

# Michael J. O'Donnell

(2011 January 27)

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## Vita

Birth Spartanburg SC, 4 April, 1952  
Family Married, 2 children  
Citizenship United States of America

## Education

B.S. Computer Sciences Highest Distinction Purdue University 1972  
Ph.D. Computer Science R. Constable, advisor Cornell University 1976

## Employment

Research Associate	University of Toronto (on leave from Purdue)	1976–1977
Assistant Professor	Purdue University	1976–1981
Associate Professor	Purdue University	1981–1985
Visiting Associate Professor	The Johns Hopkins University (on leave from Purdue)	1983–1984
Associate Professor	The Johns Hopkins University (on leave from Purdue)	1984–1985
Professor	University of Chicago	1985–present
Associate Chairman C.S.	University of Chicago	1986–1987
Chairman of C.S. Dept.	University of Chicago	1987–1990
Visiting Professor	University of Iowa (on sabbatical from U. Chicago)	1996–1997
Senior Fellow in the Computation Institute	University of Chicago	2000–present

## Professional Societies

ACM, IEEE Computer Society, Association for Symbolic Logic, Computer Professionals for Social Responsibility, Acoustical Society of America, American Physical Society, Free Software Foundation, Electronic Frontier Foundation.

## Research Interests

- Infrastructure for public key distribution.
- The nature of formal systems.
- Sound synthesis.
- Semantics for constructive reasoning.

## Papers in Refereed Journals

- [1] Geometrical problems with applications to hashing (with D. Comer). *SIAM Journal on Computing*, 11(2):217–226, May 1982. Also appeared as Purdue University Technical Report TR-303, 1979.
- [2] Pattern matching in trees (with C. Hoffmann). *Journal of the ACM*, 29(1):68–95, January 1982. Also appeared in the collection *Computer Algorithms: string pattern matching strategies*, J.-I. Aoe, editor, IEEE Computer Society Press, Los Alamitos CA, 1994, 154–181.
- [3] Programming with equations (with C. Hoffmann). *ACM Transactions on Programming Languages and Systems*, 4(1):83–112, January 1982. A preliminary version of [2, 3] with some additional material, appeared as An interpreter generator using tree pattern matching. *6th Annual ACM Symposium on Principles of Programming Languages*, 169–179, January 1979.
- [4] A critique of the foundations of Hoare-style programming logics. *Communications of the ACM*, 25(12):927–934, December 1982. Also appeared as Purdue University Technical Report TR-338, 1980, and in the *Logics of Programs Workshop*, D. Kozen editor, Yorktown Heights, New York, May 1981, *Lecture Notes in Computer Science*, 131:349–374, Springer-Verlag, 1982.
- [5] The expressiveness of simple and second order type structures (with S. Fortune and D. Leivant). *Journal of the ACM*, 30(1):151–185, January 1983. Also appeared as IBM Research Report RC 8542 (#37221) 10/31/80. Some of the material in this paper also appeared in conference [1] and lecture [1].

- [6] A combinatorial problem concerning interconnection networks (with C. Smith). *IEEE Transactions on Computing*, C-31(2):163–164, February 1982. Also appeared as Purdue University Technical Report CSD TR 352, 1981.
- [7] A combinatorial analysis of static-key hashing (with F. Berman, M. Bock, E. Dittert and D. Planck). *SIAM Journal on Computing*, 15(2):604–618, May 1986.
- [8] Lower bounds for sorting with realistic instruction sets (with E. Dittert). *IEEE Transactions on Computers*, C-34(4):311–317. April 1985. Also appeared as Johns Hopkins University Technical Report JHU/EECS 84/06. An error is corrected in C-35(10):932, October 1986.
- [9] Implementation of an interpreter for abstract equations (with C. Hoffmann and R. Strandh). *Software—Practice and Experience*, 15(2):1185–1204, December 1985. An earlier version, by Hoffmann and O’Donnell, appeared in *10th Annual ACM Symposium on Principles of Programming Languages*, 111–120, January 1984. Also appeared as Johns Hopkins University Technical Report JHU/EECS/84/03, 1984.
- [10] How to prove representation-independent independence results (with S. Kurtz and J. Royer). *Information Processing Letters*, 24:5–10, January 1987. Also appeared as University of Chicago Department of Computer Science Technical Report 85-006, 1985.
- [11] Some intuitions behind realizability semantics for constructive logic: Tableaux and Läuchli countermodels (with J. Lipton). *Annals of Pure and Applied Logic*, 81:187–239, 1996.
- [12] Leveled Garbage Collection (with G. Tong). *Journal of Functional and Logic Programming*, 2001:5, 2001.
- [13] Cell-Utes and Flutter-Tongued Cats: Sound Morphing Using Loris and th Reassigned Bandwidth-Enhanced Model (with K. Fitz, L. Haken, S. Lefvert, C. Champion). *Computer Music Journal*, 27(3):44–65, Fall 2003.
- [14] A Proposal to Separate Handles from Names on the Internet. *Communications of the Association for Computing Machinery*, 48(12):78–83, December 2005. Longer version in Technical Report [9].

