

# Preface

Computational Science is the scientific discipline that aims at the development and understanding of new computational methods and techniques to model and simulate complex systems.

The area of application includes natural systems – such as biology, environmental and geo-sciences, physics, and chemistry – and synthetic systems such as electronics and financial and economic systems. The discipline is a bridge between ‘classical’ computer science – logic, complexity, architecture, algorithms – mathematics, and the use of computers in the aforementioned areas.

The relevance for society stems from the numerous challenges that exist in the various science and engineering disciplines, which can be tackled by advances made in this field. For instance new models and methods to study environmental issues like the quality of air, water, and soil, and weather and climate predictions through simulations, as well as the simulation-supported development of cars, airplanes, and medical and transport systems etc.

Paraphrasing R. Kenway (R.D. Kenway, Contemporary Physics. 1994): ‘There is an important message to scientists, politicians, and industrialists: in the future science, the best industrial design and manufacture, the greatest medical progress, and the most accurate environmental monitoring and forecasting will be done by countries that most rapidly exploit the full potential of *computational science*’.

Nowadays we have access to high-end computer architectures and a large range of computing environments, mainly as a consequence of the enormous stimulus from the various international programs on advanced computing, e.g. HPCC (USA), HPCN (Europe), Real-World Computing (Japan), and ASCI (USA: Advanced Strategic Computing Initiative). The sequel to this, known as ‘grid-systems’ and ‘grid-computing’, will boost the computer, processing, and storage power even further. Today’s supercomputing application may be tomorrow’s desktop computing application.

The societal and industrial pulls have given a significant impulse to the rewriting of existing models and software. This has resulted among other things in a big ‘clean-up’ of often outdated software and new programming paradigms and verification techniques. With this make-up of arrears the road is paved for the study of real complex systems through computer simulations, and large scale problems that have long been intractable can now be tackled. However, the development of complexity reducing algorithms, numerical algorithms for large data sets, formal methods and associated modeling, as well as representation (i.e. visualization) techniques are still in their infancy. Deep understanding of the approaches required to model and simulate problems with increasing complexity and to efficiently exploit high performance computational techniques is still a big scientific challenge.

The International Conference on Computational Science (ICCS) series of conferences was started in May 2001 in San Francisco. The success of that meeting motivated the organization of the meeting held in Amsterdam from April 21–24, 2002.

These three volumes (Lecture Notes in Computer Science volumes 2329, 2330, and 2321) contain the proceedings of the ICCS 2002 meeting. The volumes consist of over 350 – peer reviewed – contributed and invited papers presented at the conference in the Science and Technology Center Watergraafsmeer (WTCW), in Amsterdam. The papers presented reflect the aims of the program committee to bring together major role players in the emerging field of computational science.

The conference was organized by The University of Amsterdam, Section Computational Science (<http://www.science.uva.nl/research/scs/>), SHARCNET, Canada (<http://www.sharcnet.com>), and the Innovative Computing Laboratory at The University of Tennessee.

The conference included 22 workshops, 7 keynote addresses, and over 350 contributed papers selected for oral presentation. Each paper was refereed by at least two referees.

We are deeply indebted to the members of the program committee, the workshop organizers, and all those in the community who helped us to organize a successful conference. Special thanks go to Alexander Bogdanov, Jerzy Wasniewski, and Marian Bubak for their help in the final phases of the review process. The invaluable administrative support of Manfred Stienstra, Alain Dankers, and Erik Hitipeuw is also acknowledged. Lodewijk Bos and his team were responsible for the local logistics and as always did a great job.

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Amsterdam, April 2002

Peter M.A. Sloot,  
Scientific Chair 2002,

on behalf of the co-editors:  
C.J. Kenneth Tan  
Jack J. Dongarra  
Alfons G. Hoekstra

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The 2002 International Conference on Computational Science was organized jointly by The University of Amsterdam, Section Computational Science, SHARCNET, Canada, and the University of Tennessee, Department of Computer Science.

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