Molecular Biology of RNA

Molecular Biology of RNA: a Versatile Macromolecule

Nucleic acids are the fundamental building blocks of DNA and RNA and are found in virtually every living organism. Understanding the molecular biology of RNA is crucial for comprehending the mechanisms of inheritance and biological information handling.

This volume of Progress in Molecular Biology and Translational Science explores the history of molecular biology to inform the future of scientific discovery. It examines the major players in the machinery of inheritance and biological information handling, such as DNA, RNA, ribosomes, and proteins. Landmark experiments that have constituted major turning points in the birth and evolution of molecular biology are critically considered.

In recent years, the focus on RNA has increased, thanks to the recent high-throughput sequencing technologies allowing scientists to investigate complete transcriptomes at single nucleotide resolution. Adopting strategies to predict secondary and tertiary structures, and novel algorithms based on massive RNA sequencing, interest in RNA bioinformatics has rapidly increased.

This volume provides an overview of RNA bioinformatics methodologies, including basic protocols, and key tips on troubleshooting and avoiding known pitfalls. Comprehensive and practical, RNA: Methods and Protocols views the transcriptional landscape with a novel perspective.

This book is a comprehensive resource for scientists interested in the study of RNA. It covers a range of topics, from single molecule analyses using nanomaterials to gene regulation using RNA nanostructures. The volume aims to provide the readers with a novel view and give them opportunities to think outside the box when working with RNA.
Coding RNAs from high throughput sequencing datasets at high volume is complex. Therefore, it is usually possible for biologists to complete all of the necessary steps technologies for identifying different classes of non-coding RNAs and predicting the possible functions of these molecules. Finding, quantifying, and visualizing non-originated circRNAs and back-spliced circRNAs, the identification of miRNA/siRNA targets, and the identification of mutations and editing sites in miRNAs. The book through which RNA is regulated and regulates biological processes in plant cells. Computational Non-coding RNA Biology is a resource for the computation of non-

considerable advances have been made in identifying RNA-binding and processing factors involved in the synthesis and maturation of different forms of RNA molecules and the creation of public datasets and databases have exposed a new universe of RNA-based mechanisms and led to the discovery of new families of non-coding RNAs, including development, growth, reproduction and stress tolerance. Innovations in methodologies, the expanding application of next-generation sequencing technologies, are recognized as active regulatory molecules influencing gene expression, chromatin organization and genome stability, thus impacting all aspects of plant life decades revealed that RNA molecules are much more than inert intermediates between the coding DNA sequences and their functional products, proteins. Today, RNAs contemporary techniques * Incorporates flow charts, tables, and graphs to facilitate learning and assist in the planning phases of projects Discoveries from the past

recognized expert in the field of RNA experimentation and founded Exon-Intron, a well-known biotechnology educational workshop center * Includes classic and improved RT-PCR techniques; innovative 5' and 3' RACE techniques; subtractive PCR methods; methods for improving cDNA synthesis. * Author is a well-

material, including chapters on the more recent technologies of RNA interference including: RNAi; Microarrays; Bioinformatics. It also includes new sections on: new

animations provided include topics in protein purification, transcription, splicing reactions, cell division and DNA replication and SDS-PAGE Updated chapters on

helping the student learn how to read and understand research to prepare them for the scientific world. NEW: Academic Cell Study Guide features all articles from the

text with concurrent case studies to help students build foundations in the content while allowing them to make the appropriate connections to the text. NEW: Academic Cell Study Guide features all the articles from the text with concurrent case studies to help students build foundations in the content while allowing them to make the appropriate connections to the text. Animations provided deal with topics such as protein purification, transcription, splicing reactions, cell division and

molecular biology while incorporating primary literature from today's leading researchers. This updated edition includes Focuses on Relevant Research sections that

contributions from the leaders in the field * Has abundant referencesMolecular Biology of RNAMolecular Biology, Second Edition, examines the basic concepts of

compilation of reviews comprising each volume. * Provides a forum for discussion of new discoveries, approaches and ideas in molecular biology * Includes

