

Bobby Forrester Caviness
Department of Computer and Information Sciences
103 Smith Hall
University of Delaware
Newark, DE 19716
March, 2000

Personal Data

Born March 24, 1940, Asheboro, North Carolina
Married to Jane Carolyn Shearin, December 17, 1961

Education

B.S. (with honors), Mathematics	University of North Carolina at Chapel Hill, 1962
M.S., Mathematics	Carnegie-Mellon University, 1964
Ph.D., Mathematics & Computer Science	Carnegie-Mellon University, 1968
	Thesis: On Canonical Forms and Simplification
	Adviser: Alan J. Perlis

Professional Career

1959 - 1961	Part-time computer operator, University of North Carolina Computer Center
1961–1962	Part-time programmer, University of North Carolina Computer Center
1962-66	NSF Fellow
1963–Summer	Programmer, University of Pittsburgh Computation Center
1965–1966	Teaching Assistant in Mathematics and Computer Science, Carnegie-Mellon University
1966–1967	Project Scientist in Computer Science, Carnegie-Mellon University
1967–1970	Assistant Professor of Mathematics, Duke University
1968–Summer	Member Technical Staff, Bell Laboratories, Murray Hill, N.J.
1970–1972	Assistant Professor, Mathematics Research Center, University of Wisconsin (Joint Appointment with Computer Sciences Department)
1970–1975	Assistant Professor of Computer Sciences, University of Wisconsin
1975–1976	Associate Professor of Computer Sciences, Illinois Institute of Technology
1976 -1979	Associate Professor of Mathematical Sciences, Rensselaer Polytechnic Inst.
1980–1981	Professor of Mathematical Sciences, Rensselaer Polytechnic Institute
1980–1981	Visiting Research Fellow, General Electric Research and Development Center (on sabbatical leave from RPI)
1981–present	Professor (Chairperson, 1981-87), Department of Computer and Information Sciences, University of Delaware. Also joint appointment as Professor of Mathematical Sciences
1987–1988	Program Director, National Science Foundation (on leave from Delaware)
1994	Guest Professor, Eidgenössische Technische Hochschule, Zürich (on leave from Delaware)
2000-01	Academic Visitor, IBM T. J. Watson Research Center, Hawthorne, NY (on leave from Delaware)

Society Memberships

Association for Computing Machinery (including SIGCSE and SIGSAM)
Society for Industrial and Applied Mathematics
Mathematical Association of America

Editorships

1971	Guest Editor, October 1971 issue of the <i>Journal of the ACM</i>
1973–77	Assistant Editor, <i>ACM SIGSAM Bulletin</i>
1974–77, 89–94	Associate Editor, <i>Transactions on Mathematical Software</i>
1983–89	Area Editor, <i>Computing Reviews</i>
1984–95	Associate Editor, <i>Journal of Symbolic Computation</i>
1995–1999	Editor-in-Chief, <i>Journal of Symbolic Computation</i>
1995–2000	Editorial Board, <i>CONSTRAINTS</i>
2000–present	Editorial Board, <i>Journal of Symbolic Computation</i>
2000–2002	Education Editor, ACM SIGecom Exchanges

Honors and Awards

Bausch and Lomb Science Medal, 1958
Phi Eta Sigma, 1959
Phi Beta Kappa, 1962
B.S. With Honors, 1962
National Science Foundation Graduate Fellowship, 1962-1966
Sigma Xi, 1967

Grants

- NSF GJ-434, Recursive Procedures and Systems in Symbolic Mathematics, \$67,400, 1969-1971.
- NSF GJ-30125X, Algorithms and Systems for Symbolic and Algebraic Computation, \$221,000, 1971-1974, (G.E. Collins, Co-Principal Investigator).
- National Research Council Travel Grants to IFIP Meetings in Edinburgh, Scotland (1968) and Ljubljana, Yugoslavia (1971).
- University of Wisconsin Research Committee, Algorithms and Systems for Symbolic Mathematical Computation, \$5,046, 1974-1975.
- NSF MCS76-23762, Algorithms for Transcendental Function Arithmetic, \$71,000, 1977-1978.
- NSF MCS79-09158, Algorithms and Systems for Symbolic and Algebraic Computation, \$239,389, 1979-1981 (R. Jenks, D. Saunders and D. Yun Co-Principal Investigators).
- ARO-D, EUROSAM '79: the 1979 European Symposium on Symbolic and Algebraic Manipulation, \$3,000, 1979 (A. C. Hearn Co-Principal Investigator).

