

PREFACE

Fluorescence Fluctuation Spectroscopy (FFS) is a growing family of methods for studying molecular motions and interactions. Introduced as Fluorescence Correlation Spectroscopy (FCS) 40 years ago, this elegant technique has evolved into a large group of powerful tools of modern fluorescence spectroscopy. FFS has found numerous applications in biophysical and biochemical studies of proteins, nucleic acids, and membranes. In combination with fluorescence imaging microscopy, FFS provides unique opportunities for characterizing dynamic processes in living cells and has been increasingly used by cell and systems biologists. Significant progress in the technology was achieved in the past decade, and the number of new FFS methods is still growing. The attraction of FFS relates to fact that it is based on statistical analysis of the fluctuations occurring at the molecular level. Therefore, these methods can resolve molecular populations and provide additional information about biological systems.

The chapters in this two-volume publication are written by the authors and first-hand users of the methods under discussion. Part A is dedicated predominately to FFS methods. It contains well-established and also recently introduced experimental techniques and data analysis algorithms. Part B continues with FFS methods and also includes various FFS applications *in vivo* and *in vitro*. Here the reader will find specific examples and detailed experimental protocols developed for several biological systems. The purpose of these chapters is to show the power and potentials of the technology in biological research.

I am very thankful to all the authors who participated in this project and wrote excellent chapters that made my editorial work easy. I am expressing my special gratitude to Elliot Elson, whose seminal work on FCS began in the early 1970s, for writing a historical note and current systemization of the FFS methods in addition to his chapter on FCS conceptual basis and theory. I am also very thankful to Shaun Gamble from Elsevier for his great assistance in organizing these volumes. On a personal note, I want to express my immense gratefulness to my wife Luda for her devotion, serenity, and constant support to all my work.

FFS offers a variety of powerful techniques for studying biological molecules *in vitro* and *in vivo*. I hope that these MIE volumes will be used by many new and experienced researchers alike.

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