

David Walker

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Positions

Assistant Professor, Princeton University, February 2002-.

Post-doctoral Researcher, Carnegie Mellon University, October 2000-October 2001.

Education

Ph.D. Computer Science, Cornell University, Advisor: Greg Morrisett, 2001

Masters of Science, Computer Science, Cornell University, 1999

Bachelors of Science (Honors), Computer Science, Queen's University, 1995

Research Interests

Programming languages, type systems, operational semantics, program logics, type-preserving compilation, "ad hoc" data processing, and language-based security.

Awards

ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI) Best Paper Award for the paper entitled "Fault-tolerant Typed Assembly Language," 2007

Emerson Junior Faculty Award for Excellence in Research and Teaching, 2005

Alfred P. Sloan Fellow, 2004

NSF Career Award, 2003

Cornell Computer Science Outstanding TA Award. May 1996.

Prince of Wales Prize, Honorable Mention, 1995 (Awarded to the student with the 2nd highest standing in faculty of Arts and Science, Queens University)

R. W. Leonard Penultimate Year Scholarship, 1994 (Awarded to the student with the highest standing through 3 years of Bachelors of Science, Queens University)

Academic Service

Associate Editor for ACM Transactions on Programming Languages and Systems. June 2007-.

NSF-sponsored Summer School on Language-Based Techniques for Integrating with the External World. Steering Committee. July 2007.

NSF-sponsored Summer School on Language-Based Techniques for Concurrent and Distributed Software. Steering Committee. July 2006.

The Computer Science Futures Project, a DARPA-sponsored panel on the Future of Computer Science Research. Panelist, 2006.

NSF-sponsored Summer School on Reliable Computing. Organizing committee (co-chair). Eugene, OR, July 2005.

NSF-sponsored Summer School on Security: Theory to Practice. Organizing committee (co-chair). Eugene, OR, June 2004.

ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages. Publicity Chair. 2003-2006.

Panelist for a number of NSF funding programs.

Program Committees

ACM SIGPLAN Workshop on Programming Languages and Analysis for Security. Program Committee, 2007.

Trends in Functional Programming. Program Committee, 2007.

ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages. Program Committee, 2007.

ACM SIGPLAN International Symposium on Code Generation and Optimization. Program Committee, 2007.

Workshop on Foundations of Object-Oriented Languages. Program Committee, 2007.

ACM/NSF Summer School on Language-Based Techniques for Concurrent and Distributed Software. Steering Committee. July 2006.

33rd International Colloquium on Automata, Languages and Programming. Program Committee, 2006.

Workshop on Foundations of Aspect-Oriented Languages, Program Committee, 2006

Workshop on Semantics, Program Analysis and Computing Environments for Memory Management. Program Co-chair, 2006.

Workshop on Foundations of Aspect-Oriented Languages. Program Chair, 2005.

Workshop on Logics for Resources, Processes and Programs, Program Committee. 2004.

ACM SIGPLAN International Conference on Functional Programming. Program Committee, 2004.

ACM SIGPLAN International Workshop on Types in Language Design and implementation. Program Committee, 2004.

Workshop on Foundations of Aspect-Oriented Languages, Program Committee. March 2004.

New Jersey Programming Languages Seminar, Host. September 2003.

New Jersey Programming Languages Seminar, Program Chair. December, 2002.

Workshop on Partial Evaluation and Semantics-based Program Manipulation, Program committee, January 2002.

Princeton Service

Committee on Undergraduate Admission and Financial Aid 2007-.

BSE '09 academic advisor.

Freshman advisor.

Graduated Ph.D. Students

Yitzhak Mandelbaum. Graduated August 2006.

Thesis title: The Theory and Practice of Data Description.

First position: Researcher, AT&T Labs Research.

Jay Ligatti. Graduated May 2006.

Thesis title: Policy Enforcement via Program Monitoring.

First position: Assistant Professor, University of South Florida.

Current Ph.D. Students

Limin Jia. Supervised since February 2002. Graduation expected October 2007.

Dan Dantas. Supervised since February 2003. Graduation expected August 2007.

Frances Perry. Supervised since February 2004.

