

## Richard C. Waters

ACM Distinguished Scientist

Mitsubishi Electric Research Laboratories (MERL)  
201 Broadway; Cambridge MA 02139

617-621-7508  
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### Experience

1999–, President and CEO, Mitsubishi Electric Research Labs (MERL) (Cambridge MA).  
Leading the 80-person North American R&D operations of Mitsubishi Electric. As in any research lab, the central challenge is creating a culture that leads to results that are both scientifically significant and of significant economic benefit to the parent company.

2001–02, Interim Director, MERL Cambridge Systems Lab (Cambridge MA).  
Directly supervised an advanced development staff of 20 for six months while piloting the transition to a new director for the laboratory. Took strong steps to energize the laboratory and focus its efforts in new directions.

1998–99, Senior Vice President, MERL (Cambridge MA).

1998–00, Director, MERL Cambridge Research Lab (Cambridge MA).

Directly supervised a research staff of 25 in pursuit of application-oriented basic research in computer science, while participating in the management team of MERL as a whole. Guided the laboratory toward greater impact on the parent company. (Continued to lead the laboratory for a year after becoming President of MERL.)

1996–, Research Fellow, MERL (Cambridge MA).

1991–96, Senior Research Scientist, MERL Cambridge Research Lab (Cambridge MA).

Founding member of the laboratory. Led research on distributed virtual environments for education and collaboration—computer systems where multiple users interact in real time over the Internet in 3D visual and audio environments. In the late 90s, continued research in the areas of computer graphics, speech interfaces, and computer vision applications.

1991–04, Research Affiliate, MIT AI Laboratory (Cambridge MA).

Involved with research on AI, software engineering, and multimedia; supervised theses.

1982–91, Principal Research Scientist, MIT AI Laboratory (Cambridge MA).

1978–82, Research Scientist, MIT AI Laboratory (Cambridge MA).

Co-principal investigator Programmer’s Apprentice project. The goal of this project was the creation of a system that could assist programmers in developing and maintaining computer programs. Supervised a number of PhD, MS and BS theses.

1999–, President, John L. and Geraldine R. Weil Memorial Charitable Foundation (Newton MA).

Head of this foundation dedicated to the understanding and elimination of child abuse (see “<http://jgweil.org>”).

### Education

Ph.D. 1978, MIT Department of EE & CS (Cambridge MA)

Research on Artificial Intelligence and Software Engineering under G.J. Sussman.  
Minor in Linguistics.

M.S. 1973, Harvard University (Cambridge MA).

B.S. 1972 Magna Cum Laude, Brown University (Providence RI).

### Selected Additional Activities

- Member board of Trustees, The Carroll School (Lincoln MA), 2010–  
 Chair, 2015–21.  
 Vice-Chair, 2013–15.  
 Member Executive Committee, 2012–21.
- Member Board of Directors, Mitsubishi Electric America Foundation, 2003–  
 (the philanthropic arm of the Mitsubishi Electric Company in North America).
- Member General Board of Directors, YMCA of Greater Boston, 2006–15.  
 Treasurer, 2011–14.
- General Co-Chair, 2012 Computing Research Association Snowbird Conference,  
 Snowbird Utah, July 2012.
- Member Board of Directors, Computing Research Association, 2002–2011  
 Member of the Executive Committee, 2005–07.
- Member Association for Computing Machinery Job Migration Task Force, 2004–05.  
 Chair of the committee that wrote the section on the globalization of IT research.
- General Co-Chair, 2004 Computing Research Association Snowbird Conference,  
 Snowbird Utah, July 2004.
- Member editorial board of *Presence: Teleoperators and Virtual Environments*, MIT Press, 1998–2005.
- General Co-Chair (with Chikofsky E.), first Working Conference on Reverse Engineering,  
 Baltimore MD, May 1993.
- Founding member editorial board of *Automated Software Engineering*, Kluwer Academic Press, 1992–98.
- Member organizing committee, AAAI-92 Workshop on Artificial Intelligence  
 and Automated Program Understanding, July 1992.
- Editor Algorithms section of *ACM Lisp Pointers*, 1991–96.
- Program Co-Chair, *Enabling Technology and Systems* area of the  
 1991 National Conference on Artificial Intelligence, Anaheim CA, July 1991.
- Major technical contributor to the ANSI Common Lisp standardization committee (X3J13), 1987–90.

### Books

- Waters R.C. & Chikofsky E.J. (editors), *Proc. Working Conference on Reverse Engineering*,  
 (Baltimore MD, May 1993), IEEE Computer Society Press, Los Alamitos CA, 1993.
- Rich C. & Waters R.C., *The Programmer's Apprentice*,  
 Addison-Wesley, Reading MA and ACM Press, Baltimore MD, 1990.
- Rich C. & Waters R.C. (editors), *Readings in Artificial Intelligence and Software Engineering*,  
 Morgan Kaufmann, Los Altos CA, 1986.

### Publications in Refereed Journals

- Waters R.C, Anderson D.B., Barrus J.W., Brogan D.C., Casey M.A., McKeown S.G.,  
 Nitta T., Sterns I.B. & Yerazunis W.S.,  
 “Diamond Park and Spline: Social Virtual Reality with 3D Animation,  
 Spoken Interaction, and Runtime Extendability,”  
*Presence: Teleoperators and Virtual Environments*, 6(4):461–480, August 1997.

- Waters R.C. & Barrus J.W., "The Rise of Shared Virtual Environments,"  
*IEEE Spectrum*, 34(3):20-25, March 1997.
- Barrus J.W., Waters R.C. & Anderson D.B., "Locales: Supporting Large Multiuser Virtual Environments,"  
*IEEE Computer Graphics and Applications*, 16(6):50-57, November 1996.
- Schabes Y. & Waters R.C., "Tree Insertion Grammar: A Cubic-Time Parsable Formalism  
That Lexicalizes Context-Free Grammar Without Changing the Trees Produced,"  
*Computational Linguistics*, 21(4):479-513, December 1995.
- Waters R.C., "The Audio Interactive Tutor,"  
*Computer Assisted Language Learning*, 8(4):325-354, December 1995.
- Anderson D.B., Barrus J.W., Howard J., Rich C., Shen C. & Waters R.C.,  
"Building Multiuser Interactive Multimedia Environments at MERL,"  
*IEEE MultiMedia*, 2(4):77-82, Winter 1995.
- Rich C., Waters R.C., Strohecker C., Schabes Y., Freeman W.T., Torrance M.C., Golding A.R. & Roth M.,  
"Demonstration of an Interactive Multimedia Environment,"  
*IEEE Computer*, 27(12):15-22, December 1994.
- Rich C., Waters R.C., Schabes Y., Freeman W.T., Torrance M.C., Golding A.R. & Roth M.,  
"An Animated On-Line Community with Artificial Agents,"  
*IEEE MultiMedia*, 1(4):32-42, Winter 1994.
- Waters R.C. & Chikofsky E.J. (editors), *Special Section on Reverse Engineering*,  
*Communications of the ACM*, 37(5):22-93, May 1994.
- Waters R.C., "Cliché-Based Program Editors,"  
*ACM Transactions on Programming Languages and Systems*, 16(1):102-150, January 1994.
- Rich C. & Waters R.C., "Knowledge Intensive Software Engineering Tools,"  
*IEEE Transactions on Knowledge and Data Engineering*, 4(5):424-430, October 1992.
- Reubenstein H.B. & Waters R.C., "The Requirements Apprentice:  
Automated Assistance for Requirements Acquisition,"  
*IEEE Transactions on Software Engineering*, 17(3):226-240, March 1991.  
(Reprinted in *Conceptual Modelling, Databases and CASE: An Integrated View of Information  
Systems Development*, Loucopoulos P. & Zicari R. (editors), John Wiley, New York, 1992.)
- Waters R.C., "Automatic Transformation of Series Expressions into Loops,"  
*ACM Transactions on Programming Languages and Systems*, 13(1):52-98, January 1991.
- Waters R.C., "Automated Software Management Based on Structural Models,"  
*Software—Practice & Experience*, 19(10):931-955, October 1989.
- Rich C. & Waters R.C., "The Programmer's Apprentice Project: A Research Overview,"  
*IEEE Computer*, 21(11):10-25, November 1988.  
(Reprinted in *Artificial Intelligence at MIT: Expanding Frontiers*, Volume 1, 166-195,  
Winston P.H. with Shellard S.A. (editors), MIT Press, Cambridge MA, 1990.)  
(Reprinted in *Artificial Intelligence and Software Engineering*, 155-182,  
Partridge D. (editor), Ablex, Norwood NJ, 1991.)
- Waters R.C., "Program Translation via Abstraction and Reimplementation,"  
*IEEE Transactions on Software Engineering*, 14(8):1207-1228, August 1988.  
(Reprinted in *Software Reengineering*, Arnold R. (editor),  
IEEE Computer Society Press, Los Alamitos CA, 1993.)

- Rich C. & Waters R.C., “Automatic Programming: Myths and Prospects,”  
*IEEE Computer*, 21(8):40–51, August 1988.  
 (Reprinted in translation in *Automatic Programming Handbook*, 41–55,  
 Ohno Y. & Harada M. (editors), Ohmsha Ltd., Tokyo Japan, 1989.)
- Waters R.C., “The Programmer’s Apprentice: A Session With KBEmacs,”  
*IEEE Transactions on Software Engineering*, 11(11):1296–1320, November 1985.  
 (Reprinted in *Readings in Artificial Intelligence and Software Engineering*, 351–376,  
 Rich C. & Waters R.C. (editors), Morgan Kaufmann, Los Altos CA, 1986.)  
 (Reprinted in *Language Architectures and Programming Environments*, 204–255,  
 Ichikawa T. & Tsubotani H. (editors), World Scientific Publishing Co., Singapore, 1992.)
- Waters R.C., “User Format Control in a Lisp Prettyprinter,”  
*ACM Transactions on Programming Languages and Systems*, 5(4):513–531, October 1983.
- Waters R.C., “The Programmer’s Apprentice: Knowledge Based Program Editing,”  
*IEEE Transactions on Software Engineering*, 8(1):1–12, January 1982.  
 (Reprinted in *Interactive Programming Environments*, 464–486,  
 Barstow D., Shrobe H. & Sandewal E. (editors), McGraw-Hill, New York NY, 1984.)
- Waters R.C., “A Method for Analyzing Loop Programs,”  
*IEEE Transactions on Software Engineering*, 5(3):237–247, May 1979.