increased understanding of nucleic acids and their role in molecular biology will further many of the biological sciences including genetics, biochemistry, and cell. Molecular biology is a branch of science that studies the physicochemical properties of molecules in a cell, including nucleic acids, proteins, and enzymes. This laboratory guide represents a growing collection of tried,
This publication summarizes the current status of our understanding of RNA, with particular discoveries on involvement of Argonaute and Piwi proteins in different biological processes and diseases as well as their possible use in diagnosis. It reports breakthroughs in small ncRNAs and their targets. It unveils the diverse molecular mechanisms by which miRNAs and piRNAs regulate gene expression in animal cells. It showcases recent research identifying the hidden treasures of several new types of ncRNAs encoded in the genomes of several organisms and decrypting their versatile roles in gene expression or function. The book is geared towards scientists, students, and will particularly appeal to active investigators in RNA biology, molecular biology, cancer research as well as clinicians and will provide them a comprehensive view of recent discoveries and research progresses to utilize miRNAs, piRNAs and their interacting proteins, Ago and Piwi for diagnosis, prognosis and therapeutics of diseases. The 'RNA world' hypothesis that proposed RNA molecules as the first form of genetic material was put forward in the late 1980s but got impetus only recently when high-throughput sequencing technologies began unearthing new types of non-coding RNA (ncRNA) transcripts in higher eukaryotes. Till then, research on ncRNAs were primarily confined to transfer RNAs and, ribosomal RNAs, which act as the messengers of the protein synthesis and allow translation of genetic information encoded by DNA into proteins. In recent years, the integration of high-throughput genomic technologies with molecular biology and omics sciences have revolutionized the fields of ncRNA research by extracting, detection, quantification, visualization, and genome-wide profiling, from conventional methods to state-of-the-art high throughput approaches. RNA plays a central, and until recently, somewhat underestimated role in the genetics underlying all forms of life on earth. This versatile molecule not only plays a crucial part in the synthesis of proteins from a DNA template, but is also intrinsically involved in the regulation of gene expression, and can even act as a catalyst in the form of a ribozyme. This latter property has led to the hypothesis that RNA - rather than DNA - could have played an essential part in the origin of life itself. This landmark text on molecular biology of RNA not only provides a consolidated, clear, and comprehensive presentation of the relevant research results but also provides insight into the controversies surrounding the current topics. The book contains many illustrations, tables, and formulas, and a veritable wealth of references. It aims to provide a basis for graduate courses in molecular biology, and an up-to-date reference for those doing research in the molecular biology field. The book includes detailed descriptions of the RNA structure that are helpful for researchers in the field. It provides a complete and up-to-date source of information on the molecular biology of RNA, more introductory material has been incorporated at the beginning of the text, to aid students studying the subject for the first time. Throughout the book, we now know, are described throughout, while the relevance of the subject to human disease is highlighted via frequent boxes. For the second edition of Molecular Biology of RNA, new material has been included - particularly in relation to RNA binding domains, non-coding RNAs, and the connection between RNA biology and epigenetics. Finally, a new closing chapter discusses how exciting new technologies are being used to explore current topical areas of research.
Molecular Biology Of RNA Modifications and techniques to dissect their roles in physiology and disease. Chapter 20 is available open access under a CC BY 4.0 license.

The existence of genes for viruses in human cancers. This book will be of value both to graduate students and to established investigators with specific interest in other aspects of molecular biology.

This detailed book describes some of the most recent advances and up-to-date methodologies to detect, quantify, analyze, and elucidate the biological function of RNA modifications. Written for the highly successful Methods in Molecular Biology series style, this book addresses biological and clinical questions. Beginning with a section on bioinformatics tools, the collection continues with sections on detecting RNA modifications using various methodologies.

The biology of endogenous retroviruses, their transmission both within and between species, and cellular regulatory factors influencing their expression are subsequently discussed. This book then addresses the nature and origin of transforming RNA viruses and gives a detailed review of knowledge concerning the genomic structure of type C viruses. Translational products encoded by the type C viral genome are species-specific and targets of cellular regulatory factors.

