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Computing with lambda-terms: A special issue dedicated to Corrado Böhm for his 90th birthday

Preface

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We are very proud and honoured to dedicate this volume to Corrado Böhm, who has been for us a teacher, mentor, colleague, and friend. But most of all, he was a brilliant role-model to follow.

Stefano Guerrini
Henk Barendregt
Adolfo Piperno

On the occasion of his 90th birthday, with Henk Barendregt and Adolfo Piperno, we decided to honour Corrado Böhm with a volume collecting some of the latest developments in the λ-calculus, with a particular emphasis on the aspects that have always driven his research: the computational properties of λ-terms and their relevance for the foundations of computing and programming languages.

We thank Peppe Longo for his immediate acceptance and encouragement of our proposition to create a special issue of Mathematical Structures in Computer Science. We were touched by the enthusiasm of the authors to whom we proposed to write an invited paper, but also of the other researchers that submitted a paper to the open call. All those that regretted not to have anything interesting enough to submit claimed to have been proud contributing to a volume dedicated to Corrado Böhm.

In response to our call for papers, we received 16 submissions, among which 6 invited. All the papers were peer reviewed according to the high standard of Mathematical Structure in Computer Science. In the end, we selected 13 papers. The result is the present volume in your hands.

Stefano Guerrini

During his long active research life Corrado Böhm has had a particular scientific taste. To explain this, let us contrast ways in which people can be interested in numbers. To

many persons numbers stand for possession, the amount of money available in their banking account: the bigger it is, the happier they are. Mathematicians have different reasons to like numbers: these can be a prime, member of a prime-twin, and so on; for these kinds of reasons those objects turn out to be interesting.

Similarly, there are different emotional attitudes towards programs, objects of principal relevance in computer science, in particular the representations of these: combinators or lambda-terms. One possible attitude is that programs are something that one may sell, or may generate gain on the stock market. Alternatively, one may try to be secretive about programs and obtain copyrights and even patents. The attitude of Corrado Böhm to anything he encountered always was: 'Is it interesting? Is it elegant?'

During his PhD studies with Paul Bernays at the ETH Zürich Böhm wrote the historical first compiler that is capable to understand the language it is written in, and thereby capable of compiling itself. This idea contributed to the art of compiler designs with possible speedup of the resulting programs. In the 1960's Böhm, together with his collaborator Giuseppe Jacopini, became interested in the possibility of eliminating 'goto'-statements. This has led to structured programming and the rise of more advanced programming languages.

The greatest scientific interest displayed by Corrado Böhm consisted of his love for combinators and lambda-terms. These form a stylized way to represent computer programs, as was known from the work of Turing. Böhm was taken by the importance of these for actual software, as shown by his work on the CUCH-machine. But also he studied them for their mathematical interest and beauty. This arises when comparing the syntactic and semantic properties of these objects: the expressions given to us versus their behaviour. His fundamental work from 1968 on separability of $\beta\eta$-normal forms falls under this scope. An unexpected consequence was that the technique developed made it possible to analyse equality of two terms in the lattice models of the lambda calculus that were invented by Dana Scott in 1969.

Corrado Böhm attracted many talented persons to work with him. He has been the co-founder of the Computer Science departments in Turin and Rome. He put Italy on the map of places were lambda calculus flourishes. But more than this, he has put the study of abstract objects coming from computer science in the annals of scientific study.

Former students of Corrado Böhm emphasize his amazing Socratic way of teaching. Not only this is witnessed by the number of his students who are still active in universities around the world, but also by the memory of those who did not follow an academic career. 'A course he often gave was 'Operational semantics of programming languages,' with a large part about lambda-calculus and functional programming. Corrado's lessons were organized as follows. He proposed some exercises, never giving their solution. He used to walk around in the classroom, sometimes sitting next to a student, giving hints, listening and trying to understand his or her efforts. The course started at the beginning of October and ended in June. It usually happened that the first three or four months were frustrating: nobody was able to find any solution to the proposed problems. Nevertheless, Corrado patiently continued asking for some lambda term with some tricky behaviour, moving around combinators to represent some problem. Every student of that class still remembers that there was a day (though not the same one for everyone) in which suddenly

everything became clear. A whole world of objects revealed their meaning! For everyone, the final months of the course consisted of a joyful descent into the world and practice of mathematics.'

It almost is an easy consequence that it is pleasant to be around such a person. And indeed this is the case: I have felt more than 40 years a warm welcome by Corrado Böhm and his family.

Henk Barendregt

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