### Publications in Refereed Conference Proceedings

- Kruja E., Marks J., Blair A. & Waters R.C., “A Short Note on the History of Graph Drawing,”  
*proc. 9th International Symposium on Graph Drawing*, (Vienna Austria, September 2001),  
 272–286, Springer-Verlag, Berlin, 2002.
- Waters R.C., Anderson D.B. & Schwenke D.L., “Design of the Interactive Sharing Transfer Protocol”,  
*Postproc. WET ICE ’97 – IEEE Sixth Workshops on Enabling Technologies:  
 Infrastructure for Collaborative Enterprises*, (MIT, June 1997), 140–147,  
 IEEE Computer Society Press, Los Alamitos CA, 1997.
- Barrus J.W. & Waters R.C., “QOTA: A Fast, Multi-Purpose Algorithm  
 For Terrain Following in Virtual Environments,”  
*Proc. VRML ’97 Symposium*, (Monterey CA, February 1997), 59–64,  
 Association for Computing Machinery, NY NY, 1997.
- Barrus J.W., Waters R.C. & Anderson D.B., “Locales and Beacons:  
 Efficient and Precise Support for Large Multi-User Virtual Environments,”  
*Proc. IEEE Virtual Reality Annual International Symposium*, (Santa Clara CA, March 1996),  
 204–213, IEEE Computer Society Press, Los Alamitos CA, 1996.
- Schabes Y. & Waters R.C., “Lexicalized Context-Free Grammars,”  
*Proc. 31st Annual Meeting of the Association for Computational Linguistics*,  
 (Columbus OH, June 1993), 121–129, Association for Computational Linguistics, 1993.
- Selfridge P.G., Waters R.C. & Chikofsky E.J., “Challenges to the Field of Reverse Engineering,”  
*Proc. Working Conference on Reverse Engineering*, (Baltimore MD, May 1993), 144–150,  
 IEEE Computer Society Press, Los Alamitos CA, 1993.
- Reubenstein H.B. & Waters R.C., “The Requirements Apprentice: An Initial Scenario,”  
*Proc. Fifth International Workshop on Software Specification and Design*, (Pittsburgh PA,  
 May 1989), 211–218, IEEE Computer Society Press, Washington DC, 1989.
- Waters R.C., “Using Obviously Synchronizable Series Expressions Instead of Loops,”  
*Proc. 1988 International Conference on Computer Languages*, (Miami FL, October 1988),  
 338–346, IEEE Computer Society Press, Washington DC, 1988.

- Waters R.C., “Efficient Interpretation of Synchronizable Series Expressions,”  
*Proc. ACM SIGPLAN '87 Symposium on Interpreters and Interpretive Techniques*,  
 (St. Paul MN, June 1987), *ACM SIGPLAN Notices*, 22(7):74–85, July 1987.
- Rich C., Waters R.C. & Reubenstein H.B., “Toward a Requirements Apprentice,”  
*Proc. Fourth International Workshop on Software Specification and Design*, (Monterey CA,  
 April 1987), 79–86, IEEE Computer Society Press, Washington DC, 1987.  
 (Reprinted in *System and Software Requirement Engineering* 439–446,  
 Thayer R. & Dorfman M. (editors), IEEE Computer Society Press, Los Alamitos CA, 1990.)
- Waters R.C., “Reuse of Clichés in the Knowledge-Based Editor,”  
*Proc. International Workshop on Advanced Programming Environments*, (Trondheim Norway,  
 June 1986), *Advanced Programming Environments, Proceedings of an International Workshop*,  
 Conradi R., Didriksen T.M. & Wanvik D.H. (editors), *Lecture notes*  
*in Computer Science*, 244:536–550, Springer-Verlag, New York NY, June 1986.
- Waters R.C., “Expressional Loops,”  
*Proc. Eleventh ACM SIGACT-SIGPLAN Symposium on Principles of Programming*  
*Languages*, (Salt Lake City UT, January 1984), 1–10, ACM Press, Baltimore MD, 1984.
- Rich C. & Waters R.C., “Formalizing Reusable Software Components,”  
*Proc. Workshop on Reusability in Programming*, (Newport RI, September 1983), 152–159,  
 ITT Corporation, Hartford CN, 1983.
- Rich C. & Waters R.C., “The Disciplined Use of Simplifying Assumptions,”  
*Proc. Second ACM SIGSOFT Software Engineering Symposium:*  
*Workshop on Rapid Prototyping*, (Columbia MD, April 1982),  
*ACM SIGSOFT Software Engineering Notes*, 7(5):150–154, December 1982.
- Waters R.C., “A Knowledge Based Program Editor,”  
*Proc. Seventh International Joint Conference on Artificial Intelligence*, (Vancouver BC Canada,  
 August 1981) 2:920–926, American Association for Artificial intelligence, Menlo Park CA, 1981.  
 (Now available from Morgan Kaufmann, Los Altos CA.)
- Waters R.C., “The Programmer’s Apprentice,”  
*Proc. CYBERSOFT 80 - International Symposium on Cybernetics and Software*, (Namur  
 Belgium, September 1980), 11–35, University of Namur, Namur Belgium, 1980.
- Waters R.C., “A Method for Automatically Analyzing Programs,”  
*Proc. Sixth International Joint Conference on Artificial Intelligence*, (Tokyo Japan,  
 August 1979), 2:935–941, Stanford University Computer Science Dept., Stanford CA, 1979.  
 (Now available from Morgan Kaufmann, Los Altos CA.)
- Rich C., Shrobe H.E. & Waters R.C., “An Overview of the Programmer’s Apprentice,”  
*Proc. Sixth International Joint Conference on Artificial Intelligence*, (Tokyo Japan,  
 August 1979), 2:827–828, Stanford University Computer Science Dept., Stanford CA, 1979.  
 (Now available from Morgan Kaufmann, Los Altos CA.)

### Book Chapters

- Waters R.C. (lead author) with Hartmanis J. & Varma R., “The Globalization of IT Research”  
 in *Globalization and Offshoring of Software - A Report of the ACM Job Migration Task Force*, 155–161,  
 Aspray W., Mayadas F. & Vardi M. (editors), Association for Computing Machinery, NY NY, 2006.
- Waters R.C. & Barrus J.W., “Sharing Distributed Virtual Worlds,”  
 in *VRML Clearly Explained – 2nd Edition*, 481–515, Vacca, J.R.,  
 Academic Press Professional, Boston MA, 1998.

- Schabes Y. & Waters R.C., “Stochastic Lexicalized Tree-Insertion Grammar,”  
in *Recent Advances in Parsing Technology*, 281–294, Bunt H. & Tomita M. (editors),  
Kluwer Academic Publishers, Norwell MA, 1996.
- Rich C. & Waters R.C., “Approaches to Automatic Programming,”  
in *Advances in Computers*, Volume 37, 1–57,  
Yovits M.C. (editor), Academic Press, San Diego CA, 1993.
- Waters R.C., “Pretty Printing,”  
Chapter 27 in *Common Lisp: the Language*, Second Edition, 748–769,  
Steele G.L.Jr., Digital Press, Burlington MA, 1990.
- Waters R.C., “Series,”  
Appendix A in *Common Lisp: the Language*, Second Edition, 923–955,  
Steele G.L.Jr., Digital Press, Burlington MA, 1990.
- Perdue C. & Waters R.C., “Generators and Gatherers,”  
Appendix B in *Common Lisp: the Language*, Second Edition, 956–959,  
Steele G.L.Jr., Digital Press, Burlington MA, 1990.
- Rich C. & Waters R.C., “Formalizing Reusable Software Components in the Programmer’s Apprentice,”  
in *Software Reusability, Volume II, Applications and Experience*, 313–343,  
Biggerstaff T. & Perlis A. (editors), Addison-Wesley, Reading MA, 1989.
- Rich C. & Waters R.C., “Artificial Intelligence and Software Engineering,”  
in *AI in the 1980’s and Beyond: An MIT Survey*, 109–154,  
Grimson W.E.L. & Patil R.S. (editors), MIT Press, Cambridge MA 1987.  
(This chapter is a revised version of the introduction to  
*Readings in Artificial Intelligence and Software Engineering*, Rich C. & Waters R.C. (editors).)
- Rich C. & Waters R.C., “Software Development Technology,”  
in *Artificial Intelligence and Fifth Generation Computer Technologies: The Technology  
and the Commercial Prospects*, 179–206, Brattle Research Corporation, Boston MA, 1982.
- Waters R.C., “Programmer’s Apprentice,”  
in *The Handbook of Artificial Intelligence*, 2:343–349, Barr A. & Feigenbaum E. (editors),  
William Kaufmann, Los Altos CA, 1982.  
(Also in *Automatic Programming*, 43–49,  
Elschlager R. & Philips J. (editors), Stanford Univ. Memo HPP-79-24, August 1979.)

### Publications in Non-Refereed Journals

- Waters R.C., “Inside MERL: Making Innovation Happen,”  
*Computing Research News*, 29(4):3-5, Computing Research Association,  
Washington DC, April 2017.
- Waters R.C., “Results of CRA’s 2004 Salary Survey of Computing Research Staff in Industrial Labs,”  
*Computing Research News*, 17(5):3&6, Computing Research Association,  
Washington DC, November 2005.
- Waters R.C., “Mitsubishi Electric Research Laboratories,”  
*Computing Research News*, 12(5):1&22, Computing Research Association,  
Washington DC, November 2000.
- Waters R.C., “Mitsubishi Electric Information Technology Center America, Inc.”  
(in Japanese), *Transactions of the Institute of Electronics, Information and  
Communication Engineers*, 5(1):18-19, April 2000.

