Workshop on Membrane Computing
Curtea de Argeş, Romania, August 20–25, 2001

Foreword

Membrane computing is a recent and vivid branch of (theoretical) Molecular computing which deals with computing models inspired from the way the alive cells are structured and function. In short, in the compartments of a membrane structure one places objects (described by symbols or by strings of symbols), which evolve according to rules also associated with the compartments. The rules are applied in the nondeterministic maximally parallel manner: in each step, all objects which can evolve, from all membranes, should evolve. A result is associated with halting computations in the form of the (number of) objects present in the halting configuration in a specified membrane, or which exit the system during the computation.

In the about four years since the systematic research in this area has started, many classes of membrane systems (also called P systems) were considered. Most of them are computationally universal (they can compute all Turing computable sets of numbers, or of number relations, or languages – depending on the type of the system). Moreover, by trading space for time, in many cases one can solve NP-complete problems in polynomial time (an exponential space is obtained in linear time by membrane division, membrane creation, or string replication).

Comprehensive information about membrane systems (current bibliography, addresses, downloadable papers, conferences announcements, open problems, news, etc) can be found at the web address `http://bioinformatics.bio.disco.unimib.it/psystems`, maintained in Milano, Italy, by Claudio Zandron.

The present volume contains a selection of papers presented during the **Workshop on Membrane Computing (WMC-CdeA2001)**, held in Curtea de Argeş, Romania, from 20 to 25 of August 2001; these papers are new versions of the initial papers, improved according to the discussions held during the workshop.

As one can see also in what follows, the workshop was intended as a forum where people from different areas related to Membrane computing can interact. Were present in Curtea de Argeş (and are contributing to the volume at hand) mathematicians, computer scientists (theoretically oriented or more practically oriented), biologists, biochemists, while the debated topics ranged from mathematics

and computer science to biology, linguistics, semiotics. This diversity is not only an illustration of the interdisciplinarity of the domain (of Natural computing in general), but was also an explicit goal of the meeting, to facilitate an active exchange of ideas, in the aim of making as (bio)realistic as possible and as (computer science and bio) relevant as possible the models in discussion.

The 2001 workshop should be seen as a direct continuation of the **Workshop on Multiset Processing (WMP-CdeA 2000)**, which was organized in the same place, from 21 to 26 of August, 2000, and which was mainly devoted to the mathematical backgrounds of Membrane computing, with a special emphasis on the notion of a multiset and the many circumstances where this notion appears and is investigated. (The papers presented at the 2000 workshop were published in a special issue of *Romanian Journal for Information Science and Technology*, volume 4, numbers 1-2, 2001, while a selection of papers, as well as several invited papers not presented in Curtea de Argeş, were included in volume 2235 of *Lecture Notes in Computer Science*, entitled *Multiset Processing; Mathematical, Computer Science, and Molecular Computing Points of View*, edited by C.S. Calude, Gh. Păun, G. Rozenberg, A. Salomaa, at Springer-Verlag, Berlin, 2001.)

The Workshop on Membrane Computing, WMC-CdeA2001, was organized by the Institute of Mathematics of the Romanian Academy, Bucharest, the Research Group on Mathematical Linguistics of Rovira i Virgili University, Tarragona, Spain, and "Vlaicu Vodă" High School of Curtea de Argeş, under the auspices of the European Molecular Computing Consortium – EMCC (for EMCC, see the web page `http://www.tucs.fi/EMCC`).

The program committee of the workshop was composed of C. Calude (Auckland, New Zealand), C. Martín-Vide (Tarragona, Spain), G. Mauri (Milano, Italy), Gh. Păun (Bucharest, Romania) – Chair, G. Rozenberg (Leiden, The Netherlands), A. Salomaa (Turku, Finland), while the organizing committee was led by C. Gheorghe (Curtea de Argeş), N. Lazăr (Curtea de Argeş), C. Martín-Vide (Tarragona), Gh. Păun (Bucharest).

The pre-proceedings volume, available at the workshop, was published as *Research Report 17/01* of the Research Group on Mathematical Linguistics, Rovira i Virgili University, Tarragona (editors: C. Martín-Vide and Gh. Păun).

Tarragona, December 2001

Carlos Martín-Vide

Gheorghe Păun

Rovira i Virgili University
Pl. Imperial Tárraco 1
43005 Tarragona, Spain
`cmv,gp@astor.urv.es`