

# Steven Swanson

Professor  
Computer Science & Engineering  
University of California, San Diego

swanson@cs.ucsd.edu  
(858) 534-1743  
<http://swanson.ucsd.edu>

## Appointments

Full Professor Department of Computer Science & Engineering University of California, San Diego.	2016–present
Associate Professor Department of Computer Science & Engineering University of California, San Diego.	2012–2016
Assistant Professor Department of Computer Science & Engineering University of California, San Diego.	2006–2012
Graduate Research Assistant Department of Computer Science & Engineering University of Washington.	1999–2006

## Education

<b>Ph.D., Computer Science &amp; Engineering</b> Advisors: Mark Oskin & Susan Eggers Dissertation: “The WaveScalar Architecture” University of Washington, Seattle, WA.	2006
<b>M.S., Computer Science &amp; Engineering</b> Advisors: Susan Eggers & Hank Levy University of Washington, Seattle, WA.	2001
<b>B.S., Computer Science and Mathematics with Honors</b> The University of Puget Sound, Tacoma, WA.	1999

## Refereed Journal and Conference Publications

Devon Merrill and Steven Swanson. Reducing Instructor Workload in an Introductory Robotics Course via Computational Design. In *The 50th ACM Technical Symposium on Computer Science Education (to appear)*, 2019.

Steven Swanson. Trial by Flyer: Building Quadcopters From Scratch in a Ten-Week Capstone Course. In *The 50th ACM Technical Symposium on Computer Science Education (to appear)*, 2019.

Yang Liu, Jianguo Wang, and Steven Swanson. Griffin: Uniting CPU and GPU in Information Retrieval Systems for Intra-query Parallelism. In *Proceedings of the 23rd ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming*, PPOPP '18, pages 327–337, ACM, New York, NY, USA, 2018.

Kunal Korgaonkar, Ishwar Bhati, Huichu Liu, Jayesh Gaur, Sasikanth Manipatruni, Sreenivas Subramoney, Tanay Karnik, Steven Swanson, Ian A. Young, and Hong Wang. Density Tradeoffs of Non-Volatile Memory as a Replacement for SRAM based Last Level Cache. In *43rd International Symposium on Computer Architecture*, ISCA 2018, 2018.

Jian Xu, Lu Zhang, Amirsaman Memaripour, Akshatha Gangadharaiah, Amit Borase, Tamires Brito Da Silva, Steven Swanson, and Andy Rudoff. NOVA-Fortis: A Fault-Tolerant Non-Volatile Main Memory File System. In *Proceedings of the 26th Symposium on Operating Systems Principles*, SOSP '17, pages 478–496, ACM, New York, NY, USA, 2017.

