James S. Miller

World Wide Web Consortium
Room NE43-408
545 Technology Square
Cambridge, MA 02139
USA
JMiller@w3.org
+1-(617)253-3194

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Areas of Interest

I've designed and implemented a number of novel and useful real-world systems over more than twenty-five years, including: the PICS system for Internet content selection (1995); the first public implementation of the Dylan programming language (Thomas, 1993); an e-mail mediated group conversation system (MECCA/Systers' data base, 1992); a multi-directional gateway between email, news groups, and a proprietary threaded discussion system (Telegraph, 1991); an early complete programming system for a parallel computer (MultiScheme, 1989); the first portable implementation of the programming language Scheme (CScheme, 1983); a complete multi-tasking PASCAL system (Jericho Pascal, 1979); the first full-function electronic mail system (Hermes, 1976); a concurrent-access data base system (MIT Clearinghouse, 1973); and a very early source-level debugging system for a high-level language (BDDT, 1972);

My work involves people interacting with computers to perform tasks better than either can do alone. I create systems which allow each partner in the task to understand the other's abilities and limitations, so each can make informed decisions about the division of labor. My work deals with creating simple models of what the computer does and conveying them to the human partners. I draw on my strengths as both a teacher and a computer professional.

I have contributed to the integration of software technologies; computer protocols and public policy; programming languages; parallel symbolic processing; human–computer interaction; computer security, data privacy, and societal issues.

Education

1987	PhD, MIT	Computer Science: MultiScheme: A Parallel Processing System Based on MIT Scheme
1981	MS, U. Alaska	Engineering Management: Computer Architecture for Military Message Systems
1976	B. Eng., MIT	Materials Engineering: Kinetics of Nucleation in Hexadecane

Employment Experience

June 1994–Present: Research Scientist, MIT Laboratory for Computer Science, World

Wide Web Consortium (W^3C). As Domain Leader for the Technology and Society Domain at W^3C, I am a member of the senior management team reporting directly to Tim Berners-Lee, director of W^3C. I manage an international team that initiates, manages, and coordinates a number of projects related to the evolution of the World Wide Web. I have been responsible for all external fund raising, as well as rallying support from W3C's over 200 member organizations. Projects revolve around the impact of a new medium on society:

Payment Negotiation for Electronic Commerce
The Joint Electronic Payment Initiative (JEPI), undertaken by W3C and CommerceNet, created a general negotiation protocol (Protocol Extension Protocol or PEP) that was then used to simplify the user experience of choosing a payment vehicle.

Child Protection and Content Regulation
Principle designer (with Paul Resnick) of the PICS system for Content Selection. PICS was the first widely-deployed metadata system that addressed the full range of issues that arise in a distributed system: separation of data from the schema for the data; multiple distribution mechanisms; digital signatures on the metadata and/or data; separation of processing rules from the schema, data, and metadata. PICS provides parents "controls without censorship".

Trustworthy Metadata
The Digital Signature Initiative (DSig) addresses the problem of signing metadata in a distributed environment. By attaching digital signatures to metadata, it becomes possible to separate the author of the data from the author of the metadata from the person or organization vouching for either. This allows a new business model to evolve, in which third parties provide trust.

General Metadata
Beginning with the work on PICS and DSig, the Technology and Society Domain was able to demonstrate to the W3C's members the vital role that metadata will play in the evolving Web infrastructure. The Resource Description Framework (RDF) project capitalizes on this by bringing the engineering resources of over twenty companies and organizations together to expand the ideas in PICS with those arising elsewhere (XML, CDF, MCF, XML/Data, and others) to form a robust metadata system for the Web's future.

Data and Personal Privacy Protection
The Platform for Privacy Preferences Project (P3P) builds on the work in RDF and JEPI to combine the ideas of metadata and negotiation to form the basis for an international privacy protection system. The idea is to use RDF to label the privacy policies enforced by individual Web site owners, use a variant of PICS Rules to allow users to express their privacy preferences (what data may be revealed under what guarantees of future use), and use PEP to negotiate a privacy protection agreement.

All of this provides a market-based driver to encourage site owners to provide explicit privacy policy statements, reduce the redistribution of private data, and receive explicit informed consent for the use of private data.

Access by People With Disabilities
The Web Accessibility Initiative, funded jointly by W3C, the U.S. National Science Foundation, U.S. Department of Education, and the European Commission TIDE program, addresses both the technological and the societal issues of providing access to this new medium by people who have disabilities. The key idea is to provide the needed technological hooks and at the same time provide guidelines for tool makers and content creators so that Web content becomes accessible to all. There is a major educational component, as well, with a theme of "universal design helps everyone, not just those with disabilities."

December 1993–June 1994: Senior Research Fellow, Open Software Foundation Research Institute. Team leader for the Wide-Area Intelligent Browsing Assistant project, which concentrates on tools for helping users cope with the complexity of the World-Wide Web. Our work has included the development of a portable, extensible Web browser (Ariadne), the creation of an agent toolkit (OreO), and a tool kit for creating Web clients.

