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Principles of Fluorescence Spectroscopy Principles and Applications of Fluorescence Spectroscopy Handbook of Fluorescence Spectroscopy and Imaging Principles of Fluorescence Spectroscopy Handbook of Fluorescence Spectra of Aromatic Molecules Practical Fluorescence Spectroscopy Fluorescence Spectroscopy, Imaging, and Probes Introduction to Fluorescence Spectroscopy Topics in Fluorescence Spectroscopy Modern Fluorescence Spectroscopy Fluorescence and Phosphorescence Spectroscopy Introduction to Fluorescence Molecular Fluorescence Aquatic Organic Matter Fluorescence Fluorescence Spectroscopy and Microscopy Handbook of Measurement in Science and Engineering, Volume 3 Molecular Fluorescence Fluorescence Lifetime Spectroscopy and Imaging Reviews in Fluorescence 2008 Protein Fluorescence Topics in Fluorescence Spectroscopy An Introduction to Fluorescence Correlation Spectroscopy Fluorescence Spectroscopy in Biology Biophysical and Biochemical Aspects of Fluorescence Spectroscopy New Trends in Fluorescence Spectroscopy Modern Fluorescence Spectroscopy Fluorescence Methods and Applications The Fluorescence and Absorption Spectra of Sodium Vapor ... Reviews in Fluorescence 2007 X-Ray Fluorescence Spectroscopy for Laboratory Applications Fluorescence Spectroscopy in Biology Fluorescence and Phosphorescence Spectroscopy Surface Plasmon Enhanced, Coupled and Controlled Fluorescence Fluorescence Assay in Biology and Medicine Metal-Enhanced Fluorescence Handbook of Biomedical Fluorescence X-Ray Fluorescence Spectrometry Laser Induced Fluorescence Spectroscopy of OH in Flames Handbook of Single Molecule Fluorescence Spectroscopy Radiative Decay Engineering

This volume features papers on new spectroscopic methods and techniques, the development and application of fluorescent probes, and new techniques and applications of fluorescence imaging. Specific areas include the following: fluorescence lifetime, fluorescence (in vivo) imaging, time-resolved fluorescence, luminescence anisotropy, fluorescent (NMIR) labels, luminescent lanthanides, fluorescent sensors and probes, fluorescence microscopy, FRET, fluorescent nanoparticles and dots, high-throughput screening, fluorescent bioassays, luminescence-based DNA technologies, FISH and immunohistochemistry, luminescence on metal surfaces, fluorescent proteins, upconversion, multiphoton fluorescence, confocal techniques, near-field and far-field techniques, single photon counting, fluorescence correlation spectroscopy (FCS), and flow cytometry. NOTE: Annals volumes are available for sale as individual books or as a journal. For information on institutional journal subscriptions, please visit www.blackwellpublishing.com/nyas. ACADEMY MEMBERS: Please contact the New York Academy of Sciences directly to place your order (www.nyas.org). Members of the New York Academy of Science receive full-text access to the Annals online and discounts on print volumes. Please visit www.nyas.org/membership/main.asp for more information about becoming a member. The intrinsic or natural fluorescence of proteins is perhaps the most complex area of biochemical fluorescence. Fortunately the fluorescent amino acids, phenylalanine, tyrosine and tryptophan are relatively rare in proteins. Tr- tophan is the dominant intrinsic fluorophore and is present at about one mole % in protein. As a result most proteins contain several tryptophan residues and even more tyrosine residues. The emission of each residue is affected by several excited state processes including spectral relaxation, proton loss for tyrosine, rotational motions and the presence of nearby quenching groups on the protein. Additionally, the tyrosine and tryptophan residues can interact with each other by resonance energy transfer (RET) decreasing the tyrosine emission. In this sense a protein is similar to a three-particle or mul- particle problem in quantum mechanics where the interaction between particles precludes an exact description of the system. In comparison, it has been easier to interpret the fluorescence data from labeled proteins because the fluorophore density and locations could be controlled so the probes did not interact with each other. From the origins of biochemical fluorescence in the 1950s with Prof- sor G. Weber until the mid-1980s, intrinsic protein fluorescence was more qualitative than quantitative. An early report in 1976 by A. Grindvald and I. Z. Steinberg described protein intensity decays to be multi-exponential. Attempts to resolve these decays into the contributions of individual tryp- phan residues were mostly unsuccessful due to the difficulties in resolving closely spaced lifetimes. The phenomenon known as fluorescence is now widely used in the chemical and life sciences largely due to the development of highly sophisticated fluorescent probe chemistries and the commercial availability of these probes as well as the development of novel microscopy approaches. Introduction to Fluorescence helps readers acquire a sound understanding of basic fluorescence theory and practice. It