## Competitive Conference Papers

- [1] A programming language theorem which is independent of Peano arithmetic. *11th Annual ACM Symposium on Theory of Computing*, 176–186, May 1979. Similar papers appeared as A practical programming theorem which is independent of Peano arithmetic. *100th Anniversary Conference in honor of Gottlob Frege*, Friedrich Schiller

- Universität, Jena, D.D.R., 1979, and as Purdue University Technical Report TR-299, 1979.
- [2] Parallel stepwise simulation of combinatory reduction systems. *1984 Conference on Information Sciences and Systems*, Princeton, N.J., May 1984. A longer version containing additional material appeared as Universal reduction systems for sequential and parallel computation, Johns Hopkins University Technical Report JHU/EECS/84/04, 1984, and was included in book [3].
  - [3] Realizability semantics for error-tolerant logics (with J. Mitchell). In J. Halpern, editor, *Theoretical Aspects of Reasoning About Knowledge, Proceedings of the 1986 Conference*, Morgan Kaufman, New York, 1986. An earlier version by O'Donnell appeared as A type-theoretic foundation for epistemic and relevance logics, Johns Hopkins University Technical Report JHU/EECS/85/02.
  - [4] Exact real arithmetic: a case study in higher order programming (with H-J. Boehm, R. Cartwright, and M. Riggle). *1987 Symposium on LISP and Functional Programming*.
  - [5] Testing confluence of nonterminating overlapping systems of rewrite rules (with Y. Chen). *Conditional and Typed Rewriting Systems*, 2nd International CTRS Workshop, Montreal, June 1990. *Lecture Notes in Computer Science* 516, Springer-Verlag, 1991, pp. 127–136. Preliminary versions appeared as University of Chicago Department of Computer Science Technical Report 89-03, 1989 and 90-07, 1990.
  - [6] Infinite Terms and Infinite Rewritings (with Y. Chen). *Conditional and Typed Rewriting Systems*, 2nd International CTRS Workshop, Montreal, June 1990. *Lecture Notes in Computer Science* 516, Springer-Verlag, 1991, pp. 115–126. Preliminary version appeared as University of Chicago Department of Computer Science Technical Report 90-08, 1990.
  - [7] Sound Morphing using Loris and the Reassigned Bandwidth-Enhanced Additive Sound Model: Practice and Applications (with S. Lefvert, K. Fitz, L. Haken). *International Computer Music Conference*, Göteborg, September 2002.

## Book Chapters

- [1] Introduction: Logic and Logic Programming Languages. Chapter 1 of *Handbook of Logic in Artificial Intelligence and Logic Programming*, volume 5 on *Logic Programming*, D. Gabbay, editor. 1998, pp. 1–67.
- [2] Equational Logic Programming. Chapter 2 of *Handbook of Logic in Artificial Intelligence and Logic Programming*, volume 5 on *Logic Programming*, D. Gabbay, editor. 1998, pp. 69–161.

## Open Conference Papers and Technical Reports

- [1] Toward a fully parallel implementation of the lambda calculus (with R. Strandh). Johns Hopkins University Technical Report JHU/EECS/84/13, 1984.
- [2] Multidimensional interpolation at inaccurate points (with E. Dittert). Johns Hopkins University Technical Report JHU/EECS/84/17, 1984.
- [3] Proving unorientable equational formulas (with Y. Chen). University of Chicago Department of Computer Science Technical Report 90-26, August 1990.
- [4] Nonterminating rewritings with head boundedness (with Y. Chen). University of Chicago Department of Computer Science Technical Report 90-27, August 1990.
- [5] Connecting formal semantics to constructive intuitions (with S. Kurtz, J. Mitchell). Proceedings of a Symposium on Constructivity in Computer Science, Trinity University, San Antonio TX, June 1991. *Lecture Notes in Computer Science*, Volume 613, Springer-Verlag, 1992, pp. 1–21. Also appeared as University of Chicago Department of Computer Science Technical Report 92-01, January 1992. Also presented at the annual meeting of the *Association for Symbolic Logic*, Notre Dame, February 1993.
- [6] Decomposition of steady state instrument data into an excitation system and formant filter components (with I. Bisnovaty). COST Digital Audio Effects Workshop, DAFx99, Trondheim, Norway, 9–11 December 1999, pp. 113–116.
- [7] The Sound Manifesto (with I. Bisnovaty). Critical Technologies for the Future of Computing, *The International Society for Optical Engineering (SPIE)*, San Diego, CA, 30 July through 4 August 2000.
- [8] Open Network Handles Implemented in DNS. Internet Draft draft-odonnell-onhs-imp-dns-00.txt filed with Internet Engineering Task Force, 17 September 2002. A version with different pagination is archived permanently in the *Computing Research Repository (CoRR)*, <http://xxx.lanl.gov/archive/cs/intro.html>) as cs.NI/0301011, 14 January 2003.
- [9] A Proposal to Separate Handles from Names on the Internet. *Computing Research Repository (CoRR)*, <http://xxx.lanl.gov/archive/cs/intro.html>), number cs.NI/0302017, 12 February 2003. Shorter version in Refereed [14].

## In Preparation and Submitted

- [1] Against Nonmonotonic Logic.
- [2] Relational realizability (with J. Lipton).

## Books

- [1] *Computing in Systems Described by Equations, Lecture Notes in Computer Science*, Volume 58, Springer-Verlag, 1977. A preliminary version appeared as Subtree replacement systems: a unifying theory for recursive equations, LISP, Lucid and combinatory logic. *9th Annual ACM Symposium on Theory of Computing*, 295–305, May 1977. Also appeared as Reduction Strategies in Subtree Replacement Systems, Ph.D. Dissertation, Cornell University, August 1976.
- [2] *A Programming Logic* (with R. Constable), Winthrop, 1978.
- [3] *Equational Logic as a Programming Language*, MIT Press, 1985. Includes some material from papers [2, 3, 9] and conference [2], as well as original material.