- Hung-Wei Tseng, Qianchen Zhao, Yuxiao Zhou, Mark Gahagan, and Steven Swanson. Morpheus: Creating Application Objects Efficiently for Heterogeneous Computing. In *43rd International Symposium on Computer Architecture, ISCA 2016*, 2016.
- Gunjae Koo, Kiran Kumar Matam, Te I, H. V. Krishna Giri Narra, Jing Li, Hung-Wei Tseng, Steven Swanson, and Murali Annavaram. Summarizer: Trading Communication with Computing Near Storage. In *Proceedings of the 50th Annual IEEE/ACM International Symposium on Microarchitecture, MICRO-50 '17*, pages 219–231, ACM, New York, NY, USA, 2017.
- Z. Yang, M. Hoseinzadeh, A. Andrews, C. Mayers, D. T. Evans, R. T. Bolt, J. Bhimani, N. Mi, and S. Swanson. AutoTiering: Automatic data placement manager in multi-tier all-flash datacenter. In *2017 IEEE 36th International Performance Computing and Communications Conference (IPCCC)*, pages 1–8, Dec 2017.
- Z. Yang, M. Hoseinzadeh, P. Wong, J. Artoux, C. Mayers, D. T. Evans, R. T. Bolt, J. Bhimani, N. Mi, and S. Swanson. H-NVMe: A hybrid framework of NVMe-based storage system in cloud computing environment. In *2017 IEEE 36th International Performance Computing and Communications Conference (IPCCC)*, pages 1–8, Dec 2017.
- Jianguo Wang, Chunbin Lin, Yannis Papakonstantinou, and Steven Swanson. An Experimental Study of Bitmap Compression vs. Inverted List Compression. In *Proceedings of the 2017 ACM International Conference on Management of Data*, pages 993–1008, ACM, 2017.
- Michael Wei, Amy Tai, Christopher J. Rossbach, Ittai Abraham, Maithem Munshed, Medhavi Dhawan, Jim Stabile, Udi Wieder, Scott Fritch, Steven Swanson, Michael J. Freedman, and Dahlia Malkhi. vCorfu: A Cloud-scale Object Store on a Shared Log. In *Proceedings of the 14th USENIX Conference on Networked Systems Design and Implementation, NSDI'17*, pages 35–49, USENIX Association, Berkeley, CA, USA, 2017.
- Amirsaman Memaripour, Anirudh Badam, Amar Phanishayee, Yanqi Zhou, Ramnatthan Alagappan, Karin Strauss, and Steven Swanson. Atomic In-place Updates for Non-volatile Main Memories with Kamino-Tx. In *Proceedings of the Twelfth European Conference on Computer Systems, EuroSys '17*, pages 499–512, ACM, New York, NY, USA, 2017.
- Y. Jin, H. W. Tseng, Y. Papakonstantinou, and S. Swanson. KAML: A Flexible, High-Performance Key-Value SSD. In *2017 IEEE International Symposium on High Performance Computer Architecture (HPCA)*, pages 373–384, Feb 2017.
- Jianguo Wang, Chunbin Lin, Ruining He, Moojin Chae, Yannis Papakonstantinou, and Steven Swanson. MILC: Inverted List Compression in Memory. *Proc. VLDB Endow.*, volume 10(8):853–864, April 2017, .
- Jian Xu and Steven Swanson. NOVA: A Log-structured File System for Hybrid Volatile/Non-volatile Main Memories. In *14th USENIX Conference on File and Storage Technologies (FAST 16)*, USENIX Association, Santa Clara, CA, February 2016.
- Yang Liu, Hung-Wei Tseng, and Steven Swanson. SPMario: Scale up MapReduce with I/O-Oriented Scheduling for the GPU. In *34th IEEE International Conference on Computer Design, ICCD 2016, Scottsdale, AZ, USA, October 2-5, 2016*, pages 384–387, 2016.
- Yang Liu, Hung-wei Tseng, Mark Gahagan, Jing Li, and Steven Swanson. Hippogriff: Efficiently Moving Data in Heterogeneous Computing Systems. In *Proceedings of the 34th IEEE International Conference on Computer Design, ICCD'16*, 2016.
- Michael Wei, Christopher J Rossbach, Ittai Abraham, Udi Wieder, Steven Swanson, Dahlia Malkhi, and Amy Tai. Silver: A Scalable, Distributed, Multi-versioning, Always Growing (Ag) File System. In *HotStorage*, 2016.
- Jing Li, Hung-Wei Tseng, Chunbin Lin, Yannis Papakonstantinou, and Steven Swanson. HippogriffDB: Balancing I/O and GPU Bandwidth in Big Data Analytics. *Proc. VLDB Endow.*, volume 9(14):1647–1658, October 2016, .
- Jianguo Wang, Dongchul Park, Yannis Papakonstantinou, and Steven Swanson. SSD In-Storage Computing for Search Engines. *IEEE Trans. Computers*, 2016, .
- Yiying Zhang and Steven Swanson. A study of application performance with non-volatile main memory. In *Mass Storage Systems and Technologies (MSST), 2015 31st Symposium on*, pages 1–10, May 2015.
- Yiying Zhang, Jian Yang, Amirsaman Memaripour, and Steven Swanson. Mojim: A Reliable and Highly-

