

Book Reviews

Topics in Fluorescence Spectroscopy, Vol. 1-3 by Joseph R. Lakowicz, Editor

Plenum Press, New York. Vol. 1: 453 pages, 1991, \$79.95; Vol. 2: 432 pages, 1991, \$79.95; Vol. 3: 390 pages, 1992, \$79.95

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"Fluorescence spectroscopy" encompasses a diverse set of techniques capable of probing a wide range of fundamentally different physical, chemical, and biological processes. Because of its versatility, fluorescence spectroscopy has been employed in virtually every discipline of the physical and biological sciences. Over the last decade or so, the number and range of applications of fluorescence have grown dramatically, particularly in the biological sciences. This expansion has been driven by technological improvements on all fronts; fluorescent molecules, excitation and recording instrumentation, application theory, and data analysis tools. As a result of this growth, it is becoming increasingly necessary to become familiar with the various methodologies to understand and critically evaluate observations made with them.

The editor, Joseph R. Lakowicz, is the author of the classic textbook in this field, *Principles of Fluorescence Spectroscopy*. The motivation for initiating this series was to provide an advanced text that summarizes the progress made in fluorescence spectroscopy over the past decade. The three volumes, consisting of eight chapters each, are subtitled *Techniques*, *Principles*, and *Biochemical Applications*, representing the general emphasis of the component chapters (although often the distinction is a matter of degree). The individual chapters aim to describe the current state of the art in a particular area.

The focus of Vol. 1 is on the theory, techniques, and instrumentation used for a variety of different fluorescence applications. A range of topics are surveyed, including chapters on time-correlated single photon counting, lasers and microchannel plates, streak cameras, synchrotron radiation sources, frequency domain fluorescence spectroscopy, fluorescence correlation spectroscopy, fluorescence microscopy, and flow cytometry. Vol. 2 focuses mainly on the principles underlying particular applications of fluorescence spectroscopy. It consists of three chapters that examine different aspects of fluorescence (fluorescence anisotropy, fluorescence quenching, and resonance energy transfer), four chapters on the analysis and interpretation of fluorescence data (least-squares analysis, analysis of fluorescence intensity and anisotropy decay, fluorescence polarization from oriented systems, and inhomogeneous broadening of electronic spectra), and one chapter on fluorescence-based fiber-optic sensors.

The first two volumes touch on aspects of fluorescence spectroscopy that are common to many applications, either from a practical or a theoretical point of view, and thus will have a relatively broader appeal. In contrast, Vol. 3 is a somewhat more specialized text, and will appeal more to those interested in the specific applications. It contains six chapters dealing with general biochemical applications of fluorescence: tyrosine fluorescence and phosphorescence from proteins, fluorescence and dynamics in proteins, tryptophan phosphorescence from proteins, nucleic acid fluorescence, fluorescence in membranes, and immunodiagnostic methods. Two technically oriented chapters (on total internal reflection fluorescence and on microparticle fluorescence and energy transfer) complete the volume. Although the applications are the principal focus in this volume, as a rule the authors discuss the relevant principles and techniques in detail.

The authors made good use of their generous space allotments to explore their topic in detail and the general level of exposition is very good. For the most part, the presentations are geared, appropriately, towards those with some familiarity with fluorescence spectroscopy, although not necessarily with the specific applications. As is typical of such collections, some chapters will be considered useful only to those interested in the particular technique or application, whereas others will be appreciated by a more general audience. For example, among those in the latter category, the chapter by E. W. Small on laser sources and microchannel plate detectors is notable for its excellent primer on laser fundamentals.

The field of fluorescence spectroscopy includes such a large and diverse set of techniques that, even within 24 chapters, one can only hope to provide a sampling of the many "states of the art." Yet advances in the field often result from the adaptation of instruments or techniques initially developed for other fluorescence applications and, thus, there is a need for references that allow one to keep abreast of developments in other areas. Progress in the field of fluorescence spectroscopy appears certain to continue at a rapid rate, and the editor promises additional volumes to keep pace. Recent advances in fluorophore design and in the field of fluorescence microscopy (to name but two areas that are underrepresented in the first three volumes) would appear to provide strong justification for continuing this worthwhile series.