

Panel Proposal for SHOT 2007

Title: Fifty Years of Computer Use – Continuity amid Change

Organizer:

Thomas Haigh. University of Wisconsin-Milwaukee. thaigh@computer.org

Chair:

Michael S. Mahoney. Princeton University. mike@princeton.edu

Presenters:

David Hemmendinger. Union College, Schenectady. hemmendd@union.edu
"50 Years of Programming Languages"

Greg Downey. University of Wisconsin-Madison. gdowney@wisc.edu
"The Library vs. the Computer: Five Decades of Premature Obituaries?"

William W. McMillan. Eastern Michigan University. wcmillan@emich.edu
"Fifty-Plus Years of Amnesia in Computing: The Disappearance and Resurrection of Virtual Machines as a Case Study"

Roy G. Saltman. Consultant and Writer, roygsaltman@msn.com.
"50 Years of Computerized Elections: Technologies and Institutions"

Commentator:

Laurie Robertson. Virginia Tech. lroberts@computer.org

Relationship to Conference Themes:

All papers look back over the events of 50 years.

Panel is organized by the SIG on Computers, Information and Society

"The Historian and other Disciplines" & request for "Diversity of Approaches" within a panel: two members of the panel are academic computer scientists, one spent a career as a NIST researcher on computerized voting, while the fourth has a Ph.D. in History of Technology and Human Geography and has an appointment split between Information Science and Mass Communication. The commentator is an IT project manager currently undertaking a Ph.D. in STS.

Session Abstract

Fifty Years of Computer Use – Continuity amid Change

Computing is a field consumed by novelty, in which users and producers of technology both grapple with a constant stream of new products and technologies. Like science fiction writers and so-called futurists, computing professionals must make educated guesses about future developments in order to do their job. They understand that any product promised for delivery in five years is little more than a rumor, while truly speculative developments such as artificial intelligence have been forecast to arrive in about twenty years time for many decades.

Yet as historians, amateur or professional, it is our responsibility to redirect attention from the frothy uncertainty ahead of us to the surprisingly steady wake that the computer has left behind it over the past half century. As SHOT celebrates its anniversary, we explore four areas of computer application in which the constant stream of new hardware and software technologies has masked, and perhaps even caused, startling historical continuity in the use and social meaning of information technologies.

Hemendinger explores the history of programming languages, going beyond the existing internalist literature on languages and their invention to consider programming languages as technologies. He explores the practice of programming and the needs of users, examining why the most widely used languages have retained a relatively low-level approach criticized by many academic researchers. McMillan applies a similar analysis to the history of virtual machines: a software technology created to run programs on a range of different computers without modification. He argues that this is one of many examples where earlier work has been forgotten, so that an apparently disruptive technology such as Java is actually a continuation of established practice. To explain this, McMillan explores the culture and social organization of the computing field as well as its commercial dynamics.

The other two panelists explore the use of computer technologies in different fields. Downey looks at popular representations of libraries and computers, documenting the reliance of the library and the printed book against consistently exaggerated reports of their demise. Saltman draws on long personal experience and historical analysis to document the mutual shaping of technologies and institutions in the controversial field of election technology. Both discover that the appeal of new technology in these fields rests in large part in its promise of a decisive break with the problems of the past. Yet the perspective of a half century, and the presentations of all four panelists, suggests that the influence of history is not so easily eluded.

The Library vs. the Computer: Five Decades of Premature Obituaries

Greg Downey. University of Wisconsin-Madison. gdowney@wisc.edu

Topic: This paper reviews how the popular press has understood libraries and computers over the last half-century.

Argument: As the computer in its various forms penetrated more and more areas of the economy over the last half-century, journalists and pundits in the popular press have repeatedly predicted the death of print or the withering of the library, with the Google Books project just the most recent in a long line of death-dirges. But tracing how this discourse of both progress and obsolescence unfolded historically, privileging certain visions of library computerization at certain times, can help us understand the path that library computerization actually took.

Evidence: A sampling of "library of the future" news articles from major daily US newspapers and newsweeklies are contrasted with a sampling of "library and computer" articles from major library and MIS trade publications over the last fifty years.

