

Ariel Hecht

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Education

National Institute of Standards and Technology **2013—2016**
Stanford University, Department of Bioengineering
National Research Council Postdoctoral Fellowship

- Advisor: Matthew S. Munson
- Visiting scholar in the lab of Drew Endy

University of Michigan, Ann Arbor **2008—2013**
Ph.D., Biomedical Engineering

- 3-year Department of Homeland Security Graduate Research Fellowship
- 1-year Rackham Pre-doctoral fellowship
- Thesis title: “Development of Magnetorotation as a Signal Transduction Method for Protein Detection”
- Research Advisor: Raoul Kopelman
- Committee Members: Xudong Fan, Ari Gafni, Alan Hunt, Robert Kennedy and Shuichi Takayama

University of California, Los Angeles **2004—2008**
B.S. cum laude, Bioengineering

- Research Advisors: Chih-Ming Ho and Tim Deming

Research and Work Experience

National Institute of Standards and Technology, Stanford, CA **2016—Present**
Stanford University, Department of Bioengineering
Staff Scientist (NIST); Supervisor: Marc Salit. Visiting Scholar (Stanford)

- Quantifying factors that affect growth and productivity of engineered *E. coli* at milliliter scale using fractional factorial experiments
- Developing a synthetic biology minimum information standard
- Member of Joint Initiative for Metrology in Biology (JIMB)

National Institute of Standards and Technology, Stanford, CA **2013—2016**
Stanford University, Department of Bioengineering
National Research Council Postdoctoral Fellow (NIST). Visiting Scholar (Stanford)

- Measured translation initiation from all 64 codons in *E. coli*
- Developed a competitive assay for transcription and translation *in vitro* in *E. coli* cell-free lysate

University of Michigan, Ann Arbor, MI **2008—2013**
Graduate Student; Advisor: Raoul Kopelman.

- Developed magnetorotation as a signal transduction method for rapid, point-of-care protein measurement
- Achieved a limit of detection of 80 fM
- Mentored three undergraduate students

- Sandia National Laboratories, Livermore, CA** **Summer 2009**
Department of Homeland Security Summer Intern. Advisors: Greg Sommer and Anson Hatch
- Characterized a newly-developed aptamer from targeting NF-κB in an integrated on-chip electrophoretic immunoassay.
 - Detected nanomolar concentrations of NF-κB in buffer and serum.
- University of California, Los Angeles, Los Angeles, CA** **2007—2008**
Undergraduate Research Assistant. Advisors: Ioeng Wong and Chih-Ming Ho
- Micropatterned polyethylene glycol via polydimethylsiloxane stamps on glass substrates for controlling protein adhesion.
- University of California, Los Angeles, Los Angeles, CA** **2006—2007**
Undergraduate Research Assistant. Advisors: Jarrod Hanson and Tim Deming
- Functionalized and crosslinked polypeptide silicone oil emulsions using Click chemistry.
- LA Biomedical Research Institute at Harbor-UCLA Medical Center, Carson, CA** **2004—2008**
Research Assistant. Advisors: Janos Porszasz and Richard Casaburi
- Designed and implemented an algorithm for analyzing triaxial accelerometer data from patients with Chronic Obstructive Pulmonary Disease in a long-term oxygen therapy clinical trial.

Honors and Awards

<i>Nucleic Acids Research</i> Breakthrough Article	2017
National Research Council (NRC) Postdoctoral Fellowship at NIST	2013
U of M Rackham Predoctoral Fellowship	2012
Finalist for U of M Towner Prize for Outstanding Engineering PhD Research	2011
Department of Homeland Security (DHS) Graduate Research Fellowship	2008

Journal Publications

- A. Hecht**, J. Filliben, S. Munro, and M. Salit, “Reproducing small-scale cell growth and productivity measures.” In preparation.
- A. Hecht***, J. Glasgow*, P. Jaschke*, L. Bawazer*, M. Munson, J. Cochran, D. Endy and M. Salit, “Measurements of translation initiation from all 64 codons in *E. coli*.” *Nucleic Acids Research*, 45(7):3615-3626, 2017. [NAR Breakthrough article](#), [NIST press release](#).
- A. Hecht**, D. Endy, M. Salit and M. Munson, “When wavelengths collide: Bias in cell abundance measurements due to expressed fluorescent proteins.” *ACS Synthetic Biology*, 5:1024–1027, 2016.
- A. Hecht**, P. Commiskey, N. Shah and R. Kopelman, “Bead Assembly Magnetorotation as a signal transduction method for protein detection.” *Biosensors and Bioelectronics*, 48:26-32, 2013.
- R. Casaburi, J. Porszasz, **A. Hecht**, B. Tiep, et al, “Influence of lightweight ambulatory oxygen on oxygen use and activity patterns of COPD patients receiving long-term oxygen therapy.” *Journal of Chronic Obstructive Pulmonary Disease*, 9:3-11, 2012.
- A. Hecht**, A. Kumar, and R. Kopelman, “Label-acquired magnetorotation as a signal transduction method for protein detection: aptamer-based detection of thrombin.” *Analytical Chemistry*, 83(18):7123-7128, 2011.

