

Contents

Preface, ix

Acknowledgments, xiii

1 A Brief History of Epigenetics, 1

Gary Felsenfeld

2 The Next Generation: Young Scientists Forging Exciting
New Discoveries in Epigenetic Research, 11

The Discovery of Histone Demethylases, 13

Yujiang Geno Shi and Yu-ichi Tsukada

Cellular Reprogramming, 16

Kazutoshi Takahashi

lncRNAs: Linking RNA to Chromatin, 18

John L. Rinn

Enhancer RNAs: A Class of Long Noncoding RNAs
Synthesized at Enhancers, 21

Tae-Kyung Kim, Martin Hemberg, and Jesse M. Gray

Expanding the Epigenetic Landscape: Novel
Modifications of Cytosine in Genomic DNA, 24

Skirmantas Kriaucionis and Mamta Tahiliani

Plant Mobile Small RNAs, 27

*Patrice Dunoyer, Charles Melnyk, Attila Molnar, and
R. Keith Slotkin*

CpG Island Chromatin Is Shaped by Recruitment of
ZF-CxxC Proteins, 30

Neil P. Blackledge, John P. Thomson, and Peter J. Skene

Bromodomain and Extraterminal Domain Inhibitors
(BETi) for Cancer Therapy: Chemical Modulation of
Chromatin Structure, 33

Jun Qi

Pharmacological Inhibition of Bromodomain-
Containing Proteins in Inflammation, 36

Uwe Schaefer

Histone H3 Mutations in Pediatric Brain Tumors, 40

*Xiaoyang Liu, Troy A. McEachron, Jeremy
Schwartzentruber, and Gang Wu*

Chromosome Folding: Driver or Passenger of
Epigenetic State?, 44

Tom Sexton and Eitan Yaffe

3 Overview and Concepts, 47

*C. David Allis, Marie-Laure Caparros, Thomas Jenuwein,
Monika Lachner, and Danny Reinberg*

4 Writers and Readers of Histone Acetylation: Structure,
Mechanism, and Inhibition, 117

Ronen Marmorstein and Ming-Ming Zhou

5 Erasers of Histone Acetylation: The Histone Deacetylase
Enzymes, 143

Edward Seto and Minoru Yoshida

6 Structural and Functional Coordination of DNA and
Histone Methylation, 169

Xiaodong Cheng

7 A Structural Perspective on Readout of Epigenetic
Histone and DNA Methylation Marks, 193

Dinshaw J. Patel

8 Epigenetics in *Saccharomyces cerevisiae*, 241

Michael Grunstein and Susan M. Gasser

9 Epigenetic Regulation of Chromatin States in
Schizosaccharomyces pombe, 269

Robin C. Allshire and Karl Ekwall

10 *Neurospora crassa*, a Model System for Epigenetics
Research, 295

Rodolfo Aramayo and Eric U. Selker

11 Epigenetics of Ciliates, 313

Douglas L. Chalker, Eric Meyer, and Kazufumi Mochizuki

12 Position-Effect Variegation, Heterochromatin Formation,
and Gene Silencing in *Drosophila*, 337

Sarah C.R. Elgin and Gunter Reuter

13 Epigenetic Regulation in Plants, 363

Craig S. Pikaard and Ortrun Mittelsten Scheid

- 14 The Use of Mouse Models to Study Epigenetics, 395
Marnie Blewitt and Emma Whitelaw
- 15 DNA Methylation in Mammals, 423
En Li and Yi Zhang
- 16 RNAi and Heterochromatin Assembly, 445
Robert Martienssen and Danesh Moazed
- 17 Transcriptional Silencing by *Polycomb*-Group Proteins, 463
Ueli Grossniklaus and Renato Paro
- 18 Transcriptional Regulation by Trithorax-Group Proteins, 489
Robert E. Kingston and John W. Tamkun
- 19 Long-Range Chromatin Interactions, 507
Job Dekker and Tom Misteli
- 20 Histone Variants and Epigenetics, 529
Steven Henikoff and M. Mitchell Smith
- 21 Nucleosome Remodeling and Epigenetics, 555
Peter B. Becker and Jerry L. Workman
- 22 Maintenance of Epigenetic Information, 575
Geneviève Almouzni and Howard Cedar
- 23 Regulation of the X Chromosomes in *Caenorhabditis elegans*, 599
Susan Strome, William G. Kelly, Sevinc Ercan, and Jason D. Lieb
- 24 Dosage Compensation in *Drosophila*, 621
John C. Lucchesi and Mitzi I. Kuroda
- 25 Dosage Compensation in Mammals, 641
Neil Brockdorff and Bryan M. Turner
- 26 Genomic Imprinting in Mammals, 667
Denise P. Barlow and Marisa S. Bartolomei
- 27 Germline and Pluripotent Stem Cells, 687
Wolf Reik and M. Azim Surani
- 28 Induced Pluripotency and Epigenetic Reprogramming, 711
Konrad Hochedlinger and Rudolf Jaenisch
- 29 Epigenetic Control of Immunity, 737
Meinrad Busslinger and Alexander Tarakhovsky
- 30 Metabolic Signaling to Chromatin, 763
Shelley L. Berger and Paolo Sassone-Corsi
- 31 Epigenetic Regulation in Plant Responses to the Environment, 787
David C. Baulcombe and Caroline Dean
- 32 Histone and DNA Modifications as Regulators of Neuronal Development and Function, 807
Stavros Lomvardas and Tom Maniatis
- 33 Epigenetics and Human Disease, 831
Huda Y. Zoghbi and Arthur L. Beaudet
- 34 Epigenetic Determinants of Cancer, 859
Stephen B. Baylin and Peter A. Jones
- 35 Histone Modifications and Cancer, 895
James E. Audia and Robert M. Campbell
- 36 The Necessity of Chromatin: A View in Perspective, 927
Vincenzo Pirrotta
- Appendix 1: WWW Resource Pages, 943
- Appendix 2: Comprehensive Catalog of Currently Documented Histone Modifications, 947
Yinming Zhao and Benjamin A. Garcia
- Index, 967