describes general principles in a straightforward way and uses examples from a variety of disciplines to demonstrate them. In color throughout, the book takes readers through the history of important discoveries to the most current advances. It introduces the fundamentals of the fluorescence phenomenon and gives detailed examples of fluorescence applications in the molecular life sciences, including biochemistry, biophysics, clinical chemistry and diagnostics, pharmaceutical science, and cell and molecular biology. The author presents the basic theories underlying the applications and offers in-depth information on practical aspects. Along with a list of references in each chapter, the text incorporates more than 250 figures that clearly illustrate the concepts and gives the chemical structures of the most widely used fluorescent molecules. In addition, the appendix provides a "Rogue's Gallery" of the most common errors and pitfalls to avoid. This volume serves as a comprehensive collection of current trends and emerging hot topics in the field of fluorescence spectroscopy. It summarizes the year's progress in fluorescence and its applications as well as includes authoritative analytical reviews. This second edition of the well-established bestseller is completely updated and revised with approximately 30 % additional material, including two new chapters on applications, which has seen the most significant developments. The comprehensive overview written at an introductory level covers fundamental aspects, principles of instrumentation and practical applications, while providing many valuable tips. For photochemists and photophysicists, physical chemists, molecular physicists, biophysicists, biochemists and biologists, lecturers and students of chemistry, physics, and biology. Presenting a detailed, hands-on approach to fluorescence spectroscopy, this book describes experiments that cover basic spectroscopy and advanced aspects of fluorescence spectroscopy. It emphasizes practical guidance, providing background on fundamental concepts as well as guidance on how to handle artifacts, avoid common errors, and interpret data. Nearly 150 experiments from biophysics, biochemistry, and the biomedical sciences demonstrate how methods are applied in practical applications. The result is a hands-on guide to the most important aspects of fluorescence spectroscopy, from steady-state fluorescence to advanced time-resolved fluorescence. Provides a complete overview of nearly 150 experiments using fluorescence spectroscopy, from basic to advanced applications Presents laboratory methods using a variety of instrumental setups with detailed discussion of data analysis and interpretations Covers steady-state phenomena, time-resolved phenomena, and advanced methods Spans biophysical, biochemical, and biomedical applications Describes related concepts, theory, and mathematical background as well as commercially available instruments used for measurements An accessible guide to all aspects of molecular fluorescence spectroscopy This book introduces the uninitiated reader to the growing body of analytical methods based on molecular fluorescence. Geared to practitioners with no particular training or exposure to the field, it highlights fluorescence spectroscopy's tremendous appeal in present-day pharmaceutical, biomedical, and environmental analysis. Written by two highly respected experts in the field, Introduction to Fluorescence Spectroscopy covers all aspects of the technology-physical fundamentals, instrumentation, methods, and applications. The information is offered at 0a very practical level and addresses a broad range of chemical, physical, biological, and geological problems. The authors incorporate recent advances in commercially available instrumentation as well as fluorescent derivatizing agents, provide many examples of state-of-the-art applications, and discuss future

trends. Concise, accessible, up-to-date, Introduction to Fluorescence Spectroscopy is an indispensable reference and an invaluable primer for those involved in the field of analytical science and other professionals interested in this fast-evolving analytical technique. Melding basic and clinical science, this reference provides a comprehensive overview of the roles that biophysics, photochemistry, and computational modeling play in the biomedical applications of fluorescence spectroscopy and imaging. Penned by pioneering researchers, the Handbook of Biomedical Fluorescence discusses fundamental aspects of fluorescence generation in organic molecules within tissue, theoretical and experimental views of how light propagation in tissue can be used to interpret fluorescence signals, endogenous and exogenous fluorescence agents in medical or basic research studies, and radiation transport, diffusion theory, and the Monte Carlo method. Molecular Biology: An International Series of Monographs and Textbooks: Fluorescence Assay in Biology and Medicine, Volume II covers the many applications of fluorescence and phosphorescence. This book discusses the principles of fluorescence