Department of Engineering
Seminar Program
Wednesday, February 4, 2015
Shanahan Teaching and Learning Center
Lecture Hall 1430, 4:15pm

"Memories of the Future: A Survey of Emerging, Non-Volatile Memory Technologies"

Matthew Spencer, ***Visiting Professor, Harvey Mudd College***

Summary:

The ubiquity of flash memory -- on USB sticks, SD cards, phones, cameras and elsewhere -- is ready proof that non-volatile memory is extremely useful. However, there are frontiers that flash has not yet reached. In particular, flash memory has not been widely co-integrated on the same chip as processors or other systems-on-chip. Having non-volatile memory physically close to logic would allow computers to turn on and off more quickly and reduce the power consumed when storing data, which would lead to energy savings and improvements in functionality. Consequently, there's great research interest in alternative non-volatile memories that can replace flash.

This seminar will survey emerging non-volatile memories with brief overviews of the physics, circuit models, and architectures for magnetic tunnel junctions, conductive-bridge oxides, and phase change memories. In addition, the seminar will introduce a new kind of nano-electro-mechanical non-volatile memory (NEMory). Experimental results for a proof of concept prototype of NEMory will be shown, and there will be discussion of analytical and simulated predictions of its energy and delay performance at the cell and circuit level.

Bio:

Matthew Spencer received his B.S. and M.Eng. degrees from The Massachusetts Institute of Technology, Cambridge, in 2007 and 2008, respectively and is finalizing a Ph.D. degree at the University of California, Berkeley. His research interests are energy-efficient circuits, emerging circuit technologies and, particularly, the integration of the two. His Ph.D. research focuses on modeling new technologies for integrated circuits and doing systems level analysis to determine their efficacy.

Matthew has worked briefly at Texas Instruments and Intel on emerging technology topics. He has been a co-recipient of the ISSCC Outstanding Technical Paper Award and an Intel Fellowship. Currently, he is a visiting professor at Harvey Mudd College for the 2014-2015 academic year. He also created an interpretive dance of his dissertation.