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Foreword

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This special issue of Natural Computing contains selected papers from the 16th International Meeting on DNA Computing and Molecular Programming, held during June 14–17, 2010, at the Hong Kong University of Science and Technology.

This conference series serves as one of the many task forces aimed at establishing biomolecular computing in both life sciences and computer science. Through the efforts of many scientists in the past 16 years, the research accomplishments ranging from DNA computing to programmed construction of 1D, 2D, and 3D DNA scaffolds and DNA origami have been reported at this conference. Participants of this conference carry out well-funded research projects in DNA-controlled drug delivery systems, DNA nanomachines, DNA-induced information storage devices, DNA scaffolds and patterning, etc. as well as in the underlying theoretical foundations. Scientists, engineers and students meet every year to present new results and discuss research goals for the future.

Four selected papers presented in this special issue are expanded and enhanced versions of their conference versions. Three of the papers deal with DNA tile self-assembly, and one paper is devoted to an artificial nanomaterial.

- *Simple evolution of complex crystal species* (by Rebecca Schulman and Erik Winfree): this paper investigates whether complex crystal patterns could evolve using a very specific model system based on DNA tile crystals. This paper shows that evolution driven only by the dearth of one monomer type could produce complex crystals from just 12 monomer types.
- *Self assembly of rectangular shapes on concentration programming and probabilistic tile assembly models* (by Vamsi Kundeti and Sanguthevar Rajasekaran): this theoretical paper presents new techniques for design of tile sets that approximately self-assemble into certain rectangular shapes. The first result of this paper shows how to self assemble rectangles with a fixed aspect ratio with high probability. The second result applies staircase sampling on the equimolar concentration programming model to self assemble rectangles with high probability.
- *Efficient 3-SAT Algorithms in the tile assembly model* (by Yuriy Brun): this paper proposes a novel algorithm to solve 3-SAT based on DNA tile self-assembly. The main result of this paper is the construction of a tile system that implements a fast algorithm for the solution of the 3-SAT problem, using a small set of tiles (147 distinct tiles).
- *Design of an artificial functional nanomaterial with high recognition ability* (by Xingguo Liang, Toshio Mochizuki, Taiga Fujii, Hiromu Kashida, and Hiroyuki Asanuma): this paper provides interesting results concerning the properties of oligomers with a phosphodiester backbone that combine nucleobases with a high proportion of photo-isomerized azobenzene moieties. These molecules display photoswitchable and sequence-specific binding and moreover they are interesting building blocks of photoresponsive devices.

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