## Software Research Projects

*Equation Interpreter/Compiler*, (with C. Hoffmann, G. Sacco, P. Golick, R. Strandh, S. Rebel-sky, D. Sherman, S. Bailey). Announced in *SIGPLAN Notices*, September 1983. Demonstrated at the *Workshop on Logics of Programs*, 1985. Abstract appeared as “Equational logic as a programming language”, *Logics of Programs: Proceedings 1985, Lecture Notes in Computer Science* 193:255, Springer-Verlag, 1985. First distribution May, 1983. Second distribution as compiler December, 1985. Distributed to Purdue University; Indiana University; The Johns Hopkins University; Los Alamos National Laboratory; Stichting Mathematisch Centrum, Amsterdam; Oregon Graduate Center; Universität des Saarlandes; Mergenthaler Linotype, Frankfurt; Philips Research Laboratories, Sunnyvale, California; University of North Carolina; Moorhead State University; Tektronix, Portland, Oregon; The Foxboro Co., Massachusetts; Colby College; Scientific Calculations, Inc., Santa Cruz, California; University of Iowa; Telefonaktiebolaget L. M. Ericsson, Stockholm, Sweden; Universität Ulm, Germany; U.C. Berkeley; SUN Microsystems; SCS, Hamburg; University of Michigan; Lulea University, Sweden; University of Tasmania; University of York; University of Wisconsin; Advanced Computer Communications, Santa Barbara, CA; MCC; Franz, Inc.; Université de Genève; Rice University; University of Louvain; University of North Carolina; University of Washington; University of Arizona; Software Research Associates, Tokyo; Weizmann Institute; SUNY College of Technology; Imperial Software Technology, Cambridge England; Collège Militaire Royal de Saint-Jean, Quebec; Gessellschaft für Mathematik und Datenverarbeitung mbH, Sankt Augustin, Germany; MacQuarie University, North Ryde, Australia; University of Nebraska; Memorial University of Newfoundland; Universität Kaiserslautern; Carnegie-Mellon University; University of Queensland, Australia; University of New Hampshire.

*TEX macros for the Chicago Journal of Theoretical Computer Science*. *cjstruct.cls* allows unambiguous structural markup of published journal articles in  $\text{\LaTeX}$  source format. First version distributed 4 April 1995. Used by MIT Press for *CJTCS* and for the *Journal of Functional and Logic Programming*.

## Invited Lectures

- [1] Computational complexity and proof-theoretic power in typed lambda calculi. *American Mathematical Society Summer Meeting*, 1982. Abstract appeared in *Abstracts of the American Mathematical Society*, 3(5):376, August 1982. Results from paper [5].
- [2] Two lectures on logic and computer science: 1. Does arrow denote implication or functionality? A profound mathematical pun. 2. Why the Church-Turing thesis doesn't help parallel functional programming. *University of Maryland Special Year in Mathematical Logic and Theoretical Computer Science*, October 1984. Results from paper [5], book [3], and original material.
- [3] What it means to have a universal parallel reduction language. *Graph Reduction Workshop*, Santa Fe, October 1986. Results from book [3].
- [4] Survey of the equational logic programming project. *Colloquium on Resolution of Equations in Algebraic Structures*, Lakeway, Texas, March 1987. Survey of material from papers [3, 9], book [3], plus original material.
- [5] Term-rewriting implementation of equational logic programming. In P. Lescanne, editor, *Rewriting Techniques and Applications — Bordeaux, France, May 1987 — Proceedings, Lecture Notes in Computer Science*, 256, Springer-Verlag, 1987. Similar material to invited lecture [4].
- [6] Open Problems in Equational Logic Programming. Distinguished Lecture Series, SUNY Stony Brook, February 1988. Similar material to invited lectures [4, 5].
- [7] Equational Logic as a Programming Language. Colloquium Series in Term Rewriting, Portland State University, March 1991. Similar material to invited lectures [4, 5, 6].
- [8] Electronic Journals—scholarly invariants in a changing medium. Conference on Academic and Professional Journals in the Twentieth Century, University of Chicago, April 1992 (presented by author as discussant for session on “The Future of Journals”). Also appeared (invited, unrefereed) in *Journal of Scholarly Publishing*, volume 26, number 3, April 1995, University of Toronto Press, pp. 183-199, and as University of Chicago Department of Computer Science Technical Report 92-07, April 1992.
- [9] Issues Involved in Publishing an Electronic Journal. Seminars on Academic Computing 1993 University Executive Program, Snowmass CO, August 1993. Very similar to [8], but a more detailed presentation—revised version of paper appeared as University of Chicago Department of Computer Science Technical Report 93-11, July 1993.
- [10] Intuitive Counterexamples for Constructive Fallacies (with J. Lipton). *Mathematical Foundations of Computer Science 1994 — 19th International Symposium, MFCS '94, Košice, Slovakia, August 1994 — Proceedings, Lecture Notes in Computer Science*,

volume 841, Igor Prívvara, Branislav Rován and Peter Ružička editors, Springer-Verlag, 1994, pp. 87–111.

- [11] The Structure of Scholarship in Cyberspace. *Professors and Publishing in the Electronic Academy*. The University of Tennessee, Knoxville Library, September 1996.
- [12] The Sources of Certainty in Computation and Formal Systems. *Computer Science as a Human Science: The Cultural Impact of Computerization*, the 1999–2000 Sawyer Seminar at the University of Chicago. The University of Chicago, October 1999.
- [13] Against Nonmonotonic Logic. *ACM SIGART Chicago*, March 2001.

## Editorial Duties

1. Category editor for Theory of Computation, *Computing Reviews*, 1985–1987.
2. Managing Editor and founder of the *Chicago Journal of Theoretical Computer Science*, a refereed scholarly journal published by MIT Press on the World Wide Web, 1994–2000.
3. Editorial Board for the *Journal of Functional and Logic Programming*, 1995–present.
4. Advisory Board for *Logical Methods in Computer Science*, 2002–present.
5. Moderator for the *Sound* topic in the *CoRR* online repository of technical reports, 2002–present.

## Refereeing

*Journal of Computer and Systems Sciences*; *SIAM Journal on Computing*; *Communications of the ACM*; *Journal of the ACM*; *ACM Transactions on Programming Languages and Systems*; *Information Processing Letters*; *Software Practice and Experience*; *Journal of Computer Languages*; *Theoretical Computer Science*; *Information and Control*; *Acta Informatica*; *Journal of Philosophical Logic*. ACM annual conference; MIT Press; Elsevier North-Holland; Springer-Verlag; National Science Foundation; Research Council of Canada; Australian Research Grants Scheme; *Journal of Symbolic Computation*.

