

This book, the proceedings of an international workshop, attempts to change this situation. The book is directed toward laboratory plasma physicists, space scientists, and plasma theoreticians. Astronomers may also find it useful. It covers eight topics, ranging from "exotic" ones such as critical velocity and double layers to more standard ones such as instabilities and turbulence. Each topic is covered by three or four papers, most of which deal with rather specific aspects of limited problems. Interaction between space and laboratory plasma physics can be fruitful in dealing with such limited but well-defined problems.

An excellent example is the study of the so-called critical velocity phenomenon originally introduced by Alfvén in 1954. Alfvén proposed that there exists an upper limit to the relative velocity of a neutral gas and a magnetized plasma. This limit, the critical velocity, is reached when the kinetic energy of the neutral gas equals its ionization energy. In 1975, Alfvén and Arrhenius proposed this effect as an explanation for the "band structure" of the distribution of matter in the solar system. Others believe it to be of importance in the interaction of the solar wind with comets or the Jovian magnetosphere with the moon Io. Acceptance of the idea has been slow, and up until a few years ago the majority of laboratory plasma physicists did not deem it necessary to test the phenomenon. The situation has changed in the last five years or so, however, and today a reasonably large body of data and theory concerning the critical velocity phenomenon exist. Most of it is reviewed in the book. There is also a reasonably large body of data and theory concerning the double-layer phenomenon, although the book's coverage of it is much less complete than one would wish. There are, for example, no papers on numerical simulations, and the treatment of recent theoretical advances is sketchy at best. Other examples of the advantage of using clean, simple, and small-scale laboratory experiments to understand space plasma phenomena are treated in sections on instabilities in the equatorial and auroral electrojet, turbulent and anomalous plasmas, and plasma irregularities. Newly designed active experiments are treated in the last section of the book.

A major shortcoming of the book is its lack of focus. The scope is simply too

ambitious. But perhaps that criticism is unavoidable when one deals with such a diverse family of complex phenomena. Finally, the book could have been improved if introductory and summary papers had covered the topics treated in the book more extensively than the ideas of the editor. Even though his ideas are interesting, they seem to be rather unrelated to the main body of the book. Perhaps it is unfair to expect an editor to remain a neutral collector of papers when, clearly, he has many unconventional ideas on the subject himself.

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Ecological Effects of Fire

Fire Ecology. United States and Southern Canada. HENRY A. WRIGHT and ARTHUR W. BAILEY. Wiley-Interscience, New York, 1982. xxiv, 502 pp., illus. $44.95.

The first plant ecology textbook to recognize fire as an ecological factor was published in 1947. Over the next quarter century a revolution in attitudes toward fire took place, and research on fire history and fire effects on plant communities has increased exponentially. The first book devoted solely to fire ecology was published in 1974 (*Fire and Ecosystems*, T. T. Kozlowski and C. E. Ahlgren, Eds., Academic Press), and now a second one is available. The authors of the present book fairly claim that it is a "progress report" in a rapidly developing field.

The book begins with chapters on temperature and heat effects, soil and water, and wildlife. Eleven chapters are devoted to particular types of plant communities, such as grasslands, chaparral and oakbrush, ponderosa pine, spruce-fir, and coast redwood and giant sequoia. These chapters discuss fire history, distribution, climate, soils, vegetation, fire effects, and management implications. A detailed chapter on prescribed burning techniques concludes the book.

Both authors are range specialists, and it is thus no surprise that chapters on grasslands and shrublands are excellent. Fire effects are related to various prescriptions for igniting controlled fires, and the effects of varying frequencies and intensities of fire are clearly presented. Each of the grass-shrub chapters exhibits considerable breadth, only occasionally at the expense of a thorough treatment of the plant community. The chapter on chaparral covers a much wider array of communities than was covered in *Fire and Ecosystems*. However, the treatment of California chaparral is far too brief in comparison to that in the earlier book and is marred by numerous misspellings (at least 10) of scientific names (including the most common species, *Adenostoma fasciculatum*).

Though there appears to be a slight overlap between some chapters (for example, those on seral ponderosa pine forests and the drier Douglas fir forests), the wide variety of forest types have generally been organized into sensible groupings. One surprise is the chapter on coast redwood and giant sequoia, related taxonomically but not ecologically; the discussion of fire effects in this chapter is largely species-specific and is less ecosystem-oriented than the discussions in other chapters. In most of the forest chapters, stand development as related to fire is covered, although only marginally, for the study of the subject has just emerged as a discrete subdiscipline. That it is covered at all is one of the reasons the authors consider their book to be an up-to-date treatise.

Some introductory treatment of plant adaptations to fire and fire history methodology would have been desirable. Both subjects are briefly discussed in the middle of the book in the chapter on Douglas fir, but a treatment of both subjects that was applicable to all the chapters on plants would have been useful. In particular, point, cluster, and area fire frequencies are seldom adequately compared in the open literature, and the proper interpretation of them would have been a strong addition.

The major strength of the book is a management-oriented approach, perhaps best exemplified by the long chapter on prescribed burning technique. The authors wisely avoid trying to present a complete fire behavior manual and suggest that proper training coupled with increasing levels of experience is the key to successful burning. A discussion of firing techniques, with emphasis on planned ignitions, makes up the bulk of the chapter.

Photographs in the text show many before-and-after scenes, and the maps of types of vegetation provide good orientation for the reader. In my copy, an occasional map did not print well (white pine, p. 330) and one map (Douglas fir and associates, p. 239) seems to have the same pattern designating two forest types.

The book is clearly the best work on the ecological effects of fire in the United States and southern Canada. It is an exceptionally balanced treatment of a tremendous variety of vegetation types and will be considered the definitive treatment of the subject to date.

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