



Manuel Eric Bronstein

August 28 1963 – June 6 2005

in memoriam

Manuel Bronstein, a leader in the computer algebra community, passed away in his sleep on the night of June 6, while on a scientific visit to Montpellier, France. Dr. Bronstein was recognized internationally for his contributions to algorithms and software for symbolic mathematical computation.

Manuel Bronstein was born August 28, 1963 in Neuilly sur Seine, France. He received his Ph.D. from the University of California, Berkeley, in 1987 with dissertation entitled *Integration of Elementary Functions*. His thesis represented the most complete understanding of closed form integration at the time. His Ph.D. supervisor was Maxwell Rosenlicht, who was in turn supervised by Oscar Zariski.

Upon graduation, Manuel joined IBM Research as a postdoctoral fellow. He worked at the T.J. Watson Research Center in the group of Richard D. Jenks. There he contributed to the *Scratchpad II* project and produced the most complete implementation to date of the Risch integration procedure. Manuel was a part of the team that transformed *Scratchpad II* from an internal research project at IBM to a commercial product launched by the Numerical Algorithms Group Ltd of the UK.

In February 1990, Manuel met Karola Trapp in Leipzig and they were married in Paris on December 21st of the same year. Also in 1990, Manuel joined the *Eidgenössische Technische Hochschule* (ETH) in Zurich. There he served first as Oberassistent in the group of Professor Gaston H. Gonnet, and in 1993 was appointed Assistant Professor. In 1997, Manuel accepted a position at the *Institut National de Recherche en Informatique et Automatique* (INRIA) at Sophia Antipolis, France. There he created and led the CAFÉ project (Calcul Formel et Équations).

Manuel's research centered on algorithms and software implementations for linear ordinary differential equations. It also ventured into neighbouring areas to support this main theme. A bibliography of his publications follows. In it, the papers are single authored unless otherwise indicated. Manuel's research also resulted in the creation of a number of notable software packages, including significant *Aldor* libraries and the interactive *Bernina* and *Shasta* servers for linear ordinary differential and difference operators.

Manuel was very active in the scientific community. He served on the Editorial Board of the *Journal of Symbolic Computation* and the Springer series *Algorithms and Computation in Mathematics*, as Program Chair for ISSAC in 1993 and later on the ISSAC Steering Committee. Over the years, he was involved in ACM SIGSAM, elected as Vice Chair in 2003, and supported the community in many other ways. Manuel supervised or co-supervised a number of doctoral students, including Niklaus Mannhart, Philip Santas, Raphael Bomboy (U. Nice 2001) and Min Wu (Chinese Academy of Sciences/U. Nice 2005).

Everyone who met him will remember Manuel's intensity, his intelligence and his pointed sense of humour. It was impossible to know Manuel without seeing how his family, his religion and his science permeated his existence. He will be sorely missed by all of us whose lives he touched. He has been laid to rest at the Har HaMenuhot cemetery in Jerusalem.

Manuel is survived by his wife, Karola, his children, Yael, Myriam, Dinah, Samuel, Rivka and Naomi, his parents, Simone and Henri, and his brother Yonah Alexandre.

Stephen M. Watt, London Ontario

Publications of Manuel Bronstein

Books and Book Chapters

1. *Symbolic Integration*, in Computer Algebra Handbook, Grabmeier, Kaltfofen & Weispfenning (editors), Springer-Verlag, Heidelberg, 2003, 94-96.
2. *Differential Algebra and Differential Equations*, MB & W. Sit (editors), Special Issue of J. Symbolic Computation 28, 1999.
3. *Symbolic Rewriting Techniques*, MB, J. Grabmeier & V. Weispfenning (editors), Progress in Computer Science and Applied Logic 15, Birkhauser-Verlag, Basel, 1998.
4. *Symbolic Integration I — Transcendental Functions, Algorithms and Computation in Mathematics 1*, Springer-Verlag, Heidelberg, 1997. Second Edition 2005.
5. *Proc. ISSAC'93*, MB (editor), ACM Press, New York, 1993.