- Waters R.C., Anderson D.B., Yerazunis W.S., Kozuka H. & Fukuoka H.,  
 “Spline: A Software Platform For Distributed Virtual Environments,”  
 (in Japanese), *Mitsubishi Denki Giho* (Mitsubishi Electric’s technical journal), 71(2):26–29,  
 February 1997.
- Waters R.C., “Interactive Story Systems: Plot and Character,”  
 in “The 1995 AAAI Spring Symposia Reports,” *AI Magazine*, 16(3):7–10, Fall 1995.
- Waters R.C., “The Survival of Lisp: Either We Share, Or It Dies,”  
*ACM Lisp Pointers*, 7(1-2):23–26, January–June 1994.
- Waters R.C., “To NReverse When Consing a List or By Pointer Manipulation, To Avoid It;  
 That Is the Question,”  
*ACM Lisp Pointers*, 6(4):27–34, October–December 1993.
- Waters R.C., “Macroexpand-All: An Example of a Simple Lisp Code Walker,”  
*ACM Lisp Pointers*, 6(1):25–32, January–March 1993.
- Waters R.C., “Using the New Common Lisp Pretty Printer,”  
*ACM Lisp Pointers*, 5(2):27–34, April 1992.
- Norvig P. & Waters R.C., “Implementing Queues in Lisp,”  
*ACM Lisp Pointers*, 4(4):2–8, October 1991.
- Waters R.C., “Determining the Coverage of a Test Suite,”  
*ACM Lisp Pointers*, 4(4):33–43, October 1991.
- Waters R.C., “System Validation via Constraint Modeling,”  
*ACM SIGPLAN Notices*, 26(8):27–36, August 1991.
- Waters R.C., “Supporting the Regression Testing of Lisp Programs,”  
*ACM Lisp Pointers*, 4(2):47–53, June 1991.
- Waters R.C. & Tan Y.M., “Toward a Design Apprentice:  
 Supporting Reuse and Evolution in Software Design,”  
*ACM SIGSOFT Software Engineering Notes*, 16(2):33–44, April 1991.
- Waters R.C., “The Series Macro Package,”  
*ACM Lisp Pointers*, 3(1):7–28, March 1990.
- Finkelstein A. & Waters R.C., “Summary of the Requirements Elicitation, Analysis and  
 Formalization Track [of the Fifth International Workshop on Software Specification and Design],”  
*ACM SIGSOFT Software Engineering Notes*, 15(5):40, July 1989.
- Waters R.C., “KBEmacs: Where’s the AI?,”  
*AI Magazine*, 7(1):47–56, Spring 1986.  
 (Reprinted in *Proc. Second Kansas Conference: Knowledge-Based Software Development*,  
 (Manhattan KS, October 1986), Kansas State University, Manhattan KS, 1986.)
- Waters R.C., “Program Editors Should Not Abandon Text Oriented Commands,”  
*ACM SIGPLAN Notices*, 17(7):39–46, July 1982.
- Rich C. & Waters R.C., “Computer Aided Evolutionary Design for Software Engineering,”  
*ACM SIGART Newsletter*, (76):14–15, April 1981.

### Publications in Non-Refereed Conference Proceedings

- Waters R.C., “A Prototype Interactive Environment for Collaborative Learning,”  
*Proceedings of the Computer Assisted Language Instruction Consortium 1995 Annual  
 Symposium “Computers & Collaborative Learning”*, 184–185, (Middlebury VT, June 1995),  
 Duke University, Durham NC, 1995.

- Waters R.C., “‘Plot Control’ in a Foreign Language Practice System,”  
*Working Notes 1995 AAAI Spring Symposium: Interactive Story Systems: Plot and Character*, 112–113, (Stanford University, March 1995), 1995.
- Rich C., Waters R.C., Strohecker C., Schabes Y., Freeman W.T., Torrance M.C., Golding A.R. & Roth M.,  
 “A Prototype Interactive Environment for Collaboration and Learning,”  
*Notes 1994 AAAI workshop on Artificial Intelligence, Artificial Life, and Entertainment*, page 56,  
 (Seattle WA, August 1994), 1994.
- Schabes Y. & Waters R.C., “Combining Word Sensitivity, Hierarchical Structure Sensitivity,  
 and Processing Efficiency in a Stochastic Language Model,”  
*Proc. 1993 IEEE Workshop on Automatic Speech Recognition*,  
 (Snowbird Utah, December 1993), 1993.
- Schabes Y. & Waters R.C., “Stochastic Lexicalized Context-Free Grammar,”  
*Proc. Third International Workshop On Parsing Technology*, (Tilburg, The Netherlands,  
 August 1993), 257–266, Association for Computational Linguistics Special Interest  
 Group on Parsing, 1993.
- Waters R.C., “Support for Reuse in the Programmer’s Apprentice,”  
*Proc. Fall 1990 Conference on the 4 Rs of Software Automation: RAD, Re-Engineering, Repositories, and Reusability*, (Boston MA, August 1990), L64–L76,  
 Extended Intelligence Inc., Chicago IL, 1990.
- Waters R.C., “Programming in the Year 2009,”  
*Preprints for the International Workshop on Artificial Intelligence and Software Engineering*,  
 (Exeter, England, April 1989), 1-5, University of Exeter, England, 1989.
- Rich C. & Waters R.C., “The Programmer’s Apprentice,”  
*Proc. CASE ’87 First International Workshop on Computer-Aided Software Engineering*,  
 (Cambridge MA, May 1987), 2:1036–1039, Index Technology Corp., Cambridge MA, 1987.
- Waters R.C., “The Programmer’s Apprentice: Knowledge Based Program Editor,”  
*Conference Record IEEE Mini/Micro Northeast-84*, (Boston MA, May 1984),  
 Session 16:1-9, IEEE, Piscataway NJ, 1984.
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*Proc. of the Eighth IBM (ACIS) University Study Conference*,  
 (Raleigh NC, October 1983), 95–117, IBM, White Plains NY, 1983.

### Patents

- Laughman C., Burns D., Bortoff S, Waters R.C.,  
*Spatially distributed air-conditioning system*,  
 US Patent 9,518,765, Disclosed 2/12, filed 9/13, granted 12/16.
- Kniazev A., Gadde A., Tian D., Mansour H., Waters R.C.,  
*Method and System for Reconstructing Sampled Signals*  
 US Patent 9,510,787, Disclosed 5/14, filed 12/14, granted 8/16.
- Waters R.C., Thornton J., Raskar R., Kato M. & Dietz P.,  
*Self-Correcting Rear Projection Television*,  
 US Patent 7,227,592, Disclosed ?/03, filed 9/03, granted 6/07.
- Waters R.C., *Automatic Indicator System and Method*,  
 US Patent 7,215,324, Disclosed 3/02, filed 10/02, granted 5/07.
- Waters R.C. & Russell F., *Video Camera Controlled Surround Sound*,  
 US Patent 6,741,273, disclosed 6/99, filed 7/99, granted 5/04.



- Waters R.C., *Situation Awareness System*,  
US Patent 6,396,535, disclosed 12/98, filed 2/99, granted 5/02.
- Waters R.C., Jones T.R., Perry R. & Seiler L., *Method and Apparatus For Multi-Phase Rendering*,  
US Patent 6,359,619, disclosed 6/98, filed 6/99, granted 3/02.
- Waters R.C. & Anderson D.B., *System For the Reliable, Fast, Low-Latency Communication of Object State Updates Over a Computer Network by Combining Lossy and Lossless Communications*,  
US Patent 6,006,254, disclosed 7/97, filed 8/97, granted 12/99.
- Waters R.C., *Beacons for Locales*,  
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- Anderson D.B. & Waters R.C., *System For Sending Small Positive Data Notification Messages Over a Network To Indicate That a Recipient Node Should Obtain a Particular Version of a Particular Data Item*,  
US patent 5,842,216, disclosed 1/96, filed 5/96, granted 11/98.
- Yerazunis W.S. & Waters R.C., *Method for Smooth Motion in a Distributed Virtual Environment*,  
US patent 5,793,382, disclosed 12/95, filed 6/96, granted 8/98.
- Barrus J.W. & Waters R.C., *System For Designing a Virtual Environment Utilizing Locales*,  
US patent 5,736,990, disclosed 6/95, filed 8/95, granted 4/98.
- Waters R.C., *Audio Interactive Tutor*,  
US patent 5,540,589, disclosed 3/93, filed 4/94, granted 7/96.
- Schabes Y. & Waters R.C., *System For Decreasing the Time Required To Parse a Sentence*,  
US patent 5,475,588, disclosed 6/93, filed 6/93, granted 12/95.

### Doctoral Theses (Supervisor)

- Reubenstein, Howard B., *Automated Acquisition of Evolving Informal Descriptions*,  
MIT/AI/TR-1205, June 1990.
- Ciccarelli, Eugene C. IV, *Presentation Based User Interfaces*,  
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### Doctoral Theses (Reader)

- MacIntyre, Blair, *Exploratory Programming of Distributed Augmented Environments*,  
Columbia University, December 1998.
- Casey, Michael A., *Auditory Group Theory: With Applications to Statistical Basis Methods for Structured Audio*,  
MIT, December 1997.
- Rodriguez, Luis H. Jr., *View-Based Abstraction: Enhancing Maintainability and Modularity in the Presence of Implementation Dependencies*,  
MIT, August 1997.
- Turbak, Franklyn, *An Inquiry Into the Shape of Computation*,  
MIT, August 1994.
- Tan, Yang Meng, *Formal Specification Techniques for Promoting Software Modularity, Enhancing Documentation, and Testing Specifications*,  
MIT/LCS/TR-619, June 1994.  
(Later published as a book *Formal Specification Techniques for Engineering Modular C Programs*,  
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Wills, Linda M., *Automated Program Recognition by Graph Parsing*,  
MIT/AI/TR-1358, March 1992.

### Master's Theses (Supervisor)

Tan, Yang Meng, *Supporting Reuse and Evolution in Software Design*,  
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Monegan, Michael D., *An Object-Oriented Software Reuse Tool*,  
MIT/AIM-1118, April 1989.

Kennedy, Thomas R. III, *Using Program Transformations to Improve Program Translation*,  
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Robbins, Richard E., *Build: A Tool for Maintaining Consistency in Modular Systems*,  
MIT/AI/TR-874, November 1985.

Sterpe, Peter J., *Tempest: A Template Editor for Structured Text*,  
MIT/AI/TR-843, June 1985.

Barton, G. Edward Jr., *A Multiple-Context Equality-Based Reasoning System*,  
MIT/AI/TR-715, June 1983. (Co-supervised by Szolovits P.)

Shapiro, Daniel G., *Sniffer: A System that Understands Bugs*,  
MIT/AIM-638, June 1981.

Faust, Gregory G., *Semiautomatic Translation of Cobol into Hibol*,  
MIT/LCS/TR-256, March 1981. (Co-supervised by Martin W.A.)

### Bachelor's Theses (Supervisor)

Pham, Thuan Q., *Creating a Hierarchical Network of Objects that Represents a File of Programs*,  
MIT, June 1990.

Tan, Yang Meng, *Ace: A Cliché-Based Program Structure Editor*,  
MIT/AI/WP-294, May 1987.  
(Awarded the Martin prize—best Computer Science bachelor's thesis.)

Parker, G. Randolph, *Annotation-Based Program Stepping*,  
MIT, May 1986.

Turrisi, Elizabeth K., *Chapter and Verse Program Description*,  
MIT/AI/WP-256, June 1984.

Spitzak, William A., *A Display Generator for Structure Editors*,  
MIT, May 1983.

Handsaker, Robert E., *Code Generation in the Programmer's Apprentice*,  
MIT/AI/WP-233, May 1982.

Cyphers, David S., *Programming Clichés and Cliché Extraction*,  
MIT/AI/WP-223, February 1982.

### Research Grants

Rich C. & Waters R.C., *Representing and Reasoning in DSSA*,  
(part of a joint proposal with IBM Federal Systems Division)  
(responsibility for the research taken over by McAllester D.M. in 1991)  
DARPA (F33615-91-C-1788), \$580,000 9/91–8/94.

