

Preface

This volume contains papers presented at the 15th Unconventional Computation and Natural Computation Conference (UCNC 2016), which was held in Manchester, UK, during July 11–15, 2016.

As a field of research, *unconventional computation* augments classical modes of computation (i.e., the Turing and von Neumann models), by offering new conceptual frameworks, abstractions, substrates, and applications. Intersecting with this field is the study of *natural computation*, which draws inspiration from the physical world to develop new forms of computing. Taken together, these two deeply related fields offer the possibility of entirely new forms of computational devices and applications, as well as providing a space in which to rethink the entire notion of “computation” and “computability.”

Topics that are generally considered to be within scope of the conference include (but are not limited to):

- Molecular, cellular, quantum, optical, and chaos computing
- Cellular automata
- Neural and evolutionary computation
- Artificial immune systems
- Ant algorithms and swarm intelligence
- Amorphous computing
- Membrane computing
- Computational systems biology and computational neuroscience
- Synthetic biology

The first UCNC was held in Auckland, New Zealand, in 1998, organized by the Centre for Discrete Mathematics and Theoretical Computer Science, University of Auckland, and the Santa Fe Institute. Since then, it has been held in Brussels, Belgium (2000), Kobe, Japan (2002), Seville, Spain (2005), York, UK (2006), Kingston, Canada (2007), Vienna, Austria (2008), Ponta Delgada, Portugal (2009), Tokyo, Japan (2010), Turku, Finland (2011), Orléans, France (2012), Milan, Italy (2013), London, Ontario, Canada (2014), and Auckland, New Zealand (2015, the first time the conference has returned to a site).

The 15th iteration of UCNC was organized and hosted by the Informatics Research Centre of Manchester Metropolitan University, UK. The conference received 30 full-paper submissions, of which we accepted 15 for oral presentation. We were also pleased to host six distinguished speakers:

Invited Lectures:

- Bob Coecke (University of Oxford, UK): “In Pictures: From Quantum Foundations to Natural Language Processing”
- Steve Furber (University of Manchester, UK): “The SpiNNaker Project”

- Friedrich Simmel (Technische Universität München, Germany): “Chemical Communication Between Cell-Sized Reaction Compartments”

Tutorials

- Masami Hagiya (University of Tokyo, Japan): “Gellular Automata”
- Rebecca Schulman (Johns Hopkins University, USA): “Self-Assembling Adaptive Structures with DNA”
- Jon Timmis (University of York, UK): “Many Hands Make Light Work: A Case Study in Swarm Robotics”

Fundamental to the spirit of UCNC are the satellite workshops, which allow participants to focus on specific areas of interest. We were delighted to host two such sessions:

- Membrane Computing (organized by Marian Gheorghe and Savas Konur)
- Physics and Computation (organized by Alastair Abbott and Dominic Horsman)

We thank the authors and invited speakers for contributing to the meeting, and the workshop organizers for enriching the event. We thank the Program Committee and the additional reviewers for their exemplary work in assessing the submissions, and the Organizing Committee for their efforts on behalf of the meeting. We also thank the Dean of Science and Engineering and the Informatics Research Centre for sponsoring the event, the LNCS team at Springer (Alfred Hofmann and Anna Kramer) for supporting the continued publication of the UCNC proceedings, and the EasyChair project for providing essential infrastructure.

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