Contribution: Contribution: This paper is part of a larger social history of the computerization of libraries over the past fifty years, from World War Two to the World Wide Web, which extends the current "internalist" library history literature by paying key attention to spatial, social, and technical divisions of labor within both the human geography and the technological infrastructure of librarianship.

Fifty Years of Computerized Voting: Technologies and Institutions

Roy G. Saltman, Consultant and Author on Election Technologies, roygsaltman@msn.com

The application of computer technology to voting has been a learning experience. The new technology was eagerly embraced, but difficulties quickly appeared in its use. A successful application depends on institutional factors that help, not hinder. The conditions of US election administration: extreme decentralization, “states’ rights” ideology that prevented funding of necessary research, and the low priority given the function at every governmental level, caused early local disasters and a national crisis in November 2000.

Advances in hardware: The genesis of computers in vote-casting began in about 1958 when Los Angeles County issued a contract for a system that would sense votes cast on ballots stamped with fluorescent ink. In the early 1960s, voting systems employing either mark-sense or punch-card ballots were used. The counting of ballots, as opposed to casting them, was initially accomplished centrally with general-purpose computers. When large-scale integration was invented in the mid-1970s, ballot-counting at precincts, with special-purpose computers, became possible. Direct-recording electronic (DRE) voting systems were invented about that time, updating mechanical lever machines. By the late 1990s, with touch-screen equipment, only a few contests at a time are shown to the voter, on a succession of screen presentations.

Questions of Software Integrity: In 1969, computer scientists showed that software could be manipulated; the malicious changes could not be found because the program would delete itself after doing its mischief. The issue was raised again in 1985 in Dallas and in a series of articles in *The New York Times*. In 2003, the controversy was revived, led by computer scientists concerned over potential software manipulation in DRE equipment.

Federal Institutional Change (1972-2000): The first stirring of institutional change occurred with the 1972 establishment of the Clearinghouse on Election Administration (CEA). The CEA was created as a result of reports of excessive delays and bungling in computerized elections from a significant number of cities and counties nationwide. This five-person office had the function of undertaking studies on subjects including voting and counting methods.

In 1977, the CEA’s Advisory Panel of state and local government election officials recommended that a set of voluntary engineering and procedural performance standards be developed. The standards were finally issued in 1990. The delay was caused by the problem of getting funding from Congress. A related requirement was to establish independent testing laboratories (ITAs) whose function would be to assure that election equipment accepted for use by states was in conformance with requirements of the standards. A voluntary professional organization of state election officials accredited the laboratories.

Federal Institutional Change, Post 2000: The Presidential election debacle in Florida in 2000 occurred despite the fact that Florida had adopted the 1990 Clearinghouse standards. None of the punching devices used by 60% of voters was able to carry out the standards’ requirements. The result of the fiasco was the Help America Vote Act. The act replaced the Clearinghouse with a bi-partisan Election Assistance Commission (EAC). The National Institute of Standards and Technology was given responsibility to recommend ITAs for the EAC’s approval. The standards are now called guidelines, and controversies remain. Bills in Congress in 2007 demand universal application of “paper trails,” based on lack of confidence in DRE results, but this is a technological fix, not the needed concept of “independent verification.”

Fifty Years of Programming Languages

David Hemmendinger

Department of Computer Science, Union College, Schenectady, NY 12308

Topic: 50 years ago IBM released a compiler for Fortran, the first "high-level" programming language. Other important languages followed in the next few years: Cobol, Algol, Lisp, and the first object-oriented language, Simula, appeared in 1967. Programming languages continued to emerge, but the first decade provided major languages for scientific and commercial use and for the theoretical foundations of computing. From the start there was debate about the merits of the "academic" languages like Algol, with industry representatives arguing that despite their elegance, they were impractical to implement and use. Although many of those arguments have lost force, some of the most widely used languages, such as C and C++, reflect the concerns of industrial efficiency more than the elegance and safety of recent languages.

Argument: One Whig account of programming-language history is that it is the story of gradually freeing programmers from low-level laborious attention to details, particularly details of storage-management. However (a) some of the highest-level languages from this standpoint (logic and functional languages) have played only niche roles and (b) with parallel programming we're right back at the beginning, with lots of attention to storage management still required. Although languages now do free programmers from many low-level details, the ones that see widespread use, such as C and Fortran, are generally characterized by relatively simple performance models that reflect the machine model of data as bits and bytes rather than a more abstract view of the user's data structures. The persistence of the low-level view results not only from industrial demands, but also reflects a discipline that has not yet found the appropriate abstractions that are both elegant and practical. As one might expect, both social practices and technical merits shape language-choice, but there is not a simple opposition between the two.