A. Hecht, P. Kinnunen, B. McNaughton, and R. Kopelman, "Label-acquired magnetorotation for biosensing: An asynchronous rotation assay." *Journal of Magnetism and Magnetic Materials*, 323:272-278, 2011.

A. Hecht*, G. Sommer*, R. Durland, X. Yang, A. Singh, and A. Hatch, "Aptamers as affinity reagents in an integrated electrophoretic lab-on-a-chip platform." *Analytical Chemistry*, 82(21):8813-8820, 2010.

S. Ma, **A. Hecht**, J. Varga, M. Rambod, S. Morford, S. Goto, R. Casaburi and J. Porszasz, "Breath-by-breath quantification of progressive airflow limitation during exercise in COPD: A new method." *Respiratory Medicine*, 104:389-396, 2010.

A. Hecht, S. Ma, J. Porszasz, and R. Casaburi, "Methodology for describing daily activity of COPD patients using a triaxial accelerometer." *Journal of Chronic Obstructive Pulmonary Disease*, 6:121-129, 2009.

Patents

R. Kopelman, R. Elbez, **A. Hecht**, and B. McNaughton, "Magnetically Induced Microspinning for super-detection and super-characterization of biomarkers and live cells." U.S. Patent No. 9,816,993, November 14, 2017.

A. Hecht, B. McNaughton, P. Kinnunen and R. Kopelman, "Magnetic-Label-Acquired Rotation to Measure the Concentration of a Protein or Other Biomarker in Solution." U.S. Provisional Patent Application No. 61/474,113, filed April 11, 2011.

Invited Talks

A. Hecht, "Identifying opportunities for better measurements in iGEM (and beyond...)," iGEMeta Symposium, Boston, MA, July 7, 2017.

A. Hecht, M. Munson, D. Endy, and M. Salit, "Seeing the Invisible: Exploiting Crosstalk to Measure Genetic Constructs," Control and Dynamical Systems (CDS) seminar series, California Institute of Technology, Pasadena, CA, July 18, 2014.

Oral Presentations

A. Hecht, "What do I need to know to reproduce the growth and productivity of my engineered cells?" NIST Bioforum, Gaithersburg, MD, February 7, 2018.

A. Hecht, M. Munson, D. Endy and M. Salit, "Context Dependence of Resources in Synthetic Biology Metrology: Mathematical Modeling, Implications for Measuring Construct Activity, and a Proposal for Context Characterization." NIST Division 644 Seminar, Gaithersburg, MD, February 19, 2015.

M. Munson, **A. Hecht**, S. Rasaputra, S. Ghosh, L. Kennedy, M. Takahashi, D. Savage, and J. Lucks, "TXTL Best Practices," Cold Spring Harbor Laboratory Synthetic Biology Course, Cold Spring Harbor, NY, August 10, 2014

A. Hecht, P. Commiskey, N. Shah and R. Kopelman, "Label-Acquired Magnetorotation as a Protein Detection Platform." Gordon Research Seminar: Bioanalytical Sensors, Salve Regina University, Newport, RI, June 16, 2012.

A. Hecht and R. Kopelman, "Label-Acquired Magnetorotation as a Novel Application of Magnetic Beads for Protein Detection." Vaughan Symposium, University of Michigan, Ann Arbor, MI, July 28, 2011.

A. Hecht and R. Kopelman, "Label-Acquired Magnetorotation as a Novel Application of Magnetic Beads for Protein Detection." Frontiers in BioMagnetic Particles, Clemson University, Charleston, SC, May 17, 2011.

A. Hecht, P. Kinnunen, B. McNaughton, and R. Kopelman. "Towards an asynchronous magnetic bead rotation method for immunological assays." NanoTech, Anaheim, CA, June 22, 2010.

