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DNA Computing

7th International Workshop on DNA-Based Computers, DNA7
Tampa, FL, USA, June 10-13, 2001
Revised Papers

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Preface

Biomolecular computing is an interdisciplinary field that draws together molecular biology, chemistry, physics, computer science, and mathematics. DNA nanotechnology and molecular biology are key relevant experimental areas, where knowledge increases with each passing year. The annual international meeting on DNA-based computation has been an exciting forum where scientists of different backgrounds who share a common interest in biomolecular computing meet and discuss their latest results. The central goal of this conference is to bring together experimentalists and theoreticians whose insights can calibrate each other's approaches. DNA7, *The Seventh International Meeting on DNA Based Computers*, was held at The University of South Florida in Tampa, FL, USA, June 10–13, 2001. The organizers sought to attract the most significant recent research, with the highest impact on the development of the discipline. The meeting had 93 registered participants from 14 countries around the world. The program committee received 44 abstracts, from which 26 papers were presented at the meeting, and included in this volume. In addition to these papers, the Program Committee chose 9 additional papers from the poster presentations, and their revised versions have been added to this volume.

As is now a tradition, four tutorials were presented on the first day of the meeting. The morning started with general tutorials by Erik Winfree (Caltech) and Junghuei Chen (University of Delaware), designed to bridge between their respective areas of expertise, computer science and molecular biology. More specialized tutorials on encoding DNA sequences and on non-standard DNA motifs and interactions were given in the afternoon by Anne Condon (University of British Columbia) and Nadrian C. Seeman (New York University), respectively. Four plenary lectures were given during the conference by Nicholas Cozzarelli (University of California at Berkeley) on DNA topology, Richard Lipton (Georgia Technology Institute) on the state of DNA-based computation, John SantaLucia (Wayne State University) on DNA hybridization thermodynamics and Ronald Breaker (Yale University) on DNA catalysis. Those presentations are not included in this volume.

The research presented here contains a diverse spectrum of ideas and topics. The papers under *Experimental Tools* deal with issues such as optimization of biomolecular protocols or a computer program for designing DNA sequences that could be found useful in performing experiments. The papers in *Theoretical Tools* study theoretical properties of DNA sequences and structures that could be used in designing models and subsequently, experiments. Several papers deal with *Probabilistic Theoretical Models* which try to capture the inexact nature of the biomolecular protocols. As the experience of many has shown, sequence design and computer simulations can be very valuable before preparing an actual experiment and several researchers addressed these issues in *Computer Simulation and Sequence Design*. New algorithms for solving difficult problems

such as the knapsack problem and SAT are introduced in *Algorithms*. Several researchers, in fact, reported on successful experimental solutions of instances of computational problems. Their results are included in *Experimental Solutions*. The papers in *Nano-tech Devices* report on the experimental design of DNA nano-mechanical devices. The section on *Biomimetic Tools* contains research on computational tools that primarily use processes found naturally in the cells of living organisms. Several papers deal with the theory of splicing systems and the formal language models of membrane computing. These papers are included in *Splicing and Membrane Systems.*

The editors would like to acknowledge the help of the conference's Program Committee in reviewing the submitted abstracts. In addition to the editors, the Program Committee consisted of Junghuei Chen, Anne Condon, Masami Hagiya, Tom Head, Lila Kari, George Paun, John Reif, Grzegorz Rozenberg, Erik Winfree, David Wood, and Bernard Yurke. The editors thank Denise L. Marks for helping us with her skillful typesetting abilities. The Organizing Committee (Anne Condon, Grzegorz Rozenberg, and the editors) is grateful for the generous support and sponsorship of the conference by the Center for Integrated Space Microsystems within the Jet Propulsion Laboratory, NASA, and the following branches of The University of South Florida: The College of Arts and Sciences, the Institute for Biomolecular Science, the Department of Mathematics, the Department of Biology, the Department of Chemistry; and the USF Research Foundation.

The meeting was held in cooperation with the ACM Special Interest Group on Algorithms and Computation Theory (ACM SIGACT) and the European Association for Theoretical Computer Science (EATCS).

We note with sadness the passing of Michael Conrad, who participated in several of the earlier conferences. His contributions will be missed by all.

Finally, the editors would like to thank all of the participants in the DNA7 conference for making it a scintillating and fruitful experience. This is a discipline that has not yet found its 'killer ap,' but the excitement that is generated when this group assembles is virtually palpable at the conference. The interactions, collaborations, and advances that result from each of the meetings on DNA Based Computers are the key products of the meeting. We hope that this volume has captured the spirit and exhilaration that we experienced in Tampa.

April 2002   Nataša Jonoska
                                                                                  Nadrian Seeman

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Participants of DNA7

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