

Jonathan Sobel

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Summary of Qualifications

Expert in software architectures and programming language theory, design, and implementation, including compilers for embedded systems. Extensive education, training, and research. Unusually broad and deep knowledge of the theory and practice of computing and information systems. Experience with many programming languages and paradigms. Strong awareness of business issues and their impact on the information-systems design space.

Professional Experience

2007–present

Software Engineer, Technology Center, Cisco Systems, Research Triangle Park, NC.

- Established distributed infrastructure for multi-medium collaboration environment, including knowledge server and distributed knowledge cache, supporting 2D and 3D collaboration tools.
- Served as a Cisco representative on Virtual Worlds Interoperability Forum, representing Cisco's interest in standards-based protocols for more manageable and interoperable virtual environments.
- Worked with management and business development to envision and prototype the next generation of contextually-aware social network systems.

2002–2007

Senior Computer Scientist, SAS Institute, Cary, NC.

- Worked directly with executives and senior management at top-tier financial institutions to prioritize requirements and deliver superior risk management systems for global banking.
- Designed and implemented innovative object-relational bridge between Java and databases, with compile-time checking of correspondence between code and data model and strong guarantees about data integrity and auditability.
- Designed and implemented an approval workflow framework that allows end users to express just the local constraints on workflow, eliminating the complex burden of global workflow construction.
- Acquired mastery of SAS Business Intelligence Platform code base and produced Analytical Solutions Library, relied on by several commercial products for simple access to server-side computational resources. Defect-free for two years.
- Designed and implemented an industry-leading multidimensional security system that is simultaneously simple-to-understand, highly expressive, and very scalable. Carried this authorization system across web tier, row-level access in tabular reports, and OLAP cube exploration in Business Intelligence toolset.

2001–2002

Senior Software Engineer, Storage Networking Division, IBM, Research Triangle Park, NC.

- As a Customer Enablement Team member, quickly designed specialized storage solutions for large corporate customers, working between customer and internal development organizations.
- With a small team, designed and implemented a high-reliability distributed system for Fibre Channel resource and topology discovery, delivering production-grade software that beat coding-time, defect-rate, and performance expectations, each by an order of magnitude or more.
- Worked on system architecture and design for high-performance, high-availability Linux NAS product, achieving significant SMP performance gains through improved lock handling in the Linux kernel NFS server.

(continued)

- 2000–2001 **Senior Software Analyst, Reliametrics Group, Nortel Networks, Research Triangle Park, NC.**
- Performed analysis and evaluation of telecommunications systems software at Nortel Networks and its acquisitions, reporting on systemic flaws in design and implementation, with recommendations for corrective action.
 - Created and articulated new vision for Reliametrics research group.
 - Invented new source-to-source transformations for C, C++, and Java.
- 1997–2000 **Research Assistant, Computer Science Dept., Indiana Univ., Bloomington, IN.**
- Developed techniques and authored research articles on multi-threaded programming, compile-time elimination of the overhead introduced by abstraction, automatic elimination of stack-space usage, and more expressive programming through the use of reflection.
 - Wrote two compilers for Dylan, with C and the JVM as targets, and a compiler for Scheme, with Digital (now HP/Compaq) Alpha™ as target.
 - Created a type analyzer based on abstract interpretation, used as “soft-typer” for Scheme. (At the time, this system was able to reconstruct more type information than any other such system in existence.)
- 1995–2000 **Senior System Administrator and Head of Information Systems; Abodes, Inc., The Bakehouse, and Perennial Designs** (three companies with the same owners).
- Performed retail sales analysis, managed database and point-of-sale systems.
 - Designed and implemented database and user interface for point-of-sale, wholesale, and management reporting system.
 - Installed and managed servers (file, print, web, e-mail) and networks.
 - Implemented commercial web site.
- 1991–1992 **Research Assistant, Furman Univ., Greenville, SC.**
- Developed a system for simulating the solution to arbitrarily many partial differential equations, using a VCR-like interface, including a stereographic 3D display and frame interpolation for smooth playback at any rate; built on a custom object-oriented interface to the lowest level of Xlib.

Education

Ph.D., Indiana Univ., *in progress*. Major: Computer Science (Programming Languages). Minor: Logic.
M.S., Indiana Univ., 1998. Major: Computer Science (Programming Languages).
B.S., *magna cum laude*, Furman Univ., 1992. Majors: Physics and Computer Science/Math.

Publications

Jonathan Sobel, Erik Hilsdale, Daniel P. Friedman, and R. Kent Dybvig. Abstraction and performance from explicit monadic reflection. In *Proceedings of the Sixth Workshop on Scheme and Functional Programming (Scheme 2005)*, pages 27–40, Tallinn, Estonia, September 2005.

Jonathan Sobel and Daniel P. Friedman. Recycling continuations. In *Proceedings of the Third ACM SIGPLAN International Conference on Functional Programming (ICFP '98)*, pages 251–260. ACM, Baltimore, September 1998.

Jonathan M. Sobel and Daniel P. Friedman. An introduction to reflection-oriented programming. In *Proceedings of Reflection '96*, pages 117–136, San Francisco, April 1996.

Additional Professional Activities

- 1992–present Member of Association for Computing Machinery (ACM) and its special interest group on programming languages (SIGPLAN).
- 1992–present Member of the Programming Languages group at Indiana University.
- 1997–1999 Graduate representative on IU Computer Science Department’s Undergraduate Education Committee.

Works in Progress

Jonathan Sobel, Steven E. Ganz, Daniel P. Friedman, and Mitchell Wand. A monadic categorical semantics for threads.

Jonathan Sobel. *Compiling with Categories*. Ph.D. thesis, Indiana University.

Ongoing Projects

2001–present A high-quality compiler for an expressive typed language, derived from a precise categorical semantics, targeting the JVM.

1995–present A set of theoretically founded language extensions for supporting computational reflection. The focus of this project is on the ability to reflect about meta-level concepts with as few ties as possible to specific implementation details.

Interests and Activities

Mathematical foundations as a route to practical, highly reliable, high-performance software. For example, it was the domain-theoretic foundations of multidimensional hierarchical spaces that led directly to the design and implementation of a very practical security system in 2005.

Computational reflection as a means of making meta-information available to a process. Also, the foundational connection between monads and reflection and the composition of reflective components via object-orientation.

Static analysis to improve program performance and understanding, especially abstract interpretation.

Team software design and team programming.

Abstract control operators to manipulate flow in well-defined, mathematically understandable ways.

Computer science pedagogy.

Various musical interests. I sing, play violin, and compose.

Awards and Honors

2003 SAS R&D High Performance Team.

1992 National Science Foundation Graduate Research Fellowship, *Honorable Mention*.

1992 Indiana Univ. College of Arts and Sciences Fellowship.

1988–1992 Awards during undergraduate education: Gladden String Quartet Scholarship (also, original/founding member); Furman Univ. Symphony Orchestra, *Principal Second Violinist*; Furman Univ. Physics Award; James B. Duke Fellowship; National Merit Scholarship.

1988 High School Valedictorian, Strom Thurmond H.S., Edgefield, SC.

Also, member of the following honorary societies:

Phi Beta Kappa, Omicron Delta Kappa, and Sigma Pi Sigma.