Preface

This volume contains the Proceedings of the workshop COMETA 2003, held at the University of Udine (Italy), December 15–17, 2003. This was the concluding meeting of the Project COMETA, Computational Metamodels. The project was biennial, starting on December 2001, and financed by the Italian Ministry of Education, University and Research (MIUR) and by the Italian Universities of Insubria, Pisa, Torino, Udine. The overall project leader was Furio Honsell (University of Udine).

The project originates from the remark that Computer Science has evolved into a complex discipline which acts at various levels of abstraction. It appears convenient to distinguish two different metalevels, above the basic one where hardware and software systems live.

The semantical and syntactical tools which are normally used to specify and analyze the object level systems appear on the first of these metalevels. The development of Computer Science in the last decades has indicated clearly that there is no chance to come up some day with the universal programming or modeling language, or with the ultimate universal computational logic. We have to live with a plethora of different calculi and special-purpose formalisms, and we have to be constantly ready to develop new conceptual frameworks.

But we do not want to start over from first principles the theory of each and every one of these systems, calculi or logics. Nor we want to reimplement from scratch, for each of them, interactive tools for manipulating them rigorously.

It is inevitable therefore to conceive another abstraction level above the first one, where common features across different systems can be focused and factored out. On this level we can define framework theories within which to prove structural results which prevent us from duplicating efforts in developing the metatheory of the lower level systems. This second metalevel is the level of computational metamodels.

The COMETA Project arises from the consideration that reductionism
is not even conceivable, however, at the level of metamodels. A universal metamodel is just as utopian as a universal programming language. If we want to keep the mathematical overhead in representations to a minimum and have simple and transparent encodings we have to entertain more than one computational metamodel.

The main objectives of the COMETA Project were to study general issues concerning computational metamodels, and to explore the possibility of utilizing successfully as computational metamodels some logical and categorical frameworks recently proposed: Logical Frameworks based on constructive type theories and exploiting higher order abstract syntax, various syntax-free approaches to concurrency and mobility (such as Tile Logics, double categories, graph transformation systems, bialgebras, and the categorical algebra of cospan-span of graphs), and systems of logical semantics based on implicit intersection type theories.

The scientific expertise of the various groups involved in the project was established well before the COMETA project. However, communication and dissemination of ideas between these groups was as yet unsatisfactory. One of the results of COMETA has been that of fostering and establishing joint collaborations, sharing of techniques and, more generally, cross-fertilization.

More than 40 researchers were involved in the project. The significance of the scientific impact of COMETA is evident from the impressive number of papers (more than 120), published by the members of the project in many important international journals and in the proceedings of the most important conferences in the area. It is not possible to gather all these outcomes in a single volume; however, these papers are available from the COMETA web page [http://cometa.dimi.uniud.it/](http://cometa.dimi.uniud.it/).

The COMETA project was organized in four tracks corresponding to four different perspectives on metamodels:

1. Logical Frameworks (coordinator: Furio Honsell, Udine);
2. Transition and Rewriting Systems (coordinator: Ugo Montanari, Pisa);
3. Logical Semantics (coordinator: Simona Ronchi Della Rocca, Torino);

The Program Committee of COMETA 2003 was composed by Mariangiola Dezani-Ciancaglini (Torino), Furio Honsell (Udine, chair), Ugo Montanari (Pisa), Simona Ronchi Della Rocca (Torino), Nicoletta Sabadini (Insibria).

This volume contains the papers presented at the final workshop. Out of the 20 papers that were submitted, 14 of them were selected after a regular refereeing process. The papers were reviewed by the program committee members and by F. Alessi, F. Barbanera, S. Berardi, L. Bocchi, R. Bruni, F.

There were two invited lectures at the workshop: Computer Modelling and Imitation, and Natural Phenomena by Giuseppe Longo, Algorithmic Game Semantics and Software Model Checking by Samson Abramsky. This volume includes the abstracts of the two invited lectures.

We feel that the COMETA project has been very fruitful in establishing new collaborations across the various preexisting research groups. This is witnessed by the papers of this volume, which are mainly joint works between researchers of different areas and universities. We are confident that many collaborations started during the project will fruitfully continue in the future.

We are very grateful to all members of the project and to Michael Mislove, Managing Editor of the ENTCS series, for his assistance with the use of the ENTCS style files. Thanks also to the University of Udine for the support in organizing the workshop.

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Udine, 10 February 2004