Contents

Foreword vii
Preface ix
List of Contributors xi

1 Chemical Synthesis of Modified RNA 1
   Claudia Höbartner and Falk Wachowius

2 Expansion of the Genetic Alphabet in Nucleic Acids by Creating New Base Pairs 39
   Ichiro Hirao and Michiko Kimoto

3 Chemical Biology of DNA Replication: Probing DNA Polymerase Selectivity Mechanisms with Modified Nucleotides 63
   Andreas Marx

4 Nucleic Acid-templated Chemistry 73
   Michael Oberhuber

5 Chemical Biology of Peptide Nucleic Acids (PNAs) 103
   Peter E. Nielsen

6 The Interactions of Small Molecules with DNA and RNA 115
   Yun Xie, Victor K. Tam and Yitzhak Tor

7 The Architectural Motifs of Folded RNAs 141
   Valérie Fritsch and Eric Westhof

8 Genesis and Biological Applications of Locked Nucleic Acids (LNAs) 175
   Harleen Kaur and Souvik Maiti

9 Small Non-coding RNA in Bacteria 199
   Sabine Brantl

10 MicroRNA-guided Gene Silencing 223
    Gunter Meister

11 Nucleic Acid-based Therapies 233
    Britta Hoehn and John J. Rossi
12 Innate Immune Recognition of Nucleic Acids
   Stefan Bauer

13 Light-responsive Nucleic Acids for the Spatiotemporal Control
   of Biological Processes
   Alexander Heckel and Günter Mayer

14 DNA Methylation
   Albert Jeltsch and Renata Z. Jurkowska

15 Frameworks for Programming RNA Devices
   Maung Nyan Win, Joe C. Liang and Christina D. Smolke

16 RNA as a Catalyst: The Diels–Alderase Ribozyme
   Andres Jäschke

17 Evolving an Understanding of RNA Function by In Vitro Approaches
   Qing Wang and Peter J. Unrau

18 The Chemical Biology of Aptamers: Synthesis and Applications
   Günter Mayer and Bernhard Wulffen

19 Nucleic Acids as Detection Tools
   Jeffrey C.F. Lam, Sergio Aguirre and Yingfu Li

20 Bacterial Riboswitch Discovery and Analysis
   Tyler D. Ames and Ronald R. Breaker

Index