- Available Non-Volatile Memory System. In *Proceedings of the 20th International Conference on Architectural Support for Programming Languages and Operating Systems*, 2015.
- Sudharsan Seshadri, Mark Gahagan, Sundaram Bhaskaran, Trevor Bunker, Arup De, Yanqin Jin, Yang Liu, and Steven Swanson. Willow: A User-Programmable SSD. In *Proceedings of the 11th USENIX Symposium on Operating Systems Design and Implementation (OSDI '14)*, 2014.
- Rajeev Balasubramonian, Jichuan Chang, Troy Manning, Jaime H. Moreno, Richard Murphy, Ravi Nair, and Steven Swanson. Near-Data Processing: Insights from a MICRO-46 Workshop. *Micro, IEEE*, volume 34(4):36–42, July 2014, .
- Dejan Vučinić, Qingbo Wang, Cyril Guyot, Robert Mateescu, Filip Blagojević, Luiz Franca-Neto, Damien Le Moal, Trevor Bunker, Jian Xu, Steven Swanson, and Zvonimir Bandić. DC Express: Shortest Latency Protocol for Reading Phase Change Memory over PCI Express. In *Proceedings of the 12th USENIX Conference on File and Storage Technologies, FAST'14*, pages 309–315, USENIX Association, Berkeley, CA, USA, 2014.
- Michael Wei, Matias Björling, Philippe Bonnet, and Steven Swanson. I/O Speculation for the Microsecond Era. In *2014 USENIX Annual Technical Conference (USENIX ATC 14)*, pages 475–481, USENIX Association, Philadelphia, PA, June 2014.
- Qiaoshi Zheng, Nathan Goulding-Hotta, Scott Ricketts, Steven Swanson, Michael Bedford Taylor, and Jack Sampson. Exploring Energy Scalability in Coprocessor-Dominated Architectures for Dark Silicon. *ACM Trans. Embed. Comput. Syst.*, volume 13(4s):130:1–130:24, April 2014, .
- Steven Swanson and Adrian M. Caulfield. Refactor, Reduce, Recycle: Restructuring the I/O Stack for the Future of Storage. *Computer*, volume 46(8):52–59, 2013, .
- Joel Coburn, Trevor Bunker, Meir Shwarz, Rajesh K. Gupta, and Steven Swanson. From ARIES to MARS: Transaction Support for Next-Generation Solid-State Drives. In *Proceedings of the 24th International Symposium on Operating Systems Principles (SOSP)*, 2013.
- Laura M. Grupp, John D. Davis, and Steven Swanson. The Harey Tortoise: Managing Heterogeneous Write Performance in SSDs. In *Proceedings of the 2013 USENIX Annual Technical Conference, USENIX ATC'13*, pages 1–12, USENIX Association, Berkeley, CA, USA, 2013.
- Adrian M. Caulfield and Steven Swanson. QuickSAN: A Storage Area Network for Fast, Distributed, Solid State Disks. In *ISCA '13: Proceeding of the 40th Annual International Symposium on Computer Architecture*, pages 1–11, ACM, New York, NY, USA, June 2013.
- P. Gupta, Y. Agarwal, L. Dolecek, N. Dutt, R.K. Gupta, R. Kumar, S. Mitra, A. Nicolau, T.S. Rosing, M.B. Srivastava, S. Swanson, and D. Sylvester. Underdesigned and Opportunistic Computing in Presence of Hardware Variability. *Computer-Aided Design of Integrated Circuits and Systems, IEEE Transactions on*, volume 32(1):8–23, jan. 2013, .
- Arup De, Maya Gokhale, Rajesh Gupta, and Steven Swanson. Minerva: Accelerating Data Analysis in Next-Generation SSDs. In *Proceedings of The 21st IEEE International Symposium on Field-Programmable Custom Computing Machines*, pages 1–8, 2013.
- Trevor Bunker and Steven Swanson. Latency-Optimized Networks for Clustering FPGAs. In *Proceedings of the 21st Annual IEEE International Symposium on Field-Programmable Custom Computing Machines (FCCM 2013)*, pages 1–8.
- MD Kamruzzaman, Steven Swanson, and Dean Tullsen. Load-Balanced Pipeline Parallelism. In *Proceedings of the Supercomputing '13*, 2013.
- V. Mohan, T. Bunker, L. Grupp, S. Gurusurthi, M.R. Stan, and S. Swanson. Modeling Power Consumption of NAND Flash Memories Using FlashPower. *Computer-Aided Design of Integrated Circuits and Systems, IEEE Transactions on*, volume 32(7):1031–1044, 2013, .
- Md kamruzzaman, Steven Swanson, and Dean M. Tullsen. Underclocked Software Prefetching: More Cores, Less Energy. *IEEE Micro*, volume 32(4):32–41, July 2012, .
- Hung-Wei Tseng, Laura M. Grupp, and Steven Swanson. Underpowering NAND Flash: Profits and Perils. In *50th Design Automation Conference (DAC 2013)*, pages 1–6, June 2013.
- Keaton Mowery, Michael Wei, David Kohlbrenner, Hovav Shacham, and Steven Swanson. Welcome to the