Qian Xi. Supervised since June 2007.

Ph.D. Dissertation Committees

Zhaozhong Ni, Ph.D. Yale University, 2006

Spyridon Triantafyllis. Ph.D., 2006

Dinghao Wu. Ph.D., 2005

Gang Tan. Ph.D., 2005

Xinming Ou. Ph.D., 2005

Eun-Young Lee, Ph.D., 2004

Juan Chen, Ph.D., 2004

Amal Ahmed. Ph.D., 2004

Yitzchak, Gottlieb. Ph.D., 2004

Kedar N. Swadi, Ph.D., 2003

Lujo Bauer, Ph.D., 2003

Undergraduate Research Advising

Aaron Potechin, Summer Research, 2007

David Costanzo, Summer Research, 2007

Zach Devito, Junior Independent Work, Fall 2006

Ben DeLoache, Senior Independent Work, Fall 2006

Lester Mackey, Junior Independent Work, Spring 2006; Summer Research 2006

Jin Oh, Senior Independent Work, Spring 2006

Mark Daly, Senior Thesis, Fall 2005-Spring 2006

Michael Ten-Pow, Junior Independent Work. Fall 2005

Rob Simmons, Senior Thesis, Fall 2004-Spring 2005

Jonathon Heinberg, Junior Independent Work, Fall 2002-Spring 2003

Bismark Paliz, Senior Independent Work, Fall 2002

Awards Won by my Students

CRA Outstanding Undergraduate Student, won by Lester Mackey, 2007 (Awarded to one male and one female student from any North American university for demonstrated excellence in computer research. Awarded to Lester Mackey in part for his junior independent research and summer research with me.)

Moses Taylor Pyne Honor Prize, won by Lester Mackey, 2007 (The highest general distinction conferred on an undergraduate at Princeton. Awarded to Lester Mackey in part for his junior independent research and summer research with me.)

Princeton Computer Science Department Senior Thesis Award, won by Rob Simmons, my undergraduate advisee, 2005.

Teaching

COS JIW/397/SRT/497: Undergraduate Independent Research Program (Fall 07)

COS 226: Introduction to Algorithms and Data Structures (Co-taught with Robert Sedgewick, Spring 07)

COS 320: Compiling Techniques (Spring 03, Spring 04, Spring 05, Spring 06)

COS 441: Programming Languages (Undergraduate) (Fall 05, Fall 07)

COS 510: Programming Languages (Graduate) (Fall 02, Fall 03)

COS 597: Computer Security Foundations (Fall 04)

COS 598: Foundations of Language-Based Security (Spring 02)

TACL Seminar: Princeton's research seminar on programming languages and compiler technology (Periodically)

Refereed Publications

2007

1. Towards 1-click Tool Generation with PADS. David Burke, Kathleen Fisher, David Walker, Peter White and Kenny Q. Zhu. In the ICML-2007 Workshop on Challenges and Applications of Grammar Induction. June 2007.
2. Fault-tolerant Typed Assembly Language. Frances Perry, Lester Mackey, George A. Reis, Jay Ligatti, David I. August, and David Walker. ACM SIGPLAN Conference on Programming Language Design and Implementation. June 2007. Winner of the PLDI 07 Best Paper Award.
3. A Dual Semantics for the Data Description Calculus (Extended Abstract). Yitzhak Mandelbaum, Kathleen Fisher and David Walker. In the Eighth Symposium on Trends in Functional Programming, April 2007.
4. PADS/ML: A Functional Data Description Language. Yitzhak Mandelbaum, Kathleen Fisher, David Walker, Mary Fernandez, and Artem Gleyzer. ACM SIGPLAN-SIGACT Symposium on Principles of Programming languages. January 2007.

