Resonance Energy Transfer

Theory and Data

B. Wieb Van Der Meer
George Coker, III
S.-Y. Simon Chen
1. Introduction

1.1. Names and Acronyms
1.2. Citations, 1961-1992

2. Concepts

2.1. Rate of Decay, Quantum Yield, and Lifetime
2.2. Transition Dipole Moments
2.3. Fluorescence Polarization and Anisotropy
2.4. Transfer Mechanisms
2.5. Energy Level Diagrams for RET
2.6. Rate and Efficiency of Transfer, Förster Distance
2.7. Kappa Squared
2.8. The Overlap Integral
2.9. The Index of Refraction
2.10. The Donor Quantum Yield
2.11. Homotransfer, Heterotransfer, and Energy Migration
2.12. Reversible Heterotransfer
2.13. Concentration Depolarization and Critical Concentrations
2.14. Concentration Quenching
2.15. Kinetics
2.16. Averaging Regimes
2.17. Rapid Diffusion Limit
2.18. Methods of Measuring RET
2.19. Experimental Design

3. Förster Theory

3.1. Classical Approach with One Frequency
3.2. Classical Approach with a Range of Frequencies
3.3. Quantum Mechanical Approach
3.4. Fluorescence from a Random Set of Donors and Acceptors
3.5. Concentration Depolarization

Appendix 3A : Equation in mks and cgs Units
Appendix 3B : Energy Absorbed at Resonance
Appendix 3C: Transfer in a Random System

4. Kappa Squared

4.1. Visualization of Kappa Squared
4.2. Probability Distribution for Kappa Squared 60
4.3. Relations Between Kappa Squared and Anisotropies 66
4.4. Concluding Remarks About Kappa Squared 82

5. The Top Ten 85
5.1. Förster's 1948 Paper 85
5.2. Stryer's 1978 Review 87
5.3. Förster's 1959 Review 89
5.4. Förster's 1949 Paper 90
5.5. Förster's 1965 Review 91
5.6. The Dale-Eisinger-Blumberg Paper of 1979 91
5.7. The Stryer-Haugland Paper of 1967 92
5.8. The Haas-Katchalski-Katzir-Steinberg Paper of 1978 93
5.10 Steinberg's 1971 Review 95
5.11 The Most Cited Homotransfer Papers 96

6. Trends and Applications 101
6.1. Membranes 101
6.2. Muscle 105
6.3. Nucleic Acids 105
6.4. Dimensionality 106
6.5. Red-Edge Spectroscopy 107
6.6. Kappa Squared 107
6.7. Photosynthesis 110
6.8. Distance Distributions 112
6.9. Motion During Transfer 114
6.10. Microscopy 120
6.11. Applications 121

7. Data 133
7.1. Introduction to the Table of Chromophores 133
7.2. Förster Distances and Other RET Data 143

Index 175