- ARO-D, SYMSAC '81: the 1981 ACM Symposium on Symbolic and Algebraic Computation, \$3,000, 1981 (R. D. Jenks Co-Principal Investigator).
- Unidel Foundation, Enrichment Grant for the University of Delaware Dept. of Computer and Information Sciences, \$665,000, 1981.
- NSF MCS-8203947, Acquisition of Computer Science and Computer Engineering Research Equipment, \$175,000, 1982 (P.J. Warter Co-Principal Investigator).
- System Development Foundation #301, Support for research visit by Dr. James Davenport, \$19,840, 1983.
- Hewlett-Packard 17-83722, Equipment Proposal for Computer Science Research, \$157,360, 1982. Equipment Upgrade \$123,823, 1984.
- Unidel Foundation, Grant to Significantly Enhance the Mathematical and Statistical Capabilities of Delaware Students. I was the principal author of the proposal for this grant to the Department of Mathematical Sciences, \$100,000, 1991.
- NSF USE-9251602, Undergraduate Mathematics: Technology to Improve Student Capabilities, \$60,000. Co-Principal Investigator with John Bergman and Richard Weinacht, 1992.
- NSF INT-9224304, Symposium on Quantifier Elimination and Cylindrical Algebraic Decomposition, \$15,250. Principal Investigator with Jeremy Johnson, 1993.
- NSF CDA-9405068, Post-doctoral Associate in Experimental Symbolic Computation. \$44,200, 1994.
- NSF CCR-95xxxxx, East Coast Computer Algebra Day. Amount: \$9,880. Co-PI with D. Saunders, 1995.

Other Professional Activities

- 1968 Member, panel on Algorithmic Approaches to Symbolic Integration and Simplification at FJCC.
Referee or reviewer for Jour. ACM., Computing Reviews, Mathematical Reviews, ACM Conferences, NSF, Army Research Office, Academic Press.
- 1970-71 Member of program committee for Second Symposium on Symbolic and Algebraic Manipulation.
- 1973-75 ACM SIGSAM National Lecturer.
- 1975 Summer Session Chair, Computer Sciences Dept., University of Wisconsin.
- 1975-76 Program Chair, ACM SIGSAM 1976 Symposium on Symbolic and Algebraic Computation.
- 1976 Spent two week period lecturing to and working with the Computational Physics Group, University of Utah.

- 1977–79 Chair ACM SIGSAM.
- 1978–79 Member(78 & 83), Chair(79) National Research Council Panel to evaluate NSF Graduate Fellowship Applications in Applications of Mathematics(including computer science).
- 1978 Consultant to Universidad Simon Bolivar, Caracas, Venezuela.
- 1979–82 Member(79), Chair(80-82) Advisory Screening Committee in Computer Science for the Council for International Exchange of Scholars.
- 1980 Lecturer for American Mathematical Society short course on Computer Algebra, Ann Arbor, MI
- 1980–81 General Chair, SYMSAC '81; the 1981 Symposium on Symbolic and Algebraic Computation, Snowbird, Utah, August, 1981.
- 1981 Member Visiting Committee in Computer Science, University of Maine.
- 1981–82 ACM National Lecturer.
- 1982 Principal Lecturer for Mathematical Association of America workshop on Algebraic and Symbolic Computing held at Salisbury State College, June 14-18, 1982.
- 1983 Principal Lecturer for Lehigh Valley Assoc. of Independent Colleges workshop on Algebraic and Symbolic Computing held at Moravian College, June 1983.
- 1983–84 Vice-Chair for the 1984 IEEE Micro-Delcon symposium.
Member, State of Delaware Computer Education Planning Committee.
- 1985 Organized ARO workshop on Large Scale Computing on Micro-Computers, Univ. of Delaware, May 1985.
Member of the Scientific Committee for the 3rd International Conf. on Algebraic Algorithms and Error Correcting Codes, Grenoble, France
- 1985–86 Chairperson, Search Committee for Chairperson of Mechanical Engineering Dept., University of Delaware
- 1986 Member External Review Committee for the Dept. of Computer and Information Sciences, Temple University
Member Visiting Committee in Computer Science, Rensselaer Polytechnic Institute
Program Committee, 1987 European Symposium on Computer Algebra, Leipzig
Two week visit to Computer Science Dept., Univ. of Leipzig, E. Germany
Program Committee, AAEECC-5, Menorca, Spain
- 1987 Member of NSF Panel for Scientific Computing Research Equipment for the Mathematical Sciences
Invited participant in workshop on New Generation Computer Algebra System sponsored by Texas Instruments, SMU and Los Alamos National Laboratories
- 1988 Member Middle States Accreditation Team, Syracuse University
Coordinator, NSF Workshop on Symbolic & Algebraic Computation
Consultant, NSF Division of Computer and Computation Research
Member External Review Committee for the graduate program in Computer Science, Howard University
- 1989 External Review Committee, Dept. of Computer & Info. Sci., Ohio State Univ.
Advisory Committee for Office of Cross-Disciplinary Activities, National Science Foundation
Member of NSF Panel for Scientific Computing Research Equipment for the Mathematical Sciences