2006

5. A Type-Theoretic Interpretation of Pointcuts and Advice. Jay Ligatti, David Walker and Steve Zdancewic. *Science of Computer Programming*. Volume 63, Issue 3, pp 240-266. December 2006.
6. Expressing Heap-shape Contracts in Linear Logic. Frances Spalding, Limin Jia and David Walker. *ACM SIGPLAN-SIGSOFT International Conference on Generative Programming and Component Engineering*. October 2006.
7. Static Typing for a Faulty Lambda Calculus. David Walker, Lester Mackey, Jay Ligatti, George Reis, and David August. *ACM SIGPLAN International Conference on Functional Programming*. September 2006.
8. Mechanized Metatheory for User-Defined Type Extensions. Daniel Marino, Brian Chin, Todd Millstein, Gang Tan, Robert J. Simmons and David Walker. *ACM SIGPLAN Workshop on Mechanizing Metatheory*. September 2006.
9. PADS: An End-to-end System for Processing Ad Hoc Data. Mark Daly, Mary Fernandez, Kathleen Fisher, Robert Gruber, Yitzhak Mandelbaum, David Walker and Xuan Zheng. *ACM SIGMOD demo*. June 2006.
10. ILC: A Foundation for Automated Reasoning about Pointer Programs. Limin Jia and David Walker. *European Symposium on Programming Languages*. In *Programming Languages and Systems*, LNCS 3924, pp 131-145, Peter Sestoft editor. March 2006.
11. AspectML: A Polymorphic Aspect-oriented Functional Programming Language. Daniel S. Dantas, David Walker, Geoffrey Washburn, Stephanie Weirich. Generated March 2006. Accepted for publication in *ACM Transactions on Programming Languages and Systems*, 2007.
12. Making Extensibility of System Software Practical with the C4 Toolkit. Marco Yuen, Marc E. Fiuczynski, Robert Grimm, Yvonne Coady and David Walker. *Workshop on Software Engineering Properties of Languages and Aspect Technologies*. March 2006.
13. The Next 700 Data Description Languages. Kathleen Fisher, Yitzhak Mandelbaum and David Walker. *ACM SIGPLAN-SIGACT Symposium on Principles of Programming languages*. January 2006.
14. Harmless Advice. Daniel S. Dantas and David Walker. *ACM SIGPLAN-SIGACT Symposium on Principles of Programming languages*. January 2006.
15. LaunchPADS: A System for Processing Ad Hoc Data. Mark Daly, Mary Fernandez, Kathleen Fisher, Yitzhak Mandelbaum and David Walker. *Demo Paper in PLAN-X 06: Programming Language Technologies for XML*. January 2006.

2005

16. PolyAML: A Polymorphic Aspect-oriented Functional Programming Language. Daniel S. Dantas, David Walker, Geoffrey Washburn and Stephanie Weirich. *ACM SIGPLAN International Conference on Functional Programming*. September 2005.
17. Enforcing Non-safety Security Policies with Program Monitors. Jay Ligatti, Lujo Bauer and David Walker. *Tenth European Symposium on Research in Computer Security*. September 2005.
18. Patch(1) Considered Harmful. Marc E. Fiuczynski, Robert Grimm, Yvonne Coady and David Walker. *Workshop on Hot Topics in Operating Systems*. June, 2005.
19. Certifying Compilation for a Language with Stack Allocation. Limin Jia, Frances Spalding, David Walker and Neal Glew. *IEEE Symposium on Logic in Computer Science*. June 2005.

20. A Refined Proof Theory for Reasoning About Separation. Limin Jia and David Walker. IEEE Symposium on Logic in Computer Science, short paper. June 2005.
21. Composing Security Policies in Polymer. Lujo Bauer, Jay Ligatti and David Walker. ACM SIGPLAN Conference on Programming Language Design and Implementation. June 2005.
22. Edit Automata: Enforcement Mechanisms for Run-time Security Policies. Jay Ligatti, Lujo Bauer and David Walker. International Journal of Information Security, Volume 4, Number 2, pp. 2-16, February 2005. ISSN: 1615-5262, Springer-Verlag.
23. Substructural Type Systems. Chapter 1 of Advanced Topics in Types and Programming Languages, Benjamin Pierce, ed., January 2005.
24. Harmless Advice. Daniel S. Dantas and David Walker. In Foundations of Object-Oriented Languages, January 2005.