polarization, comparison of luminescence methods of analysis, and direct measurement of fluorescence decay times. The photodecomposition, sulfhydryl compounds, determination of primary structure, and fluorescent staining are also deliberated. This text likewise covers the assay of purines in nucleic acid hydrolyzates, formyltetrahydrofolate synthetase, and ovarian hormones. This volume is valuable to chemists, physicists, and biophysicists intending to use fluorescence in studying reaction mechanisms and elucidate the structure of complex biopolymers. Providing much-needed information on fluorescence spectroscopy and microscopy, this ready reference covers detection techniques, data registration, and the use of spectroscopic tools, as well as new techniques for improving the resolution of optical microscopy below the resolution gap. Starting with the basic principles, the book goes on to treat fluorophores and labeling, single-molecule fluorescence spectroscopy and enzymatics, as well as excited state energy transfer, and super-resolution fluorescence imaging. Examples show how each technique can help in obtaining detailed and refined information from individual molecular systems. A multidisciplinary reference of engineering measurement tools, techniques, and applications "When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely in your thoughts advanced to the stage of science." — Lord Kelvin Measurement is at the heart of any engineering and scientific discipline and job function. Whether engineers and scientists are attempting to state requirements quantitatively and demonstrate compliance; to track progress and predict results; or to analyze costs and benefits, they must use the right tools and techniques to produce meaningful data. The Handbook of Measurement in Science and Engineering is the most comprehensive, up-to-date reference set on engineering and scientific measurements—beyond anything on the market today. Encyclopedic in scope, Volume 3 covers measurements in physics, electrical engineering and chemistry: Laser Measurement Techniques Magnetic Force Images using Capacitive Coupling Effect Scanning Tunneling Microscopy Measurement of Light and Color The Detection and Measurement of Ionizing Radiation Measuring Time and Comparing Clocks Laboratory-Based Gravity Measurement Cryogenic Measurements Temperature-Dependent Fluorescence Measurements Voltage and Current Transducers for Power Systems Electric Power and Energy Measurement Chemometrics for the Engineering and Measurement Sciences Liquid Chromatography Mass Spectroscopy Measurements of Nitrotyrosine-Containing Proteins Fluorescence Spectroscopy X-Ray Absorption Spectroscopy Nuclear Magnetic Resonance (NMR) Spectroscopy Near Infrared (NIR) Spectroscopy Nanomaterials Properties Chemical Sensing Vital for engineers, scientists, and technical managers in industry and government, Handbook of Measurement in Science and Engineering will also prove ideal for academics and researchers at universities and laboratories. Discover how metal-enhanced fluorescence is changing traditional concepts of fluorescence This book collects and analyzes all the current trends, opinions, and emerging hot topics in the field of metal-enhanced fluorescence (MEF). Readers learn how this emerging technology enhances the utility of current fluorescence-based approaches. For example, MEF can be used to better detect and track specific molecules that may be present in very low quantities in either clinical samples or biological systems. Author Chris Geddes, a noted pioneer in the field, not only explains the fundamentals of metal-enhanced fluorescence, but also the significance of all the most recent findings and models in the field. Metal-enhanced fluorescence refers to the use of metal colloids and nanoscale metallic particles in fluorescence systems. It offers researchers the opportunity to modify the basic properties of fluorophores in both near- and far-field fluorescence formats. Benefits of metal-enhanced fluorescence compared to traditional fluorescence include: Increased efficiency of fluorescence emission Increased detection sensitivity Protect against fluorophore photobleaching Applicability to almost any molecule, including both intrinsic and extrinsic chromophores Following a discussion of the principles and fundamentals, the author examines the process and applications of metal-enhanced fluorescence. Throughout the book, references lead to the primary literature, facilitating in-depth investigations into particular topics. Guiding readers from the basics to state-of-the-technology applications, this book is recommended for all chemists, physicists, and biomedical engineers working in the field of fluorescence. Fluorescence and Phosphorescence Spectroscopy: Physicochemical Principles and Practice deals with the physicochemical principles and applications of fluorescence and phosphorescence spectroscopy in experimental biology and chemistry. Topics covered include the absorption of light by molecules; instrumentation for the measurement of fluorescence and