- Entropics: Boot-Time Entropy in Embedded Devices. In *IEEE Symposium on Security and Privacy (Oakland 2013)*, pages 1–15.
- Md Kamruzzaman, Steven Swanson, and Dean M. Tullsen. Coalition Threading: Combining Traditional and Non-Traditional Parallelism to Maximize Scalability. In *Proceedings of the 21st International Conference on Parallel Architectures and Compilation Techniques*, pages 1–10, September 2012.
- Ryan Gabrys, Eitan Yaakobi, Laura M. Grupp, Steven Swanson, and Lara Dolecek. Tackling Intracell Variability in TLC Flash Through Tensor Product Codes. In *International Symposium on Information Theory, ISIT*, pages 1–5, 2012.
- Laura M. Grupp, John D. Davis, and Steven Swanson. The Bleak Future of NAND Flash Memory. In *Proceedings of the 10th USENIX conference on file and storage technologies, FAST'12*, pages 1–8, USENIX Association, 2012.
- Adrian M. Caulfield, Todor I. Mollov, Louis Eisner, Arup De, Joel Coburn, and Steven Swanson. Providing Safe, User Space Access to Fast, Solid State Disks. In *Proceeding of the 17th international conference on Architectural support for programming languages and operating systems, ACM, New York, NY, USA, March 2012*.
- Ganesh Venkatesh, John Sampson, Nathan Goulding, Sravanthi Kota Venkata, Steven Swanson, and Michael Taylor. QsCores: Configurable Co-processors to Trade Dark Silicon for Energy Efficiency in a Scalable Manner. In *Proceedings of The 44th International Symposium on Microarchitecture*, pages 1–12, 2011.
- Ryan Gabrys, Laura Grupp, Steven Swanson, and Lara Dolecek. Tackling Temporal Variability in Multilevel Flash: New Error-Control Code Design and Architectural Validation. In *Invited Talk, Forty-Ninth Annual Allerton Conference*.
- Jack Sampson, Manish Arora, Nathan Goulding-Hotta, Ganesh Venkatesh, Jonathan Babb, Vikram Bhatt, Steven Swanson, and Michael Bedford Taylor. An Evaluation of Selective Depipelining for FPGA-based Energy-Reducing Irregular Code Coprocessors. In *2011 International Conference on Field Programmable Logic and Applications, IEEE*, September 2011.
- Pravin Prabhu, Ameen Akel, Laura Grupp, Wing-Key Yu, G. Edward Suh, Edwin Kan, and Steven Swanson. Extracting Device Fingerprints from Flash Memory by Exploiting Physical Variations. In *Proceedings of the 4th International Conference on Trust and Trustworthy Computing*, pages 1–17, 2011.
- Michael Wei, Laura M. Grupp, Frederick E. Spada, and Steven Swanson. Reliably Erasing Data From Flash-based Solid State Drives. In *Proceedings of the 9th USENIX conference on File and storage technologies, FAST'11*, pages 1–13, USENIX Association, Berkeley, CA, USA, 2011.
- Steven Swanson and Michael Bedford Taylor. GreenDroid: Exploring the next evolution in smartphone application processors. *Communications Magazine, IEEE*, volume 49(4):112–119, April 2011, .
- Manish Arora, Jack Sampson, Nathan Goulding-Hotta, Jonathan Babb, Ganesh Venkatesh, Michael Bedford Taylor, and Steven Swanson. Reducing the Energy Cost of Irregular Code Bases in Soft Processor Systems. *Field-Programmable Custom Computing Machines, Annual IEEE Symposium on*, volume 0:210–213, 2011, .
- Hung-Wei Tseng, Laura M. Grupp, and Steven Swanson. Understanding the Impact of Power Loss on Flash Memory. In *48th Design Automation Conference (DAC 2011)*, pages 1–6, June 2011.
- Nathan Goulding-Hotta, Jack Sampson, Ganesh Venkatesh, Saturnino Garcia, Joeseph Auricchio, Po-Chao Huang, Manish Arora, Siddhartha Nath, Vikram Bhatt, Jonathan Babb, Steven Swanson, and Michael Bedford Taylor. The GreenDroid Mobile Application Processor: An Architecture for Silicon's Dark Future. *Micro, IEEE*, volume 31(2):86–95, march-april 2011, .
- Joel Coburn, Adrian M. Caulfield, Ameen Akel, Laura M. Grupp, Rajesh K. Gupta, Ranjit Jhala, and Steven Swanson. NV-Heaps: Making Persistent Objects Fast and Safe With Next-Generation, Non-Volatile Memories. In *Proceedings of the sixteenth international conference on Architectural support for programming languages and operating systems, ASPLOS '11*, pages 105–118, ACM, 2011.
- Md Kamruzzaman, Steven Swanson, and Dean M. Tullsen. Inter-core prefetching for multicore processors using migrating helper threads. In *Proceedings of the sixteenth international conference on Architectural support for programming languages and operating systems, ASPLOS '11*, pages 393–404, ACM, New York,

NY, USA, 2011.