- Rich C. & Waters R.C., *Intelligent Assistance for Program Recognition, Design, Optimization, and Debugging*, NSF (CCR-8908273), \$208,000 10/89–9/91.
- Rich C. & Waters R.C., *The Programmer's Apprentice*, Siemens, \$150,000 1/89–12/90.
- Rich C. & Waters R.C., *Research in Program Recognition and Program Design*, Microelectronics and Computer Technology Corporation, \$40,000 12/88–12/89.
- Rich C. & Waters R.C., *The Programmer's Apprentice*, IBM Systems Integration Division, \$15,000 11/88–3/89.
- Rich C. & Waters R.C., *The Programmer's Apprentice*, DARPA (N00014-88-K-0487), \$343,000 7/88–12/89.
- Rich C. & Waters R.C., *The Programmer's Apprentice*, Siemens, \$100,000 10/87–9/88.
- Rich C. & Waters R.C., *The Programmer's Apprentice*, NYNEX, \$100,000 7/87–6/89.
- Rich C. & Waters R.C., *Toward a Requirements Apprentice: On the Boundary Between Informal and Formal Specifications*, NSF (IRI-8616644), \$411,000 3/87–9/90.
- Rich C. & Waters R.C., *The Programmer's Apprentice*, IBM Federal Systems Division, \$199,000 6/85–5/87.
- Rich C. & Waters R.C., *The Programmer's Apprentice*, (part of a continuing overall grant to the MIT AI Laboratory) DARPA (N00014-85-K-0124), \$600,000 (approximate funding for this part) 1/85–2/88.
- Rich C. & Waters R.C., *The Programmer's Apprentice*, IBM Palo Alto Scientific Center, \$346,000 12/82–4/85.
- Rich C. & Waters R.C., *Abstraction, Inspection, and Debugging in Programming*, (with assistance in the writing of the proposal by Sussman G.J.), NSF (MCS-8117633), \$407,000 2/82–7/85.
- Rich C. & Waters R.C., *The Programmer's Apprentice*, (part of a continuing overall grant to the MIT AI Laboratory) DARPA (N00014-80-C-0505), \$250,000 (approximate funding for this part) 8/82–12/84.
- Rich C. & Waters R.C., *Computer Aided Evolutionary Design For Software Engineering*, (with assistance in the writing of the proposal by Shrobe H.E., Sussman G.J. & Hewitt C.E.), 1/2 NSF (MCS-7912179) & 1/2 DARPA (N00014-75-0643), \$420,000 12/79–2/82.

### Consulting

- 1990-91, Digital Equipment Corporation (AI Technology Group), Maynard MA.
- 1990, Extended Intelligence Inc., Chicago IL.
- 1989-90, Cooper, Raburn & Kniffin, Cambridge MA.
- 1988, NASA Johnson Space Center, Houston TX.
- 1987-89, Bachman Information Systems, Cambridge MA.
- 1986-87, IBM Federal Systems Division, Houston TX.
- 1985, Boeing Military Airplane Company, Wichita KA.
- 1985, Digital Equipment Corporation (AI Technology Group), Maynard MA.
- 1984, Naval Electronics System Command, Washington DC.
- 1983, Digital Equipment Corporation (AI Technology Group), Maynard MA.

1982, Digital Equipment Corporation (Technical Languages), Maynard MA.  
 1982, Perkin-Elmer Inc., Tinton Falls NJ.

### Additional Activities Not Listed Above

Member Board of Trustees, First Parish (Unitarian) in Concord MA, 2006–2016.  
 Treasurer, 2012–2014.

President, Friends of Concord Rural Trails (Concord MA), 2006–2008.

Chairman Undergraduate Awards Committee  
 of the Board of Directors of the Computing Research Association, 2005–11.

Member board of Trustees, The Fenn School (Concord MA), 2005–06.

Co-Chairman Industry Committee  
 of the Board of Directors of the Computing Research Association, 2004–05.

Session Chairman, *Research in Corporate Labs*,  
 2002 Computing Research Association Snowbird Conference,  
 Snowbird Utah, July 2002.

Member conference committee, 2002 Computing Research Association Snowbird Conference,  
 Snowbird Utah, July 2002.

Member program committee and Publication Chair, 2001 Int. Symposium on Wearable Computers,  
 Zurich Switzerland, October 2001.

Member program committee, 2000 International Symposium on Wearable Computers,  
 Atlanta Georgia, October 2000.

Session Chairman, *Managing Corporate Research Labs*,  
 2000 Computing Research Association Snowbird Conference,  
 Snowbird Utah, July 2000.

Member Industrial Advisory Board, Graphics, Visualization & Usability Center  
 of the College of Computing of the Georgia Institute of Technology, 1996–01.

Member program committee, 2nd Working Conference on Reverse Engineering,  
 Toronto Ontario Canada, July 1995.

Member review panel for the Ontario Canada Information Technology Research Centre, 1994.

Member program committee, 8th Knowledge-Based Software Engineering Conference,  
 Chicago IL, September 1993.

Member program committee, IEEE International Symposium on Requirements Engineering,  
 San Diego CA, January 1993.

Member program committee, 7th Knowledge-Based Software Engineering Conference,  
 McLean VA, September 1992.

Registration Chair, 1992 Lisp and Functional Programming Conference,  
 San Francisco CA, June 1992.

Member program committee, 4th International Symposium on Applications of AI,  
 Monterey Mexico, October 1991.

Member technical-writing-prize committee  
 1991 National Conference on Artificial Intelligence, Anaheim CA, July 1991.

Session Chairman, *Automated Reasoning: Theorem Proving I and Program Synthesis*,  
 1990 National Conference on Artificial Intelligence, Boston MA, August 1990.

Member program committee, 1990 National Conference on Artificial Intelligence, Boston MA, August 1990.

Member program committee, First Domain Modeling for Software Engineering Workshop, held in conjunction with OOPSLA'89, New Orleans LA, October 1989.

Discussion Chairman, *Requirements Elicitation, Analysis, and Formalization* track, Fifth International Workshop on Software Specification and Design, Pittsburgh PA, May 1989.

### Other Research Supervised

Wu, Leejay, *Beyond Tapes: Computerized Foreign Language Instruction*, report to the Research Science Institute, August 1993.

Lefelhocz, Paul M., *An Experiment in Knowledge Acquisition for Software Requirements*, MIT/AI/WP-330, May 1990. (Co-supervised by Reubenstein H.B.)

Orwant, Jonathan L., *Support of Obviously Synchronizable Series Expressions in Pascal*, MIT/AI/WP-312, November 1988.

Pitman, Kent M., *Interfacing to the Programmer's Apprentice*, MIT/AI/WP-244, February 1983. (Co-supervised by Rich C.)

Duffey, Roger D. II, *Formalizing the Expertise of the Assembly Language Programmer*, MIT/AI/WP-203, September 1980.

### Other Publications

Waters R.C. *The John Leopold Weil and Geraldine Rickard Weil Memorial Charitable Foundation Website*, "<http://www.jgweil.org>", Continuously updated from September, 2003.

Vetro A & Waters R.C. *Mitsubishi Electric Research laboratories: 25 years 1991–2016*, June 2016.

Waters R.C. & Anderson D.B., *The Java Open Community Application Program Interface*, "<http://www.merl.com/opencom/opencom-java-api.html>",  
Version 0.8, November 5, 1996.  
Version 0.9, February 19, 1997.

Waters R.C. & Anderson D.B., *The ANSI C Open Community Application Program Interface*, "<http://www.merl.com/opencom/opencom-c-api.html>",  
Version 0.8, November 5, 1996.  
Version 0.9, February 19, 1997.

Anderson D.B., Greening D., Ma M., Marvit M. & Waters R.C., *Open Community Overview*, "<http://www.merl.com/opencom/opencom-overview.htm>", November 5, 1996.  
(Handed out under the name *Universal Worlds Overview* at the Earth2Avatars conference, (San Francisco CA, October 26, 1996).)

Anderson D.B., Barrus J.W., Marks J., Waters R.C., Yerazunis A.S. & Rich C., "Social Virtual Reality: DiamondPark and SPLINE", video, Fall 1995.

Waters R.C. "SERIES: Common Lisp looping macro package", distributed on CD in *Prime Time Freeware for AI*, Kantrowitz M. Ed., Issue 1-1, Prime Time Freeware, Sunnyvale CA, August 1994.

Waters R.C. "XP: Common Lisp pretty printer", distributed on CD in *Prime Time Freeware for AI*, Kantrowitz M. Ed., Issue 1-1, Prime Time Freeware, Sunnyvale CA, August 1994.

Rich C. & Waters R.C., "Electronic Meeting Place", video, 1993.

**Mitsubishi Electric Research Laboratories Technical Reports**

- Deegan M., & Waters R.C., *MERL Annual Report, April 2019 Through March 2020*, MERL TR 2020-00, June, 2020.
- Deegan M., & Waters R.C., *MERL Annual Report, April 2018 Through March 2019*, MERL TR 2019-00, June, 2019.
- Deegan M., Dickie K., & Waters R.C., *MERL Annual Report, April 2017 Through March 2018*, MERL TR 2018-00, July, 2018.
- Deegan M., & Waters R.C., *MERL Annual Report, April 2016 Through March 2017*, MERL TR 2017-00, June, 2017.
- Deegan M., Dickie K., & Waters R.C., *MERL Annual Report, April 2015 Through March 2016*, MERL TR 2016-00, May, 2016.
- Dickie K., & Waters R.C., *MERL Annual Report, April 2014 Through March 2015*, MERL TR 2015-00, June, 2015.
- Dickie K., Young R. & Waters R.C., *MERL Annual Report, April 2013 Through March 2014*, MERL TR 2014-00, May, 2014.
- Dickie K., Young R. & Waters R.C., *MERL Annual Report, April 2012 Through March 2013*, MERL TR 2013-00, July, 2013.
- Dickie K., Young R. & Waters R.C., *MERL Annual Report, April 2011 Through March 2012*, MERL TR 2012-00, September, 2012.
- Dickie K., & Waters R.C., *MERL Annual Report, July 2010 Through March 2011*, MERL TR 2011-00, December, 2011.
- Dickie K., O'Halloran J., & Waters R.C., *MERL Annual Report, July 2009 Through June 2010*, MERL TR 2010-00, September 2010.
- Dickie K., McAndless J., O'Halloran J. & Waters R.C., *MERL Annual Report, July 2008 Through June 2009*, MERL TR 2009-00, November 2009.
- Dickie K., O'Halloran J., McAndless J. & Waters R.C., *MERL Annual Report, July 2007 Through June 2008*, MERL TR 2008-00, July 2009.
- Bogue A., Dickie K., O'Halloran J., McAndless J. & Waters R.C., *MERL Annual Report, July 2006 Through June 2007*, MERL TR 2007-00, November 2007.
- Bogue A., Dickie K., O'Halloran J. & Waters R.C., *MERL Annual Report, July 2005 Through June 2006*, MERL TR 2006-00, July 2006.
- Bogue A., Dickie K., O'Halloran J. & Waters R.C., *MERL Annual Report, July 2004 Through June 2005*, MERL TR 2005-00, August 2005.
- Bogue A., Dickie K., O'Halloran J. & Waters R.C., *MERL Annual Report, July 2003 Through June 2004*, MERL TR 2004-00, August 2004.
- Bogue A., Dickie K., O'Halloran J. & Waters R.C., *MERL Annual Report, July 2002 Through June 2003*, MERL TR 2003-00, August 2003.
- Bogue A., Dickie K., O'Halloran J. & Waters R.C., *MERL Annual Report, July 2001 Through June 2002*, MERL TR 2002-00, August 2002.
- Bogue A., Dickie K., O'Halloran J. & Waters R.C., *MERL Annual Report, July 2000 Through June 2001*, MERL TR 2001-00, August 2001.