## Program Committees

1. *25th Annual IEEE Symposium on the Foundations of Computer Science*, 1984.
2. *12th Annual ACM Symposium on Principles of Programming Languages*, 1985.
3. *26th Annual IEEE Symposium on the Foundations of Computer Science*, 1985.

4. *1985 Conference on Information Sciences and Systems*, cochairman.
5. *13th Annual ACM Symposium on Principles of Programming Languages*, 1986
6. *14th Annual ACM Symposium on Principles of Programming Languages*, 1987, chairman.
7. *Rewriting Techniques and Applications*, 1991.
8. *Rewriting Techniques and Applications*, 1993.
9. *Dartmouth Institute for Advanced Graduate Studies, 4th annual summer symposium, Electronic Publishing and the Information Superhighway*, 1995.
10. *Algebraic Methodology and Software Technology*, 2000.

## Professional Service

1. Organized Midwest Theory of Computation Meeting, December 1986.
2. Founder and president of Midwest Society for Programming Languages and Systems (Midwest Local SIGPLAN), 1987–1994.
3. National Science Foundation Research Initiation Panel, February 1988.
4. Conference cochair for *16th Annual ACM Symposium on Principles of Programming Languages*, 1989.
5. Advisory Board for Foundations of Computation Laboratory, Key Centre for Software Technology, Department of Computer Science, The University of Queensland, 1989–present.
6. National Science Foundation Small-Scale Institutional Infrastructure Panel, June 1990.
7. Founded the Association of Electronic Scholarly Journals, 1990.
8. New York Statewide Review of Doctoral Programs, site visitor, October 1990.
9. Universities Space Research Association Science Councils: CESDIS 1991–1996, ICASE 1991–1992.
10. Conference cochair for research contributions *Constructivity in Computer Science*, 1991.
11. NSF/CRA Workshop on the Computing Research Infrastructure, July 1991.
12. Advisory Board for the Information Science Research Institute at the University of Nevada, Las Vegas, 1991–1994.
13. Organizing Committee, *Third International Conference on Algebraic Methodology and Software Technology*, 1992–1993.
14. Organized *Annual NSF Infrastructure Workshop*, June 1993.
15. Chair of ACM SIGSOUND, 2001–2003.

## University Administration and Service

### Purdue University

- Dept. of Computer Sciences Undergraduate Committee, 1977–1978.
- Organized Theoretical Computer Science Seminar, 1978–1983.

- School of Science Student Cases Committee, 1978–1980.
- Science Board (renamed Science Council), a faculty/student service organization in the School of Science, 1978–1983.
- Dept. of Computer Sciences Faculty Secretary, 1979–1981.
- Faculty advisor to Purdue Velo Club, 1980–1981.
- Faculty advisor to Purdue Ethnic Dancers, 1980–1983.
- Graduate Council, 1980–1983.
- School of Science Grade Appeals Committee, 1980–1983.
- Department of Computer Sciences Personnel Committee, 1981–1983.
- Evaluated Purdue Fellowship Candidates, 1980.
- Evaluated Purdue Summer XL Proposals, 1982.
- PALS program computer demonstration for high school students, 1979–1982.
- Lecture to high school students on careers in Computer Science, 1981.
- Special Graduate School committee to study retention of female graduate students, 1982–1983. Produced a detailed multifactor statistical study of graduate student retention at Purdue.
- Department of Computer Sciences Head Search Committee, 1983.

### **The Johns Hopkins University**

- CSNet Liaison, 1983–1985.
- Engineering Computing Facility Advisory Committee, 1983–1985.
- Chairman, Faculty Search Committee, 1984.
- *Ad Hoc* Committee to Study Fiber Optic Network, 1984.
- Facilities Manager for EECS UNIX 1984–1985. Installed two VAX 11/750 systems running UNIX 4.2 BSD.

### **The University of Chicago**

- Graduate Committee, 1985–1987.
- McCormick Fellowship Selection Committee, 1986.

- Associate Chairman, Department of Computer Science, 1986–1987.
- Chairman, Department of Computer Science, 1987–1990.
- Board of Computing Activities and Services, 1986–1990; Steering Committee 1989–1994.
- Ethernet Management Committee, 1986.
- Review Committee for the Mathematics and Computer Science Division at Argonne National Laboratory, 1987–1992. Chairman, 1990–1992.
- Chairman of Working Group on Data Communications, 1987–1988.
- Working Group on Public Computing, 1987–1988.
- Supervised design and renovation of Ryerson 4th floor to add 4,000 square feet of graduate student offices, lounge, etc., 1987–1991.
- Working Group on High-Performance Computing, 1988–1989.
- Designed university statute and policy on intellectual property rights to software developed on campus, 1989.
- Chairman of Public Computing Policy Committee, 1990–1991.
- Committee on Patents, Software, and Intellectual Property, 1989–1993, chairman 1992–1993.
- Communications Architecture Committee, 1991–1995.
- Library Board, 1991–1994.
- Chairman of C.S. Dept. Computing Facilities Committee, 1991–1999, 2000–present.
- Council on Research, 1992–1993.
- Provost’s Faculty Task Force on Library Migration (studying changes to library computer systems) 1993–1994.
- Council of the University Senate, 1994–1996.
- Faculty advisor to University of Chicago Student Computing Operation, 1994–present; Student Linux Users Group 1997–present.
- Board of Computing Activities and Services, standing committee on networking, 1995–1997.