- Member of NSF Panel for Institutional Infrastructure—Small Scale
 Organizer, Workshop on Differential Equations & Symbolic Computation, Institute
 for Mathematics & Its Application, Univ. of Minnesota
 Program Committee, 1989 International Symp. on Symbolic & Algebraic
 Computation
- 1990 Advisory Committee for Office of Cross-Disciplinary Activities, National Science
 Foundation
 Organizer of minisymposium on Symbolic Computation Theory & Algorithms,
 SIAM National Meeting, Chicago.
 Consultant to the Dept. of Mathematics & Computer Science, Wake Forest Univ.
 re the feasibility of a new MS program in computer science.
 Co-Chair (with Richard Weinacht) of the Delaware Dept. of Mathematical Sciences
 Ad-Hoc Computational Mathematics Committee.
- 1991 Advisory Committee for Office of Cross-Disciplinary Activities, National Science
 Foundation
 Invited participant, NSF Workshop on Numeric, Symbolic & Geometric Computing
 Chairperson, Search Committee for Chairperson of the Dept. of Mathematical
 Sciences, Univ. of Delaware
- 1992 Lecturer on Integration in Finite Terms, RISC-Linz Summer School on Computer
 Algebra, Linz, Austria.
- 1992-93 Member Univ. of Delaware College of Arts and Science Budget Council.
 Member Peer Review Committee, UD Dept. of Food Science
- 1993-94 Principal Organizer (with B. Buchberger and J. Johnson), Symp. on Quantifier
 Elimination & Cylindrical Algebraic Decomposition at the Research Inst. for Sym-
 bolic Computation, Linz, Austria.
- 1995 Program Chair, East Coast Computer Algebra Day, Newark, DE.
- 1996 Member Program Committee, International Workshop on New Computer Technolo-
 gies in Control Systems, Pereslavl-Zalessky, Russia
 Program Chair, 1996 International Symp. on Symbolic & Algebraic Computation,
 Zurich.
- 1996-97 Member Assoc. for Computing Machinery Ad-Hoc Comm. to nominate a new
 Editor-in-Chief for the *J. of the ACM*.
 Delaware Center for Teaching Effectiveness Advisory Committee on TAs.
- 1997-98 Hosted Fulbright Scholar, Prof. A. Juozapavicius from Vilnius Univ., Lithuania.
- 1998-99 Member NSF Panel on Integrative Graduate Education & Research Training
 (IGERT).
- 2003-04 Chair, Award Committee for the Jenks Prize in Software Engineering for Computer
 Algebra

Ph. D. Thesis Supervision

1. Harvey I. Epstein, Algorithms for Elementary Transcendental Function Arithmetic, Univ. of Wisconsin, May 1975. Current position: Computer Scientist, Mitre Corp.
2. Michael Rothstein, Aspects of Symbolic Integration and Simplification of Exponential and

Primitive Functions, Univ. of Wisconsin, December 1976. Current position: Assoc. Prof. of Computer Science, Kent State University.

3. Myra J. Prella, Elementary First Integrals of Differential Equations, RPI, May 1982. Current position: Head of AI Group, Mitre Corp.
4. Erich L. Kaltofen, On the Complexity of Factoring Polynomials with Integer Coefficients, RPI, November 1982. Current position: Professor of Mathematical Sciences, North Carolina State University.
5. Guy W. Cherry, Algorithms for Integrating Elementary Functions in Terms of Error Functions and Logarithmic Integrals, Univ. of Delaware, August 1983. Current position: Director of Systems Software, NCube, Inc., Beaverton, Oregon.