phosphorescence; solvent and acidity effects on electronic spectra; and polarization of fluorescence and phosphorescence. Comprised of four chapters, this book begins with a discussion on photophysical processes in isolated molecules and molecules in solution, paying particular attention to thermal equilibration of electronically excited molecules, phototautomerism, and coordination by metal ions. The next chapter describes the instrumentation for measuring fluorescence and phosphorescence, which consists essentially of a light source to electronically excite the sample; a monochromator to separate the light of desired energy from the source; a sample compartment; a second monochromator to isolate the sample's fluorescence energy from the excitation energy; a photodetector to translate the fluorescent light into an electrical signal; and a readout system such as a galvanometer or a recorder, coupled with an amplifier to determine the intensity of fluorescent light that is emitted. The final chapter is devoted to various applications of fluorescence and phosphorescence spectroscopy, including the analysis of organic and inorganic compounds. This monograph is written primarily for analytical chemists and biological scientists. Moreover, the development of many new molecular probes with higher selectivity for specific micro-environmental properties has stimulated many new researchers to employ fluorescence techniques."--Cover. Since the appearance of the first two volumes of Modern Fluorescence Spectroscopy in 1976, important advances continue to be made in both the techniques and applications of molecular luminescence. In terms of "hardware," it is only recently that the application of laser excitation to molecular fluorometry has become feasible under conditions that are analy tically realistic. The improvements that can be effected in sensitivity, analy tical selectivity, and ability to handle "difficult" samples by laser fluorometry have only begun to be exploited. Likewise, time-resolved fluorometry has received widespread use in fundamental studies (a sizable number of which deal with biological systems), but has as of yet received relatively little analytical utilization. The use of electronic array detectors offers the promise of obtaining luminescence spectra more rapidly, and perhaps ultimately with greater sensitivity, than is possible by the use of scanning instruments equipped with conventional detectors. The increasing capabilities of microcomputers and the increasing sophistication of "smart" spectroscopic instrumentation signify that much more efficient acquisition and use can now be achieved of the information contained in the "excitation-emission matrix" inherent in the luminescence phenomenon. X-Ray Fluorescence Spectrometry, Ron Jenkins Written by the principal scientist for JCPDS, the International Centre for Diffraction Data, Swarthmore, Pennsylvania, this book focuses on the scientific and technological developments achieved in the field during the past decade. It offers comprehensive coverage of all crucial topics, including: the properties and uses of X-ray emission spectrometry in material analysis; its industrial applications; X-ray diffraction; instrumentation for X-ray fluorescence spectrometry; a comparison of wavelength and energy dispersive spectrometers; and use of X-ray spectrometry for qualitative analysis. Explains the principles and current thinking behind plasmon enhanced Fluorescence Describes the current developments in Surface Plasmon Enhanced, Coupled and

Controlled Fluorescence Details methods used to understand solar energy conversion, detect and quantify DNA more quickly and accurately, and enhance the timeliness and accuracy of digital immunoassays Contains contributions by the world’s leading scientists in the area of fluorescence and plasmonics Describes detailed experimental procedures for developing both surfaces and nanoparticles for applications in metal-enhanced fluorescence The principles of fluorescence spectroscopy are by now well established, and, after a rather lengthy gestation period, the technique is now routinely applied to a broad spectrum of problems, ranging from mechanistic photo chemistry to chemical analyses in biomedical and environmental systems to probes of structure and function in biological macromolecules. Phosphor escence spectrometry and chemiluminescence are also well-known tech niques; they are somewhat less well established than fluorescence (at least in analytical chemistry), but they too are receiving greatly increased appli cation to both laboratory and "real" problems. This is not to imply that luminescence spectroscopy, viewed in its broadest sense, is a static field. In fact, recent advances in instrumentation make it feasible to apply fluorescence to problem areas in which its use five years ago would have been unthinkable. Advances in hardware generate advances in application, and very significant progress is being recorded in the application of fluorescence (and its close relatives, phosphorescence and chemiluminescence) in the biochemical, biomedical, and