2004

25. Dynamic Typing with Dependent Types (extended abstract). Xinming Ou, Gang Tan, Yitzhak Mandelbaum, and David Walker. In the 3rd IFIP International Conference on Theoretical Computer Science, August, 2004.
26. Specifying Properties of Concurrent Computations in CLF. Kevin Watkins, Iliano Cervesato, Frank Pfenning and David Walker. Workshop on Logical Frameworks and Meta-Logics. Cork, Ireland, July 2004.
27. Modal Proofs As Distributed Programs (extended abstract). Limin Jia and David Walker. In the European Symposium on Programming, LNCS 2986, David Schmidt (Ed.), pp. 219-233, Springer, April, 2004.
28. A Concurrent Logical Framework: The Propositional Fragment. Kevin Watkins, Iliano Cervesato, Frank Pfenning and David Walker. In S. Berari, M. Coppo, and F. Damiani, Ed, Types for Proofs and Programs, Lecture Notes in Computer Science 3085, Springer-Verlag, pages 355-377, 2004. Revised selected papers and from the Third International Workshop along the Types for Proofs and Program, Torino, Italy, April 2003.

2003

29. A Theory of Aspects. David Walker, Steve Zdancewic and Jay Ligatti. In the ACM SIGPLAN International Conference on Functional Programming, August 2003.
30. An Effective Theory of Type Refinements. Yitzhak Mandelbaum, David Walker and Robert Harper. In the ACM SIGPLAN International Conference on Functional Programming, August 2003.
31. Reasoning about Hierarchical Storage. Amal Ahmed, Limin Jia and David Walker. IEEE Symposium on Logic in Computer Science, pp. 33-44. Ottawa, Canada, June 2003.
32. Resource Usage Analysis Via Scoped Methods. Gang Tan, Xinming Ou and David Wnoalker. Foundations of Object-Oriented Languages. January, 2003.
33. The Logical Approach to Stack Typing. Amal Ahmed and David Walker. ACM workshop on Types in Language Design and Implementation. January, 2003.

2002

34. Types and Effects for Non-interfering Program Monitors. Lujo Bauer, Jarred Ligatti and David Walker. International Symposium on Software Security. Tokyo, November, 2002. Revised for printing in Software Security – Theory and Systems, LNCS 2609, Springer, pp 154–171. December 2002.
35. More Enforceable Security Policies. Lujo Bauer, Jarred Ligatti and David Walker. Workshop on Computer Security Foundations. Copenhagen, July 2002.
36. Stack-based Typed Assembly Language. Greg Morrisett, Karl Crary, Neal Glew, and David Walker. Journal on Functional Programming, 12(1):43-88, January 2002.

2001

37. On Linear Types and Regions. David Walker and Kevin Watkins. In ACM SIGPLAN International Conference on Functional Programming, September 2001.
38. On Linear Types and Regions. David Walker and Kevin Watkins. In the Workshop on Semantics, Program Analysis and Computing Environments for Memory Management. London, UK, January 2001.
39. Alias Types for Recursive Data Structures. David Walker and Greg Morrisett. Workshop on Types in Compilation. Montreal, Canada. Selected and revised papers printed in LNCS 2071 (Harper, ed.) March 2001.

2000

40. Typed Memory Management via Static Capabilities. David Walker, Karl Crary, and Greg Morrisett. ACM Transactions on Programming Languages and Systems, 22(4):701-771, July 2000.
41. Alias Types. Frederick Smith, David Walker, and Greg Morrisett. European Symposium on Programming. Published in Lecture Notes in Computer Science, Gert Smolka, editor, volume 1782, 366-381, Berlin, Germany, March 2000.
42. A Type System for Expressive Security Policies. David Walker. Twenty-Seventh ACM SIGPLAN Symposium on Principles of Programming Languages . pages 254-267, Boston, January 2000.

1999

43. A Type System for Expressive Security Policies. David Walker. In the FLOC '99 Workshop on Run-time Result Verification. Trento, Italy, July 1999.
44. From System F to Typed Assembly Language. Greg Morrisett, David Walker, Karl Crary, and Neal Glew. ACM Transactions on Programming Languages and Systems, 21(3):527-568, May 1999.
45. TALx86: A Realistic Typed Assembly Language. Greg Morrisett, Karl Crary, Neal Glew, Dan Grossman, Richard Samuels, Frederick Smith, Dave Walker, Stephanie Weirich, and Steve Zdancewic. In the ACM SIGPLAN Workshop on Compiler Support for System Software. pages 25-35, Atlanta, May 1999.
46. Typed Memory Management in a Calculus of Capabilities. Karl Crary, David Walker, and Greg Morrisett. Twenty-Sixth ACM SIGPLAN Symposium on Principles of Programming Languages. pages 262-275, San Antonio, January 1999.