- Jack Sampson, Ganesh Venkatesh, Nathan Goulding, Saturnino Garcia, Steven Swanson, and Michael Bedford Taylor. Efficient Complex Operators for Irregular Codes. In *Proceedings of the 17th IEEE International Symposium on High-Performance Computer Architecture Conference (HPCA 17)*, pages 1–12, 2011.
- Adrian M. Caulfield, Arup De, Joel Coburn, Todor I. Mollov, Rajesh K. Gupta, and Steven Swanson. Moneta: A High-Performance Storage Array Architecture for Next-Generation, Non-volatile Memories. In *Proceedings of the 2010 43rd Annual IEEE/ACM International Symposium on Microarchitecture, MICRO '10*, pages 385–395, IEEE Computer Society, Washington, DC, USA, 2010.
- David G. Andersen and Steven Swanson. Rethinking Flash in the Data Center. *IEEE Micro*, volume 30(4):52–54, july-aug. 2010, .
- Adrian M. Caulfield, Joel Coburn, Toder I. Mollov, Arup De, Ameen Akel, Jiahua He, Arun Jagatheesan, Rajesh K. Gupta, Allan Snaveley, and Steven Swanson. Understanding the Impact of Emerging Non-Volatile Memories on High-Performance, IO-Intensive Computing. In *Proceedings of the 2010 ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis, SC '10*, pages 1–11, IEEE Computer Society, Washington, DC, USA, 2010.
- Ganesh Venkatesh, Jack Sampson, Nathan Goulding, Saturnino Garcia, Vladyslav Bryksin, Jose Lugo-Martinez, Steven Swanson, and Michael Bedford Taylor. Conservation cores: reducing the energy of mature computations. In *Proceedings of the fifteenth edition of ASPLOS on Architectural support for programming languages and operating systems, ASPLOS '10*, pages 205–218, ACM, New York, NY, USA, 2010.
- Md Kamruzzaman, Steven Swanson, and Dean M. Tullsen. Software data spreading: leveraging distributed caches to improve single thread performance. In *Proceedings of the 2010 Conference on Programming Language Design and Implementation*, volume 45, pages 460–470, ACM, New York, NY, USA, June 2010.
- Adrian M. Caulfield, Laura M. Grupp, and Steven Swanson. Gordon: An Improved Architecture for Data-Intensive Applications. *IEEE Micro*, volume 30:121–130, 2010, **IEEE Micro Top Picks**.
- Laura M. Grupp, Adrian M. Caulfield, Joel Coburn, Steven Swanson, Eitan Yaakobi, Paul H. Siegel, and Jack K. Wolf. Characterizing flash memory: anomalies, observations, and applications. In *Proceedings of the 42nd Annual IEEE/ACM International Symposium on Microarchitecture, MICRO 42*, pages 24–33, ACM, New York, NY, USA, 2009.
- Adrian M. Caulfield, Laura M. Grupp, and Steven Swanson. Gordon: using flash memory to build fast, power-efficient clusters for data-intensive applications. In *ASPLOS '09: Proceeding of the 14th international conference on Architectural support for programming languages and operating systems*, pages 217–228, ACM, New York, NY, USA, 2009.
- Steven Swanson, Anderw Putnam, Martha Mercaldi, Ken Michelson, Andrew Petersen, Andrew Schwerin, Mark Oskin, and Susan J. Eggers. Area-Performance Trade-offs in Tiled Dataflow Architectures. In *Proceedings of the 33rd annual international symposium on Computer Architecture, ISCA '06*, pages 314–326, IEEE Computer Society, Washington, DC, USA, 2006.
- Steven Swanson, Andrew Schwerin, Martha Mercaldi, Andrew Petersen, Andrew Putnam, Ken Michelson, Mark Oskin, and Susan J. Eggers. The WaveScalar Architecture. *ACM Transactions Computer Systems*, volume 25(2):4, 2007, .
- Steven Swanson, Ken Michelson, Andrew Schwerin, and Mark Oskin. WaveScalar. In *Proceedings of the 36th annual IEEE/ACM International Symposium on Microarchitecture, MICRO 36*, pages 291–302, IEEE Computer Society, Washington, DC, USA, 2003.
- Steven Swanson, Luke K. McDowell, Michael M. Swift, Susan J. Eggers, and Henry M. Levy. An evaluation of speculative instruction execution on simultaneous multithreaded processors. *ACM Transactions on Computer Systems*, volume 21(3):314–340, 2003, .
- Martha Mercaldi, Steven Swanson, Andrew Petersen, Andrew Putnam, Andrew Schwerin, Mark Oskin, and Susan J. Eggers. Instruction scheduling for a tiled dataflow architecture. In *Proceedings of the 12th international conference on Architectural support for programming languages and operating systems, ASPLOS-XII*, pages 141–150, ACM, New York, NY, USA, 2006.

Andrew Petersen, Andrew Putnam, Martha Mercaldi, Andrew Schwerin, Susan J. Eggers, Steven Swanson, and Mark Oskin. Reducing control overhead in dataflow architectures. In *Proceedings of the 15th international conference on Parallel architectures and compilation techniques*, PACT '06, pages 182–191, ACM, New York, NY, USA, 2006.

Martha Mercaldi, Steven Swanson, Andrew Petersen, Andrew Putnam, Andrew Schwerin, Mark Oskin, and Susan J. Eggers. Modeling instruction placement on a spatial architecture. In *Proceedings of the eighteenth annual ACM symposium on Parallelism in algorithms and architectures*, SPAA '06, pages 158–169, ACM, New York, NY, USA, 2006.

Robert Grimm, Janet Davis, Eric Lemar, Adam Macbeth, Steven Swanson, Thomas Anderson, Brian Bershad, Gaetano Borriello, Steven Gribble, and David Wetherall. System support for pervasive applications. *ACM Transactions on Computer Systems*, volume 22(4):421–486, 2004, .

Perry Fizzano and Steven Swanson. Scheduling Classes on a College Campus. *Comput. Optim. Appl.*, volume 16(3):279–294, September 2000, .

Steven Swanson and Perry Fizzano. General Techniques for Multithreading Algorithms. In *Proceedings of 1999 International Conference on Parallel and Distributed Techniques and Algorithms*, 1999.

## Patents

U.S. Patent No. 8,868,867: Method for reducing latency of accessing data stored in a file system on a computer storage device by caching file system permission information in the computer storage device

U.S. Patent No. 7,657,882: Wavescalar architecture having a wave order memory and processing in cache

## Workshops

Michael Wei and Steven Swanson. SYS: Synchronize Your System with Simple Hardware. In *LADIS 2013: The 7th Workshop on Large-Scale Distributed Systems and Middleware*, Farmington, PA, USA, 2013.

Meenakshi Sundaram Bhaskaran, Jian Xu, and Steven Swanson. BankShot: Caching Slow Storage in Fast Non-Volatile Memory. In *1st Workshop on Interactions of NVM/Flash with Operating Systems and Workloads*, INFLOW'13, 2013.

