

## Laudation on the Occasion of Egon Börger's 70th birthday

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This mini symposium has been organized to celebrate Egon Börger on the occasion of his 70<sup>th</sup> birthday on the 13<sup>th</sup> of May. It is a great pleasure for me to give this laudation in honor of Egon, also on half of Vincenzo Gervasi and Uwe Glässer.

Egon Börger was born in Westfalia (Germany). He studied philosophy, logic and mathematics at La Sorbonne in Paris (France), the University of Louvain (Belgium) and the University of Münster (Germany), where he got his doctoral degree and his "Habilitation" in mathematics.

He started very early his academic carrier in 1971 as research assistant at the University of Münster. From 1972 to 1976, he was Associate Professor in Salerno (Italy) where he contributed to create the computer science department, and from 1976 to 1978, he was lecturer in Münster. In 1978, he became full professor in Computer Science in Dortmund. In 1982, he moved on to Italy. He first joined the new computer science department in Udine (Italy) as a professor. In 1985, he accepted a computer science chair at the University of Pisa, which he held until his retirement in 2011, rejecting various offers from other prestigious universities.

Since 2005, he is Emeritus member of the International Federation for Information Processing, and since 2010, he is a member of Academia Europea.

During his long and still very active research carrier, Egon has made significant contributions to the field of logic and computer science. Indeed, in recognition of his pioneering work in logic and its applications in computer science, in 2007, Egon received the prestigious Humboldt Research Award.

In the Egon's scientific life, we can identify two main periods.

In the first 20 years of his carrier, roughly from 1969 to 1989, he mainly worked on applying logical methods to solve problems in computational complexity. In 1989, Egon published his first milestone-book on *Computability, Complexity, Logic*. This book went through numerous editions, was translated into several different languages, and, for over a decade, it became the main reference book for academic courses on this subject in German universities. The research activities on logic and complexity theory culminated in the book on *The Classical Decision Problem* he wrote with Erich Grädel and Yuri Gurevich. For this book, Egon wrote the part on the classification of undecidable classes of first-order logic formulas. During this period, he actively promoted a concrete interaction between logicians and computer scientists, based upon his conviction that the major challenges for contemporary logic are to be found in applying logical methods in computer science. He did this through multiple activities: scientific publications, edited books and journal articles, organization of workshops, summer schools, and conferences, including various seminars at the Mathematical Research Institute in Oberwolfach, and also at the Computer Science Research Institute Schloss Dagstuhl. To provide an institutional basis for such an interaction, he founded together with his colleagues Michael Richter and Hans Kleine Büning the series of annual Computer Science Logic workshops in 1986/7. This conference, by Egon's initiative, became later, in the 1992, the Annual Conference of the European Association for Computer Science Logic. Egon acted as first President of this Association from 1992 to 1997.

The second period started in the years 1986-89, which brought a shift of interest. These were years of a close cooperation with Yuri Gurevich on the eventual definition of the notion of Abstract State Machines (ASMs), initially defined as Evolving Algebras. I knew Egon at that time during a summer school in Cortona (Italy), where he taught a course on the operational semantics of Pascal using Evolving Algebras. It was during his sabbatical in 1989/90 at IBM Corp. in

Heidelberg (Germany), that Egon recognized the potential of ASMs as rigorous but practical method for specifying and verifying complex software-based systems. At the time, he was working on defining an operational semantics of the Warren Abstract Machine for Prolog programs, and this work by Egon brought about the formal foundation for a comprehensive abstract semantics of Prolog used by the ISO Prolog standardization committee.

Since then, he systematically and tirelessly pushed experiments to apply ASMs to real-life software systems, in particular industrial software-based systems. He did this by means of different activities: by organizing several Dagstuhl Seminars, by acting as co-chair of several summer schools, by giving numerous invited talks, by visiting International institutions and academies in Europe and in the USA. To name a few, we recall his extended research visits at Siemens in Munich, Microsoft Research in Redmond, SAP in Karlsruhe, GMD FIRST in Berlin, SCCH in Linz, and at many universities: University of Michigan, Paderborn, Munich, Freiburg, Rutgers University in New Jersey, IRIN in Nantes, ETH in Zürich, Kiel, Dortmund and Linz. Egon has always been a true Cosmopolitan—both in his private life and his scholarly activities.

He triggered and led the effort of an international group of researchers that developed what is now known as the *ASM method for high-level system design and analysis*. At the beginning of 2000, he wrote his second milestone book, also known as the *ASM book*, to establish the theoretical foundation of a formal method for building and verifying complex software-based systems in an effectively controllable manner, namely by stepwise refinement of abstract ground models to executable code. To provide a forum for ASMs, he started, in 1994, the annual workshop on Abstract State Machines, which later, in 2008, turned into the ABZ successful international conference series to promote a fruitful integration among state-based formal methods.

Many extensions of the ASM method are due to Egon, who has always been able to identify and capture new inner potential of the method, referring to new characteristics of modern complex systems. With the intention of exploiting the ASM method to tackle new challenging computational aspects, Egon has worked in many different computer science areas: from programming languages to hardware architectures, software architectures, control systems, workflow and interaction patterns, business processes, WEB applications, and currently concurrent systems. He is the author of more than 30 books and over 150 scientific publications. Among the published books, we underline two others as example of ASM method applications: (a) the book on Java and the JVM, that provides a high-level description, together with a mathematical and an experimental analysis, of Java and of the Java Virtual Machine (JVM), including a standard compiler of Java programs to JVM code and the security critical bytecode verifier component of the JVM; and (b) the one on Business Process Management, which presents a novel BPM methodology focusing on process actors and their interactions.

Besides his scientific contributions as logician and computer scientist, we like to remark two prominent characteristics of Egon as a “researcher”, namely his uncommon intuition for addressing real, open and challenging problems, and his passionate approach toward solving research problems by looking deeply into problems, understanding them thoroughly, discussing them broadly with other researchers, and consistently working very hard—never ever something is too much for Egon.

Many international computer science communities owe a lot to Egon, be it for his scientific contributions and wide dissemination of his scholarly work, for his open mind, his still active service activity and his tenacious intellectual honesty.

Today we want to give a special thanks to Egon, a *real master of science and life*.

With great admiration and gratefulness,

Elvinia, Uwe and Vincenzo

(on behalf of the ASM and ABZ communities)