

*Methods in Enzymology*

*Volume 278*

# *Fluorescence Spectroscopy*

EDITED BY

*Ludwig Brand*

DEPARTMENTS OF BIOLOGY AND BIOPHYSICS  
McCOLLUM-PRATT INSTITUTE  
JOHNS HOPKINS UNIVERSITY  
BALTIMORE, MARYLAND

*Michael L. Johnson*

DEPARTMENT OF PHARMACOLOGY  
UNIVERSITY OF VIRGINIA  
HEALTH SCIENCES CENTER  
CHARLOTTESVILLE, VIRGINIA



ACADEMIC PRESS

San Diego London Boston New York Sydney Toronto

## Table of Contents

CONTRIBUTORS TO VOLUME 278. . . . .		ix
PREFACE. . . . .		xi
VOLUMES IN SERIES . . . . .		xiii
1. Fluorescence in Biophysics: Accomplishments and Deficiencies	GREGORIO WEBER	1
2. Design of Profluorescent Protease Substrates Guided by Exciton Theory	BEVERLY Z. PACKARD, DMITRI D. TOPTYGIN, AKIRA KOMORIYA, AND LUDWIG BRAND	15
3. Picosecond Fluorescence Decay Curves Collected on Millisecond Time Scale: Direct Measurement of Hydrodynamic Radii, Local/Global Mobility, and Intramolecular Distances during Protein-Folding Reactions	JOSEPH M. BEECHEM	24
4. Time-Resolved Room Temperature Tryptophan Phosphorescence in Proteins	JOSEPH A. SCHAUERTE, DUNCAN G. STEEL, AND ARI GAFNI	49
5. Fluorescence Line Narrowing Spectroscopy: A Tool for Studying Proteins	JANE M. VANDERKOOI, PAUL J. ANGIOLILLO, AND MONIQUE LABERGE	71
6. Determination of Ground-State Dissociation Constant by Fluorescence Spectroscopy	ANDRZEJ KOWALCZYK, NOËL BOENS, AND MARCEL AMELOOT	94
7. $^1L_a$ and $^1L_b$ Transitions of Tryptophan: Applications of Theory and Experimental Observations to Fluorescence of Proteins	PATRIK R. CALLIS	113
8. Enhancement of Protein Spectra with Tryptophan Analogs: Fluorescence Spectroscopy of Protein-Protein and Protein-Nucleic Acid Interactions	J. B. ALEXANDER ROSS, ARTHUR G. SZABO, AND CHRISTOPHER W. V. HOGUE	151
9. Time-Resolved Fluorescence of Constrained Tryptophan Derivatives: Implications for Protein Fluorescence	MARK L. McLAUGHLIN AND MARY D. BARKLEY	190
10. Conformational Heterogeneity in Crystalline Proteins: Time-Resolved Fluorescence Studies	TANYA E. S. DAHMS AND ARTHUR G. SZABO	202
11. Fluorescence Methods for Studying Equilibrium Macromolecule-Ligand Interactions	MAURICE R. EFTINK	221

12. Fluorescence Methods for Studying Kinetics of Protein-Folding Reactions	MAURICE R. EFTINK AND M. C. R. SHASTRY	258
13. Intramolecular Pyrene Excimer Fluorescence: A Probe of Proximity and Protein Conformational Change	SHERWIN S. LEHRER	286
14. Long-Lifetime Metal-Ligand Complexes as Probes in Biophysics and Clinical Chemistry	EWALD TERPETSCHNIG, HENRYK SZMACINSKI, AND JOSEPH R. LAKOWICZ	295
15. N-Terminal Modification of Proteins for Fluorescence Measurements	PENGGUANG WU AND LUDWIG BRAND	321
16. Fluorescence Studies of Zinc Finger Peptides and Proteins	PEGGY S. EIS	330
17. Fluorescence Assays for DNA Cleavage	S. PAUL LEE AND MYUN K. HAN	343
18. Fluorescent Nucleotide Analogs: Synthesis and Applications	DAVID M. JAMESON AND JOHN F. ECCLESTON	363
19. Fluorescence Approaches to Study of Protein-Nucleic Acid Complexation	JOHN J. HILL AND CATHERINE A. ROYER	390
20. Fluorescence Resonance Energy Transfer as a Probe of DNA Structure and Function	MENG SU YANG AND DAVID P. MILLAR	417
21. Energy Transfer Methods for Detecting Molecular Clusters on Cell Surfaces	JANOS MATKO AND MICHAEL EDIDIN	444
22. Distribution Analysis of Depth-Dependent Fluorescence Quenching in Membranes: A Practical Guide	ALEXEY S. LADOKHIN	462
23. Mechanism of Leakage of Contents of Membrane Vesicles Determined by Fluorescence Quenching	ALEXEY S. LADOKHIN, WILLIAM C. WIMLEY, KALINA HRISTOVA, AND STEPHEN H. WHITE	474
24. Fluorescence Probes for Studying Membrane Heterogeneity	LESLEY DAVENPORT	487
25. Preparation of Bifluorescent-Labeled Glycopeptides for Glycoamidase Assay	KYUNG BOK LEE AND YUAN CHUAN LEE	512
26. Preparation of Fluorescence-Labeled Neoglycolipids for Ceramide Glycanase Assays	KOJI MATSUOKA, SHIN-ICHIRO NISHIMURA, AND YUAN C. LEE	519
27. Applications of Fluorescence Resonance Energy Transfer to Structure and Mechanism of Chloroplast ATP Synthase	RICHARD E. MCCARTY	528

---

28. Intrinsic Fluorescence of Hemoglobins and Myoglobins	ZYGMUNT GRZYNSKI, JACEK LUBKOWSKI, AND ENRICO BUCCI	538
29. Multiple-Domain Fluorescence Lifetime Data Analysis	MICHAEL L. JOHNSON	570
AUTHOR INDEX . . . . .		585
SUBJECT INDEX . . . . .		613