- Dickie K., O'Halloran J. & Waters R.C., *MERL Annual Report, July 1999 Through June 2000*, MERL TR 2000-00, August 2000.
- Howard J., Johnson R., O'Halloran J. & Waters R.C., *ITA Annual Report, July 1998 Through June 1999*, MERL TR 1999-00, July 1999.
- Waters R.C., Anderson D.B., Greysukh A., Lambert W., Kozuka H., Perlman B., Phan V., Schwenke D., Shipman S., Suits E. & Yerazunis W., *The ANSI C (Internal) Spline Version 3.0 Application Program Interface*, MERL TR 97-11, December 1997.
- Waters R.C., Anderson D.B. & Schwenke D.L., *The Interactive Sharing Transfer Protocol Version 1.0*, MERL TR 97-10, October 1997. (Part I appeared in WET ICE '97.)
- Barrus J.W. & Waters R.C., *QOTA: A Fast, Multi-Purpose Algorithm For Terrain Following in Virtual Environments*, MERL TR 96-17, September 1996. (Early version of paper in VRML '97.)
- Waters R.C., *Time Synchronization In Spline*, MERL TR 96-09, April 1996.
- Waters R.C., Anderson D.B., Barrus J.W., Brogan D.C., Casey M.A., McKeown S.G., Nitta T., Sterns I.B. & Yerazunis W.S., *Diamond Park and Spline: A Social Virtual Reality System with 3D Animation, Spoken Interaction, and Runtime Modifiability*, MERL TR 96-02, January 1996.  
MERL TR 96-02a, November 1996. (Revised version. Early version of paper in *Presence* 6(4).)
- Anderson D.B., Barrus J.W., Howard J., Rich C., Shen C. & Waters R.C., *Building Multi-User Interactive Multimedia Environments at MERL*, MERL TR 95-17, November 1995. (Early version of paper in *IEEE MultiMedia* 2(4).)
- Barrus J.W., Waters R.C. & Anderson D.B., *Locales and Beacons: Efficient and Precise Support for Large Multi-User Virtual Environments*, MERL TR 95-16, November 1995. (Early version of paper in *VRAIS 96*).  
MERL TR 95-16a, August 1996. (Revised version. Early version of paper in *IEEE CG&A* 16(6).)
- Schabes Y. & Waters R.C., *Tree Insertion Grammar: A Cubic-Time Parsable Formalism That Lexicalizes Context-Free Grammar Without Changing the Trees Produced*, MERL TR 94-13, June 1994. (Early version of paper in *Computational Linguistics* 21(4).)
- Waters R.C., *Bibliography of Technical Reports*, July 1994. (Revised December 1994.)
- Rich C., Waters R.C., Strohecker C., Schabes Y., Freeman W.T., Torrance M.C., Golding A.R. & Roth M., *A Prototype Interactive Environment for Collaboration and Learning*, MERL TR 94-06, May 1994. (Early version of papers in *IEEE Computer*, 27(12) and *MultiMedia*, 1(4).)
- Waters R.C., *The Audio Interactive Tutor*, MERL TR 94-04, April 1994. (Early version of paper in *Computer Assisted Language Learning* 8(4).)
- Waters R.C., *Some Useful Lisp Algorithms: Part 2*, MERL TR 93-17, August 1993. (Early versions of papers in *ACM Lisp Pointers*, 5(2), 6(1) & 6(4).)
- Schabes Y. & Waters R.C., *Stochastic Lexicalized Context-Free Grammar*, MERL TR 93-12, July 1993. (Early version of paper in *3rd Int. Workshop On Parsing Technology*.)
- Schabes Y. & Waters R.C., *Lexicalized Context-Free Grammar: A Cubic-Time Parsable, Lexicalized Normal Form For Context-Free Grammar That Preserves Tree Structure*, MERL TR 93-04, June 1993.

- Selfridge P.G., Waters R.C. & Chikofsky E.J., *Challenges to the Field of Reverse Engineering*,  
MERL TR 93-02, February 1993. (Early version of paper in *Working Conf. on Reverse Engineering*.)
- Rich C. & Waters R.C., *Approaches to Automatic Programming*,  
MERL TR 92-04, May 1992. (Early version of paper in *Advances in Computers* Volume 37.)
- Waters R.C., *Some Useful Lisp Algorithms: Part 1*,  
MERL TR 91-04, December 1991. (Early versions of papers in *ACM Lisp Pointers*, 4(2) & 4(4).)
- Rich C. & Waters R.C., *Knowledge-Intensive Software Engineering Tools*,  
MERL TR 91-03, September 1991. (Early version of paper in *IEEE TKDE*, 4(5).)
- Waters R.C., *Cliché-Based Program Editing*,  
MERL TR 91-01, March 1991. (Early version of paper in *ACM TOPLAS*, 16(1).)

### Mitsubishi Electric Research Laboratories Working Papers and Notes

- Bogue A., Dickie K., O'Halloran J, McAndless J. & Waters R.C.,  
*Confidential Supplement to MERL Annual Report, July 2006 Through June 2007*,  
MERL Note 2007-00, November 2007.
- Bogue A., Dickie K., O'Halloran J & Waters R.C.,  
*Confidential Supplement to MERL Annual Report, July 2005 Through June 2006*,  
MERL Note 2006-00, July 2006.
- Bogue A., Dickie K., O'Halloran J & Waters R.C.,  
*Confidential Supplement to MERL Annual Report, July 2004 Through June 2005*,  
MERL Note 2005-00, August 2005.
- Bogue A., Dickie K., O'Halloran J & Waters R.C.,  
*Confidential Supplement to MERL Annual Report, July 2003 Through June 2004*,  
MERL Note 2004-00, August 2004.
- Bogue A., Dickie K., O'Halloran J & Waters R.C.,  
*Confidential Supplement to MERL Annual Report, July 2002 Through June 2003*,  
MERL Note 2003-00, August 2003.
- Bogue A., Dickie K., O'Halloran J & Waters R.C.,  
*Confidential Supplement to MERL Annual Report, July 2001 Through June 2002*,  
MERL Note 2002-00, August 2002.
- Bogue A., Dickie K., O'Halloran J & Waters R.C.,  
*Confidential Supplement to MERL Annual Report, July 2000 Through June 2001*,  
MERL Note 2001-00, August 2001.
- Dickie K., O'Halloran J & Waters R.C.,  
*ITA Annual Report, July 1999 Through June 2000, Confidential version*,  
MERL Note 2000-00, June 2000.
- Howard J., O'Halloran J & Waters R.C.,  
*ITA Annual Report, July 1998 Through June 1999, Confidential version*,  
MERL Note 1999-00, June 1999.
- Moghaddam B., Brand M., Waters R.C., Freeman W.T. & Beardsley P.,  
*Motion-Based Optical Sensing and Control Using Multiple Cameras*,  
MERL Working Paper 99-11, August 1999.
- Waters R.C., *Thoughts on the Volume Graphics Chip*,  
MERL Working Paper 98-01, January 1998.



- Waters R.C., Anderson D.B., Barrus J.W., Yerazunis W.S. & Kozuka H.,  
*Spline: A Software Platform For Distributed Virtual Environments*,  
MERL Working Paper 96-11, August 1996.  
(Early version in English of paper in *Mitsubishi Denki Giho* 71(2).)
- Waters R.C. & Barrus J.W., *Distributed Virtual Environments*,  
MERL Working Paper 96-08, July 1996. (Early version of paper in *IEEE Spectrum* 34(3).)
- Waters R.C., Anderson D., Barrus J. & Marks J.,  
*A Brief Description of the Spline Scalable Platform for Interactive Environments*,  
MERL Note 94-17, December 1994.
- Waters R.C., Anderson D., Barrus J. & Marks J., *A Proposed Scalable Platform for  
Interactive Environments for Collaboration, Learning, and Play*,  
MERL Note 94-09, May 1994.
- Ohkami T. & Waters R.C., *Trip Report (November 7-22):  
MELCO Laboratory Open House and Laboratory Visits*,  
MERL Note 92-35, December 1992.
- Golding A., Rich C. & Waters R.C., *Baseline Architecture for a Foreign Language Learning Environment*,  
MERL Note 92-24, August 1992.
- Golding A., Rich C. & Waters R.C., *AAAI-92 Conference*,  
MERL Note 92-21, July 1992.
- Waters R.C., *Public Distribution of MERL Software*,  
MERL Note 92-16, May 1992.
- Waters R.C., *An Evaluation of DragonDictate*,  
MERL Note 92-12, March 1992.
- Waters R.C., *Berkeley ILP Conference*,  
MERL Note 92-11, March 1992.
- Waters R.C., *The Technical Evaluation of Candidates in MERL's Recruiting Process*,  
MERL Note 92-07, February 1992.  
MERL Note 92-07a, June 1992. (Revised version.)
- Waters R.C., *Computer Aided Foreign Language Instruction*,  
MERL Note 92-04, February 1992.
- Waters R.C., *Using the New Common Lisp Pretty Printer*,  
MERL Note 92-03, February 1992. (Early version of paper in *ACM Lisp Pointers* 5(2).)
- Lauer H.C. & Waters R.C., *MERL Notes and Technical Reports*,  
MERL Note 92-01, January 1992.
- Waters R.C., *Series Expressions*,  
MERL Note 91-09, November 1991.
- Waters R.C., *Efficient Programming Without Loops*,  
MERL Note 91-05, October 1991.
- Waters R.C., *MIT ILP Symposium "Building the Information Marketplace"*,  
MERL Note 91-03, October 1991.
- Waters R.C., *A Smorgasbord of Research Ideas*,  
MERL Note 91-02, September 1991.
- Waters R.C., *Speech Input*,  
MERL Note 91-01, June 1991.