Poster Presentations

- A. Hecht**, J. Glasgow, P. Jaschke, L. Bawazer, M. Munson, J. Cochran, D. Endy and M. Salit, "Measurements of translation initiation from all 64 codons in *E. coli*," SEED 2017, Vancouver, Canada, June 21, 2017.
- A. Hecht**, J. Glasgow, P. Jaschke, L. Bawazer, M. Munson, J. Cochran, D. Endy and M. Salit, "Measurements of translation initiation from all 64 codons in *E. coli*," SB7.0, Singapore, Singapore, June 13, 2017.
- A. Hecht**, D. Endy, M. Salit and M. Munson, "When wavelengths collide: Bias in cell abundance measurements due to expressed fluorescent proteins," SEED 2016, Chicago, IL, July 19, 2016.
- A. Hecht**, D. Endy, M. Salit and M. Munson, "Seeing the invisible: exploiting crosstalk to measure genetic constructs *in vivo*," SEED 2016, Chicago, IL, July 20, 2016.
- A. Hecht**, M. Munson, D. Endy and M. Salit. "Seeing the Invisible, and Considering Context: Exploiting Crosstalk to Measure Genetic Constructs," SEED 2015, Boston, MA, June 11, 2015.
- A. Hecht**, M. Munson, D. Endy and M. Salit. "Seeing the Invisible: Exploiting Crosstalk to Measure Genetic Constructs," NIST Sigma Xi Postdoctoral Poster Presentation, Gaithersburg, MD, February 18, 2015.
- A. Hecht**, M. Munson, D. Endy and M. Salit. "Seeing the Invisible: Exploiting Crosstalk to Measure Genetic Constructs," SEED 2014, Manhattan Beach, CA, July 18, 2014.
- A. Hecht**, M. Munson, D. Endy and M. Salit. "Analysis of the activity of non-fluorescent genetic constructs using indirect competitive construct characterization (iCCC)." NIST Sigma Xi Postdoctoral Poster Presentation, Gaithersburg, MD, February 12, 2014.
- A. Hecht**, P. Kinnunen, B. McNaughton and R. Kopelman. "An asynchronous magnetic bead rotation assay: A magnetic-torque based biosensor." Biomedical Engineering Society, Austin, TX, October 6-9, 2010.
- A. Hecht**, P. Kinnunen, B. McNaughton and R. Kopelman. "The AMBR assay: A novel biosensor based on magnetic torque." Magnetic Carriers, Rostock, Germany, May 25-29, 2010.
- A. Hecht**, P. Kinnunen, B. McNaughton and R. Kopelman. "The Rotating Magnetic Sandwich Assay: A Novel Biosensor Based on Magnetic Torque." Annual Department of Homeland Security University Network Summit, Washington, DC, March 10-12, 2010.
- A. Hecht**, J. Porszasz, S. Ma, and R. Casaburi. "Daily Activity Patterns of Long-Term Oxygen patients as Compared to Sedentary Controls as Revealed by Triaxial Accelerometry." Annual Meeting of the American Thoracic Society, May 18-23, 2007.
- A. Hecht**, J. Porszasz, S. Ma, R. Casaburi, "Daily Activity Patterns Of Long-Term Oxygen Patients As Compared To Sedentary Controls As Revealed By Triaxial Accelerometry." Southern California Pulmonary Rehabilitation Symposium, Indian Wells, CA, May 4-6, 2007.
- J. Porszasz, **A. Hecht**, S. Ma, B. Tiep, and R. Casaburi. "Methodology for Continuous Long-Term Assessment of Ambulatory and Stationary Oxygen Use in Hypoxemic COPD Patients." Annual Meeting of the American Thoracic Society, San Francisco, CA, May 18-23, 2007.
- J. Varga, S. Ma, **A. Hecht**, D. Hsia, R. Casaburi, and J. Porszasz, "Detection of Dynamic Airway Compression during Exercise in COPD by Breath by Breath Analysis of Spontaneous Flow-Volume Loops." Annual Meeting of the European Respiratory Society, Munich, Germany, September 2-6, 2006.
- S. Ma, **A. Hecht**, R. Casaburi, B. Whipp, and J. Porszasz. 2006. "Detecting Dynamic Airway Compression by Breath-by-Breath Geometric Analysis of Spontaneous Flow-Volume Loops of COPD Patients during Exercise." Annual Meeting of the American Thoracic Society, San Diego, CA, May 19-24, 2006.

Teaching Experience

BioE 44—Fundamentals for Engineering Biology Lab

Spring and Fall 2017

Guest lecturer, Stanford University

- Lecture titled, “Managing biological complexity and coordinating labor: Standards and Metrology.”

BME 450—Senior Capstone Design

Spring 2012

Graduate Student Instructor, University of Michigan

- 4-unit semester-long senior design course
- Mentored student teams as they designed and built medical device prototypes

BME 458—Biomedical Instrumentation Lab

Fall 2011

Graduate Student Instructor, University of Michigan

- 4-unit upper division lab course
- Supervised students in design and bread-boarding of electrical circuits, and integration with LabVIEW for data acquisition and feedback control
- Students built spirometers, electrocardiograms, and pulse oximeters

Professional Service

Judge at iGEM Giant Jamboree

2016

Mentor in Michigan Mentorships for High School Students Program

2011

Student representative on U of M BME Graduate Education Council

2008-09

Certifications

DataCamp Data Scientist with Python Track (February 2018, Certificate No. 26,359)

Certified Associate LabVIEW Developer (June 2011, Serial No. 100-311-1750)

Technical Skills

Computational Skills:

R, Python, MATLAB, LabVIEW, JavaScript, PHP, MySQL, HTML/CSS

Adobe Creative Suite and Microsoft Office Suite

Laboratory Skills:

Plasmid design, assembly, preparation and sequencing

Bacterial and yeast transformation and culture

PCR and Gel electrophoresis

Fluorescence spectroscopy

In vitro transcription and translation

Aptamer and antibody conjugation, and assay design

Magnetic and nonmagnetic micro- and nano-particles