Evidence: The Datamation trade journal from 1961-62 reports some of the early Fortran-Algol debates, and several more academic articles from that period provide further information. A 2005 IEEE Software article provides information on current language use. Between those dates lie a number of articles by language researchers and designers such as C.A.R. Hoare, and Niklaus Wirth, arguing for simple and elegant languages as the tools for writing reliable software. Several essays by less strictly academic researchers, such as Maurice Wilkes and Richard Gabriel, provide accounts of the needs of industry. The final part of the paper, on the problems posed by parallel computing, is more speculative, but there is at least negative evidence -- the absence of any general-purpose high-level parallel languages -- to support my argument.

Contribution to Existing Literature: Programming languages are among the more thoroughly-studied areas of software, particularly in the two (soon to be three) History of Programming Languages conferences on major and some minor languages. Programming languages are among the more thoroughly-studied areas of software, particularly in the two (soon to be three) History of Programming Languages conferences on major and some minor languages. There has been less attention paid to questions of use: how programming languages interacted with practice and how they came to be accepted or rejected.

Fifty-Plus Years of Amnesia in Computing: The Disappearance and Resurrection of Virtual Machines as a Case Study

William W. McMillan, Eastern Michigan University

Topic: To many observers, computing seems to march ever onward toward more powerful, flexible, and sophisticated technological achievements. Curiously, though, many innovative, successfully implemented ideas in the field find temporary and notable niches, only to be forgotten by most practitioners, marginalized for a time, and then resurrected and popularized under a different guise. Examples are easy to find; this has occurred in operating systems, machine architecture, calculation engines, computing services, and other areas. Here, the focus will be on one particular technology in which this has occurred: virtual machines that allow computer programs to be compiled once and then run on multiple platforms. An example of this was the portable p-code language and virtual machine of the early 1970s, delivered to a wide user population with the UCSD Pascal System. It fell into disuse, not being successfully brought into the mainstream of the PC culture. The reincarnation of the technology was in the Java Virtual Machine from Sun Microsystems, which allows bytecode generated by a Java compiler to run on practically any modern platform without recompilation.

Argument: The likely reasons that some successful, advanced technologies are forgotten for a time include: 1) lack of adequate user resources to deploy the original technique widely, 2) promotion of inferior technology by powerful commercial players, 3) lack of knowledge on the part of many informally educated computing professionals, and 4) a scholarly tradition in the field that encourages short-term and narrow views of previous work. In the case of p-code, the first and second reasons were the major causes of the hiatus in the technology's use.

Evidence: The evidence for the existence of the described phenomenon is abundant for a host of examples. For the popularity of p-code in the 1970s, one has only to retrieve the manuals and technical reports from that era that are on the web and make use of the many accounts of the success of UCSD Pascal. The disappearance of p-code systems is evident from its absence in the commercial world for more than decade, along with the popularity of native-code-only compilers. Evidence for the stated reasons that some good technologies are set aside comes from histories of the software industry, consideration of technical capabilities of systems of relevant time periods, records of the number of professionals with degrees in computing, and analysis of citation patterns in computing literature.

Contribution to Existing Literature: This work seeks to point out a significant phenomenon that appears to have had little play in the historical computing literature and to shed light on some possible societal, economic, and epistemic forces at work in the evolution of the field. The more general topic is the dissemination of technology, which has been shown to be a significant factor by Mokyry and others.

Thomas Haigh

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SELECTED ACADEMIC:

University of Wisconsin--Milwaukee, Asst. Professor, School of Information Studies, 2004-
Indiana University, Bloomington, Visiting Assistant Professor, Informatics School, Fall 2003
Colby College, Visiting Instructor/Visiting Researcher, STS/Admin. Sci., 2001-3
University of Pennsylvania, History and Sociology of Science Ph.D. May 2003
Manchester University (UK), Department of Computer Science, B.Sc. & M.Eng, 1991-1995

SELECTED PEER REVIEWED PUBLICATIONS:

"Remembering the Office of the Future: Word Processing and Office Automation before the Personal Computer," forthcoming in *IEEE Annals of the History of Computing* 28:4 (October-December 2006).

