Math. Struct. in Comp. Science (2009), *vol.* 19, *pp.* 1061–1063.
doi:10.1017/S0960129509990119

Foreword: special issue in memory of Nadia Busi

LUCA ACETO[†‡] and ANNA INGOLFSDOTTIR[†]

ICE-TCS, School of Computer Science, Reykjavík University, Kringlan 1, 103 Reykjavík, Iceland
[‡]*Email:* luca@ru.is.

Received 10 August 2009

In memory of Nadia Busi

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 just before lunch on that very day some of Nadia's latest work had been presented. 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 that 'Nadia has passed away'. After receiving this message, a cloud came over all the CONCUR participants who had known her.

Nadia had also become our 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 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 have already said, our memories of Nadia as a person will remain in our minds for many years to come, but her colleagues in Bologna also 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 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*, which is devoted to journal versions of papers reporting for the most part on the

[†] The authors' work has been partially supported by the projects 'The Equational Logic of Parallel Processes' (nr. 060013021) and 'New Developments in Operational Semantics' (nr. 080039021) of the Icelandic Research Fund.

wealth of work that Nadia Busi was carrying out at the time of her premature death, is the result of this collaborative effort.

Before describing the contents of this special issue, we wish to stress that we decided from the very beginning that we only wanted to include articles that *clearly met the standards of the journal*. We believe that this is the best way to honour Nadia's memory, and, with the 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 included 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 before her untimely death. The papers appear in the order in which they were submitted.

— The paper *Structural non–interference in elementary and trace nets* by Busi and Gorrieri proposes a structural notion of non-interference over Petri nets and provides a characterisation for it over contact-free elementary net systems. This characterisation 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 in connection with the problem of confidentiality in concurrent systems, lies in its focus on the structural, rather than the behavioural, properties of nets.

— The study of Petri nets has been one of the recurring themes in Nadia's scientific career. The paper *Process discovery and Petri nets* by Busi and Pinna presents another facet of Nadia's research on this classic model of concurrent computation by employing Petri nets in 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. The paper compares various net-based approaches to this problem, and proposes some novel ideas for overcoming the weaknesses of some of them.

— The paper *Efficient computation in rational-valued P systems* by Busi, Gutiérrez-Naranjo and Pérez-Jiménez deals with a line of research that had greatly excited Nadia in recent years, namely the study of biologically inspired models of computation. The paper describes a new representation for deterministic rational-valued P systems that provides a bridge between the fields of membrane computing and classic linear algebra.

— The paper *(Tissue) P systems with cell polarity* by Besozzi, Busi, Cazzaniga, Ferretti, Leporati, Mauri, Pescini and Zandron provides another indication of the work Nadia was carrying out in the area of 'bio-computing'. This study consists of an investigation into the computational power of P systems with cell polarity, which is a model of computation that was 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 *An expressiveness study of priority in process calculi* by Versari, Busi and Gorrieri highlights another of Nadia's long-term research interests, namely the study of the expressiveness of computational formalisms. The paper reports on an investigation

into the expressive power of notions of priority in process calculi, using problems from distributed computing to reveal the different expressive powers of both prioritised and non-prioritised calculi.

— Expressiveness is also the theme of the paper *On the expressive power of recursion, replication and iteration in process calculi* by Busi, Gabbrielli and Zavattaro, which focuses on the expressive power of Milner's CCS with recursion, replication and iteration, and 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 *Deciding reachability problems in Turing complete fragments of Mobile Ambients* by Busi and Zavattaro, which 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 paper settles two open problems in that area, so that a hierarchy of fragments of the calculus of pure Mobile Ambients can be completely characterised in terms of Turing completeness and the decidability of reachability. As a further contribution, the paper studies a generalised version of the reachability problem, called target reachability, where the target process is only partially specified.

— The final technical contribution in this special issue is a paper, *Mobile Petri nets*, that Nadia co-authored with Andrea Asperti, which is a faithful copy of a well-known technical report of the University of Bologna dating back to 1996. Like many of Nadia's other contributions, this work was in large part ahead of its time, and consequently had trouble in being published in either a conference or archival journal. Nevertheless, it acquired a large underground reputation, becoming one of the most cited works by the authors, who were amused to see its growing success, and used to joke together about it. However, possibly due to obstinacy, they never tried to resubmit the paper. Our aim here is to pay an honest and tender tribute to Nadia's memory by including this contribution in the present volume. As we mentioned earlier, this is the only paper in this special issue that has not undergone formal refereeing.

This special issue of *Mathematical Structures in Computer Science* is concluded by a bibliography listing references to Nadia Busi's scientific output. The bibliography was kindly provided by Gianluigi Zavattaro, whom we thank for his sterling efforts, which have been 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, due to Nadia's inspiration, some of the young researchers reading this volume will be led to pursue work in the field of concurrency theory.