- Faculty Advisory Committee for *The Challenge of Modern Democracy*, an interdisciplinary conference held 9–10 April 1998 at the University of Chicago.
- Advisory Board to create a new program in Interactive Media in the Graham School of General Studies, 1997–2000.
- Planning committee for Franke Institute and Computation Institute joint lecture series on "Design and Information/Communication Technologies," 2000–2004.
- Physical Sciences Division Computing Committee, 2000–2004.
- Coach the University of Chicago Programming Team, 1998–present. The team competed in the World Finals in 2001, 2002, 2009, 2010, 2011.
- Physical Sciences Division Advisory Committee for the Center for Elementary Mathematics and Science Education, 2002–2005.
- Computer Science Professional Programs Faculty Oversight Committee, 2002–2008.
- Faculty advisor for student chapter of the *Association for Computing Machinery*, 1999–present.
- Faculty advisor for the *Secular Student Alliance*, 2010–present.

## Community Service

- Interviewed for the radio program "Science Alive!" April, 1986.
- Glencoe IL School District 35 Strategic Planning Retreat December, 1991.

## Research Grants and Contracts

1. *A Uniform Theory for Implementations of Descriptive Languages* (with C. Hoffmann \$5,400) Purdue Summer XL grant, 1978.
2. *A Uniform Theory for Implementations of Descriptive Languages* (with C. Hoffmann \$71,117) National Science Foundation, 1978–1980.
3. *A Uniform Theory for Implementations of Descriptive Languages* (with C. Hoffmann \$160,659) National Science Foundation, 1981–1983.
4. *Research on Programming with Equations* (with C. Hoffmann \$116,149) National Science Foundation, 1983–1985.

5. *Highly Parallel Architectures for General-Purpose Concurrent Programming Languages* (with G. Masson \$57,940) National Security Agency, 1984–1985.
6. *Equational Logic as a Programming Language* (\$27,500) Louis Block Fund, 1985–1986.
7. *Equational Logic as a Programming Language* (\$185,193) National Science Foundation, 1986–1988.
8. *Theory and Implementation of Equational Logic Programming* (\$176,333) National Science Foundation, 1988–1990.
9. *The University of Chicago Computer Science Laboratory* (\$2,030,221) National Science Foundation, 1989–1994.
10. *Rigorous Mathematical Sciences Curriculum for the Humanities and Social Sciences* (\$50,000) National Science Foundation 1990–1992.
11. *Theory and Implementation of Equational Logic Programming* (\$161,136) National Science Foundation, 1991–1993.

## Meetings Attended

1. *17th Annual Symposium on Foundations of Computer Science*, Houston, 1976.
2. *9th Annual Symposium on Theory of Computing*, Boulder, 1977.
3. *19th Annual Symposium on Foundations of Computer Science*, Ann Arbor, 1978.
4. *6th Annual Symposium on Principles of Programming Languages*, San Antonio, 1979.
5. *11th Annual Symposium on Theory of Computing*, Atlanta, 1979.
6. *Frege Conference*, Friedrich Schiller Universität, Jena, DDR, 1979.
7. *12th Annual Symposium on Theory of Computing*, Los Angeles, 1980.
8. *21st Annual Symposium on Foundations of Computer Science*, Syracuse, 1980.
9. *Verification Workshop*, Yorktown Heights, NY, 1981.
10. *13th Annual Symposium on Theory of Computing*, Milwaukee, 1981.
11. *Workshop on Recursion Theoretic Aspects of Computer Science*, W. Lafayette IN, 1981.
12. *14th Annual Symposium on Theory of Computing*, San Francisco, 1982.
13. *23rd Annual Symposium on Foundations of Computer Science*, Chicago, 1982.

14. *15th Annual Symposium on Theory of Computing*, Boston, 1983.
15. *24th Annual Symposium on Foundations of Computer Science*, Tucson, 1983.
16. *Brooklyn College Symposium on Theoretical Computer Science I: Logic in Computer Science*, 1983.
17. *11th Annual Symposium on Principles of Programming Languages*, Salt Lake City, 1984.
18. *International Symposium on Logic Programming*, Atlantic City, 1984.
19. *1984 Conference on Information Sciences and Systems*, Princeton NJ.
20. *16th Annual Symposium on Theory of Computing*, Washington DC, 1984.
21. *25th Annual Symposium on Foundations of Computer Science*, West Palm Beach, 1984.
22. *University of Maryland Special Year in Mathematical Logic and Theoretical Computer Science*, 1984–1985.
23. *12th Annual Symposium on Principles of Programming Languages*, New Orleans, 1985.
24. *Logics of Programs Workshop*, Brooklyn New York, 1985.
25. *26th Annual Symposium on Foundations of Computer Science*, Portland OR, 1985.
26. *13th Annual Symposium on Principles of Programming Languages*, St. Petersburg FL, 1986.
27. *Workshop on Theoretical Aspects of Reasoning About Knowledge*, Asilomar CA, 1986.
28. *SIGPLAN 1986 Symposium on Practical Program Development Environments*, Palo Alto CA.
29. *14th Annual Symposium on Principles of Programming Languages*, Munich, 1987.
30. *Colloquium on Resolution of Equations in Algebraic Structures*, Lakeway, Texas, 1987.
31. *2nd International Conference on Rewriting Techniques and Applications*, Bordeaux, 1987.
32. *SIGPLAN 1987 Symposium on Interpreters and Interpretive Techniques*, St. Paul MN.
33. *15th Annual Symposium on Principles of Programming Languages*, San Diego CA, 1988.
34. *1988 Snowbird Meeting of CS and EECS Department Chairs*, Snowbird UT.