November 1993–June 1994: Visiting Scientist, MIT AI Lab. Primarily concerned with documenting via publications the significant technology in the MIT Scheme system. This work, done over the previous decade, includes advances in the areas of compiler optimization for higher-order and dynamic languages, language design, garbage collection, and object representation.

July–November 1993 (full-time), November 1993–December 1993 (part-time): DEC Information Delivery Utility. Joined an existing engineering group developing a corporate-wide system for preparing and delivering customized management reports. Over the initial four month period, prepared an alternative design based on the use of Mosaic and World-Wide Web technology from the Internet. The design was adopted to replace major components of the existing system. The decision to adopt Internet technology has been hailed within the company as a major step forward in Digital's internal information system organization. Currently working on strategy for deploying the system and integrating it with major legacy servers across the company.

Spring 1993: Visiting Lecturer, MIT EECS. Taught two sections of "6.001: Structure and Interpretation of Computer Programs." Worked with Prof. Harold Abelson on a user interface toolkit for Scheme under X and MS Windows.

1990–June 1993: Member of Research Staff, Digital Equipment Corporation Cambridge Research Laboratory

The Organization Engine
Designed and implemented a research prototype demonstrating seamless "virtual data integration" from a desktop to heterogeneous data sources, including audio and image data. Demonstrated it in the health care market using two pre-existing hospital systems.

Telegraph
Designed and implemented a system providing remote, asynchronous access to Internet news and Digital's VAXnotes via electronic mail. Exploits the ubiquitous nature of electronic mail to provide subscription and browsing services for streams of information. Currently in routine operational use within Digital.

MECCA: Systers' Data-Based E-Mail
Designed in collaboration with Anita Borg and Brian Reid to support group electronic conversations. Implemented the existing system and supported initial deployment efforts. MECCA defines five specific services offered to the group through the use of a combined electronic mail system and user profile data base: publication/subscription, direct mail, external list building, archival/retrieval, and administration.

Scheme Language
Co-editor of the IEEE (now ANSI and ISO) Standard for the Scheme Programming Language. Initiator of a joint effort (MIT/Digital) to design and implement a user interface tool kit for Scheme to run under both X Windows (using TK/TCL) and MicroSoft Windows.

Dylan Language
Directed a three person implementation team for the first publically available version of the Dylan^{tm} language (the language was designed and the name trademarked by Apple Computer). This implementation, "Thomas," is written in portable IEEE Scheme and is distributed freely with sources. Designed and implemented a new syntax, "Bob," for the same underlying language, but based on BCPL rather than LISP notation.

1987–1990: Assistant Professor, Brandeis University

Computer Mediated Information Exchange.
Directed a study of a number of applications which can be viewed as exchanging information between participants: database applications, document preparation, on-line reference works, on-line directory service, electronic mail, and business form tracking. This study evolved into the Organization Engine work at Digital.

Parallel Symbolic Computing.
Supervised work on Gambit, a retargetable compiler for a parallel extension to Scheme including a back-end that generates portable C code.

1982–1987: Visiting scientist and research staff, MIT Artificial Intelligence Laboratory; Lecturer, MIT Electrical Engineering and Computer Science Department

VLSI design tools and Connection Machine.
Coordinated project to design and develop a new generation of computer based tools for design of custom VLSI chips. Worked with Danny Hillis on the design of the Connection Machine, including coding the initial set of microcode for message delivery.

Scheme system development.
Implemented Scheme in C. This system is still in world-wide use, and is the basis for a current course offering at MIT to 800 students annually. Coordinated 7 undergraduates to prepare the system for full-scale use in an undergraduate laboratory. Coordinated the installation of hardware and software for 48 personal computers at the laboratory.

Continuing Education.
Served as contact person for industrial participants in MIT's Lifelong Continuing Education program. Prepared educational materials and computer programs for use with the course.

1976–1982: Staff Programmer (MTS), Bolt, Beranek and Newman, Inc.

Project Hermes, Programmer and Team Leader
Implemented and later co-managed the development of Hermes, one of the first electronic mail systems and a prototype for more powerful office automation systems. Work included the design of a secure human interface for use in military applications.

INTELPOST, Technical Manager
Implemented the human interface and managed the development of INTELPOST, a service of the U.S. Postal Service that provides guaranteed overnight delivery of a facsimile copy of printed material between the United States and selected foreign countries. The system was developed under severe time, equipment, and budget constraints.

Other projects Included a proposal for a multi-media mail system; design of an e-mail system based on standard data base technology; Jericho PASCAL system design and development (microcode through windowing OS).

1972–1976: Part-time programmer, Bolt, Beranek, and Newman, Inc.
Work included design, implementation, and maintenance of the BCPL compiler, runtime system, and source code debugger as well as the creation of the MIT Clearinghouse system, an on-line multi-user data base system which is still in use at MIT.

References

References are available upon request.