Methods and procedures with broad application to diverse areas of molecular biology, including cell culture procedures, competition radioimmunoassays, molecular hybridization, oligonucleotide mapping, heteroduplex mapping, and restriction endonuclease techniques, are considered. This book is organized into 12 chapters and begins with a historical overview of tumor virology beginning with the early studies of Peyton Rous and leading up to the significant surge of activity during the later decade. The biology of endogenous retroviruses, their transmission both within and between species, and cellular regulatory factors influencing their expression are subsequently discussed. This book then addresses the nature and origin of transforming RNA viruses and gives a detailed review of knowledge concerning the genomic structure of type C viruses. Translational products encoded by the type C viral genome are species-specific and targets of cellular regulatory factors.

Molecular Biology of RNA Tumor Viruses deals with the molecular biology and biologic significance of RNA tumor viruses. Methods and procedures with broad application to diverse areas of molecular biology, including cell culture procedures, competition radioimmunoassays, molecular hybridization, oligonucleotide mapping, heteroduplex mapping, and restriction endonuclease techniques, are considered. This book is organized into 12 chapters and begins with a historical overview of tumor virology beginning with the early studies of Peyton Rous and leading up to the significant surge of activity during the later decade. The biology of endogenous retroviruses, their transmission both within and between species, and cellular regulatory factors influencing their expression are subsequently discussed. This book then addresses the nature and origin of transforming RNA viruses and gives a detailed review of knowledge concerning the genomic structure of type C viruses. Translational products encoded by the type C viral genome are species-specific and targets of cellular regulatory factors.

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Biology: The Search for the Secrets of Life provides the historical knowledge behind techniques founded in molecular biology, also presenting an appreciation of how, and by whom, these discoveries were made. It deals with the evolution of intellectual concepts in the context of active research in an approachable language that accommodates readers from a variety of backgrounds. Each chapter contains a prologue and epilogue to create continuity and provide a complete framework of molecular biology. This foundational work also functions as a historical and conceptual supplement to many related courses in biochemistry, biology, chemistry, genetics and history of science. In addition, the book demonstrates how the roots of discovery and advances–and an individual's own research–have grown out of the history of the field, presenting a more complete understanding and context for scientific discovery. Expands on the development of molecular biology from the convergence of two independent disciplines, biochemistry and genetics Discusses the value of molecular biology in a variety of applications Includes research ethics and the societal implications of research Emphasizes the human aspects of research and the consequences of such advances to society.

Diagnostic Molecular Biology describes the fundamentals of molecular biology in a clear, concise manner to aid in the comprehension of this complex subject. Each technique described in this book is explained within its conceptual framework to enhance understanding. The targeted approach covers the principles of molecular biology including the basic knowledge of nucleic acids, proteins, and genomes as well as the basic techniques and instrumentations that are often used in the field of molecular biology with detailed procedures and explanations. This book also covers the applications of the principles and techniques currently employed in the clinical laboratory. • Provides an understanding of which techniques are used in diagnosis at the molecular level • Explains the basic principles of molecular biology and their application in the clinical diagnosis of diseases • Places protocols in context with practical applications.

Molecular Biology of RNA: New Perspectives provides an overview of the developments in RNA research as well as the approaches, strategies, and methodologies used. Most of the contributing authors in the present volume participated in the Fifth Stony Brook Symposium entitled “New Perspectives on the Molecular Biology of RNA” in May 1986. The text is organized into six parts. Part I contains papers dealing with RNA as an enzyme. Part II presents studies on RNA splicing. Part III examines RNA viruses while Part IV focuses on the role of RNA in DNA replication. Part V is devoted to the structure, function, and isolation of RNA. Finally, Part VI takes up the role of RNA in regulation and repression. This volume will help provide new direction and insight for those already working on the subject and will serve as a useful guide to those about to start research in the molecular biology of RNA.

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