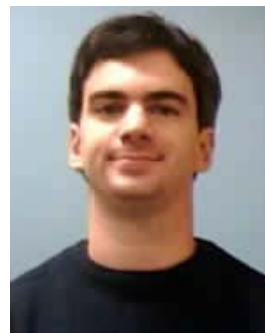


David K. Karig

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Education

Princeton University, Princeton, NJ	Electrical Engineering	Ph.D., 2007
Princeton University, Princeton, NJ	Electrical Engineering	M.A., 2002
Clemson University, Clemson, SC	Electrical Engineering	B.S., <i>Summa Cum Laude</i> , 2000

Professional Experience

2008 – Present	Postdoctoral Research Associate, Center for Nanophase Materials Sciences, ORNL
2001	Summer Intern, Hewlett-Packard Labs, Palo Alto, CA
1998	Summer Intern, Space and Naval Warfare Systems Center (SPAWAR), Charleston, SC

Professional and Synergistic Activities

1999 – Present	Member, Institute of Electrical and Electronic Engineers (IEEE)
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Honors and Awards

2004 – 2005	PICASso (Program in Integrative Information, Computer and Application Sciences) Fellowship
2000 – 2003	Department of Defense NDSEG Fellowship

Publications

Full publication list follows CV.

Research Synopsis

1. *Cell-free synthetic biology*. We build synthetic gene networks and characterize them in cell-free protein expression systems. These cell-free reactions can be confined in different nanofabricated devices and reaction vessels. This enables the study of various properties of gene circuit function in contexts that are simpler than living cells.
2. *Engineering cell communities*. Using quorum sensing components from a variety of organisms, we equip cells with new intercellular communication capabilities. We then interface these communication components to intracellular gene regulation components in order to engineer consortia, direct pattern formation, and divide tasks among group of engineered cells.
3. *Gene expression noise analysis*. Gene expression in cells is inherently noisy due to the fact that reactions are discrete, randomly timed, and confined to small volumes. Analysis of the noise in gene expression of either live cells or of cell-free reactions confined in small volumes can reveal important design principles of genetic networks.

Graduate and Postdoctoral Advisors:

Graduate Advisor:	Prof. Ron Weiss (MIT)
Postdoctoral Advisor:	Prof. Michael L. Simpson (ORNL, University of Tennessee)

Publications

David Karig, Ph. D.

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Journal Publications

Karig DK, Iyer S, Simpson ML, Doktycz MJ. Expression Optimization and Synthetic Gene Networks in Cell-Free Systems. 2011. *Nucleic Acids Research*. (submitted)

Karig DK, Siuti P, Dar RD, Retterer ST, Doktycz MJ, Simpson ML. Model for biological communication in a nanofabricated cell-mimic driven by stochastic resonance. 2011. *Nano Communication Networks* 2(1):39-49.

Dar RD, Karig DK, Cooke JF, Cox CD, Simpson ML. Distribution and regulation of stochasticity and plasticity in *Saccharomyces cerevisiae*. 2010. *Chaos* 20:037106.

Simpson ML, Cox CD, Allen MS, McCollum JM, Dar RD, Karig DK, and Cooke JF. Noise in Biological Circuits. 2009. *WIREs Nanomed Nanobiotechnol* 1:214–225.

Karig DK and Simpson ML. Tying new knots in synthetic biology. 2008. *HFSP Journal* 2:124-128.

Brenner K*, Karig DK*, Weiss R, Arnold FH. Engineered bidirectional communication mediates a consensus in a microbial biofilm consortium. 2007. *Proc Natl Acad Sci USA*. 104:17300-17304. (*equal contribution authors)

Andrianantoandro E*, Basu S*, Karig DK*, and Weiss R. Synthetic biology: new engineering rules for an emerging discipline. 2006. *Mol Syst Biol*. 2:2006.0028. (*equal contribution authors)

Karig D and Weiss R. Signal-amplifying genetic circuit enables in vivo observation of weak promoter activation in the Rhl quorum sensing system. 2005. *Biotechnol Bioeng*. 89(6):709-18.

Weiss R, Basu S, Hooshangi S, Kalmbach A, Karig D, Mehreja R and Netravali I. Genetic Circuit Building Blocks for Cellular Computation, Communications, and Signal Processing. 2003. *Natural Computing* 2(1): 47-84.

Basu S, Karig D, and Weiss R. Engineering Signal Processing in Cells: Towards Molecular Concentration Band Detection. 2003. *Natural Computing* 2(4): 463-478.

Conference Proceedings

Kumar A, Karig D, Neethirijan S, Suresh AK, Srijanto BR, Mukherjee PP, Retterer S, Doktycz MJ. Adhesion and formation of microbial biofilms in complex microfluidic devices. 2012. *Proceedings of the 3rd ASME Micro/Nanoscale Heat and Mass Transfer International Conference*. (in press)

Hsu A, Vijayan V, Fomundam L, Gerchman Y, Karig D, Hooshangi S, Basu S, and Weiss R. Dynamic control in a coordinated multi-cellular maze solving system. 2005. *American Controls Conference*.

Basu S, Karig D, and Weiss R. Engineering Signal Processing in Cells: Towards Molecular Concentration Band Detection. 2002. *Eighth International Meeting on DNA Based Computers*, pp. 61-72.

McGregor JP, Karig DK, Shi Z, and Lee RB. A Processor Architecture Defense against Buffer Overflow Attacks. 2003. *Proceedings of the IEEE International Conference on Information Technology: Research and Education (ITRE)*, pp. 243-250.

Lee RB, Karig DK, McGregor JP, and Shi Z. Enlisting Hardware Architecture to Thwart Malicious Code Injection. 2003. *Proceedings of the International Conference on Security in Pervasive Computing (SPC-2003)*, pp. 237-252.

Book Chapters and Technical Reports

Neethirajan S, Karig D, Kumar A, Mukherjee PP, Retterer ST, Doktycz MJ. 2012. "Biofilms in microfluidic devices", in *Encyclopedia of Nanotechnology*, Ed: B. Bhushan, Springer, New York. (in press)

Karig D and Lee RB. Remote Denial of Service Attacks and Countermeasures. 2001. *Princeton University Department of Electrical Engineering Technical Report CE-L2001-002*.