1998

47. Stack-Based Typed Assembly Language. Greg Morrisett, Karl Crary, Neal Glew, and David Walker. 1998 Workshop on Types in Compilation (TIC '98). Kyoto, Japan. Published in Xavier Leroy and Atsushi Ohori, editors, Lecture Notes in Computer Science, volume 1473, pages 28-52. Springer, 1998.
48. From System F to Typed Assembly Language. Greg Morrisett, David Walker, Karl Crary, and Neal Glew. Twenty-Fifth ACM SIGPLAN Symposium on Principles of Programming Languages. pages 85-97, San Diego, January 1998.

Invited Talks and Lectures

- From Dirt to Shovels: Fully Automatic Tool Generation From Ad Hoc Data. AT&T UC Symposium, August 2007.
- Summer School on Language-Based Techniques for Integrating with the External World. Invited lecturer. July 2007.
- On Cosmic Rays, Bat Droppings and What We Can Do About Them. Yale University Computer Science Department Colloquium. November 2006.
- On Cosmic Rays, Bat Droppings and What We Can Do About Them. IFIP Working Group 2.8. July 2006.
- PADS/ML: A Functional Data Description Language. Carnegie Mellon POP Seminar. May 2006.
- Logics for Checking Properties of Pointer Programs. Workshop on Intuitionistic Modal Logics and Applications. June 2005.
- Stacks, Heaps and Regions: One Logic to Bind Them. Workshop on Semantics, Program Analysis, and Computing Environments for Memory Management. January, 2004.
- Summer School on Foundations of Security. Invited lecturer. University of Oregon, June, 2003.
- ACM State-of-the-art Summer School on Foundations of Internet Security. Invited lecturer. Poland, June 2002.
- Poly stop a hacker. New Jersey Programming Languages Seminar. September, 2002.
- Symposium on Cyber Security and Trustworthy Software. March, 2002.

Funding

- Real-Time Network Forensic Analysis. DARPA subcontract under prime contract number FA8750-07-C-0014 (PI). \$79,329. January-June 2007.
- Well-typed, Trustworthy Computing in the Presence of Transient Faults. NSF award CNS-0627650 (PI). \$1,100,000. August 2006 - August 2010.
- Language Support for Data-centric Systems Monitoring. NSF award CNS 0615062 (PI). \$798,975. July 2006 - July 2009.
- Automatic Tool Generation for Ad Hoc Scientific Data. NSF award IIS 0612147 (PI). \$493,124. July 2006 - July 2009.
- Collaborative Research: CSR-PDOS: Managing OS Extensibility via Aspect-oriented Programming Technology. NSF award CSR 0615213 (Co-PI). \$315,319. July 2006 - July 2009.
- Emerson Junior Faculty Award for Excellence in Research and Teaching. \$30,000. May 2005.
- Alfred P. Sloan Fellow. \$40,000. Sept 2004-Sept 2006.

Assurance-Carrying Components. ARDA grant for BAA 03-03-FH, Co-PI. \$759,910. Oct 2003-March 2005.

CAREER: Programming Languages for Secure and Reliable Component Software Systems. NSF Career Grant, CCR-0238328, PI. \$437,700. July 2003-June 2008.

Collaborative Research: High-Assurance Common Language Runtime. NSF CCR-0208601, Co-PI. \$1,114,468.00. July 2002-June 2007.

A Gift from Microsoft Research. \$25,000. February 2002.

Scaling Proof-Carrying Code to Production Compilers and Security Policies. DARPA contract F30602-99-1-0519, Co-PI. December 2002-December 2003.

Efficient Logics For Network Security. ONR. Senior personnel (Carnegie Mellon University). February 2001-January 2002.