### MIT AI Laboratory Technical Reports

Waters R.C., *KBEmacs: A Step Toward the Programmer's Apprentice*,  
MIT/AI/TR-753, May 1985.

Waters R.C., *Automatic Analysis of the Logical Structure of Programs*,  
MIT/AI/TR-492, December 1978.

### MIT AI Laboratory Memoranda

Waters R.C., *Optimization of Series Expressions:*  
*Part II: Overview of the Theory and Implementation*,  
MIT/AIM-1083, December 1989.

Waters R.C., *Optimization of Series Expressions:*  
*Part I: User's Manual for the Series Macro Package*,  
MIT/AIM-1082, December 1989.

Waters R.C., *XP: A Common Lisp Pretty Printing System*,  
MIT/AIM-1102, March 1989.  
MIT/AIM-1102a, September 1989. (Revised version.)

Rich C. & Waters R.C., *Intelligent Assistance for Program  
Recognition, Design, Optimization, and Debugging*,  
MIT/AIM-1100, January 1989.

Waters R.C., *System Validation via Constraint Modeling*,  
MIT/AIM-1020, February 1988.

Rich C. & Waters R.C., *The Programmer's Apprentice Project: A Research Overview*,  
MIT/AIM-1004, November 1987. (Early version of paper in *IEEE Computer* 21(11).)  
(Reprinted in *Proc. Fall 1990 Conference on the 4 Rs of Software Automation:*  
*RAD, Re-Engineering, Repositories, and Reusability*, L48–L64,  
Extended Intelligence Inc., Chicago IL, August 1990.)

Waters R.C., *Obviously Synchronizable Series Expressions:*  
*Part II: Overview of the Theory and Implementation*,  
MIT/AIM-959, November 1987.  
MIT/AIM-959a, March 1988. (Revised version.)

Waters R.C., *Obviously Synchronizable Series Expressions:*  
*Part I: User's Manual for the OSS Macro Package*,  
MIT/AIM-958, November 1987.  
MIT/AIM-958a, March 1988. (Revised version.)

Rich C. & Waters R.C., *Formalizing Reusable Software Components in the Programmer's Apprentice*,  
MIT/AIM-954, February 1987. (Early version of chapter in *Software Reuse*.)

Waters R.C., *Program Translation via Abstraction and Reimplementation*,  
MIT/AIM-949, December 1986. (Early version of paper in *IEEE TSE* 14(8).)

Rich C. & Waters R.C., *The Programmer's Apprentice: A Program Design Scenario*,  
MIT/AIM-933, November 1986.  
MIT/AIM-933a, November 1987. (Revised version.)

Rich C. & Waters R.C., *Toward a Requirements Apprentice:*  
*On the Boundary Between Informal and Formal Specifications*,  
MIT/AIM-907, July 1986.

Waters R.C., *PP: A Lisp Pretty Printing System*,  
MIT/AIM-816, December 1984.

- Waters R.C., *LetS: An Expressional Loop Notation*,  
MIT/AIM-680, October 1982.  
MIT/AIM-680a, February 1983. (Revised version.)
- Waters R.C., *Gprint: A Lisp Pretty Printer Providing Extensive User Format-Control Mechanisms*,  
MIT/AIM-611, October 1981.  
MIT/AIM-611a, September 1982. (Revised version.)
- Rich C. & Waters R.C., *Abstraction, Inspection and Debugging in Programming*,  
MIT/AIM-634, June 1981.  
(Reprinted in *Automatic Software Generation, Artificial Intelligence, and Expert Systems*,  
Computer Aided Manufacturing – International inc., Dallas TX, August 1982.)
- Waters R.C., *Mechanical Arm Control*,  
MIT/AIM-549, October 1979.
- Shrobe H.E., Waters R.C. & Sussman G.J., *A Hypothetical Monolog  
Illustrating the Knowledge Underlying Program Analysis*,  
MIT/AIM-507, January 1979.
- Rich C., Shrobe H.E. & Waters R.C., *Computer Aided Evolutionary Design for Software Engineering*,  
MIT/AIM-506, January 1979.
- Rich C., Shrobe H.E., Waters R.C., Sussman G.J. & Hewitt C.E.,  
*Programming Viewed as an Engineering Activity*,  
MIT/AIM-459, January 1978.
- Waters R.C., *A System for Understanding Mathematical Fortran Programs*,  
MIT/AIM-368, May 1976. (Revised August 1976.)
- Waters R.C., *A Mechanical Arm Control System*,  
MIT/AIM-301, January 1974.

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- Rich C. & Waters R.C., *Formalizing Reusable Software Components*,  
MIT/AI/WP-251, July 1983. (Same as in *Proc. Workshop on Reusability in Programming*.)
- Rich C. & Waters R.C., *The Disciplined Use of Simplifying Assumptions*,  
MIT/AI/WP-220, December 1981. (Same as in *Proc. Second Software Engineering Symposium*.)
- Waters R.C., *A Method, Based on Plans, for Understanding How a Loop Implements a Computation*,  
MIT/AI/WP-150, July 1977.
- Waters R.C., *Cryptology and Data Communications*,  
MIT/AI/WP-136, December 1976.
- Waters R.C., *Mechanical Arm Control*,  
MIT vision flash 42, March 1973. (Early version of MIT/AIM-549.)

### Teaching Experience

- Automatic Programming*, Short four lecture seminar at MIT,  
(IAP 84) January 1984. (Co-developed and co-in-charge with Rich C.)
- Structure and Interpretation of Computer Programs*, MIT Undergraduate course 6.031,  
(ST 79) Spring 1979. (Recitation, 2 sections)

## Organizational Membership

Association for Computing Machinery (ACM), member 1974–2008, Distinguished Scientist 2008–2015, Life Distinguished Scientist 2015–.

Institute of Electrical and Electronics Engineers (IEEE), member 1978–86, Senior member 1986–2015, Life Senior member 2015–.

Sigma Xi, member 1972–

## Lectures

*Autonomous Driving: What was supposed to happen, what is happening, what will happen,*  
Presentation to Beacon Hill Village, May 29, 2019.

Member of a panel on *The Road to Self-Driving Vehicles,*  
Xconomy Robo Madness 2017 – A.I. Gets Real, March 28, 2017.

*What's up at MERL,*  
Worcester Polytechnic Institute, Worcester MA, January 2010.

*The Globalization of Research,*  
2006 Computing Research Association Snowbird Conference,  
Snowbird Utah, June 2006.

*Industrial Research Labs: Neither for the Feint of Heart Nor the Short of Sight, But Vital,*  
Brown University Computer Science Department Industrial Partners Program  
15th Anniversary Summit on The American Research Landscape:  
Leveraging the Academic/Industry Partnership, Brown University, May 24, 2004.

*Basic Research in Corporate Labs,*  
2002 Computing Research Association Snowbird Conference,  
Snowbird Utah, July 2002.

*Industry University Collaboration,*  
2002 Computing Research Association Snowbird Conference,  
Snowbird Utah, July 2002.

*Measuring Collaborative Technology Development in a Transnational Corporation,*  
Second Annual Conference on Performance Measurements for Research & Development,  
Chicago IL, April 2001.

*Efficient Programming Without Loops,*  
MIT AI Laboratory, Cambridge MA, May 2000.

*In-Vehicle Digital Imaging Applications,*  
GM Tech World, Warren MI, Sept 1999,  
Chrysler, Detroit MI, July 1999.

*Mitsubishi Electric Information Technology Center America (ITA) Collaboration with a US R&D Organization,*  
Mitsubishi Electric Internal Education Center, Sanda Japan, June 1999.

Member of a panel on *Leveraging R & D to Seize First Place,*  
MIT Enterprise Forum of Cambridge, Spring Workshop '99 *Strategic Alliances:*  
*Pulling Together Winning the Race,* MIT Cambridge MA, April 1999.

Discussant on *Distributed Virtual Environments*  
on the TV show *Business World With Jim Howell,*  
WABU Channel 68 Boston MA, 9:30am May 24, 1998.

*MERL A Mitsubishi Electric Research Lab*

Stanford Computer Forum, Palo Alto CA, March 1998.

*The Spline Platform for Distributed Virtual Reality,*

MIT Architecture Department, Cambridge MA, December 1997.

*MERL - A Mitsubishi Electric Research Laboratory: an Overview,*

Osaka Institute of Technology, Osaka Japan, October 1997.

*Design of the Interactive Sharing Transfer Protocol,*

WET ICE '97 – IEEE Sixth Workshops on Enabling Technologies:  
Infrastructure for Collaborative Enterprises, MIT, June 1997.

Member of a panel *Multimedia in the 21st Century,*

IEEE International Conference on Multimedia Computing and Systems (ICMCS'97)  
Ottawa Canada, June 1997.

*Diamond Park and Spline: Social Virtual Reality with 3D Animation,*

*Spoken Interaction, and Runtime Extendability*

Northeastern University, Boston MA, November 1996.

*SPLINE: Technical Details and Future Plans,*

Mitsubishi Electric Information Technology America, Waltham MA, March 1996.

Mitsubishi Electric Information Technology Center, Ofuna Japan, February 1996.

Mitsubishi Electric Research Laboratories, Cambridge MA, January 1996.

*A Prototype Interactive Environment for Collaborative learning,*

CALICO '95 Annual Symposium “Computers and Collaborative Learning”,  
Middlebury College, Middlebury VT, June 1995.

*Summary Thoughts on Interactive Story Systems: Plot and Character*

AAAI Spring Symposium Series, Plenary Session,  
Stanford University, Palo Alto CA, March 1995.

*The Necessity of Plot Control*

AAAI Spring Symposium: Interactive Story Systems: Plot and Character,  
Stanford University, Palo Alto CA, March 1995.

*A Scalable Platform for Interactive Environments*

Mitsubishi Electric Research Laboratories, Sunnyvale CA, March 1995.

Mitsubishi Electric Research Laboratories, Cambridge MA, November 1994.

MIT Media Laboratory, Cambridge MA, November 1994.

Mitsubishi Electric Research Laboratories, Cambridge MA, August 1994.

*Interactive Environments for Learning and Play: Foreign Language Learning*

Mitsubishi Electric Research Laboratories, Cambridge MA, December 1992.

Mitsubishi Electric Central Research Laboratory, Itami Japan, November 1992.

Mitsubishi Electric Consumer Products Research Laboratory, Kyoto Japan, November 1992.

Mitsubishi Electric Computer and Information Sciences Laboratory, Ofuna Japan, November 1992.

*Efficient Programming Without Loops,*

ACM Greater Boston Chapter, Cambridge MA, February 1992.

Mitsubishi Electric Research Laboratories, Cambridge MA, October 1991.

Digital Equipment Corporation, Cambridge Research Laboratory, Cambridge MA, October 1990.

*The Requirements Apprentice,*

IBM T.J. Watson Research Center, Hawthorne NY, September 1990.