"Engineering the Progressive Office: Technical Claims to Administrative Authority, 1917-1931" forthcoming in *Enterprise and Society*

"A Veritable Bucket of Facts: Origins of the Data Base Management System," *ACM SIGMOD Record* 35:2 (June 2006).

Thomas Haigh, "Software in the 1960s as Concept, Service, and Product", *IEEE Annals of the History of Computing* 24 (January-March 2002): 5-13.

Thomas Haigh, "The Chromium Plated Tabulator: Institutionalizing an Electronic Revolution, 1954-1958", *IEEE Annals of the History of Computing* 23 (October-December 2001): 75-104

Thomas Haigh, "Inventing Information Systems: The Systems Men and the Computer, 1950-1968" *Business History Review* 75 (Spring 2001): 15-61.

OTHER PUBLICATIONS, HONORS & SERVICE:

Around twenty five other publications, including research articles, book reviews, obituaries, biographies, and a review essay. Around thirty published or forthcoming oral history interviews.

Seventeen competitively reviewed presentations, including four SHOT papers, three Business History Conference papers, and papers at the North American Labor History Conference and Hagley conference on the Technological Fix. Ten invited presentations and departmental seminars including Tokyo University and a public keynote address at the 2005 CHOC workshop in Amsterdam.

Awards, Grants and Fellowships include: Software History Center Research Fellowship (2003), IEEE Life Member Fellowship in Electrical History (2000-01), Tomash Fellowship in the History of Information Processing (Babbage Institute, 1999-00), William Penn Fellowship (1995-99), Fulbright Award for post-graduate study in the US (1995-96)

Biographies editor and board member of *IEEE Annals of the History of Computing*

Chair, SHOT SIG on Computers, Information and Society, 2005-

Michael S. Mahoney

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Education: Phillips Academy, Andover, 1953-57; Harvard University, B.A. magna cum laude (History and Science), 1960; Universität München, 1960-1962; Princeton University, Ph.D. (History and History of Science), 1967

Academic Honors, Fellowships, and Grants: National Merit Scholar, 1957-1960; Harvard National Scholar, 1957-1960; Stipendiat des Deutschen Akademischen Austauschdiensts, 1960-1962; National Science Foundation Graduate Fellowship, 1964-1965; NSF-NATO Postdoctoral Fellow, 1969-1970; National Endowment for the Humanities Summer Stipend, 1975; Director, National Endowment for the Humanities Summer Seminar for Secondary School Teachers, 1984, 1985; Alfred P. Sloan Foundation, Grants in support of research and development of curricular materials on "The Engineer's Experience and the New Liberal Arts", 1984-91 (with D.P. Billington, R. Mark, and J. Mulvey); Fellow, Dibner Institute for History of Science and Technology, MIT, 1995-96; Visiting Scholar, Department of History of Science, Harvard University, 1995-96; Corresponding Member, Académie Internationale d'Histoire des Sciences

Teaching Career: *Princeton University*, Instructor in History to Professor of History, 1965--; Director, Program in History and Philosophy of Science, 1972-1976; Program in History of Science and Program in Science in Human Affairs, 1983-1984, 1987-90; Associate Chair of History, 2005-07.

Non-Academic Employment: Computer Programmer, Melpar Electronics, Boston, 1959-1960 (parttime); Member of Technical Staff, AT&T Bell Laboratories, Government Information Systems, Holmdel, NJ, Summer 1987; Consultant on Software Development, 1987-88; Consultant on History of UNIX, 1989-90

Memberships and Professional Service (selected): History of Science Society; Society for the History of Technology; Association for Computing Machinery (Historical Consultant to SIGPLAN History of Programming Language Conferences II [1993] and III [2007] and to SIGSOFT Impact Project); IEEE Computer Society; Consulting Editor, *Studies in History and Philosophy of Science*; Editorial Board, *Annals of the History of Computing, Interdisciplinary Science Reviews*; Chair, OTA Advisory Panel for "Computer Software and Intellectual Property: Meeting the Challenges of Technological Change and Global Competition", 1990-91

Pertinent Recent Publications (since 2001):