environmental spheres. Provides comprehensive coverage on using X-ray fluorescence for laboratory applications This book focuses on the practical aspects of X-ray fluorescence (XRF) spectroscopy and discusses the requirements for a successful sample analysis, such as sample preparation, measurement techniques and calibration, as well as the quality of the analysis results. X-Ray Fluorescence Spectroscopy for Laboratory Applications begins with a short overview of the physical fundamentals of the generation of X-rays and their interaction with the sample material, followed by a presentation of the different methods of sample preparation in dependence on the quality of the source material and the objective of the measurement. After a short description of the different available equipment types and their respective performance, the book provides in-depth information on the choice of the optimal measurement conditions and the processing of the measurement results. It covers instrument types for XRF; acquisition and evaluation of X-Ray spectra; analytical errors; analysis of homogeneous materials, powders, and liquids; special applications of XRF; process control and automation. An important resource for the analytical chemist, providing concrete guidelines and support for everyday analyses Focuses on daily laboratory work with commercially available devices Offers a unique compilation of knowledge and best practices from equipment manufacturers and users Covers the entire work process: sample preparation, the actual measurement, data processing, assessment of uncertainty, and accuracy of the obtained results X-Ray Fluorescence Spectroscopy for Laboratory Applications appeals to analytical chemists, analytical laboratories, materials scientists, environmental chemists, chemical engineers, biotechnologists, and pharma engineers. Handbook of florescence spectra of Aromatic Molecules ... An Introduction to Fluorescence Correlation Spectroscopy represents a comprehensive introduction to fluorescence correlation spectroscopy (FCS), a biophysical experimental technique increasingly used to study and quantify molecular mobility, concentrations and interactions in vitro, as well as in living cells and multicellular organisms. Students and researchers who are new to FCS can use the book as the first introduction to the technique, while those who are already using FCS regularly in their research may find it useful to deepen their understanding of the technique, its possibilities, limitations, and potential pitfalls as well as ways to avoid them. This book introduces the reader to all aspects of FCS needed for practical usage of the technique in their research. In the beginning the concept of fluorescence intensity fluctuations and their auto- and cross-correlation functions are explained to give readers an understanding of the underlying principles. This is followed by an overview of instrumental FCS setups and various ways of data collection and processing, the derivations of theoretical models relating the experimentally obtained correlation functions to the underlying molecular processes, and the description of the fitting of experimental data with those models. Mathematically more involved portions are separated from the rest of the text and can be easily skipped by readers more interested in the conceptual and practical aspects of FCS. The book contains interactive graphics and is accompanied by an interactive computable document file allowing the reader to test the dependence of FCS results on a variety of experimental parameters, and to gain practical insights into FCS data fitting. Key Features Introduces the concepts of FCS in an accessible way, supported by animations and graphics in the ebook. Includes a supplementary interactive computable document file that allows the reader to experiment with various FCS setup and fit parameters, allowing readers to test their understanding and simulate experimental outcomes. Provides rigorous mathematical derivations of fundamental FCS equations and models. Pedagogical features include questions, short reviews and critical discussions of literature relevant to the particular chapter that include applications and fundamental developments in the field of FCS. During recent years our enthusiasm for this field has continually increased. This book presents expert contributions describing the fundamental principles for the widespread use of radiative decay engineering in the biological sciences and nanotechnology. The third edition of this established classic text reference builds upon the strengths of its very popular predecessors. Organized as a broadly useful textbook Principles of Fluorescence Spectroscopy, 3rd edition maintains its emphasis on basics, while updating the examples to include recent results from the scientific literature. The third edition includes new chapters on single molecule detection, fluorescence correlation spectroscopy, novel probes and radiative decay engineering. Includes a link to Springer Extras to download files reproducing all book artwork, for easy use in