
Preface

Gene expression can be a term of many meanings, depending on the type of research field one belongs to. The activity of genes has been measured since the days when radioactive labeling of nucleic acids became possible, and ever since the field has been ploughed through by scores of biochemical and molecular analyses, and recently, bioinformatics and genomics approaches. Imaging of gene expression has also made an impact on our understanding of the gene expression pathway, particularly since the field uniquely deals with gene activity within single cells rather than taking a population view like the above-mentioned techniques. As imaging technologies and approaches have evolved, the scope of certain imaging techniques has moved far beyond the production of purely illustrative images or appealing time-lapse movies to providing the scientist with a rich range of ways to measure and quantify the biological process and outcome of gene expression. Close interactions between biologists and physicists trying to better understand the mechanistics of gene activity have allowed the import of techniques and terminology once solely used in physics, thereby bringing to light the emerging field of biophysics.

This book aims to offer up-to-date approaches and protocols that scientists in the field have developed, which would benefit the broader scientific community. The methods not only describe the technical design of the experiments but also focus on the expected outcome and provide tips and personal insights for the benefit of the user, which we all know can sometimes tip the outcome between the failure and success of a technique. This volume is divided into three parts. The first section deals with the output of a gene, namely the RNA molecules that are transcribed from the gene and the way by which these molecules can be tracked or quantified in fixed or living cells. The second section provides protocols that focus on the gene, DNA, or chromatin. The third portrays a variety of ways by which nuclear processes intertwined with gene expression can be followed and quantified in living cells as well as approaches for studying several subnuclear structures found in eukaryotic cells. Finally, since cells make up tissues, it is imperative to be able to follow these processes in whole tissues, or even better, in the actual living organism. Therefore imaging in the context of a complete organism is given special notice in the book. The chapters have been contributed by both well-established and young scientists, and I am ever grateful to all the authors who have participated and invested time, thought, and energy in the bringing this collection to light.

Ramat Gan, Israel

Yaron Shav-Tal

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Methods and Protocols

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