Publications and Reports

1. Information Processing Language V System for the Univac 1105, Computation Center Report, University of North Carolina, August 1962 (with H. L. Butler).
2. An Introduction to the Pitt Natural Language Processor, Computation and Data Processing Center Report, University of Pittsburgh, October 1963 (with Dale Isner).
3. The Formal Description of the Pitt Natural Language Processor, Computation and Data Processing Center Report, Univ. of Pittsburgh, October 1963 (with Dale Isner).
4. On Canonical Forms and Simplification, *JACM* **17**,2 (April 1970), pp. 385-396.
5. 360 Mixal, Triangle Universities Computation Center Memorandum No. LS-93 (July 1970), 6 pages.
6. An Existence Lemma for Canonical Forms in Symbolic Mathematics, *IPL* **1** (1971), pp. 45-46 (with P. L. Pollack and C. M. Rubald).
7. Symbolic Mathematical Computation in a Ph.D. Computer Sciences Department, *Proc. of the Second Symposium on Education in Computer Science, SIGCSE Bulletin* **4** (1972), pp. 19-23. Reprinted in the *SIGSAM Bulletin*, No. 23 (July 1972), pp. 25-28 (with G. E. Collins).
8. A Lehmer-Type Greatest Common Divisor Algorithm for Gaussian Integers, (abstract), *SIAM Review* **15**, 2, Part 1 (April 1973), p. 414.
9. On the Algebraic Independence of Certain Logarithmic and Exponential Functions, (abstract), *SIAM Review* **16**,1 (Jan 1974), p. 121 (with H. I. Epstein).
10. SAM Course Outlines (ed.), *SIGSAM Bulletin* **8**,4 (1974), pp. 15-25. Reprinted in *SIGCSE Bulletin* **9**,3 (1975), pp. 18-28.
11. A Liouville Theorem on Integration in Finite Terms for Line Integrals, *Comm. in Algebra* **3** (1975), pp. 781-795 (with M. Rothstein).

12. More on Computing Roots of Integers, *SIGSAM Bulletin* **9,3** (1975), pp. 18-20.
13. A Modular Greatest Common Divisor Algorithm for Gaussian Polynomials, *Proc. of the 1975 ACM Annual Conf.*, pp. 270-273 (with M. Rothstein).
14. Algorithms for Gaussian Integer Arithmetic, *Proc. of the 1976 ACM Symposium on Symbolic and Algebraic Computation* (R. D. Jenks, ed.), pp. 36-45 (with G. E. Collins).
15. Simplification of Radical Expressions, *Proc. of the 1976 ACM Symposium of Symbolic and Algebraic Computation* (R. D. Jenks, ed.), pp. 329-338 (with R. J. Fateman).
16. Methods for Symbolic Computation with Transcendental Functions, *Proc. of the Fourth International Colloquium on Advanced Computational Methods in Theoretical Physics*, Saint Maximin, France (1977), pp. 16-43.
17. Modular Polynomial Arithmetic in Partial Fraction Decomposition, *Proc. of the 1977 MAC-SYMA Users' Conference*, University of California, Berkeley (July 1977), pp. 253-261 (with S. K. Abdali and A. Pridor).
18. A Note on the Complexity of Algebraic Differentiation, *IPL* **7** (1978), pp. 122-124 (with H. I. Epstein).
19. A Note on the Algebraic Independence of Logarithmic and Exponential Constants, *SIGSAM Bulletin* **12,2** (May 1978), pp. 18-20 (with M. J. Prelle).
20. A Structure Theorem for the Elementary Functions and Its Application to the Identity Problem, *Inter. J. of Comp. and Info. Sci.* **8,1** (February 1979), pp. 9-37 (with H. I. Epstein).
21. A Structure Theorem for Exponential and Primitive Functions, *SIAM J. Comput.* **8,3** (August 1979), pp. 357-367 (with M. Rothstein).
22. Aspects of Algebraic Computation, *Proc. of the 1981 Army Conference on Numerical Analysis and Computing*, pp. 291-302.
23. Integration in Finite Terms with Special Functions: A Progress Report, *Proc. of the 1984 International Symposium on Symbolic and Algebraic Computation*, Springer-Verlag LNCS Vol. 174 (1984), pp. 351-358 (with G.W. Cherry).
24. An extension of Liouville's theorem on integration in finite terms, *SIAM J. Comput.* **14,4** (1985), pp. 966-990 (with M.F. Singer and B.D. Saunders).
25. *Proc. of the 1985 European Conf on Computer Algebra*, Vol. 2 (editor), Springer-Verlag LNCS Vol. 204 (1985).
26. Computer Algebra: Past and Future, *J. Symbolic Comput.* **2,3** (1986), pp. 217-236.
27. Foreword of M. Bronstein, *Symbolic Integration I - Transcendental Functions*, Springer-Verlag, Berlin (1997).