IBM Cambridge Scientific Center, Cambridge MA, September 1990.

- Support for Reuse in the Programmer's Apprentice*,  
Fall 1990 Conference on the 4 Rs of Software Automation: RAD, Re-engineering,  
repositories, and reusability, Extended Intelligence Inc., Boston MA, August 1990.
- Look Before You Loop*,  
MIT, May 1990. (Joint talk with Amsterdam J.B.)
- Efficient Programming Without Loops*,  
Siemens Corporate Research inc., Princeton NJ, April 1990.
- The Requirements Apprentice*,  
AT&T Bell Laboratories, Murray Hill NJ, April 1990.
- Programming in the Year 2009*,  
International Workshop on AI and SE, University of Exeter England, April 1989.
- Toward a Requirements Apprentice*,  
University of Massachusetts, Amherst MA, March 1989.
- Efficient Programming Without Loops*,  
University of Massachusetts, Amherst MA, March 1989.  
International Conference on Computer Languages, Miami FL, October 1988.  
Thinking Machines Corporation, Cambridge MA, February 1989.
- Toward a Requirements Apprentice*,  
Microelectronics and Computer Technology Corporation, Austin TX, October 1988.
- Efficient Programming Without Loops*,  
Microelectronics and Computer Technology Corporation, Austin TX, October 1988.  
IBM Systems Integration Division, Owego NY, June 1988.
- Obviously Synchronizable Series Expressions*,  
ANSI Common Lisp standardization committee (X3J13), Cambridge MA, June 1988.
- Efficient Programming Without Loops*,  
Digital Equipment Corporation (AI Technology Group), Marlboro MA, May 1988.
- Obviously Synchronizable Series Expressions*,  
Carnegie-Mellon University, Pittsburgh PA, March 1988.  
Bachman Information Systems, Cambridge MA, March 1988.  
Harvard University, Cambridge MA, March 1988.  
Kestrel Institute, Palo Alto CA, March 1988.  
Iteration subcommittee of the ANSI Common Lisp standardization committee (X3J13),  
Palo Alto CA, March 1988.  
XEROX Palo Alto Research Center, Palo Alto CA, March 1988.  
University of California Berkeley, Berkeley CA, March 1988.  
Microelectronics and Computer Technology Corporation, Austin TX, March 1988.  
Software Engineering Institute, Pittsburgh PA, March 1988.
- The Programmer's Apprentice: A Session With KBEmacs*,  
Bachman Information Systems, Cambridge MA, January 1988.
- Obviously Synchronizable Series Expressions*,  
MIT, December 1987.
- The Programmer's Apprentice: A Session With KBEmacs*,  
ACM Greater Boston Chapter, Cambridge MA, October 1987.  
Third Annual Conference on Artificial Intelligence & Ada,  
George Mason University, Fairfax VA, October 1987.

- Constraint-Based Program Validation*,  
Fifth IBM FSD Testing Coordinating Group Conference, Toronto Canada, September 1987.
- The Programmer's Apprentice*,  
DARPA Information Science and Technology Office, Principal Investigators Meeting,  
Gaithersburg MD, September 1987.
- Efficient Interpretation of Synchronizable Series Expressions*,  
ACM SIGPLAN '87 Symposium on Interpreters and Interpretive Techniques,  
St. Paul MN, June 1987.
- Toward a Requirements Apprentice*,  
Fourth International Workshop on Software Specification and Design, Monterey CA, April 1987.
- Automatic Programming: the Programmer's Apprentice Approach*,  
IBM Federal Systems Division, Houston TX, March 1987.
- The Programmer's Apprentice: A Session With KBEmacs*,  
IBM T.J. Watson Research Center, Hawthorne NY, March 1987.  
Second Kansas Conference: Knowledge-Based Software Development,  
Kansas State University, Manhattan KS, October 1986.  
IBM Federal Systems Division, Bethesda MD, November 1986.  
The George Washington University, Washington DC, December 1986.  
Brown University, Providence RI, February 1987.
- Automatic Programming Research Is Like Cancer Research: a Host of Problems Remain Unsolved*,  
Workshop on Automatic Programming held within AAAI-86, Philadelphia PA, August 1986.
- Member of a panel *Where Should the Intelligence in Intelligent Interfaces Be Placed?*,  
AAAI-86, Philadelphia PA, August 1986.
- Reuse of Clichés in the Knowledge-Based Editor*,  
International Workshop on Advanced Programming Environments,  
(Sponsored by IFIP WG 2.4 in cooperation with ACM SIGPLAN and SIGSOFT)  
Trondheim Norway, June 1986.
- The Programmer's Apprentice: A Session With KBEmacs*,  
Seminar on Advanced Programming Environments (sponsored by the Systems Development Co.),  
Oslo Norway, June 1986.  
Kestrel Institute, Palo Alto CA, August 1985.  
USC Information Sciences Institute, Marina del Rey CA, August 1985.  
AT&T Bell Laboratories, Murray Hill NJ, September 1985.  
Rutgers University, New Brunswick NJ, September 1985.  
Bell Communications Research, Piscataway NJ, September 1985.  
Carnegie-Mellon University, Pittsburgh PA, October 1985.  
IBM System Products Division, Rochester MN, November 1985.  
Boeing Military Airplane Company, Wichita KA, December 1985.  
Boston Chapter IEEE Computer Society, Burlington MA, January 1986.
- Artificial Intelligence and Software Engineering*,  
IBM Federal Systems Division, Gaithersburg MD, June 1985.
- The Programmer's Apprentice: A Session With KBEmacs*,  
ITT Advanced Technology Center, Shelton CT, February 1985.
- Expert Systems*,  
Meeting of Kellogg Foundation fellows, MIT, Cambridge MA, July 1984.

- The Programmer's Apprentice: Knowledge Based Program Editor*,  
Mini/Micro Northeast-84 (sponsored by IEEE), Boston MA, May 1984.
- An Expressional Loop Notation*,  
Eleventh ACM SIGACT-SIGPLAN POPL Conference, Salt Lake City UT, January 1984.  
MIT, Cambridge MA, September 1983.
- The Programmer's Apprentice: Knowledge Based Program Editing*,  
8th IBM University Study Conference, Raleigh NC, October 1983.
- Formalizing Reusable Software Components*,  
Workshop on Reusability in Programming (sponsored by ITT), Newport RI, September 1983.
- The Programmer's Apprentice: Knowledge Based Program Editing*,  
IBM Federal Systems Division, Bethesda MD, September 1983.  
General Electric, Schenectady NY, June 1982.  
Texas Instruments, Dallas TX, August 1982.  
Computer Aided Manufacturing - International Inc., Dallas TX, August 1982.  
Computer Thought Corporation, Dallas TX, August 1982.  
Conference on Computers in Science (sponsored by AAAS), Chicago IL, December 1982.  
Softtech, Waltham MA, January 1983.  
IBM Scientific Center, Palo Alto CA, March 1983.  
IBM Santa Teresa Programming Center, San Jose CA, March 1983.  
1983 High Speed Computing Conference (sponsored by LLNL & LANL),  
Gleneden Beach OR, March 1983.  
Daisy Systems Corporation, Sunnyvale CA, April 1983.  
Air Force Studies Board of the National Academy of Sciences, Woods Hole MA, July 1983.
- Member of a panel on *Tools & Techniques*,  
Second ACM SIGSOFT Software Engineering Symposium: Workshop on Rapid Prototyping  
(sponsored by ONR), Columbia MD, April 1982.
- Knowledge Based Programming Tools*,  
Perkin-Elmer Inc., Tinton Falls NJ, April 1982.
- Programming With Clichés*,  
Workshop on Very High Level Languages, University of Pennsylvania,  
Philadelphia PA, February 1982.
- A Knowledge Based Program Editor*,  
IJCAI-81, Vancouver BC Canada, August 1981.  
Computer Corporation of America, Cambridge MA, January 1981.  
MIT, Cambridge MA, November 1980.  
Carnegie-Mellon University, Pittsburgh PA, November 1980.  
University of California Irvine, Irvine CA, November 1980.  
USC Information Sciences Institute, Marina del Rey CA, November 1980.  
XEROX Palo Alto Research Center, Palo Alto CA, November 1980.  
Stanford University, Palo Alto CA, November 1980.  
SRI International, Menlo Park CA, November 1980.  
Systems Control Inc., Palo Alto CA, November 1980.  
CYBERSOFT-80 (sponsored by International Association for Cybernetics),  
Namur Belgium, September 1980.
- Member of a panel *Research Directions in Computer Science*,  
Inaugural Symposium, Department of Computer Science, Brown University,  
Providence RI, September 1979.



*A Method for Automatically Analyzing Programs,*  
IJCAI-79, Tokyo Japan, August 1979.

*Plans and Plan Building Methods in the Programmer's Apprentice,*  
Brown University, Providence RI, April 1979.

*A Method for Understanding the Logical Structure of Programs,*  
IBM T.J. Watson Research Center, Yorktown Heights NY, May 1978.  
Bolt, Baranek & Newman, Cambridge MA, March 1978.  
MIT, Cambridge MA, March 1978.  
University of Maryland, College Park MD, April 1978.  
Yale University, New Haven CT, April 1978.

*Understanding Loops by Means of Plans,*  
SIGART/SIGPLAN symposium on AI and Programming Languages, Rochester NY, August 1977.

*Plans as a Basis for Understanding Programs,*  
Second International Conference on Software Engineering, San Francisco CA, October 1976.  
IBM T.J. Watson Research Center, Yorktown Heights NY, early 1976.

### **Conferences Attended**

2017 Xconomy Robo Madness: A.I. Gets Real,  
Cambridge MA, March 2017.

2012 Computing Research Association Snowbird Conference,  
Snowbird Utah, July 2012.

2010 Computing Research Association Snowbird Conference,  
Snowbird Utah, July 2010.

2008 Computing Research Association Snowbird Conference,  
Snowbird Utah, July 2008.

2006 Computing Research Association Snowbird Conference,  
Snowbird Utah, June 2006.

2004 Computing Research Association Snowbird Conference,  
Snowbird Utah, July 2004.

2002 Computing Research Association Snowbird Conference,  
Snowbird Utah, July 2002.

Computing Research Association, Conference on Grand Research Challenges in Computer Science  
and Engineering, Airlie House, Warrenton Virginia, June 2002.

MIT Engineering Conference: Micro-Electro-Mechanical Systems (MEMS),  
Cambridge MA, March 2002.

Second Annual Conference on Performance Measurements for Research & Development,  
Chicago IL, April 2001.

2000 Computing Research Association Snowbird Conference,  
Snowbird Utah, July 2000.

Distributed System Aspects of Sharing a Virtual Reality workshop in  
WET ICE '97 – IEEE Sixth Workshops on Enabling Technologies:  
Infrastructure for Collaborative Enterprises, MIT, June 1997.