Ameen Akel, Adrian M. Caulfield, Todor I. Mollov, Rajesh K. Gupta, and Steven Swanson. Onyx: A Prototype Phase-Change Memory Storage Array. In *Proceedings of the 3rd USENIX conference on Hot topics in storage and file systems*, HotStorage'11, pages 1–5, USENIX Association, 2011.

Laura M. Grupp, Adrian M. Caulfield, Joel Coburn, Steven Swanson, Eitan Yaakobi, Paul H. Siegel, and Jack K. Wolf. Characterizing flash memory: anomalies, observations, and applications. In *2010 Non-Volatile Memories Workshop*, April 2010.

Adrian M. Caulfield, Arup De, Joel Coburn, Todor I. Mollov, Rajesh K. Gupta, and Steven Swanson. Moneta: A High-performance Storage Array Architecture for Next-generation, Non-volatile Memories. In *2011 Non-Volatile Memories Workshop*, March 2011.

Joel Coburn, Trevor Bunker, Rajesh K. Gupta, and Steven Swanson. Fast, Flexible Support for Transactions in a Next-Generation, Solid-State, Storage Array. In *2012 Non-Volatile Memories Workshop*, March 2012.

Joel Coburn, Adrian Caulfield, Laura M. Grupp, Ameen Akel, and Steven Swanson. New Abstractions for Fast, Non-Volatile Storage. In *2010 Non-Volatile Memories Workshop*, March 2010.

Nathan Goulding, Jack Sampson, Ganesh Venkatesh, Saturnino Garcia, Joe Auricchio, Jonathan Babb, Michael Taylor, and Steven Swanson. GreenDroid: A Mobile Application Processor for a Future of Dark Silicon. In *Proceedings of HotChips*, 2010.

Eitan Yaakobi, Paul H. Siegel, Steven Swanson, Jack Wolf, Laura Grupp, and Jing Ma. Error Characterization and Coding Schemes for Flash Memories. In *IEEE Globecom 2010 Workshop on Application of Communication Theory to Emerging Memory Technologies (ACTEMT 2010)*, pages 1–5, Miami, Florida, USA.

Laura Grupp, Adrian M. Caulfield, Joel Coburn, John Davis, and Steven Swanson. Beyond the Datasheet: Using Test Beds to Probe Non-Volatile Memories' Dark Secrets. In *IEEE Globecom 2010 Workshop on*

*Application of Communication Theory to Emerging Memory Technologies (ACTEMT 2010)*, pages 1–6, Miami, Florida, USA.

Sungjin Lee, Kermin Fleming, Jihoon Park, Keonsoo Ha, Adrian M. Caulfield, Steven Swanson, Arvind, and Jihong Kim. BlueSSD: An Open Platform for Cross-layer Experiments for NAND Flash-based SSDs. In *The 5th Workshop on Architectural Research Prototyping*, pages 1–5, 2010.

Steven Swanson and Mark Oskin. Towards a Universal Building Block of Molecular and Silicon Computation. In *Workshop on Non-Silicon Computing*, 2002.

Steven Swanson, Ken Michelson, and Mark Oskin. The Death of ILP. In *ASPLOS XI Wild and Crazy Idea Session*, 2004.

Andrew Schwerin, Steve Swanson, and Mark Oskin. Measuring the Complexity-effectiveness of Future-generation Silicon Architectures using FPGAs: A Status Report. In *Workshop on Complexity-effective Design*, June 2003.

Steven Swanson, Ken Michelson, Andrew Schwerin, and Mark Oskin. Dataflow: The Road Less Complex. In *Workshop on Complexity-effective Design*, 2003.

Steven Swanson, Ken Michelson, and Mark Oskin. Configuration by Combustion: Online Simulated Annealing for Dynamic Hardware Configuration. In *ASPLOS X Wild and Crazy Idea Session*, 2002.

Robert Grimm, Janet Davis, Eric Lemar, Adam MacBeth, Steven Swanson, Tom Anderson, Brian Bershad, Gaetano Borriello, Steven Gribble, and David Wetherall. System-level Programming Abstractions for Ubiquitous Computing. In *Workshop on Application Models and Programming Tools for Ubiquitous Computing*, 2001.

Robert Grimm, Janet Davis, Eric Lemar, Adam MacBeth, Steven Swanson, Tom Anderson, Brian Bershad, Gaetano Borriello, Steven Gribble, and David Wetherall. Systems Directions for Pervasive Computing. In *Proceedings of the 8th Workshop on Hot Topics in Operating Systems*, 2001.

## Tech Reports

Hung-Wei Tseng, Yang Liu, Mark Gahagan, Jing Li, Yanqin Jin, and Steven Swanson. Gullfoss: Accelerating and Simplifying Data Movement among Heterogeneous Computing and Storage Resources. Technical Report CS2015-1015, Department of Computer Science and Engineering, University of California, San Diego technical report, 2015. .

Kosuke Suzuki and Steven Swanson. The Non-Volatile Memory Technology Database (NVMDB). Technical Report CS2015-1011, Department of Computer Science & Engineering, University of California, San Diego, May 2015. [Http://nvmdb.ucsd.edu](http://nvmdb.ucsd.edu).

