

Contents

List of Contributors	ix
Preface	xi
Contents of Other Volumes.....	xiii

1 The Organization of DNA Sequences in Chromosomes

Christopher J. Bostock

I. Introduction	2
II. Methods of Analyzing DNA Sequences	3
III. Characteristics of the Different Kinetic Classes of Sequences	11
IV. Interspersion of Sequences of Different Kinds	25
V. Arrangement of Specific Structural Genes	32
VI. Single-Copy Structural Genes	41
VII. Concluding Remarks	48
References	49

2 Gene Reiteration and Gene Amplification

Adrian P. Bird

I. Introduction	62
II. Alternatives to Multiple Genes	62
III. Multiple Genes Integrated in the Germ Line Genome	64
IV. Fluctuations in Tandem Gene Number	70
V. Predictable Changes in rDNA Redundancy in Somatic Cells	73
VI. Predictable Changes in rDNA Redundancy That Are Transmissible in the Germ Line-rDNA Magnification	75
VII. The Evolution of Tandem Repeated Genes	77
VIII. Amplification of a Unique Germ Line Gene in <i>Tetrahymena</i>	86
IX. Amplification in the Germ Cells of Multicellular Organisms	88
X. Concluding Remarks on the Peculiarity of Ribosomal DNA	100
References	101

3 Basic Enzymology of Transcription in Prokaryotes and Eukaryotes

Samson T. Jacob and Kathleen M. Rose

I. Introduction	114
II. Eukaryotic RNA Polymerases	114
III. Purification Characteristics and General Properties of RNA Polymerases	122
IV. Function of Individual Subunits of Core RNA Polymerase	130
V. Interrelationship of RNA Polymerases	135
VI. Conclusions	140
References	141

4 Regulation of Transcription in Prokaryotes, Their Plasmids, and Viruses

Geoffrey Zubay

I. The Scope of This Chapter	154
II. The Basic Mechanics of the Transcription Process	155
III. Different Ways of Regulating Transcription	169
IV. How Different Combinations of Factors Are Put Together to Control Specific Genes	192
V. Overall Patterns of Transcriptional Control Observed in Different Gene Systems	203
VI. Concluding Remarks	208
References	210

5 Structural Manifestation of Nonribosomal Gene Activity

J.-E. Edström

I. Introduction	215
II. Chromatin in Nonpolytene Somatic Cells	216
III. Polytene Chromosomes	223
IV. Chromosomes during Meiosis	242
V. Comparative Aspects	252
References	254

6 The Expression of Animal Virus Genes

Raymond L. Erikson

I. Introduction	265
II. The RNA-Containing Viruses	266

III. The DNA-Containing Viruses	282
IV. Remarks	293
References	294

7 Aspects of Cytoplasmic and Environmental Influences on Gene Expression

Peter M. M. Rae

I. Introduction	302
II. Cytoplasmic Influences on Gene Expression in Transplanted Nuclei	303
III. Cytoplasmic Determinants in Embryogeny	308
IV. Behavior of Nuclei in Somatic Cell Heterokaryons	317
V. Steroid Hormone Influences on Target Cell Nuclei	323
VI. "Gene Amplification" in Cultured Mammalian Cells	336
VII. Conclusions	338
References	340

8 Molecular Aspects of the Regulation of Eukaryotic Transcription: Nucleosomal Proteins and Their Postsynthetic Modifications in the Control of DNA Conformation and Template Function

Vincent G. Allfrey

I. Introduction	348
II. Control of DNA Conformation	364
III. DNA-Associated Nonhistone Proteins	402
IV. Conclusion	407
References	409

9 Maturation Events Leading to Transfer RNA and Ribosomal RNA

Gail P. Mazzara, Guy Plunkett, III, and William H. McClain

I. Introduction	439
II. Approaches to the Study of RNA Processing	443
III. Transfer RNA Biosynthesis	445
IV. Ribosomal RNA Biosynthesis	485
V. Degradation of RNA	525
References	529

10 The Processing of hnRNA and Its Relation to mRNA

Robert Williamson

I. Introduction	547
II. Labeling of hnRNA	548
III. The Sequence Complexities of Nuclear and Cytoplasmic RNA's	549
IV. Precursors for Specific mRNA's	551
V. Structural Gene Sequences and Introns	553
VI. Histone Gene Transcription	555
VII. Polyadenylation and Methylation	555
VIII. Nuclear Ribonucleoprotein	557
IX. Additional Genetic Aspects	557
X. Conclusions	558
References	559

11 Recombinant DNA Procedures in the Study of Eukaryotic Genes

Tom Maniatis

I. Introduction	564
II. Methods for <i>in Vitro</i> Recombination	565
III. Cloning Vectors	570
IV. Methods for Screening Recombinant Clones for Specific DNA Sequences	574
V. Isolation of Single-Copy Structural Gene Sequences	575
VI. Isolation and Characterization of Specific Eukaryotic Genes	581
VII. Identification of Regulatory Sequences in Cloned Eukaryotic DNA	592
References	598

12 Basic Characteristics of Different Classes of Cellular RNA's: A Directory

Yong C. Choi and Tae-Suk Ro-Choi

I. Introduction	610
II. Nuclear RNA's	613
III. Cytoplasmic RNA's	630
IV. Mitochondrial RNA's	646
References	651

Index	669
-------------	-----