lecture slides. This is an essential volume for students, researchers, and industry professionals in biophysics, biochemistry, biotechnology, bioengineering, biology and medicine. During the past two decades, there has been an increasing appreciation of the significant value that lifetime-based techniques can add to biomedical studies and applications of fluorescence. Bringing together perspectives of different research communities, Fluorescence Lifetime Spectroscopy and Imaging: Principles and Applications in Biomedical Diagnostics explores the remarkable advances in time-resolved fluorescence techniques and their role in a wide range of biological and clinical applications. Broadly accessible, the book captures the state-of-the-art of fluorescence lifetime metrology and imaging and provides current perspectives on their applications to biomedical studies of intact tissues and medical diagnosis. The text introduces these techniques within the wider context of fluorescence spectroscopy and describes basic principles underlying current instrumentation for fluorescence lifetime imaging and metrology (FLIM). It also covers the wide range of methods, including single channel (point) spectroscopy, fluorescence lifetime imaging microscopy, and single- and multi-photon excitation. Edited by pioneers in this field, with contributions from leading experts, the book includes an overview of complementary techniques that help researchers beginning FLIM research. It offers a comprehensive treatment of fundamental principles, instrumentation, analytical methods, and applications. It also provides an overview of the label-free contrast available from lifetime measurements of tissue autofluorescence and the prospects for exploiting this for clinical applications and biomedical research including drug discovery. Fluorescence spectroscopy is an important investigational tool in many areas of analytical science, due to its extremely high sensitivity and selectivity. With many uses across a broad range of chemical, biochemical and medical research, it has become an essential investigational technique allowing detailed, real-time observation of the structure and dynamics of intact biological systems with extremely high resolution. It is particularly heavily used in the pharmaceutical industry where it has almost completely replaced radiochemical labelling. Principles and Applications of Fluorescence Spectroscopy gives the student and new user the essential information to help them to understand and use the technique confidently in their research. By integrating the treatment of absorption and fluorescence, the student is shown how fluorescence phenomena arise and how these can be used to probe a range of analytical problems. A key element of the book is the inclusion of practical laboratory experiments that illustrate the fundamental points and applications of the technique. `In the second edition of Principles I have attempted to maintain the emphasis on basics, while updating the examples to include more recent results from the literature. There is a new chapter providing an overview of extrinisic fluorophores. The discussion of timeresolved measurements has been expanded to two chapters. Quenching has also been expanded in two chapters. Energy transfer and anisotropy have each been expanded to three chapters. There is also a new chapter on fluorescence sensing. To enhance the usefulness of this book as a textbook, most chapters are followed by a set of problems. Sections

which describe advanced topics are indicated as such, to allow these sections to be skipped in an introduction course. Glossaries are provided for commonly used acronyms and mathematical symbols. For those wanting additional informtion, the final appendix contains a list of recommended books which expand on various specialized topics.' from the author's Preface This first volume in the new Springer Series on Fluorescence brings together fundamental and applied research from this highly interdisciplinary and field, ranging from chemistry and physics to biology and medicine. Special attention is given to supramolecular systems, sensor applications, confocal microscopy and protein-protein interactions. This carefully edited collection of articles is an invaluable tool for practitioners and novices. Volume 3 of this new series focuses on brandnew research and applications in biology, biophysics and other fields of life sciences. Many frontline researcher have contributed to this highly attractive and interdisciplinary volume which spans the entire field of present fluorescence spectroscopy including nanotechnology, membrane and DNA studies and fluorescence imaging in cancer research. Introduction; Absorption of UV - visible light; Characterisitics of fluorescence emission; Effects of intermolecular photophysical processes on fluorescence emission; Fluorescence polarization. Emission anisotropy; Principles of steady-state and time-resolved fluorometric techniques; Effect of polarity on fluorescence emission. Polarity probes; Microviscosity, fluidity, molecular mobiity. estimation