Rajesh K. Gupta Joel Coburn, Trevor Bunker and Steven Swanson. From ARIES to MARS: Reengineering Transaction Management for Next-Generation, Solid-State Drives. Technical Report CS2012-0981, Department of Computer Science & Engineering, University of California, San Diego, June 2012. .

Louis Alex Eisner, Todor Mollov, and Steven Swanson. Quill: Exploiting Fast Non-Volatile Memory by Transparently Bypassing the File System. Technical Report CS2013-0991, Department of Computer Science & Engineering, University of California, San Diego, Jan 2013. .

Steven Swanson. Destroying Flash Memory-Based Storage Devices. Technical Report cs2011-0968, University of California, San Diego Computer Science & Engineering. .

Michael Wei and Steven Swanson. SAFE: Fast, Verifiable Sanitization for SSDs. Technical Report cs2011-0963, University of California, San Diego Computer Science & Engineering. .

Trevor Bunker, Michael Wei, and Steven Swanson. Ming II: A Flexible Platform for NAND Flash-based Research. Technical Report CS2012-0978, Department of Computer Science & Engineering, University of California, San Diego, May 2012. .

Andrew Putnam, Steven Swanson, Ken Michelson, Martha Mercaldi, Andrew Petersen, Andrew Schwerin, Mark Oskin, and Susan J. Eggers. The Microarchitecture of a Pipelined WaveScalar Processor: An RTL-Based study. Technical Report TR-2005-11-02, University of Washington Computer Science & Engineering, 2005. .

Steven Swanson, Martha Mercaldi, Andrew Petersen, Andrew Putnam, Andrew Schwerin, Mark Oskin, and Susan J. Eggers. Balancing Parallelism and Sequentiality in Dataflow Models: Wave-ordered Memory. Technical Report TR-2005-10-03, University of Washington Computer Science & Engineering, 2005. .

Robert Grimm, Janet Davis, Eric Lemar, Adam MacBeth, Steven Swanson, Tom Anderson, Brian Bershad, Gaetano Borriello, Steven Gribble, and David Wetherall. Programming for Pervasive Computing Environments. Technical Report UW-CSE-01-06-01, University of Washington Computer Science & Engineering, 2001. .

## Awards

Facebook Faculty Award	2016
NetApp Faculty Fellow	2013, 2015, 2016
Google Faculty Award	2011, 2012, 2013, 2014
NSF CAREER Award	2007-2012
University of Washington CSE Microsoft Endowed Fellowship	2004-2005
Best Student Presentation, 36th Annual International Symposium on Microarchitecture	2003
Intel Graduate Research Fellowship	2002-2003
National Science Foundation Graduate Research Fellow	1999-2002

## Teaching

CSE290: Modern Storage Systems	Wi18
CSE191: Building Quadcopters	Sp15, Sp16, Sp17, Sp18
CSE42: Robot Parade	Fa15, Sp16, Fa17, Fa18
CSE141: Intro/Computer Architecture	Fa18, Wi15, Sp14, Sp13, Wi12, Wi11, Fa09, Sp09, Wi08
CSE 141L: Project/Computer Architecture	Sp13, Wi12, Wi11, Fa09, Sp09, Wi08
CSE 240A: Graduate Processor Architecture	Fa07, Fa10, Fa11, Sp14,
CSE 240C: Advanced Microarchitecture	Wi09, Sp10, Sp11, Sp13,

## Select University Service

Jacobs School Hands-on Engineering Education	2016-2017, 2018 (Chair)
Graduate Admissions Committee	2006-2010
Architecture Comps Chair	2007, 2009

## Professional Service

Program Committee Member for USENIX ATC	2019
Program Committee Member for HotStorage	2018
Heavy Program Committee Member for OSDI	2018
Co-General Chair Non-volatile Memories Workshop	2010–2019
Program Committee Member for MICRO	2013, 2015
Steering Committee INFLOW	2015
Program Committee Member for SOSP	2015
Program Committee Member for FAST	2013–2014
Program Committee Chair for HotStorage	2014



Program Committee Member for HotStorage	2013
Reviewer, Computer Architecture Letters	2012
Reviewer Transactions on IEEE Transactions on Computers	2012
Reviewer Transactions on Storage	2012
Program Committee Member for HPCA	2012
Program Committee Member for ASPLOS	2008, 2012
Reviewer for Computer Architecture Letters	2011
Program Committee Member for Micro TopPicks	2008
Program Committee Member for HotPower	2010
Wild and Crazy Idea Chair, ASPLOS	2008
Program Committee Member for PACT	2007
Program Committee Member for FoCS	2007
Program Committee Member for HiPC	2007
Program Committee Member for WEST	2011
Program Committee Member for WECRSS	2011
Web chair for ISCA	2007
Reviewer for Embedded Systems Letters	2010, 2011
External reviewer for HPCA	2004–2005
External reviewer for ISCA	2001, 2003–2005, 2007, 2011, 2013
External reviewer for ASPLOS	2004, 2006
External reviewer for MICRO	2003, 2008, 2010
External reviewer for CGO	2010