35. *National Computer Conference*, Louisville KY, 1988.
36. *16th Annual Symposium on Principles of Programming Languages*, Austin TX, 1989.
37. *3rd International Conference on Rewriting Techniques and Applications*, Chapel Hill NC, 1989.
38. *17th Annual Symposium on Principles of Programming Languages*, San Francisco CA, 1990.
39. *1990 CER/II Meeting*, Atlanta GA, 1990.
40. *Association of Research Libraries Meeting about Refereed Academic Electronic Publishing Projects*, Raleigh NC, 1990.
41. *Symposium on Constructivity in Computer Science*, San Antonio TX, 1991.
42. *NSF/CRA Workshop on the Computing Research Infrastructure*, Washington DC, 1991.
43. *19th Annual Symposium on Principles of Programming Languages*, Albuquerque NM, 1992.
44. *Symposium on Character Recognition and Document Analysis*, Las Vegas NV, 1992.
45. *Conference on Academic and Professional Journals in the Twentieth Century*, Chicago IL, 1992.
46. *Association for Symbolic Logic, Annual Meeting*, South Bend IN, 1993.
47. *Annual NSF Infrastructure Workshop*, 1993.
48. *8th Annual IEEE Symposium on Logic in Computer Science*, Montreal Québec, 1993.
49. *Seminars on Academic Computing, University Executive Program*, 1993.
50. *International Conference on Refereed Electronic Journals*, Winnipeg Manitoba, 1993.
51. *Mathematical Foundations of Computer Science 1994 — 19th International Symposium*, Košice, Slovakia, 1994
52. *Acoustical Society of America*, Indianapolis, 1996.
53. *Professors and Publishing in the Electronic Academy*. The University of Tennessee, Knoxville Library, 1996.
54. *Acoustical Society of America*, Seattle, 1998.
55. *COST Digital Audio Effects Workshop (DAFx99)*, Trondheim, Norway, 1999.

56. *Acoustical Society of America*, Chicago, 2001.
57. National Science Foundation *Summit on Future Internet Architecture*, Arlington VA, October 12–15 2009 (by invitation).

## Unrefereed Lectures

1. Rigorous Development of a Lucid Interpreter. University of Waterloo, Fall 1976.
2. Automatic Interpreter Generation. Indiana University, Fall 1978; SUNY Buffalo, 16 February, 1979; IBM Research, Yorktown Hts., 8 March, 1979; IBM Research San Jose, 12 March, 1979; M.I.T., 9 April, 1979; Technische Universität, W. Berlin, 14 May, 1979; Universität Aachen, 30 May, 1979; Munich Universität, 31 May, 1979.
3. A Programming Language Theorem Which is Independent of Peano Arithmetic. Cornell University, August, 1978; SUNY Buffalo, 15 February, 1979; Universität Bielefeld, 16 May, 1979; Universität Kiel, 18 May, 1979; Universität Heidelberg, 22 May, 1979; Universität Münster, 25 May, 1979; Mathematical Institute, Warsaw, 4 June, 1979; Mathematical Institute, Amsterdam, 6 June, 1979.
4. Logic For Reasoning About Programs. Purdue University, April 1977; Humboldt Universität, E. Berlin, 15 May, 1979.
5. A Critique of the Foundations of Hoare-Style Programming Logics. New Mexico State University, 23 September, 1980 (videotape sent to University of New Mexico, New Mexico Tech.); Los Alamos Laboratories, 24 September, 1980; *Verification Workshop*, IBM Research Yorktown Heights, 5 May, 1981.
6. The Intuitive Foundations of Programming Logic. New Mexico Tech., 22 September, 1980; Los Alamos Laboratories, 24 September, 1980.
7. Implementation of an Interpreter for Abstract Equations. Iowa State University, 18 November, 1982; University of Maryland, 5 April, 1983; The Johns Hopkins University, 30 March, 1983; Cornell University, 3 August, 1983; New Mexico State University, 10 November, 1983; University of North Carolina, 19 March, 1984; AT&T Bell Laboratories, Murray Hill, 28 August, 1984; University of Connecticut, 16 November, 1984.
8. Equational Logic as a Programming Language. Tektronix, 4 February, 1985; University of Washington, 5 February, 1985; IBM Research, Yorktown Heights, 22 February, 1985; University of Delaware, 4 March, 1985; University of Wisconsin, 14 March, 1985; AT&T Bell Laboratories, Murray Hill, 21 March, 1985; Carnegie-Mellon University, 23 September, 1985; University of Pennsylvania, 26 September, 1985; Xerox PARC, 18 March, 1986; DePaul University, 1986; Mathematisch Centrum, Amsterdam, 15 January, 1987, Technische Universität, Berlin, 19 January, 1987; GMD Karlsruhe, Germany, 20 May, 1987; INRIA Sophia-Antipolis, France, 22 May, 1987.

9. Lower Bounds for Sorting With Realistic Instruction Sets. University of Chicago, 7 February, 1985.
10. Fault-Tolerant Logic for Automated Reasoning. SUNY Stony Brook, 20 February, 1985; University of Amsterdam, 16 January, 1987.
11. Semantics for Infinite and Indeterminate Computations in Logic Programming Languages. *Midwest Theory of Computation Meeting*, Purdue, 19 April, 1986.
12. Intuitive Constructive Semantics for Constructive Logic. *Midwest Theory of Computation Meeting*, University of Illinois, 15 April, 1987.
13. A Compiler for Equational Logic Programs. *Midwest Society for Programming Languages and Systems*, University of Illinois, Spring, 1988.
14. Open Problems in Equational Logic Programming. The Johns Hopkins University, 3 December, 1987; DePaul University, 29 January, 1988; SUNY Stony Brook, 26 February, 1988; University of Illinois at Chicago, 3 October, 1988; Indiana University at South Bend, December 6, 1989; University of Nevada at Las Vegas, 16 January, 1990; Universität Dortmund, 12 November, 1990; Universität Kaiserslautern, 14 November, 1990; Universität Ulm, 15 november, 1990; OCATE, Portland OR, 26 March, 1991.
15. Meaningful Semantics for Constructive Logic. University of Maryland, 2 May, 1990; Universität Würzburg, 10 November, 1990.
16. Connecting Formal Semantics to Constructive Intuitions. *Midwest Theory of Computation Meeting*, Northwestern University, 6 December, 1992; *ASL Annual Meeting*, Notre Dame University, 12 March, 1993; Université Pau 26 March, 1993; Université Bordeaux, 22 March and 1 April, 1993; Cornell University 7 June, 1993; Wesleyan University, 20 September 1993.
17. Applications of Logic to Programming Language Design and Implementation. The Johns Hopkins University, 17 December, 1992.
18. Term Tours—I/O for Lazy Functional Programs (work of Samuel Rebelsky as my Ph.D. Student). Universität Kaiserslautern, 18 February, 1993; Max Planck Institut, Saarbrücken, 18 February, 1993; Williams College, 24 September 1993, Grinnell College, 18 November 1993.
19. Electronic Publication, Refereeing, and the Economy of Attention. University of Chicago, Physics Department, 7 October, 1993.
20. Intuitive Counterexamples for Constructive Fallacies. SUNY Buffalo, 7 October 1994.
21. Electronic Journals — scholarly invariants in a changing medium. SUNY Buffalo, 7 October 1994; Dartmouth, 26 October 1994.