28. Foreword of *Handbook for Computer Algebra*, Springer-Verlag (2003).

Books and Monographs

1. *Symbolic Computation: Directions for Future Research—Report of a Workshop on Symbolic and Algebraic Computation* (editor with A. Boyle), SIAM Reports on Issues in the Mathematical Sciences, Soc. for Industrial & Applied Mathematics, Philadelphia, PA (July, 1990).
2. B. F. Caviness and J. Johnson (eds.), *Proceedings of the Symposium on Quantifier Elimination and Cylindrical Algebraic Decomposition*, Springer-Verlag, 1998.

Other Publications

1. Article containing information about the research of my students and myself. T. A. Heppeneimer, Computer algebra: speed is not all, *Mosaic*, a publication of the National Science Foundation **22**, 4 (1991), pp. 28–37.

Professional and Public Lectures

Symbolic Mathematical Computation, Mathematics Colloquium, Illinois Institute of Technology, February 1976.

Algebraic Simplification, Mathematics Colloquium, IBM T.J. Watson Research Center, April 1976.

Algorithms for Gaussian Integer Arithmetic, 1976 Symposium on Symbolic and Algebraic Computation at Yorktown Heights, New York, August 1976.

The SAC-1 Implementation of the Risch Structure Theorem, Computer Science Colloquium, Cambridge University, Cambridge, England, March 1977.

Methods for Symbolic Computation with Transcendental Functions, Computer Science Colloquium, University of Kent, Canterbury, England, March 1977.

_____, Invited talk to the Fourth International Colloquium on Advanced Computational Methods in Theoretical Physics, held in St. Maximin, France, March 1977.

_____, Computer Science Colloquium, Technische Hogeschool Twente, Enschede, The Netherlands, March 1977.

_____, Computer Science Colloquium, Vrije Universiteit, Amsterdam, The Netherlands, March 1977.

Minimal Field Extensions for Symbolic Integration, Mathematics Colloquium, R.P.I., October 1977.

Can Computers Find Closed Form Solutions for Differential Equations?, Computer Science Colloquium, Kent State University, November 1977.

_____, Computer Science Colloquium, Universidad Simon Bolivar, Caracas, Venezuela, January 1978.

Steps Toward Algorithms for Solving Differential Equations in Closed Form, Invited Talk to SIAM National Meeting, Madison, Wisconsin, May 1978.

A Structure Theorem for Exponential and Primitive Functions I and II, Universidad Simon Bolivar, June 1978.

The Number of Divisions Required by the Euclidean Algorithms Applied to Gaussian Integers, Universidad Simon Bolivar, June 1978.

Steps Toward Algorithms for Solving Differential Equations in Closed Form, Computer Science Colloquium, Yale University, February 1979.

_____, Computer Science Colloquium, University of Delaware, April 1979.

Algorithms for Solving Differential Equations in Closed Form, Computer Science Colloquium, Universität Karlsruhe, Karlsruhe, West Germany, July 1979.

A Survey of Symbolic and Algebraic Computation, Computer Science Colloquium, Eidgenössische Technische Hochschule, Zurich, Switzerland, July 1979.

Implicit Solutions of First-Order Differential Equations, Invited Address to the American Mathematical Society, Kent, Ohio, November 1979.

A Survey of Computer Algebra, Computer Science Seminar, General Electric Research and Development Center, Schenectady, NY, December 1979.

An Extension of Liouville's Theorem on Integration in Finite Terms, Computer Science Colloquium, University of Wisconsin, July, 1980.

Algorithms for Indefinite Integration and for Solving Differential Equations in Closed Form, AMS Short Course on Computer Algebra, Ann Arbor, Michigan, August 1980.

The Coming Revolution in Scientific Computation, Cuyahoga Valley Chapter of ACM, November 1980.

Liouville Type Theorems for Differential Equations, Mathematics Colloquium, Kent State University, November 1980.

A Survey of Computer Algebra, Joint Computer Science and Mathematics Colloquium, NC State University, December 1980.

Algorithms for Indefinite Integration and for Solving Differential Equations in Closed Form, Invited Address, European Computer Algebra Meeting, Antwerp, Belgium, January 1981.

An Introduction to Symbolic Integration with Some Recent Results, Informatica Colloquium, Institut National Polytechnique de Grenoble, January 1981., Informatica Colloquium, Johannes Kepler Universität, Linz, Austria, January 1981.

