

Matthew Spencer

Harvey Mudd College // 301 Platt Blvd. // Claremont, CA 91711 // 515-231-2743 // mspencer at g hmc edu

INTERESTS MEMS circuits, devices, simulation and modeling. Digital and mixed-signal circuit design.

EDUCATION **University of California, Berkeley**, Berkeley, CA

Doctorate in Electrical Engineering

Aug 2008 – Aug 2015

Dissertation: “Design Considerations for Nano-Electromechanical Relay Circuits.”

Advised by Professor Elad Alon

Massachusetts Institute of Technology, Cambridge, MA

Master of Electrical Engineering

Jun 2007 – Jun 2008

Bachelor of Electrical Engineering

Sep 2003 – Jun 2007

Minor in Materials Science and Engineering

EXPERIENCE **Harvey Mudd College**, Claremont, CA

Aug 2014 – Present

- Taught courses on Digital Design, Microcontroller Systems, Analog Design, Radio Frequency Circuits, Experimental Practice and Field Deployment and System Modeling.
- Advised undergraduate students as they pursued industry-sponsored projects including designing satellite payloads, RF shielding for consumer electronics, laser diode burn-in systems, aquatic robots and multi-GHz multiplexers.
- Pursued research in sequential logic for micromechanical circuits, phase change memory systems, PCB ground plane optimization and ultrasound communications.

University of California Berkeley, Berkeley, CA

Aug 2008 – Aug 2014

- Designed digital circuits using micromechanical devices while developing new architectures to take advantage of the low device leakage and minimize the effect of long device delay.
- Taped out and tested ten test chips containing custom MEM relay-based circuits, test structures and VLSI systems. Demonstration systems included adders, decoders, memory arrays, novel sequential logic and microcontroller datapaths.
- Developed mixed-physics simulator model of the micromechanical relay to expedite circuit design. Integrated simulation model with standard CAD tools: Cadence, Calibre and Spectre.

Texas Instruments DLP, Plano, TX

May 2012 – Aug 2012

- Wrote circuit-level simulation models for emerging MEMS devices.
- Developed software to assist in characterization and data processing for the new devices.
- Helped guide testing and fabrication of MEMS device.

Intel Components Research, Portland, OR

May 2011 – Aug 2011

- Wrote models and simulation scripts for emerging devices which combined atomistic simulation results with industrial tool flow.
- Used models to compare emerging technology against CMOS at digital system level.

MIT Research Laboratory for Electronics, Cambridge, MA

Sep 2006 – Jun 2008

- Designed transimpedance amplifier for measuring electrically active optoelectronic fibers.
- Helped use fiber interface circuits to take large scale field measurements for lensless camera.
- Explored chemical process to connect fibers electrodes to printed circuit boards.

Analog Devices, Wilmington, MA

Jun 2006 – Sep 2006

- Designed hardware, firmware and software for USB-to-I²C interface used in circuit eval. boards.
- Worked on system for rapid characterization of early spins of HDMI multiplexers.

A123 Systems, Watertown, MA

Jun 2005 – Sep 2005

Developed a protocol for using an inductively coupled plasma optical emission spectrometer to measure metal impurities in battery cathodes. Studied battery separator breakdown mechanisms.

Center for Materials Science and Engineering, Cambridge, MA

Sep 2004 – Jun 2005

Used in situ AFM to select materials for self assembling battery electrodes. Impedance spectroscopy to characterize electrochemical cells.

AWARDS

Best Presentation and 2nd Best Paper in First Year Programs Division of ASEE 2017
 Demetri Angelakos Award for Altruism, UC Berkeley EECS, 2013
 Intel Fellowship, Intel, 2012
 Jack Raper Outstanding Technical Directions Paper Award, ISSCC 2011
 UC Berkeley Outstanding Graduate Student Instructor for 2011
 EECS Outstanding Graduate Student Instructor for 2011

PUBLICATIONS

Erasing a Gender Gap in Performance in a Multidisciplinary Introductory Engineering Course.

Proceedings of the CoNECD Conference 2018.

Nancy Lape, Christopher Clark, Lori Bassman, Matthew Spencer, Angela Lee, Erik Spjut, Albert Dato, Laura Palucki Black, TJ Tsai

Integrating Theory and Hands-On Practice using Underwater Robotics in a Multidisciplinary Introductory Engineering Course.

Proceedings of the American Society of Engineering Education Conference, 2017

Nancy Lape, Lori Bassman, Christopher Clark, Albert Dato, Angela Lee, Matthew Spencer, Erik Spjut, Laura Palucki Blake

Exploitation of the Coffee-Ring Effect to Realize Mechanically Enhanced Inkjet-Printed Microelectromechanical Relays with U-Bar-Shaped Cantilevers.

Applied Physics Letters, 2014, Vol. 105, Iss. 26, pp. 261-271.

Seungjun Chung, Muhammad Ahsan Ul Karim, Matthew Spencer, Hyuk-Jun Kwon, Costas P. Grigoriopoulos, Elad Alon, Vivek Subramanian.

Recent Progress and Challenges for Relay Logic Switch Technology,

Very Large System Integration Symposium on Technology, 2012.

Tsu-Jae King Liu, Louis Hutin, I-Ru Chen, Rhesa Nathanael, Yenhao Chen, Matthew Spencer, Elad Alon,

Multiple-Input Relay Design for More Compact Implementation of Digital Logic Circuits.

IEEE Electron Device Letters, 2012, Vol. 33, Iss. 2, pp. 281-283

Jaeseok Jeon, Louis Hutin, Ruzica Jevtic, Nathaniel Liu, Yenhao Chen, Rhesa Nathanael, Wookhyun Kwon, Matthew Spencer, Elad Alon, Borivoje Nikolic, Tsu-Jae King Liu,

Demonstration of Integrated Micro-Electro-Mechanical Relay Circuits for VLSI Applications.

IEEE Journal of Solid State Circuits, Vol. 46, Iss. 1, Jan. 2011.

Matthew Spencer, Fred Chen, Cheng C. Wang, Rhesa Nathanael, Hossein Fariborzi, Abhinav Gupta, Hei Kam, Vincent Pott, Jaeseok Jeon, Tsu-Jae King Liu, Dejan Markovic, Elad Alon, Vladimir Stojanovic,

Analysis and Demonstration of MEM-Relay Power Gating.

Custom Integrated Circuits Conference, 2010.

Hossein Fariborzi, Matthew Spencer, Vaibhav Karkare, Jaeseok Jeon, Rhesa Nathanael, Chengcheng Wang, Fred Chen, Hei Kam, Vincent Pott, Tsu-Jae King Liu, Elad Alon, Vladimir Stojanovic, Dejan Markovic,

Demonstration of Integrated Micro-Electro-Mechanical Switch Circuits for VLSI Applications.

International Solid State Circuits Conference, 2010.

Fred Chen, Matthew Spencer, Rhesa Nathanael, Chengcheng Wang, Hossein Fariborzi, Abhinav Gupta, Hei Kam, Vincent Pott, Jaeseok Jeon, Tsu-Jae King Liu, Dejan Markovic, Vladimir Stojanovic, Elad Alon,

Exploiting Collective Effects of Multiple Optoelectronic Devices Integrated in a Single Fiber.

Nano Lett., 2009, 9 (7), pp 2630-2635

Fabien Sorin, Ofer Shapira, Ayman F. Abouraddy, Matthew Spencer, Nicholas D. Orf, John D. Joannopoulos and Yoel Fink,