"Boys' Toys and Women's Work: Feminism Engages Software", in Londa Schiebinger, Elizabeth Lunbeck, and Angela N.H. Creager (eds.), *Science, Medicine, and Technology: The Difference Feminism Has Made* (Chicago: University of Chicago Press 2001), Chap. 9

"Software: The Self-Programming Machine", in Atsushi Akera and Frederik Nebeker (eds.), *From 0 to 1: An Authoritative History of Modern Computing* (New York: Oxford U.P., 2002)

"Software as Science - Science as Software", in Arthur Norberg and Ulf Hashagen (eds.), *Mapping the History of Computing: Software Issues* (Heidelberg/Berlin: Springer Verlag, to appear)

"In Our Own Image: Creating the Computer", in Ida Stamhuis, Teun Koetsier, and Kees de Pater (eds), *The Changing Image of the Sciences* (Dordrecht: Kluwer Academic Publishers, 2002)

"Finding a History for Software Engineering", *Annals of the History of Computing* 26,1(2004), 8-

"The Histories of Computing(s)", a lecture in the series "Digital Scholarship, Digital Culture", at the Centre for Computing in the Humanities, King's College, London, 18 March 2004; published version in [Interdisciplinary Science Reviews](#) 30,2(June, 2005)

"What Was the Question? The Origins of the Theory of Computation", in *Using History to Teach Computer Science and Related Disciplines* (Selected Papers from a Workshop Sponsored by Computing Research Association with Funding from the National Science Foundation) ed. Atsushi Akera and William Aspray (Washington, DC: Computing Research Association, 2004), 225-232.

ROY G. SALTMAN, M.S., M.P.A.
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Roy G. Saltman has undertaken research, writing, and public speaking on the subject of election technology for over 30 years. He began studying the subject while employed as a computer scientist at the National Bureau of Standards (NBS), now called the National Institute of Standards and Technology (NIST). He joined NBS in 1969 after working for 14 years in the aerospace and computer industries. Among its duties, NBS/NIST carries out consultations for other federal agencies.

In 1973, he was asked to carry out a study of difficulties in computerized voting by the Office of Federal Elections of the General Accounting Office, which soon became the Federal Election Commission. The resulting report, "Effectiveness of Computing Technology in Vote-Tallying" was published in 1975. It was the first comprehensive report ever written on this subject, and many of its recommendations remain pertinent today. It laid the groundwork for the later development of the federal guidelines for voting equipment. In 1986, following stories in *The New York Times* alleging software manipulation in computerized voting, he was asked by the John and Mary R. Markle Foundation to undertake a second study. The output was the 1988 report, "Accuracy, Integrity, and Security in Computerized Vote-Tallying." Among its recommendations was that pre-scored punch-card ballots should not be used. This advice was widely publicized, but only in 2000, during the Florida election controversy in which the use of those ballots was a significant factor.

Since his retirement from NIST in 1996, he has consulted for such agencies as the Inter-American Development Bank, the International Foundation for Election Systems, the National Science Foundation, and the Smithsonian Institution. In 2001, he was asked to present his views to a Maryland state committee reviewing voting technology, and he contributed to several national task forces studying election administration. In that year, he testified to the House of Representatives Committee on Science on proposed legislation that would become the Help America Vote Act. He has served as an expert witness in lawsuits and made presentations to such organizations as Common Cause and the Caltech/MIT Voting Technology Project, and to government-sponsored conferences in Ecuador, Mexico and Peru. Both NPR and C-SPAN have broadcast his views, and he presented a paper at the 2006 SHOT annual meeting on the invention and use of lever voting machines.

In 2006, his book "The History and Politics of Voting Technology: In Quest of Integrity and Public Confidence" was published by Palgrave-Macmillan, and a complimentary review was printed in the January 2007 issue of *The Election Law Journal*. He continues to be active in his field, working with interest groups and legislative committees to craft legislation pending in Congress and the Maryland General Assembly.

His academic degrees are from Rensselaer Polytechnic Institute (BEE, 1953), MIT (MS, 1955), Columbia University (EE, 1962) and American University (MPA, 1976).

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Specialization History and geography of information/communication technology and labor.