22. Digital Sound Synthesis. Wesleyan University, 25 October 1994; Dartmouth, 26 October 1994; Carleton College, 30 January 1996.
23. Program Execution as Logical Deduction. Macalester College, 31 January 1996.
24. Leveled Garbage Collection. The University of Iowa, 13 April 1998.
25. Minimal public-key infrastructure. USTC Hefei, 2000.
26. Why is  $P \neq NP$  so Hard to Prove? Chinese Academy of Science, Beijing, 11 September 2003.
27. Prediction vs. Commitment in Garbage Collection. USTC Hefei, September 18 2003.
28. Minimal public-key infrastructure. Wesleyan University, November 15 2004.
29. The relevance of relevance. Universidad Complutense de Madrid, June 12 2006.
30. End-to-end public-key infrastructure. Universidad Politécnica de Madrid, July 5 2006.
31. Time-frequency analysis. Reed College Math Colloquium, September 9 2010.
32. The sources of certainty in computation and formal systems, University of Chicago Formal Philosophy Workshop, November 23 2010.

## Consulting and Visiting

- Prof. R. Constable, Cornell University, type theory, 13–31 July 1981.
- Prof. D. Stanat, University of North Carolina, equational logic programming, 19–20 March 1984.
- Drs. N. Gehani and P. Wolper, AT&T Bell Laboratories, concurrent  $C$ , programming logic, December 1984 to April 1985.
- Drs. J. Williams, E. Wimmers and J. Backus, IBM Almaden Research Center, functional programming languages, 23–25 October 1990.
- Professeur Associé at Université de Bordeaux 1, Unité Formation et Recherche de Mathématique et d’Informatique, 16 March to 17 April 1993.
- Chicago Department of Aviation, Y2K date problem, December 1998 through December 1999.
- Internal Revenue Service, expert testimony on research tax credit, February 1999 through May 2000.

- Illinois Attorney General, FDC failures, 2000–2003.
- Universidad Politécnica de Madrid, Spring 2006.

## M.S. Students

1. The University of Chicago
  - (a) Susanne Lefvert (visiting from Lulea University of Technology), 2001–2002, user interface for *Loris* sound synthesis/morphing/analysis.

## Ph.D. Students

1. Purdue University
  - (a) Paul Chew, 1979–1981, *Normal Forms in Term Rewriting Systems*.
  - (b) Eric Dittert, 1980–1982, *On the Complexity of Retrieving Information*.
2. The Johns Hopkins University
  - (a) Robert Strandh, 1983–1987, *Compiling Equational Programs into Efficient Machine Code*.
3. The University of Chicago
  - (a) Samuel Rebelsky, 1987–1993, *Tours, a System for Lazy Term-Based Communication*.
  - (b) David Sherman, 1987–1994, *Run-Time and Compile-Time Improvements to Equational Programs*.
  - (c) Donald Ziff, 1989–1995, *Lazy Functional Programming for Full-Text Information Retrieval*.
  - (d) Stephen Bailey, 1988–1995, *Hielp, a Fast Interactive Lazy Functional Language System*.
  - (e) Guanshan Tong, 1993–1997, *Design and Evaluation of a High-Performance Automatic Memory Management System*.
  - (f) Ilya Bisnovatyi, 1993–2006 (withdrew), sound synthesis.

## Postdoctoral Associates

1. William Winsborough, 1988–90.
2. Yiyun Chen, 1989–91.

## Courses Taught

### Summary

#### Undergraduate

- Numerical Analysis
- Introductory Programming in *Pascal*, *Fortran*, *Scheme*
- Data Structures
- Theory of Computation
- Algorithm Design and Analysis
- Programming Languages
- Digital Sound Modeling
- Operating Systems
- Advanced Operating Systems
- Computation, Information and Description (concerning applications of computational ideas to philosophy, mathematics, physics, biology, etc.)
- Computer Architecture
- Free Software Practicum

#### Graduate

- Program Verification
- Constructive Logic
- Digital Sound
- Theory of Computation
- Algorithm Design and Analysis
- File Structures
- Computational Complexity
- Logic Programming

- Lambda Calculus
- Operating Systems
- Advanced Operating Systems
- Computer System Administration
- Computer Architecture
- Mathematical Transforms for Signal Processing
- Big Ideas in Computer Science

## Chronology (G-graduate, U-undergraduate)

### **Cornell University**

Spring 1976 CS 790 Seminar in Program Verification (G)

### **University of Toronto**

Spring 1977 CSC 336S Numerical Analysis (U)

### **Purdue University**

Autumn 1977 CS 220N Programming I (U)

CS 484 Theory of Computation (U)

