Katherine Aull

Research Interests: Synthetic and systems biology. Understanding the design patterns that enable complex behavior in natural and engineered biological systems, and applying the lessons of each.

Education

B.S., Biological Engineering - Massachusetts Institute of Technology (2004-2008)

· Coursework: programming and bioinformatics; gene regulation and genomics; biomechanics and biomaterials; thermodynamics; biochemistry and cell biology; laboratory techniques.

Research Experience

Fisher Lab - Massachusetts General Hospital (2009-Present)

· Assist with launch of high-throughput screening facility, developing assays and setting up workflows

· Support research program by deriving primary skin cell cultures and maintaining culture room

· Provide IT support for the lab; helped rebuild data servers and implement backup system

Do-It-Yourself Biology (2008-Present)

· Designed biologically-encoded digital counter for *E. coli*, producing simulations and partial prototype

· Implemented SNP-based gene test for amateur labs, designed for safety, simplicity, and low cost

· Built functional, inexpensive wet-lab space; helped outfit public labs in Cambridge and elsewhere

Codon Devices - Cambridge, MA

Product Development Associate (2008-2009)

· Tested candidate genes for engineered metabolic pathway; performed full range of wet-lab duties, from building constructs to troubleshooting protein expression and implementing activity assays

· Began development of medium-throughput genome modification platform for *E. coli*

Intern (2007-2008)

· Developed series of production-caliber methods for constructing long DNA from microarrays

· Traced shutdown of complex gene assembly platform to error in oligo design software; proposed and completed experimental review to identify best parameters for assembly design

· Tested improvements to error correction protocols with higher throughput and simplified QC

Knight Lab - MIT Computer Science (2007)

· Implemented complex protocol to transform yeast with chromosome-sized genomic DNA constructs

· Began development of plasmids and recombination-based genetic editor for mycoplasma *M. florum*

Endy Lab - MIT Bioengineering (2006)

· Evaluated feasibility of using DNA sequences to predict stability of engineered genetic parts

Mars Gravity Biosatellite - MIT (2004-2006)

· Prototyped mouse habitat for unmanned space missions; poster at national space conference

Vederas Lab - U. Alberta Chemistry (2003)

· Designed and synthesized inhibitors for SARS viral protease; fourth author, *J.Med.Chem* paper

Publications

1. Jain RP, Pettersson HI, Zhang J, Aull KD, Fortin PD, Huitema C, Eltis LD, Parrish JC, James MN, Wishart DS, Vederas JC. 2004. Synthesis and evaluation of keto-glutamine analogues as potent inhibitors of severe acute respiratory syndrome 3CLpro. *J.Med.Chem.* 47: 6113-6.

Posters

· Aull KH. 2010. Pixel-based image analysis for complex samples. *CBRC Retreat*, Waltham, MA.

· Aull KH. 2008. Making biology count - in binary. *SynBERC Retreat*, Cambridge, MA.

· Quinlivan VH, Aull KH, Weiss JM, Guerra E, Wagner EB. 2005. Murine Automated Urine Sampler: Use of Chlorhexidine/N-Propyl Gallate for Hands-Off Small Animal Urine Preservation. *American Society for Gravitational and Space Biology Meeting*, Reno, NV.

Invited Presentations

- Cowell M, Aull KH, Morrison J. 2009. DIY Synthetic Biology: From Design to Construction with New Model Organisms. *CodeCon 2009*, San Francisco, CA. Repeated at 2009 *Maker Revolution (Cyberarts Boston)*, Cambridge, MA, and 2009 *XORcon*, Cambridge, MA.
- Aull KH. 2009. Homebrew Genetic Testing. *CodeCon 2009*, San Francisco, CA.
- Aull KH. 2008. The State of DIYbio. *DIYbio Meetup*, Cambridge, MA. Updated and repeated at 2009 *SynBERC Retreat*, Berkeley, CA, and 2009 *DIYbio Meetup*, San Francisco, CA.

Teaching Experience

- **USA Biology Team** - June 2005, 2006, 2009, and 2010. Supervised and trained national finalists at a two-week training camp, teaching theory as well as lab skills; helped prepare team selection exams.
- **MIT** - Summer 2009. TA for "Linguistics and AI" course in high school summer program.
- **MIT** - Spring 2008. Co-advised bio-computation group for "Intro to Synthetic Biology" seminar.
- **Fudan Research Science Institute** - Summer 2006, in Shanghai, China. As tutor for life sciences, mentored eighteen high school students performing research with university professors.
- **MIT** - Fall 2005. Taught weekly problem-based recitation section for required "Biology 101" course.

Awards and Honors

- 2008 - Won 2nd place in online synthetic biology design contest, run by science fiction site io9.com
- 2008 - Won Cambridge Science Festival trivia contest; team received lunch with Nobel Laureate
- 2004 - Received college scholarships totaling $34,500, including National Merit and Micron Scholars
- 2004 - International Biology Olympiad gold medalist; 3rd place, high scorer on record-setting team
- 2003 - International Biology Olympiad silver medalist; 24th place, with 4th place on theoretical

Selected Media Features

- Eudes Y. Biohackers: les bricoleurs d'ADN [Biohackers: the tinkerers of DNA]. *Le Monde 2*, September 4, 2009.
- Wolinsky H. 2009. Kitchen biology. The rise of do-it-yourself biology democratizes science, but is it dangerous to public health and the environment? *EMBO Rep.* 10(7):683-5.
- Whalen J. In Attics and Closets, 'Biohackers' Discover Their Inner Frankenstein. *The Wall Street Journal*, May 12, 2009.
- Johnson C. Do-it-yourself genetic sleuthing. *The Boston Globe*, May 11, 2009.
- McKenna P. Rise of the garage genome hackers. *New Scientist*, January 7, 2009.

Biology Skills

- **Organisms:** Primary cell cultures; *E. coli* and yeast; anaerobic prokaryotes; basic mouse work
- **DNA:** Advanced PCR and cloning; variant libraries; multi-gene pathway assembly; preps and gels
- **Protein:** SDS-PAGE and Western blots; expression and purification; *in vitro* activity assays

Engineering Skills

- **Automation:** High-content microscopy; liquid handling and pin transfer; capillary electrophoresis
- **Languages:** Python and Biopython; MATLAB Bioinformatics and SimBiology; C++; LaTeX
- **Software:** BLAST, ClustalX, VectorNTI; BioSPICE; JMP and Excel; Windows, Mac, and Unix