

# Preface

Fifty-one years passed since James Watson, Francis Crick, and Maurice Wilkins were awarded the Nobel Prize in physiology or medicine for their 1953 discovery that deoxyribonucleic acid, DNA, consists of two twisted oligonucleotide chains that are held together in an antiparallel fashion by highly specific oligonucleotide base pair interactions. This discovery opened a new era in biology, genetics, medicine, biotechnology, and biochemistry and provided further basis for studying and manipulating the biological processes—molecular biology science. It dramatically changed our understanding of the molecular basis of genes, genetic diseases, and the inheritance passage of genetic material from one generation to another.

Later, new powerful physical–chemical tools for synthesis, manipulation, and visualization of nucleic acids at atomic level enabled functional studies and control nucleic acids organization and function at a nanoscale level. Now, at the 60th anniversary of the discovery of the double helix, the combination of nucleic acid chemistry and nanotechnology created a new challenging direction of research called Nucleic Acid Nanotechnology, which has tremendously improved our knowledge and control of basic biological processes and enabled novel biotechnological applications in many fields including food and pharmaceutical industries, medicine, agriculture, forensics, material engineering, and computation. The necessity of a book, where the latest achievements in this rapidly expanding area of research are summarized, is evident and timely.

This book contains 12 chapters, written by the leading world’s scientists in the field of DNA and RNA nanotechnology. It represents a diverse collection of reviews devoted to basic directions in this area, from single nucleotides and single nucleic acid molecule studies and characterization to the design and synthesis of more complex DNA- and RNA-based systems and their application in nanomechanics, nanomedicine, and nanobiosensing. We believe that this book provides both a solid background knowledge for those who are not directly in the field of the research and advanced knowledge for those who are interested in the more detailed and practical information on the methods and the latest achievements in this field. We are very thankful to all the authors contributing to this book and to Prof. Janusz Bujnicki, the Editor of the “Nucleic Acids and Molecular Biology” series, for challenging us to

edit this book and Dr. Ursula Gramm, Springer, for her constant support and assistance during the editing procedure.

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