Book Reviews

Fire Ecology

Fire and Ecosystems. T. T. KOZLOWSKI and C. E. AHLGREN, Eds. Academic Press, New York, 1974. xiv, 542 pp., illus. $39.50. Physiological Ecology.

Scientists and practitioners interested in fire in forest, savannah, grassland, or desert ecosystems will find this book a useful compendium of much of the world's literature on the subject. It is arranged as a series of 13 reviews, with an introduction by C. E. Ahlgren. There is a discussion by P. J. Viro of the effects of fire on forest soils, one by I. Ahlgren on soil organisms, and one by J. F. Bendell on birds and mammals. Then follow nine papers on specific ecosystems or geographic regions by R. J. Vogl (grasslands), C. E. Ahlgren, S. Little, E. V. Komarek, and H. Weaver (American forests), H. H. Biswell (chaparral), R. R. Humphrey (deserts), Z. Naveh (Mediterranean ecosystems), and J. Phillips (African forests and savannahs). These men bring long experience and intimate field knowledge to their topics. A chapter on the use of fire in land management by A. J. Kayll closes the book. There is a subject index and an author index listing each citation of some 1100 authors. Even with this scope, much relevant literature and vast regions of the world are largely omitted (Australia, Alaska, South America, and the Soviet Union).

Interest in fire ecology is high because of current debates about the effects of fire exclusion on fuel accumulation, about theories of ecosystem dynamics, about stability and diversity in relation to fire-caused perturbations, and about the need for fire restoration programs in certain national parks and wilderness areas (see M. Dodge, *Science* **177**, 139 [1972] and H. Wright, *ibid.* **186**, 487 [1974]). The title *Fire and Ecosystems* suggests in-depth coverage of these subjects, but they are not addressed in any systematic way in either the introduction or the chapter on land management. Several of the ecosystem reviews do discuss fuel accumulations and the need for fire restoration programs (especially those by Weaver, Biswell, Komarek, and Vogl). But the editors do not achieve a focus on these subjects, and the chapters are not consistently subtitled. The early 1973 cut-off date for literature citations is unfortunate because of the extensive discussions of these subjects in the October 1973 issue of *Quaternary Research*.

The value of fire history research is discounted in the introduction because "it does not reveal the biological principles involved." This and related statements on pp. 2 and 3 are unfortunate because they could discourage further tree ring studies of fire scars and stand ages in the few extensive virgin forests of the world where such evidence remains. Yet only through such work and related stratigraphic and historical research can we evaluate the actual frequency and intensity of fire perturbations in the primeval ecosystems from which evolved the plants and animals our technological society depends on. Such evidence could be crucial in the development of valid general ecosystem theory.

In spite of these questions of focus, the book does bring together a wealth of factual data, insights, and interpretations concerning an environmental factor that has too long been treated as somehow foreign to ecosystems.

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Tunable Laser Sources

Laser Spectroscopy. Proceedings of a conference, Vail, Colo., June 1973. RICHARD G. BREWER and ARAM MOORADIAN, Eds. Plenum, New York, 1974. xii, 672 pp., illus. $34.50.

When lasers first came into use in the 1960's, their spectroscopic applications were limited by the small number of discrete wavelengths at which appreciable laser powers were available. Would-be laser spectroscopists scrutinized spectral data for transitions that matched existing wavelengths, an activity that frequently accompanied the search for likely new lasing transitions. The only spectroscopic technique of general applicability for which the frequency of the source is almost irrelevant is Raman spectroscopy, in which only the difference between the source frequency and an inelastically scattered side band carries spectroscopic information. For this application, the fixed-frequency laser is ideal; and half a dozen years ago a book on laser spectroscopy would have been a book primarily on Raman spectroscopy. But this situation is changing rapidly. Of the 46 entries under "spectroscopy" in the (very useful) index to this proceedings volume, only one refers to Raman scattering at all, and that only to its application in a tunable source. Solid state spectroscopy, a field completely transformed by laser Raman spectroscopy, is not mentioned at all. These striking omissions, which render the title of the book somewhat misleading, are consistent with the aims of the editors and organizers of the conference, who wished to publicize the birth of a basically different kind of laser spectroscopy that exploits a new class of continuously tunable laser sources.

The new sources span the spectrum from the ultraviolet to the far infrared. Most of them provide highly monochromatic, polarized, collimated beams at intensities sufficiently great to drive resonant systems far from thermal equilibrium. But the feature emphasized on these pages is tunability, which allows this intense radiation to be brought into resonance with almost any atomic or molecular transition. The broadly tunable dye lasers, and nonlinear mixing techniques to displace their tuning range to other spectral regions, are perhaps the most versatile of the new sources, although other important systems are given adequate coverage. Semiconductor lasers, spin-flip Raman lasers, and Zeeman tuned-gas lasers are all described and assessed for future usefulness. There is a good balance between papers on laser sources and papers on applications.

Prominent among the applications reported here are those in which high resolution and high precision play a role. Most schemes for optimizing either quality take advantage of nonlinear effects, such as saturated absorption, infrared rectification, and the "Lamb dip" in the center of the laser-power-versus-frequency curve. Readers not familiar with these effects must learn about them elsewhere, although ample references are provided to guide them to the original literature.

All in all, this volume accomplishes its aim. The average technical quality and readability of the papers are unusually high for conference proceedings, and, with few exceptions, the wide range of topics is well integrated. Advances in technique during the two years since this material was fresh have not made obsolete the picture it gives of the field.

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