Journal and Conference Papers

1. *Structure theorems for parallel integration*, J. Symbolic Computation (accepted).
2. *Parallel integration*, Programming and Computing Software 32, 59-60.
3. *Solving linear systems of differential and difference equations with respect to a part of the unknowns*, S.A. Abramov & MB, Computational Mathematics and Mathematical Physics, 46 218-230. Nauka/Interperiodica. (Решение линейных дифференциальных и разностных систем по отношению к части неизвестных, Журнал вычислительной математики и математической физики 46, 229-241.)
4. *On regular and logarithmic solutions of ordinary linear differential systems*, S.A. Abramov, MB & D.E. Khmel'nov, Proc. CASC 2005, LNCS 3718, 1-12.
5. *Picard-Vessiot extensions for linear functional systems*, MB, Z. Li & M. Wu, Proc. ISSAC 2005, ACM press, 68-75.
6. *Linear recurrences with polynomial coefficients*, MB & P. Solé, J. Complexity 20, 171-181.
7. *A reduction for regular differential systems*, MB & B.M. Trager, Proc. MEGA 2003.
8. *Regularization of linear recurrence systems*, S.A. Abramov, MB & D.E. Khmelov, Transactions of French-Russian A.M. Liapunov Institute, 2003 158-171.
9. *Solutions of linear ordinary differential equations in terms of special functions*, MB & S. Lafaille, Proc. ISSAC 2002, ACM Press, 23-28.
10. *On solutions of linear functional systems*, S.A. Abramov & MB, Proc. ISSAC 2001, ACM Press, 1-6.
11. *Computer algebra algorithms for linear ordinary differential and difference equations*, Proc. Third European Congress of Mathematics, vol.II, Progress in Mathematics 202, Birkhauser, 105-119.
12. *Hypergeometric dispersion and the orbit problem*, S.A. Abramov & MB, Proc. ISSAC 2000, ACM Press, 8-13.
13. *Solutions of linear ordinary difference equations in their coefficient field*, J. Symbolic Computation 29, 841-877.
14. *Solving linear ordinary differential equations over $C(x, e^{\int f(x)dx})$* , MB & A. Fredet, Proc. ISSAC'99, ACM Press, 173-179.
15. *Fast deterministic computation of determinants of dense matrices*, J. Abbott, MB & T. Mulders, Proc. ISSAC'99, ACM Press, 197-204.
16. *On symmetric powers of differential operators*, MB & T. Mulders, J.-A. Weil, Proc. ISSAC'97, ACM Press, 156-163.
17. \sum^{IT} : *A strongly-typed embeddable computer algebra library*, Proc. DISCO'96, Springer LNCS 1128, 22-33.
18. *An introduction to pseudo-linear algebra*, MB & M. Petkovšek, Theoretical Computer Science 157, 3-33.
19. *On the factorisation of linear ordinary differential operators*, Mathematics and Computers in Simulation 42, 387-389.
20. *On polynomial solutions of linear operator equations*, S.A. Abramov, MB & M. Petkovšek, Proc. ISSAC'95, ACM Press, 290-296.
21. *An improved algorithm for factoring linear ordinary differential operators*, Proc. ISSAC'94, ACM Press, 336-340.
22. *On Ore rings, linear operators and factorisation*, MB & M. Petkovšek, Programming and Computer Software 20, 14-26.
23. *Some effective methods in pseudo-linear algebra*, Proc. MEGA'94, Progress in Mathematics 143, Birkhauser, 105-113.
24. *Full partial fraction decomposition of rational functions*, MB & B. Salvy, Proc. ISSAC'93, ACM Press, 157-160.
25. *On solutions of linear ordinary differential equations in their coefficient field*, J. Symbolic Computation 13, 413-439.
26. *Integration and differential equations in computer algebra*, Programming and Computer Software 18, 201-217.
27. *Linear ordinary differential equations: breaking through the order 2 barrier*, Proc. ISSAC'92, ACM Press, 42-48.
28. *Formulas for series computations*, Applicable Algebra in Engineering, Communication and Computing 2, 195-205.
29. *The Risch differential equation on an algebraic curve*, Proc. ISSAC'91, ACM Press, 241-246.
30. *Computer algebra and indefinite integrals*, Computer Aided Proofs in Analysis IMA Volumes in Mathematics and its Applications 28, Springer-Verlag, 33-42.
31. *A unification of Liouvillian extensions*, Applicable Algebra in Engineering, Communication and Computing 1, 5-24.
32. *Integration of elementary functions*, J. Symbolic Computation 9, 117-173.
33. *The transcendental Risch differential equation*, J. Symbolic Computation 9, 49-60.
34. *Simplification of real elementary functions*, Proc. ISSAC'89, ACM Press, 207-211.
35. *Symbolic integration: towards practical algorithms*, Computer Algebra and Differential Equations (E. Tournier, editor), Academic Press 1988, 59-85.
36. *Fast reduction of the Risch differential equation*, Proc. ISSAC'88, Springer LNCS 358, 64-72.
37. *An algorithm for the integration of elementary functions*, Proc. EUROCAL'87, Springer LNCS 378, 491-497.
38. *Gsolve: a faster algorithm for solving systems of algebraic equations*, Proc. SYMSAC'86, ACM Press, 247-249.

Other Notable Publications

1. *Algebraic properties of the Lambert W function (following Liouville and Rosenlicht)*, MB, R.M. Corless, J.H. Davenport & D.J. Jeffrey, Ontario Research Centre for Computer Algebra technical report 04-02 (4 pp).
2. *Linear algebra for skew-polynomial matrices*, S.A. Abramov & MB, INRIA Rapport de recherche N° RR-4420, March 2002 (18 pp).
3. *On solutions of linear ordinary difference equations in their coefficient field*, INRIA Rapport de recherche N° RR-3797, November 1999 (43 pp).
4. *Lazy Hermite reduction*, INRIA Rapport de recherche N° RR-3562, November 1998 (13 pp).
5. *Symbolic Integration Tutorial*, Course notes of an ISSAC'98 tutorial (35 pp).