

Foreword[†]

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We still recall very vividly the announcement of Nadia Busi's death. It was Wednesday, 5 September 2007, and we were enjoying the half-day excursion at CONCUR 2007, a conference where some of Nadia's latest work had been presented on that day just before lunch. The weather was splendid and we were enjoying the gorgeous view from the Arrábida Convent, basking in the glorious sunlight and admiring the blue sea in the distance. Everything was a celebration of life until death struck. Mario Bravetti, one of our colleagues from Bologna, received a phone call and broke the news to us: 'Nadia has passed away.' That was the message we received from him and a cloud came over all the CONCUR participants who knew her.

For us, Nadia had also become a friend. She visited us twice in Reykjavik in successive years and she sent us two good M.Sc. students who worked on their theses under our joint supervision. We still remember the walks we took together around Reykjavik, a barbecue at our house with one of our students and the happiness she derived from everything Iceland had to offer. Her students called her 'Mamma Busi' (Mother Busi) and it was clear to us why: she expected much from them, but she cared deeply about their development both academically and personally.

The loss of a human life is always a tragedy and this is especially true when the world loses a young woman and the mother of a young child. In the case of Nadia, the field of Theoretical Computer Science has also lost a scientist at the height of her powers who would have offered many more contributions to our science and who would have mentored future generations of students and researchers in our field.

The late Nobel laureate Josef Brodskij wrote:

People are what we remember of them.

As we wrote above, Nadia's memory as a person will linger in our minds for many years to come. However, her colleagues in Bologna decided at some point in 2008 that it would be appropriate to have a special issue of a journal devoted to work that was close to Nadia's

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heart at the time of her untimely death. They asked us to act as editors for the volume and this special issue of *Mathematical Structures in Computer Science*, devoted to journal versions of papers mostly reporting on the wealth of work that the late Nadia Busi was carrying out at the time of her premature death, is the result of this collaborative effort.

Before describing the contents of the special issue you now hold in your hands, we think that it is appropriate to stress that we decided from the very beginning that we only wanted to publish articles that *clearly met the standards of the journal*. We believe that this is the best way to honour Nadia's memory and, apart from one exception mentioned below, all the articles in this issue have undergone strict refereeing by expert reviewers. We hope that Nadia would have been proud of the resulting quality of the papers in this issue of the journal.

Contents of the special issue. This issue of *Mathematical Structures in Computer Science* contains the following contributions, which highlight some of the research Nadia was carrying out at the time of her untimely death. The papers appear in the order in which they were submitted.

- The article by Busi and Gorrieri proposes a structural notion of non-interference over Petri nets and provides a characterization for it over contact-free elementary net systems. This characterization is then extended to the richer class of trace nets. The novelty of this approach to the study of non-interference, which has been proposed to study the problem of confidentiality in concurrent systems, lies in its focus on structural, rather than behavioural, properties of nets.
- The study of Petri nets has been one of the recurring themes in Nadia's scientific career. The paper by Busi and Pinna presents another facet of Nadia's research on this classic model of concurrent computation. The article employs Petri nets to the research area of process discovery, whose aim is to construct a model of a system that is faithful to the event logs under consideration. It compares various net-based approaches to this problem and proposes some novel ideas to overcome the weaknesses of some of them.
- The third paper in the special issue deals with a line of research that excited Nadia a lot during the last few years, namely the study of biologically-inspired models of computation. The contribution offers a new representation for deterministic rational-valued P systems that provides a bridge between the field of membrane computing and classic linear algebra.
- The paper by Besozzi et al. offers another indication of the work Nadia was carrying out in the area of 'bio-computing'. This study provides an investigation of the computational power of P systems with cell polarity, a model of computation inspired by the structure of mono-layered intestine epithelium tissue and of cell-cell junctions. It turns out that P systems with cell polarity are Turing complete and are sufficiently expressive to model biological phenomena like the transepithelial movement of glucose from the intestinal lumen into the blood.
- The paper by Versari, Busi and Gorrieri highlights another one of Nadia's long-term research interests, namely the study of the expressiveness of computational formalisms. It offers an investigation of the expressive power of notions of priority in

process calculi by using problems from distributed computing to reveal the different expressive power of prioritized calculi as well as non-prioritized ones.

- Expressiveness is also the theme of the paper by Busi, Gabbrielli and Zavattaro. That study focuses on the expressive power of Milner’s CCS with recursion, replication and iteration. It provides a strict expressiveness hierarchy for the resulting three calculi by considering the decidability of four basic algorithmic problems for them.
- The study of the decidability of algorithmic problems for process calculi is another recurring theme in Nadia’s research and is the focus of the paper by Busi and Zavattaro. That article studies the decidability of the reachability problem—that is, whether a given process can be reached from a source process—in the framework of Cardelli and Gordon’s Mobile Ambients. The study settles two open problems in that area, so that a hierarchy of fragments of the calculus of pure Mobile Ambients can be completely characterized in terms of Turing completeness and decidability of reachability. As a further contribution, the paper studies a generalized version of the reachability problem, called target reachability, where the target process is only partially specified.
- The last technical contribution in this special issue is a paper that Nadia co-authored with Asperti. This article is a faithful copy of a well-known technical report of the University of Bologna dating back to 1996. The work, as many other contributions of Nadia’s, was largely ahead of its time and had trouble in being published in a conference or an archival journal. Nevertheless, it acquired a large underground reputation, becoming one of the most cited works of the authors. Busi and Asperti were amused to see the growing success of their work and used to joke together about it, but for some kind of snobby obstinacy never tried to submit the paper again. We are sure to pay a honest and tender tribute to Nadia’s memory by including this contribution in the present volume. As already mentioned above, this is the only study in this special issue that has not undergone formal refereeing.

This special issue of *Mathematical Structures in Computer Science* ends with a bibliography including references to Nadia Busi’s scientific output. The bibliography has been kindly provided by Gianluigi Zavattaro, whom we thank for his sterling effort beyond the call of duty.

We trust that the articles in this special issue will give our readers an idea of the breadth and depth of the work Nadia was carrying out when we lost her, as well as a view of the recurring themes in her research and her ‘art of work’. We sincerely hope that some of the young researchers reading this volume will be enticed to pursue work in the field of concurrency theory following Nadia’s inspiration.