FOREWORD

The Workshop has taken place in Catania from November 12 to 14, 2003. In a realistic and complete description of most Astrophysical an Biological phenomena, one must typically face problems involving highly non-linear interactions among elementary objects, as well as non-linear couplings between different kinds of interactions. To cope with these challenging problems, sophisticated computational methods have been devised, whose growth has proceeded alongside the power of computers, but at the same time a perception amongst some theorists has emerged that we have reached certain roadblocks in this evolutionary process. While there have been technical advances, including massive parallelization, investigators have encountered various algorithmic limitations.
With the possible exception of some novel methodologies currently being explored, future progress in computational theory appears to be awaiting only the inexorable increase in raw computing power. The most advanced coding techniques, including adaptive mesh refinement (AMR), N-body tree codes, and smoothed particle hydrodynamics (SPH) and its offshoots, have been very successful, but their accuracy in the 3-dimensional realm is often questioned, especially over long time spans.

The Workshop has been an opportunity to compare the computational techniques scientists in two specific areas: Astrophysics and Biology. Emphasis has been specially given to the treatment of long-range interactions in cosmological simulations and protein folding, respectively, particularly of parallel adaptive computational techniques.

The purpose of the Workshop has been to provide a forum for discussion between scientists of the two areas and to promote an interdisciplinary exchange of research ideas. The speakers have considered the following main topics:

- AMR Techniques
- Computational Fluidodynamics
- Cosmology and Simulations
- Protein Folding
- Applications of parallel/distributed/grid computing

The Workshop has also been a good opportunity for informal meetings and interactions among the participants.
The final aim has been to stimulate the discussion about future HPC facilities and new Grid based technologies, in the next few years.

The book reports the contribution of the most important talks, but other oral contributions, that offered very important suggestions for wide discussions among participants, have been presented during the meeting. A special thanks goes to Prof. S. Motta for the concluding remarks of the meeting and for the support in the meeting organization.

The Workshop has been organized in the framework of the program *Supercalcolo e visualizzazione scientifica: problematiche astrofisiche attuali ed alta formazione* of the INAF - Osservatorio Astrofisico di Catania, and funded by the Ministry of Education, University and Research (MIUR) in the period 1999 - 2000 and 2002 - 2003.

The Workshop has also been sponsored by the Department of Physics and Astronomy of Catania and by the University of Catania. I wish to thank the Rector of the University, Prof. F. Latteri, for the support given to the meeting and for the participation in the conference.

The meeting has taken place at the Istituto Nazionale di Geofisica e Vulcanologia Sezione di Catania (INGV-Catania). I wish to thank the Director of the INGV-Catania Dr. A. Bonaccorso, for his hospitality that has the contributed to the good success of the conference. A warm expression of thanks goes to the Director of the INAF Astrophysical Observatory of Catania Prof. S. Catalano, and to the Local Organizing Committee for the support given to the meeting.

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Catania, February 2004