CS 590V Seminar in Programming Logic (G)

Spring 1978 CS 484 Theory of Computation (U)

CS 482 Algorithm Design and Analysis (U)

Autumn 1978 CS 230 Programming I (U)

CS 484 Theory of Computation (U)

Spring 1979 CS 330 Programming II (U)

CS 582 Survey of Algorithms, Automata, and Formal Languages (G)

Autumn 1979 CS 430 Data Structures (U)

CS 582 Survey of Algorithms, Automata, and Formal Languages (G)

Spring 1980 CS 580 Algorithm Design and Implementation (G)

CS 590B Seminar in Programming Logic and Verification (G)

Autumn 1980 CS 320 Programming II for Engineers and Scientists (U)

CS 582 Survey of Algorithms, Automata, and Formal Languages (G)

Spring 1981 CS 540 File Structures (G)

CS 584 Theory of Algorithms and Computational Complexity (G)

Autumn 1981 CS 540 File Structures (G)

Spring 1982 CS 580 Algorithm Design and Implementation (G)

Autumn 1982 CS 414 Numerical Methods (U)

CS 484 Introduction to the Theory of Computation (U)

Spring 1983 CS 584 Theory of Algorithms and Computational Complexity (G)

### **The Johns Hopkins University**

Autumn 1983 52.329 Logic Programming (G)

Spring 1984 52.324 The Lambda Calculus and Its Relationship  
With Computable Functions (G)

Autumn 1984 52.8 Introduction to Computer Programming (U)

Spring 1985 52.8 Introduction to Computer Programming (U)

### The University of Chicago

Winter	1986	Constructive Logic Seminar (G)
Winter–Spring	1986	ComSci 388 Logic Programming Languages I–II (G)
Winter–Spring	1987	ComSci 488 The Lambda Calculus (G)
Winter–Spring	1988	ComSci 388 Logic Programming Languages I–II (G)
Autumn	1988	ComSci 280 Theory of Computation I (U)
Winter	1989	ComSci 221 Programming Languages (U)
Winter	1990	ComSci 221 Programming Languages (U)
Spring	1990	ComSci 388 Equational Logic Programming (G)
Autumn	1990	ComSci 280 Theory of Computation I (U)
Winter	1991	ComSci 221 Programming Languages (U)
Autumn	1991	ComSci 319 The Lambda Calculus (G)
Winter	1992	ComSci 221 Programming Languages (U)
Spring	1992	ComSci 281 Theory of Computation II (U)
Autumn	1992	ComSci 388 Logic Programming Languages (G)
Winter	1993	ComSci 221 Programming Languages (U)
Autumn	1993	ComSci 398 Seminar on Sound Modeling (G)
Winter	1994	ComSci 221 Programming Languages (U)
Winter	1994	ComSci 398 Seminar on Sound Modeling (G)
Spring	1994	ComSci 295 Digital Sound Modeling (U)
Winter	1995	ComSci 221 Programming Languages (U)
Spring	1995	ComSci 295 Digital Sound Modeling (U)
Autumn	1995	ComSci 230/330 Operating Systems (U/G)
Winter	1996	ComSci 231/331 Advanced Operating Systems (U/G)
Spring	1996	ComSci 295 Digital Sound Modeling (U)

### The University of Iowa

Spring	1997	22C:096 Computation Information & Description (U)
Spring	1997	22C:196 Digital Sound Modeling (U)

## The University of Chicago

Autumn	1997	ComSci 501 System Administration in Linux (G)
Winter	1998	ComSci 222/322 Machine Organization (U/G)
Spring	1998	ComSci 230/330 Operating Systems (U/G)
Autumn	1998	ComSci 105 Fundamentals of Computer Programming (U)
Winter	1999	ComSci 222/322 Computer Architecture (U/G)
Spring	1999	ComSci 295 Digital Sound Modeling (U)
Autumn	1999	ComSci 221/321 Programming Languages (U/G)
Winter	2000	ComSci 319 The Lambda Calculus (G)
Spring	2000	ComSci 295 Digital Sound Modeling (U)
Autumn	2000	ComSci 221 Programming Languages (U)
Winter	2001	ComSci 392 Realizability Semantics (G)
Spring	2001	ComSci 295 Digital Sound Modeling (U)
Autumn	2001	ComSci 22100 Programming Languages (U)
Spring	2002	ComSci 31900 Lambda Calculus (G)
Spring	2002	ComSci 29500 Digital Sound Modeling (U)
Autumn	2002	ComSci 12500 Honors Introduction to Computer Programming (U)
Autumn	2002	ComSci 22800 Free Software Practicum (U)
Spring	2003	ComSci 22800 Free Software Practicum (U)
Spring	2003	ComSci 29500 Digital Sound Modeling (U)
Autumn	2003	CMSC 16100 Honors Introduction to Computer Programming (U)
Spring	2004	CMSC 29500 Digital Sound Modeling (U)
Winter	2005	CMSC 34910 Mathematical Transforms for Signal Processing (G)
Spring	2005	CMSC 29500 Digital Sound Modeling (U)
Spring	2005	CMSC 31900 Lambda Calculus (G)
Autumn	2006	CMSC 31100 Big Ideas in Computer Science (G)
Winter	2007	CMSC 29500 Digital Sound Modeling (U)
Spring	2007	CMSC 33601 Strategic Choices in Designing the Internet (G))
Autumn	2008	CMSC 31100 Big Ideas in Computer Science (G)
Winter	2008	CMSC 29500 Digital Sound Modeling (U)
Spring	2009	CMSC 33601 Strategic Choices in Designing the Internet (G))
Autumn	2009	CMSC 31100 Big Ideas in Computer Science (G)
Spring	2010	CMSC 29500 Digital Sound Modeling (U)
Autumn	2010	CMSC 31100 Big Ideas in Computer Science (G)