

CURRICULUM VITÆ DI BRUNO BUCHBERGER

Born 1942 in Innsbruck, Austria
Austrian citizen

Some Academic Degrees

- 1966: Ph.D. in mathematics.
University of Innsbruck, Dept. of Mathematics, Austria.
PhD Thesis: An Algorithm for Finding the Basis Elements in the Residue Class Ring Modulo a Zero Dimensional Polynomial Ideal (German, English Translation: J. of Symbolic Computation, Special Issue on Logic, Mathematics, and Computer Science: Interactions. Volume 41, Number 3-4, Pages 475-511, 2006).
- 1973: Habilitation in mathematics.
University of Innsbruck, Dept. of Mathematics, Austria.
Thesis: On Decompositions of Gödel Numberings.
- 1993: Honorary Doctorate of the University of Nijmegen,
School of Mathematics and Computer Science, The Netherlands.
- 2000: Honorary Doctorate of the University of Timisoara, Romania, School of Mathematics.
- 2005: Honorary Doctorate of the University of Bath, UK, School of Mathematics.
- 2011: Honorary Doctorate of the University of Waterloo, CAN
- 2012: Honorary Doctorate of the University of Innsbruck, A

Summary of the Unique Aspects of Buchberger's Scientific Personality

- The theory of Groebner bases, which Buchberger invented in 1965 and for whose development he spent most of his scientific effort since then, became one of the most significant and widely applicable tools in computational mathematics.
- At the same time, he devoted much of his time to build up innovative research and technology transfer institutions of which his "Softwarepark Hagenberg" with more than 1000 R&D employees is the most successful and renowned.
- Buchberger seems to be the first mathematician who managed, by his recent research in automated reasoning, to "automate his own creative potential" in the exact sense that he developed an automated algorithm synthesis algorithm that can synthesize his own Groebner bases algorithm.

Highlights in the Career

Research

- A. Inventor of the theory and method of Gröbner bases, one of the most used and best known methods in the area of computer algebra and automated reasoning:
- over 3000 citations in the on-line citation index *citeseer.nj.nec.com*,
 - several millions of installations worldwide in the current mathematical software systems like Mathematica, Maple etc.,
 - worldwide 10 textbooks written on Buchberger's Grobner bases theory,
 - worldwide over 1000 research papers published on his theory,
 - extra entry "Groebner Bases" in the AMS Mathematics Classification Index

The method has found numerous applications in all areas of science and technology and finds new applications every year, for example:

- 2003: a seemingly unbreakable crypto code was broken using Buchberger's method
- 2005: a new method for oil platform control was developed based on Buchberger's method (Shell, Amsterdam)
- 2006: a new method for re-engineering large software systems (automated reinvention of specifications from source code) was developed based on Buchberger's method
- 2007: detection of "missing links" in paleontology using Buchberger's method
- 2007: automated generation of specifications and loop invariants from program code was made possible by Buchberger's method.

- B. Current main research activity: Initiator (1995) and head of the Theorema project for formal mathematics (automated mathematical proving and formal theory mathematical exploration with applications). In the frame of this project, he developed, among other techniques, a novel automated algorithm synthesis technique that allows to syn-

thesize algorithms from formal specifications in predicate logic using various automated reasoning technique. As an illustration of the potential of this synthesis method, Buchberger managed to synthesize automatically, in 2005, his own Groebner bases algorithm, which he invented "by thinking" in 1965.

Research Management and Technology Transfer

Buchberger is one of the most active and successful research and technology transfer managers in Middle Europe, who initiated, founded and directed numerous research, technology transfer, and educational institutions, for example:

- 1985: Founding editor of the Journal of Symbolic Computation (Academic Press, London, now Elsevier) and editor-in-chief 1985-1995.
- 1987: Founder of the Research Institute for Symbolic Computation and chairman 1987-2000. (By now, 80 R&D employees.)
- 1990: Founder of the Software Park Hagenberg, Austria, and since then director. (By now, 1000 R&D employees.)
- 1992: Initiator of the Fachhochschule (University of Applied Science) for Software in Hagenberg, Austria. (By now, 1300 students)
- 1995 - : Co-founder of the Distributed Austrian Network for Parallel Computation and the Austrian Grid Project. (By now, 150 R&D co-workers.)
- 1998: Initiator of the Software Competence Center in Hagenberg, Austria. (By now, 80 R&D employees.)
- 1999-: Coordinator for establishing a Computer Science Department and computer science study at the University of Innsbruck, Austria. (Now, 600 students.)
- 2000: Coordinator of the "e-Austria" Task Force of the Austrian Government.
- 2000- Initiator of a technology transfer institute, Institute e-Austria Timisoara, in Rumania as a spin-off of RISC. (By now, over 30 R&D employees.)
- 2001: Co-initiator of RICAM (Radon Institute for Computational and Applied Mathematics, Austrian Academy of Science, Linz). (By now, over 60 researchers.)
- 2001-2002: Chairman of Mathematics and Computer Science Section of the Academia Europea (London).
- 2007 - : Initiator of the "RISC Summers", an annual series of International Conferences on Symbolic Computation and related fields at the RISC Institute; each year, typically, 800 participants.
- 2008: Evaluator of the Korean Institute of Advanced Science, Seoul.
- 2008: Inventor of the "Gmunden Lifestyle City" project for the integration of high tech and soft tech on behalf of the City of Gmunden, Austria,
- 2009: Initiator of an International Incubator for IT graduates from abroad in the Softwarepark Hagenberg.

In the frame of the above initiatives, by now, Buchberger raised approx. 100 Mio. Euro funds for scientific and technology transfer projects.

Teaching

Buchberger is an experienced, enthusiastic, and talented teacher. In addition to approximately 50 courses taught on subjects in the area of symbolic computation, automated reasoning, logic, computer algebra, theoretical computer science, systems theory, programming languages, Buchberger designed and initiated the following curricula:

- 1998: Co-designer of the Computer Mathematics Master's Curriculum at the Johannes Kepler University, Linz, Austria. (Approx. 150 students permanently in the program.)
- 2006: Head and organizer of the "Special Semester on Groebner Bases" at RICAM and RISC. Linz - Hagenberg with ~ 400 participants,
- 2007 - : Founder and head of the "International Master's Program in Informatics" of the Johannes Kepler University, Linz - Hagenberg, Austria in close cooperation with the industry in the frame of the Softwarepark Hagenberg.
- 2008: Member of the designing and executive board of the Doctorate College on Scientific Computation of the Austrian National Science Foundation.