Credentials

- 2006-present Associate Professor, School of Library & Information Studies (50%) and School of Journalism & Mass Communication (50%), University of Wisconsin-Madison. Also affiliated with: Dept. of Geography; Dept. of History of Science; Holtz Center for Science and Technology Studies (steering committee 2006-2010).
- 2001-2006 Assistant Professor, School of Library & Information Studies (50%) and School of Journalism & Mass Communication (50%), University of Wisconsin-Madison.
- 2000-2001 Woodrow Wilson Postdoctoral Fellow in the Humanities, Department of Geography and Humanities Institute, University of Minnesota, Twin Cities.
- 1995-2000 Ph.D. in both History of Technology and Human Geography, the Johns Hopkins University, Baltimore, MD. Advisers: David Harvey, Stuart Leslie, Erica Schoenberger. Thesis: "Telegraph messenger labor in the first communications internetwork, 1850-1950."
- summer 1996 Intern, Community Information Exchange, Washington, DC.
- 1993-1995 M.A. in Liberal Studies, Northwestern University. Advisers: Josef Barton and Henry Binford. Thesis: "Bookmobiles as information technologies."
- summer 1994 Intern, Center for Neighborhood Technology, Chicago, IL.
- 1992-1995 Lead programmer of multimedia educational simulation authoring tools at Roger Schank's Institute for Learning Sciences, Northwestern University, Evanston, IL.
- 1989-1992 Information systems analyst, Leo Burnett Advertising, Chicago, IL.
- 1985-1989 B.S. and M.S. in Computer Science, University of Illinois, Urbana-Champaign. Adviser: Roy Campbell. Thesis: "Artificial intelligence in object-oriented design."

Books

Greg Downey, *The push-button library: Computer automation, networking, and storage in the transformation of library labor, 1945-1995*.

Research underway, continuing through summer and sabbatical 2007. Target for manuscript completion: summer 2008.

Greg Downey, *Constructing closed captioning: Subtitling, stenography, and the digital convergence of text with television* (Baltimore: The Johns Hopkins University Press, forthcoming, 2007).

Manuscript completed Nov. 2005; reviewed, revised, and now in press.

Greg Downey, *Telegraph messenger boys: Labor, technology, and geography, 1850-1950* (New York: Routledge, 2002).

Reviews: Space and Culture, 05/2003; Isis, 06/2003; Technology and Culture, 07/2003; Journal of American History, 12/2003; American Historical Review, 12/2003; Enterprise & Society, 04/2004; Histoire Sociale / Social History 05/2004; International Review of Social History 08/2004; EH.net, 11/2004.

William W. McMillan
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Education

M.B.A. specializing in marketing	2002	Wayne State University, Detroit, MI
M.S. in Computer Science	1985	Case Western Reserve University, Cleveland, OH
Ph.D. in Experimental Psychology	1982	Case Western Reserve University
M.A. in Psychology	1979	Case Western Reserve University
B.A. <i>cum laude</i> in Psychology	1976	Cleveland State University

Professional Experience

Eastern Michigan University, Ypsilanti, MI

Interim Department Head	January 2005 to present
Professor of Computer Science	1994 to 2004
Associate Professor	1988 to 1994
Assistant Professor	1984 to 1988

Teaching and research interests: software engineering, human-computer interaction, history of technology.

Recent Publications and Presentations

McMillan, W. W. (2005). "The Standard Register Company's Developments in Systems Analysis during the Early 1940s in Anticipation of Automated Data Processing," presented at the meeting of the Society of the History of Technology, Minneapolis, MN.

McMillan, W. W. and Harrison, M. L. (2003). "Running it up the Flagpole: Techniques for Presenting Ideas and Designs," *Proceedings of the AMA Summer Marketing Educators' Conference*, presented at Chicago, IL, American Marketing Association.

LoPresti, E. F., Koester, H. H., McMillan, W. W., Moore, P., Ashlock, G., Simpson, R. C. (2002). "Tools for Assessing Computer Access Skills," *Proceedings of the ACM ASSETS Conference*, presented at Edinburgh, Scotland, New York: ACM Press.

McMillan, W.W. & Rajaprabhakaran, S. (1999). "What Leading Practitioners Say Should be Emphasized in Students' Software Engineering Projects." *Proceedings of the 12th Conference on Software Engineering Education and Training*. Los Alamitos, CA: IEEE Computer Society.