## Sponsored Research

Year	Title	Granting Agency	Total	My share
2007	CAREER: Niche-Based Systems: Unifrom Abstractions for Non-Uniform Hardware	NSF	\$400,000	\$400,000
2007	REU: CAREER: Niche-Based Systems: Unifrom Abstractions for Non-Uniform Hardware	NSF	\$12,000	\$12,000
2008	SSD Storage Device Secure Erasure	DoD	\$65,000	\$65,000
2008	Arsenal: Extending Moore's Law through the Design, Synthesis and Use of Massively Heterogeneous Systems	NSF	\$800,000	\$360,000
2009	Non-Volatile Data Intensive Supercomputing	DoD	\$700,000	\$350,000
2009	Flash Gordon: A Data Intensive Computer	NSF	\$22,000,000	\$330,000
2009	SSD Storage Device Secure Erasure	DoD	\$65,000	\$65,000
2009	Power Failure in Flash Memory	Western Digital	\$30,000	\$30,000
2010	Applications of Phase Change Memory	Numonyx	\$30,000	\$30,000
2010	Energy Proportional Warehouse Computer	Google, Inc	\$100,000	\$33,000
2010	SSD Storage Device Secure Erasure	DoD	\$65,000	\$65,000
2010	Variability-Aware Software for Efficient Computing with Nanoscale Devices	NSF	\$10,000,000	\$1,000,000
2010	Redefining IO Abstractions for Non-Volatile, Solid-State Memories: Languages and System Architectures	NSF	\$416,000	\$208,000
2010	Power Robustness in Flash Memory	Western Digital	\$30,000	\$30,000
2010	Applications of Phase Change Memory	Numonyx	\$30,000	\$30,000
2011	Reducing the Cost of Protection in Very Fast Solid-state Disks	Google, Inc	\$75,000	\$75,000
2011	Testing Flash Memories	Cisco System, Inc	\$20,000	\$20,000
2011	REU: CAREER: Niche-Based Systems: Unifrom Abstractions for Non-Uniform Hardware	NSF	\$16,000	\$16,000
2011	REU: Arsenal: Extending Moore's Law through the Design, Synthesis and Use of Massively Heterogeneous Systems	NSF	\$16,000	\$7,200
2012	Engineering A Fast PCM-based Cache for Disks	NetApp	\$40,000	\$40,000
2012	Software-Defined Solid-State Drives	Google	\$72,500	\$72,500
2012	Hybrid NVM-accelerated Data Center Storage Systems	Samsung	\$230,000	\$230,000
2012	Fast, Safe Access to Distribute Solid-State Storage	Google	\$72,500	\$72,500
2012	SHF: Small: Reengineering Database Systems for Fast SSDs	NSF	\$500,000	\$250,000
2012	Next Generation Non-Volatile Memories	AMD	\$50,000	\$50,000
2013	SSD Storage Device Secure Erasure	Erasure	\$50,000	\$50,000
2013	Non-Volatile Memory	DOD	\$125,000	\$125,000
2013	Center for Future Architectures	C-FAR	\$358,331	\$358,331
2013	Non Volatile Alchemy: Using Non-Volatile Memories to Accelerate Virtualized IO	VMWare	\$100,000	\$100,000
2013	Managing and Using Non-Volatile Main Memory	Intel	\$50,000	\$50,000
2013	CMRR Sponsored research	HGST	\$60,000	\$60,000
2013	CMRR Sponsored research	Misc	\$25,000	\$25,000
2013	Securely Erasing Solid-state storage	DOD	\$150,000	\$37,500
2014	CMRR Sponsored research	HGST	\$65,000	\$65,000
2014	Securely Erasing Solid-state storage	DOD	\$75,000	\$18,750
2014	Yahoo FREP	Yahoo	\$25,000	\$25,000
2015	Data System Optimizations for NVM	Intel	\$315,000	\$315,000
2015	NetApp Faculty Fellowship	NetApp	\$50,000	\$50,000
2016	NSF XPS	NSF	\$300,000	\$300,000
2016	NVM-based Distributed Storage System and Key Technologies Project	Huawei	\$542,500	\$542,500
2016	Directed research support through CMRR	Western Digital	\$100,000	\$100,000
2016	Directed research support through CMRR	Toshiba	\$400,000	\$400,000
2016	NetApp Faculty Fellowship	NetApp	\$50,000	\$50,000
2016	Facebook Faculty Award	Facebook	\$30,000	\$30,000
2016	Huawei Gift	Huawei	\$100,000	\$100,000
2017	Virtualizing NVMM to Extend DAX File System Capacity	Samsung	\$120,000	\$120,000
2018	Center for Research on Intelligent Storage and Processing-in-memory (CRISP)	SRC	\$6,118,774	\$1,223,755
2018	Study on improvement NAND Flash Memory Lifespan	Samsung	\$100,000	\$100,000
2010-2018	NVMW Fundraising	Various	\$208,900	\$104,450
			<b>Total:</b>	<b>\$8.1M</b>