Publications

Refereed Journals

J. S. Miller and G. Rozas, “Free Variables and First-Class Environments”, *Lisp and Symbolic Computation*, 1991.

J. S. Miller, “Implementing a Scheme-based Parallel Processing System”, *International Journal of Parallel Processing*, October, 1988.

Refereed Conferences

J. S. Miller, C. Niedner and J. London, “The Organization Engine: Virtual Data Integration”, *Society for Computer Applications in Medical Care*, 1992.

E. Simoudis and J. S. Miller, “Validated Retrieval in Case-Based Reasoning”, AAAI 1990.

J. S. Miller and M. Feeley, “A Parallel Virtual Machine for Efficient Scheme Compilation”, *LISP and Functional Programming*, 1990.

J. S. Miller, “Military Message Systems: Applying a Security Model”, *Proceedings of the 1981 Symposium on Security and Privacy*, IEEE Computer Society, October, 1981.

Books

Problem Sets for use with Structure and Interpretation of Computer Programs (Macintosh Version), G. J. Sussman, H. Abelson, J. S. Miller and friends, MIT Press, Cambridge, MA, 1988.

Other Publications

Garbage Collection in MultiScheme (Preliminary Version) (J. S. Miller and B. Epstein) in "Parallel Lisp: Languages and Systems" Springer–Verlag Lecture Notes in Computer Science, T. Ito and R. H. Halstead, Jr. editors, 1990.

BBN Report 5167, *Message Systems Design*, September, 1982.

BBN Report 4114 *Security Considerations for Military Message Systems*, October, 1979.

BBN Report 4121 *HERMES Security Design*, March, 1979.

Professional Activities

Electronic Mail mediator for the Authors of the Revised Reports on the Programming Language Scheme. 1992–present.

Member, Dylan Partners, Apple Computer. 1992–present.

Co-editor, IEEE Standard for the Scheme Programming Language. 1988–1991.

Technical editor for MIT Press: *Scheme and the Art of Computer Programming*, George Springer and Daniel P. Friedman, MIT Press, Cambridge, MA, 1990.

Technical editor for MIT Press: *Programming Languages: Abstraction, Representation, and Implementation*, Daniel P. Friedman, Mitchell Wand, Christopher T. Haynes, and Eugene E. Kohlbecker, MIT Press, Cambridge, MA, 1990.

Government review panel, Honeywell Secure Computer (SCOMP) project.

Honors and Awards

Outstanding Student, U. Alaska Fairbanks Engineering Management

MIT EECS Department Graduate Student Instructorship

American Electronics Association Teaching Fellowship

DEC DECWorld Excellence Award

DEC Outstanding Achievement Award

Theses Supervised

Trust Management for the World Wide Web, Yang-hua Chu, MEng, MIT, 1997. Available on-line at `http://www.w3.org/TandS/Theses/YangHuaChu`.

iShare–Document Annotation and Version Control for the Internet, Jason Thomas, MEng, MIT, 1997. Available on-line at `http://www.w3.org/TandS/Theses/JasonThomas`.

Caching in a Data-based Web Server, Chris Fuchs. MEng, MIT, 1996.

HTTP-based Protocol for Internet Calendaring and Scheduling, Wingkong (Oliver) Yip, MEng, MIT, 1996. Available on-line at `http://www.w3.org/TandS/Theses/OliverYip`.

Efficient Scheme-Based Parallel Processing, Marc Feeley. PhD, Brandeis, 1993.

Case Retrieval for Case-Based Reasoning, Evangelos Simoudis. PhD, Brandeis, 1990.

Speculative Computation in MultiScheme, Barbara Epstein. BA, Brandeis, 1989.

Spectrum Port of LIAR Compiler, Jeffrey Heller. BA, Brandeis, 1989.

MultiTrash: A Parallel Garbage Collector for MultiScheme, Anthony Courtemanche. SB, MIT, 1986.

Debugging Tools for Parallel Processor Scheme, Stewart Clamen. SB, MIT, 1986.

LIAR: A Compiler for Scheme, Guillermo Rozas. SB, MIT, 1984.

Patents

Filed for two U.S. and international software patents. One, on user interface technology filed jointly with Jagadeesan Ganapathi (DEC), has been issued in the U.S. One on database integration (DEC) remains pending.

Courses Taught

Structure and Interpretation of Computer Programs, MIT undergraduate course (co-lecturer for 400 students, with a staff of 7 faculty recitation instructors, 15 graduate tutors, and 20 undergraduate lab assistants). *When Human Meets Computer*, Brandeis graduate seminar.
Computer Languages and Compiler Design Brandeis graduate and undergraduate courses.
Structure and Interpretation of Computer Programs, industrial 2-week versions at MIT, Hewlett–Packard, UniForum (Sweden), Royal Melbourne Institute of Technology (Melbourne, Australia), and DEC.
Parallel Processing, Brandeis graduate seminar.
Introduction to Computer Security, Tanana Valley Community College, Fairbanks, Alaska.
Introduction to BASIC, Tanana Valley Community College.