Grants: National Institutes of Health, Small Business Technology Transfer Grants, Phase 1 and Phase 2, 1996-2002, totaling over \$500,000 (with Koester Performance Research, Ann Arbor, MI)

Comments: My current research interests, combining backgrounds in psychology, computer science, and business, are in the role of communication in innovation and in the methods that have been developed to design and use complex systems.

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Education

M.S.	Wright State University	1982	computer science
Ph.D.	Yale University	1973	philosophy
M.A.	Yale University	1966	philosophy
M.S.	Stanford University	1963	mathematics
B.A.	Harvard University	1962	mathematics (magna cum laude, PBK)

Recent employment

2002-	Union College	Professor of Computer Science
1989-	Union College	Associate Professor of Computer Science
2002		
1983-	Wright State University	Assistant Professor of Computer Science
1989		

Research interests: history of real-time computing, programming languages, CS education, concurrency and parallel processing, functional and logic programming

Publications, 2000-2007

The ACM IEEE-CS guidelines for undergraduate CS education, forthcoming *Comm. of the ACM*, May 2007.

Encyclopedia Britannica articles, 2001-2004:

- Computers (lead article)
- Programming Languages
- Computer Memory
- Computer Graphics
- Data Compression
- short articles: Database, Operating System, Spreadsheet, Web browser, Word processor

Encyclopedia of Computer Science, 4th ed. (John Wiley & Sons, Inc, 2000) edited by Anthony Ralston, Edwin D. Reilly, David Hemmendinger

Early evaluation for performance enhancement in phased logic, with R.B. Reese, M.A. Thornton, C. Traver. *IEEE Trans. on Computer-Aided Design of Integrated Circuits and Systems*, 24:4 (April 2005), pp 532-550

Professional memberships

- Phi Beta Kappa
- Sigma Xi
- Society for the History of Technology
- IEEE (Senior Member)
- Association for Computing Machinery
- ACM Special Interest Group on Programming Languages

Laurie Robertson, CSDP, PMP
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Education:

Ph.D., Science and Technology Studies, (in progress)

Dissertation: The Role of the Generative Metaphor in the Conceptualization of Software (in progress)

M.L.S., Information Science, University of Pittsburgh, 1983

B.A, Mathematics/Sociology (double major), Rice University, 1982

Academic Presentations:

Robertson, Laurie (2002). The Software Engineering presented at the Society for Literature and Science Conference, Pasadena, CA

Robertson, Laurie (2005). Motor Voter and HAVA: The Unintended Consequences of Voting Legislation and Policy presented at the STS Global Conference, Washington, DC.

Robertson, Laurie (2005). One Man, One Vote: Trust between the Electorate, the Establishment, and Voting Technology presented at the International Association of Science and Technology Studies Conference, Baltimore, MD.

Academic Publications:

Robertson, Laurie (2002). From VMS to NT. IEEE Annals of the History of Computing , 90-91

Robertson, Laurie (2004). Arlington Hall – The Lesser Known WWII Cryptoanalytic Center, IEEE Annals of the History of Computing, 93-94.

Robertson, Laurie (2005). Googling History, IEEE Annals of the History of Computing, 96-97.

Robertson, Laurie (2006). One Man One Vote: Trust between the Electorate, the Establishment, and Voting Technology, Journal of Technology Studies, 85-89.

Academic Grants and Fellowships:

MITRE Accelerated Advanced Degree Program (2006-2009)

Academic/Professional Affiliations

IEEE Annals of the History of Computing, Anecdotes Editor/Member of the Editorial Board, (2004-present)

Project Management Institute (2004-present)

IEEE Computer Society, member (1989-present)

Association for Computing Machinery, member (1987-present)

Awards and Honors:

Virginia Tech Citizen Scholar Award (2005)

PMI Certified Project Management Professional (2005)

IEEE Certified Software Development Professional (2003)

National Guard Bureau Minuteman Award (2002)

RCAS Coin Award (2001)

DARPA Appreciation Award (1985)

Experience:

Lead Information Systems Engineer, MITRE, 2005 – present

Project Manager/Senior Principal Systems Engineer, SAIC, 2002-2005

Chief Systems Engineer, Averstar/Titan, 1999-2002