by means of fluorescence probes; Resonance energy transfer and its applications; Fluorescent molecular sensors of ions and molecules; Advanced techniques in fluorescence spectroscopy; Epilog; Index. Fluorescence spectroscopy has traditionally found wide application in bio chemistry and cell biology. Since there are relatively few naturally occurring fluorescent biomolecules, fluorescence spectroscopy offers a combination of great specificity and sensitivity. Historically, these features have been ex ploited with great success utilizing both intrinsic and extrinsic probes. Re cent applications have built upon these traditional strengths and have re sulted in the development of new instrumental techniques, novel and convenient fluorescent probes, and a deeper, theoretical understanding of fundamental processes. Frequently, fluorescence techniques are tailored to attack a specific biological problem. These new methods in turn produce new physical situations and phenomena which are often of interest to the physical chemist. Thus, progress in one area stimulates renewed interest in other areas. The goal of this book is to provide detailed monographs on the use of fluorescence to investigate problems at the forefront of biochemistry and cell biology. This book is not meant to be a comprehensive survey but rather to highlight areas of recent developments. It is designed to be readable to the novice and yet provide sufficient detail for the expert to keep abreast of recent developments. The book is organized so that it proceeds from simple biochemical sys tems to more complex cell biological ones. Chapter I on fluorescence quenching of biological structures is a good introductory chapter. It intro duces a number of elementary concepts and discusses applications to pro teins and biomembranes. Time-resolved fluorescence spectroscopy is widely used as a research tool in bioch- istry and biophysics. These uses of fluorescence have resulted in extensive knowledge of the structure and dynamics of biological macromolecules. This information has been gained by studies of phenomena that affect the excited state, such as the local environment, quenching processes, and energy transfer. Topics in Fluorescence Spectroscopy, Volume 4: Probe Design and Chemical Sensing reflects a new trend, which is the use of time-resolved fluorescence in analytical and clinical chemistry. These emerging applications of time-resolved fluorescence are the result of continued advances in laser detector and computer technology. For instance, pho- multiplier tubes (PMT) were previously bulky devices. Miniature PMTs are now available, and the performance of simpler detectors is continually improving. There is also considerable effort to develop fluorophores that can be excited with the red/ne- infrared (NIR) output of laser diodes. Using such probes, one can readily imagine small time-resolved fluorometers, even hand-held devices, being used fordoctor’s office or home health care. This is a practical introduction to single molecule fluorescence experiments, the analysis of the data, and applications of the techniques to the study of biological structure and function. A core text on principles, laboratory/field methodologies, and data interpretation for fluorescence applications in aquatic science, for advanced students and researchers. Volume 3 of this new series focuses on brandnew research and applications in biology, biophysics and other fields of life sciences. Many frontline researcher have contributed to this highly attractive and interdisciplinary volume which spans the entire field of present fluorescence spectroscopy including nanotechnology, membrane and DNA studies and fluorescence imaging in cancer research. This fourth volume in the Springer series summarizes the year’s progress in fluorescence, with authoritative analytical reviews specialized enough for professional researchers, yet also appealing to a wider audience of scientists in related fields. Annotation. In this inaugural volume of a new series, experts in the field help biochemists, analytical chemists, spectroscopists, biophysicists, and other specialists keep up with the latest techniques and technologies available in fluorescence spectroscopy. Reflecting the expanding field's need for reliable protocols, Fluorescence Spectroscopy and Microscopy: Methods and Protocols offers techniques from a worldwide team of experts on this versatile and vital subject. The topics covered fall into four broad categories: steady-state fluorescence spectroscopy, time-resolved fluorescence spectroscopy, fluorescent probe development, and the various sub-categories of fluorescence microscopy, such as fluorescence recovery after photobleaching (FRAP), live cell FRET imaging (FRETim), fluorescence lifetime imaging (FLIM), fluorescence fluctuation spectroscopy (FFS), and single-molecule fluorescence spectroscopy (smFS). Written as a part of the popular Methods in Molecular Biology series, chapters include the kind of unambiguous detail and key implementation advice that proves essential for successful results.