ICMCS '97 International Conference on Multimedia Computing and Systems,  
Ottawa Canada, June 1997.

CALICO '96 Annual Symposium "Distance Learning",  
University of New Mexico, Albuquerque NM, May 1996.

JavaOne - Sun's Worldwide Java Developer Conference, San Francisco CA, May 1996.

CALICO '95 Annual Symposium "Computers and Collaborative Learning",  
Middlebury College, Middlebury VT, June 1995.

AAAI Spring Symposium: Interactive Story Systems: Plot and Character,  
Stanford University, Palo Alto CA, March 1995.

Working Conference on Reverse Engineering, Baltimore MD, May 1993.

Boston University Conference on Language Development, Boston MA, October 1992.

AAAI-92 Workshop on AI and Automated Program Understanding, July 1992.

AAAI-92 Workshop on Automating Software Design, July 1992.

AAAI-92, San Jose CA, July 1992

Lisp and Functional Programming Conference, San Francisco CA, June 1992.

Dragon Systems 10th Anniversary Technology Review, Newton MA, June 1992.

UC Berkeley Industrial Liaison Program Conference, UC Berkeley CA, March 1992.

MIT ILP Symposium on Building the Information Marketplace,  
MIT Cambridge MA, October 1991.

IFIP TC2 Working Conference on Constructing Programs from Specifications,  
Pacific Grove CA, May 1991.

Fall 1990 Conference on the 4 Rs of Software Automation: RAD, Re-Engineering, Repositories,  
and Reusability, Extended Intelligence Inc., Boston MA, August 1990.

AAAI-90, Boston MA, August 1990.

DARPA ISTO Software Technology Community Meeting, Washington DC, June 1990.

First Domain Modeling for Software Engineering Workshop,  
held in conjunction with OOPSLA '89, New Orleans LA, October 1989.

Fifth International Workshop on Software Specification and Design, Pittsburgh PA, May 1989.

DARPA ISTO Principal Investigators' Meeting, Dallas/Fort Worth TX, November 1988.

International Conference on Computer Languages, Miami FL, October 1988.

Third Annual Conference on Artificial Intelligence & Ada,  
George Mason University, Fairfax VA, October 1987.

IBM Testing Coordinating Group Conference, Toronto Canada, September 1987.

DARPA Information Science and Technology Office, Principal Investigators Meeting,  
Gaithersburg MD, September 1987.

ACM SIGPLAN '87 Symposium on Interpreters and Interpretive Techniques,  
St. Paul MN, June 1987.

Fourth International Workshop on Software Specification and Design (Sponsored by IEEE.),  
Monterey CA, April 1987.

AAAI-86, University of Pennsylvania, Philadelphia PA, August 1986.

International Workshop on Advanced Programming Environments (Sponsored by IFIP WG 2.4  
in cooperation with SIGPLAN and SIGSOFT), Trondheim Norway, June 1986.

Software Factory Workshop (sponsored by the CMU Software Engineering Institute),  
Morgentown WV, October 1985.

IJCAI-85, UCLA, Los Angeles CA, August 1985.

AAAI-84, University of Texas, Austin TX, August 1984.

Mini/Micro Northeast-84 (sponsored by IEEE), Boston MA, May 1984.

Eleventh ACM SIGACT-SIGPLAN POPL Conference, Salt Lake City UT, January 1984.

IBM Academic Information Systems, University Study Conference, Raleigh NC, October 1983.

Workshop on Reusability in Programming (sponsored by ITT), Newport RI, September 1983.

Spring 1983 MIT VLSI Research Review, MIT, Cambridge MA, May 1983.

1983 High Speed Computing Conference (sponsored by LLNL & LANL),  
Gleneden Beach OR, March 1983.

Conference on Computers in Science (sponsored by AAAS), Chicago IL, December 1982.

AAAI-82, Carnegie-Mellon, Pittsburgh PA, August 1982.

Spring 1982 MIT VLSI Research Review, MIT, Cambridge MA, May 1982.

Second ACM SIGSOFT Software Engineering Symposium: Workshop on Rapid Prototyping, Columbia MD, April 1982.  
 Workshop on Very High Level Languages (sponsored by ONR), University of Pennsylvania, Philadelphia PA, February 1982.  
 Conference on Advanced Research in Integrated Circuits, MIT, Cambridge MA, January 1982.  
 IJCAI-81, UBC, Vancouver BC Canada, August 1981.  
 Spring 1981 MIT VLSI Research Review, MIT, Cambridge MA, May 1981.  
 CYBERSOFT-80 (sponsored by International Association for Cybernetics), Namur Belgium, September 1980.  
 Programming Environments Workshop, Schlumberger-Doll Research, Ridgefield CT, June 1980.  
 Spring 1980 MIT VLSI Research Review, MIT, Cambridge MA, May 1980.  
 Conference on Advanced Research in Integrated Circuits, MIT, Cambridge MA, January 1980.  
 Second International Program Transformation Workshop, Harvard, Cambridge MA, August 1979.  
 IJCAI-79, Tokyo Japan, August 1979.  
 NSF-CBMS Conference on Logic of Computer Programming, RPI, Troy NY, May 1978.  
 IJCAI-77, MIT, Cambridge MA, August 1977.  
 SIGART/SIGPLAN symposium on AI and Programming Languages, Rochester NY, August 1977.  
 Second International Conference on Software Engineering, San Fransisco CA, October 1976.  
 IJCAI-75, Tbilisi USSR, August 1975.  
 IJCAI-73, Stanford University, Palo Alto CA, August 1973.

### **Reviewing and Refereeing**

Presence: Teleoperators and Virtual Environments, May 2004.  
 Battelle/Pacific Northwest National Laboratory, July 2002.  
 Presence: Teleoperators and Virtual Environments, October 2000.  
 2000 International Symposium on Wearable Computing, July 2000. (17 papers)  
 IEEE Spectrum, May 2000.  
 Presence: Teleoperators and Virtual Environments, May 1999.  
 IEEE MultiMedia (Special Issue on Media Spaces), October 1998. (2 papers)  
 Presence: Teleoperators and Virtual Environments, October 1997.  
 Automated Software Engineering, October 1997.  
 IEEE MultiMedia, September 1996.  
 Presence: Teleoperators and Virtual Environments, July 1997.  
 1998 International Web-Based Modeling and Simulation Conference, July 1997.  
 Artificial Intelligence, February 1997.  
 IEEE MultiMedia, July 1996.  
 Second Working Conference on Reverse Engineering, March 1995. (4 papers)  
 IEEE Transactions on Software Engineering, February 1995.  
 Automated Software Engineering, October 1994.  
 Kluwer Academic Publishers, August 1994.  
 Univ. of CA, Microelectronics Innovation and Computer Research Opportunities program, May 1994.  
 IEEE Transactions on Software Engineering, April 1994.  
 ACM Transactions on Software Engineering and Methodology, January 1994.  
 1994 International Conference on Multimedia Computing and Systems, December 1993.  
 Automated Software Engineering, June 1993.  
 IEEE Transactions on Software Engineering, June 1993. (2 papers)  
 8th Knowledge-Based Software Engineering Conference, May 1993. (7 papers)  
 Automated Software Engineering, April 1993.  
 IEEE Transactions on Software Engineering, February 1993.  
 Automated Software Engineering, December 1992.

IEEE Software, October 1992.  
IEEE Transactions on Software Engineering, October 1992.  
IEEE International Symposium on Requirements Engineering, June 1992. (13 papers)  
7th Knowledge-Based Software Engineering Conference, May 1992. (8 papers)  
IEEE Transactions on Knowledge and Data Engineering, April 1992.  
IEEE Transactions on Software Engineering and Methodology, April 1992.  
IEEE Transactions on Software Engineering and Methodology, February 1992.  
IEEE Transactions on Software Engineering, December 1991.  
IEEE Transactions on Software Engineering, October 1991.  
4th International Symposium on Applications of AI, June 1991. (11 papers)  
National Science Foundation, May 1991.  
AAAI-91, February 1991. (18 papers)  
IJCAI-91, January 1991. (5 papers)  
National Science Foundation, January 1991.  
National Science Foundation, November 1990.  
ACM Transactions on Programming Languages and Systems, August 1990.  
Software—Practice & Experience, July 1990.  
National Science Foundation, May 1990.  
IEEE Transactions on Software Engineering, April 1990. (2 papers)  
AAAI-90, March 1990. (10 papers)  
National Science Foundation, March 1990.  
Louisiana Education Quality Support Fund, February 1990.  
National Science Foundation, February 1990.  
ACM Transactions on Programming Languages and systems, January 1990.  
International Conference on Computer Languages, October 1989.  
National Science Foundation, May 1989.  
IEEE Transactions on Software Engineering, May 1989.  
National Science Foundation, April 1989.  
National Science Foundation, January 1989.  
11th World Computer Congress, January 1989.  
IEEE Software, November 1988.  
IEEE Transactions on Software Engineering, October 1988.  
National Science Foundation, April 1988.  
National Science Foundation, March 1988.  
IEEE Expert, February 1988.  
IEEE Computer, February 1988.  
National Science Foundation, December 1987.  
IEEE Computer, November 1987.  
National Science Foundation, July 1987.  
Software—Practice & Experience, May 1987.  
IEEE Software, April 1987. (2 papers)  
National Science Foundation, January 1987.  
National Science Foundation, October 1986.  
Second International Conference on Computers and Applications, September 1986. (2 papers)  
IEEE Transactions on Software Engineering, September 1986.  
4th International Workshop on Software Specification and Design, August 1986. (3 papers)  
Hawaii International Conference on Systems Sciences, July 1986. (3 papers)  
IEEE Expert, July 1986.  
National Science Foundation, February 1986.  
ACM-SIGSAM Symposium on Symbolic and Algebraic Computation, February 1986.

IEEE Transactions on Software Engineering, April 1985. (3 papers)  
IEEE Software, January 1985.  
Air Force Office of Scientific Research, July 1984.  
National Science Foundation, March 1984.  
IEEE Computer, December 1983.  
Air Force Office of Scientific Research, October 1983.  
Software—Practice & Experience, June 1983.  
IJCAI-83, May 1983.  
National Science Foundation, January 1983.  
National Science Foundation, December 1982.  
ACM Transactions on Programming Languages and systems, August 1982.  
National Science Foundation, February 1982.  
IJCAI-81, May 1981.  
National Science Foundation, March 1981.  
ACM Transactions on Programming Languages and systems, February 1981.  
National Science Foundation, March 1980.  
IEEE Transactions on Software Engineering, October 1979.  
National Science Foundation, June 1979.  
IEEE Transactions on Software Engineering, November 1978.  
Conference on Functional Languages and Architecture, April 1978.