Liouville-Type Theorems for ODEs, Lecture to Seminar on Algorithms, Université Louis Pasteur, Strasbourg, France, January 1981.

Algebraic Computation, Invited Address, Army Conference on Numerical Analysis and Computers, Huntsville, Alabama, February 1981.

An Introduction to Symbolic Integration with Some Recent Results, Combined Numerical Analysis and Theory Seminar, Computer Science Department, University of Toronto, March 1981.

A Survey of Symbolic Mathematical Computation, Invited Address Southeastern Section Mathematical Association of America, April 1981.

Algebraic Computation - New Directions in Scientific Computing, General Electric Corporate Research and Development Colloquium June 1981.

_____, Research Department Colloquium, Sperry Univac, December 1981.

Algorithms for Integration and for Solving ODEs in Closed Form, Computer Science Colloquium, Cornell University, November 1981.

A Survey and Some Recent Results on Algorithms for Symbolic Integration, Computer and Information Sciences Colloquium, University of Pennsylvania, February 1982.

_____, Mathematical Science Colloquium, Salisbury State College, March 1982.

Series of lectures on integration in finite terms, Dept. of Computer Science, Univ. of Waterloo, July 1983.

Algorithms for Solving Differential Equations in Closed Form, Computer Science Colloquium, Univ. of North Carolina, Feb. 1984.

Research in Computing and Mathematics at the Univ. of Delaware, Delaware Council of Teachers of Mathematics Awards Dinner, May 1984.

Integration in Finite Terms with Special Functions, Johannes Kepler University, Linz, Austria, June 1984.

The Mechanization of Mathematics, Provost's Faculty Dinner Seminar, Univ. of Delaware, Sept. 1984.

Computer Algebra: Past and Future, Keynote address, European Conf. on Computer Algebra, Linz, Austria, April 1985.

Some Recent Results on Integration in Finite Terms, International Conf. on Computer Algebra and Its Applications in Theoretical Physics, Joint Institute for Nuclear Research, Dubna, USSR, Sept. 1985.

Advances in Symbolic and Algebraic Computation, Computer Science Colloquium, Temple University, April 1986.

_____, Computer Science Colloquium, University of Maryland - Baltimore County, October 1986.

Decision Procedures for Solving Differential Equations in Closed Form, Computer Science Colloquium, University of Virginia, November 1986.

_____, Computer Science Colloquium, Ohio State University, January 1987.

_____, Invited lecture, Workshop on Mathematical Aspects of Scientific Software, Institute of Mathematics and Its Applications, Univ. of Minnesota, March 1987.

_____, Invited lecture, 1987 European Symposium on Computer Algebra, Leipzig, June 1987.

_____, Colloquium, Supercomputer Research Center, Oct. 1987.

_____, Colloquium, National Bureau of Standards, Nov. 1987.

_____, Invited presentation, Army Conf. on Applied Mathematics and Computing, Boulder, CO, June 1988.

Future Directions for Research in Symbolic Computation, Colloquium, Computer Science Dept., Rensselaer Polytechnic Institute, Dec. 1988.

Mathematical Computation & the Future of Mathematics, Univ. of Delaware Math Graduate Student Colloquium, Oct. 1989.

Computing First Integrals for First Order Nonlinear Differential Equations, Workshop on Geometric & Algebraic Integration Algorithms, Mathematical Sciences Inst., Cornell Univ., Nov. 1989.

Integration in Finite Terms, U. of Maryland Baltimore County, May, 1993.

Computing First Integrals for Plane Autonomous Systems of ODEs, University of Tuebingen, Tuebingen, Germany, Feb, 1994.

Towards Decision Procedures for Solving Simple Differential Equations in Closed Form, Swiss Federal Institute of Technology, Zurich, March, 1994.

Towards Decision Procedures for Solving Simple Differential Equations in Closed Form, Invited talk at the Rhine Workshop on Computer Algebra, Karlsruhe, Germany, March, 1994.

Towards Decision Procedures for Solving Simple Differential Equations in Closed Form, University of Limoges, France, June, 1994.

Academic Use of Technology at a “Typical” American University. Banquet Address, Workshop on Computer Algebra in Science & Engineering, Center for Advanced Studies, Univ. of Bielefeld, Germany, August, 1994.

Towards Decision Procedures for Solving Simple Differential Equations in Closed Form, Dynamics Seminar, UDel Math. Sciences, October, 1994.

Creating Math Web Documents, invited talk, TeX User’s Conf., Sept. 2001.