Eli J Fine, PhD
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Objective

To apply genetic engineering and analysis tools to advance human health though developing gene and cell therapies, creating cellular models for *in vitro* drug screening and discovery, building model genetic systems to better understand disease biology, or expanding personalized medicine through pharmacogenomics studies.

Education

- Georgia Institute of Technology & Emory University GPA: 4.0 March 2015
  - PhD Program in Biomedical Engineering
  - Thesis: A Toolkit for Analysis of Gene Editing and Off-Target Effects of Engineered Nucleases
- Scheller College of Business (Georgia Institute of Technology) GPA: 4.0 2014
  - Management of Technology Certificate
- Brown University B.S. in Biomedical Engineering with Honors GPA: 3.9 2010
  - Thesis: Development of a Genome Wide Screening Technique for Stop Codon Readthrough
  - Elected to Tau Beta Pi Engineering Honor Society, 2008

Selected Technical Skills

- Molecular Biology & Cloning, Mammalian Cell Culture and Transfection, Flow Cytometry (FACS)
- Proficient in Programming: Perl, Python, Javascript, HTML, C++, Microsoft VBA, Microsoft Access / SQL
- Programming Automated Liquid Handling Robotics for High-Throughput screening/testing
- Next-generation Sequencing and Analysis (Ion Torrent, Illumina, PacBio)
- Genome wide bioinformatics analysis (Bowtie and pairwise alignment, Edena genome assembler…)
- Nuclease and HDR donor design, construction, testing, and off-target analysis (TALENs and CRISPRs)
- Machine Learning Techniques (Support Vector Machines, Logistic Regression, Scikit-Learn package)

Work Experience

• Director of Genomic Science *Coyne Scientific, LLC* Reported To: Kevin Coyne 2015-Present	Developing high-throughput experimental and data analysis pipelines to analyze the effects of genetic variation on *in vitro* toxicity responses of human cells to pharmaceutical compounds.
• Summer Intern *Expression Therapeutics, LLC* Reported To: Gabriela Denning June-Aug, 2014	Developed a standard operating procedure to map viral integration sites for clinical trials of gene therapy vectors. Created a custom bioinformatics pipeline to analyze Illumina data for integration mapping. Re-engineered promoter sequences for increased cell-type specific transgene expression.
• Genome Editing Consultant *Haplomics Inc* Reported To: Tony Materna 2014-Present	Revised patent drawings, designed CRISPR guide sequences for new gene targets to minimize off-target activity, SBIR grant writing. Demonstrating experimental techniques.

Professional Development Experience

- Managed 6 undergraduate laboratory research assistants – Georgia Tech 2011-2014
- Co-Chair of Career Development Committee – Biosciences Graduate Student Council 2012-2013
- Graduate Leadership Development Program – Georgia Tech 2012-2013
- Co-Chair of Social Activities Committee – Biosciences Graduate Student Council 2011-2012
- Chapter President at Brown University – Engineering Honor Society (Tau Beta Pi) 2009-2010

Research Experience

- PhD Candidate
  Georgia Institute of Technology
  Advisor: Dr. Gang Bao
  September 2010 - Present

  Investigating design rules, off-target effects, and the therapeutic potential of TAL effector proteins and CRISPR/Cas9 systems for gene correction. Optimizing cellular repair pathway choice to favor homology directed repair over non-homolgous end-joining.

- Undergraduate Research Assistant
  Brown University
  Laboratories for Molecular Medicine
  Advisor: Dr. William Fairbrother
  June 2009 – May 2010

  Searched for novel cases of stop codon readthrough in drosophila and human genomes.
  Created Perl scripts to perform computational analysis of genomic data.
  Genetically engineered cells for *in vitro* validation of potential readthrough sequences.

- Undergraduate Research Assistant
  Brown University
  Advisor: Dr. Benjamin Kimia
  June 2008 – May 2009

  Created tools to aid in image segmentation.
  Developed a templated C++ class to store and manipulate segmented image information.
  Created an application to measure spinal disk volume and protrusion for use in a future MRI study to validate the effects of cervical traction.

- Undergraduate Research Assistant
  Brown University
  Advisor: Dr. Thomas Webster
  May 2008 – September 2008

  Tested a novel nanoscale coating for use in vascular stent applications.
  Performed *in vitro* adhesion and proliferation cell culture experiments.

Research Publications (Total Citations: 1003, H-Index: 9)

An online bioinformatics tool predicts zinc finger and TALE nuclease off-target cleavage.
Fine EJ, Cradick TJ, Zhao CL, Lin Y, Bao G. *Nucleic Acids Research*, 2013

CRISPR/Cas9 systems targeting beta-globin and CCR5 genes have substantial off-target activity.
Cradick TJ, **Fine EJ**, Antico CJ, Bao G. *Nucleic Acids Research*, 2013

DNA targeting specificity of RNA-guided Cas9 nucleases.
Hsu PD, DAS, JAW, FAR, SK, VA, YL, **Fine EJ**, OS, TJC, Marraffini LA, Bao G, Zhang F. *Nature Biotechnology*, 2013

Quantifying Genome Editing Outcomes at Endogenous Loci using SMRT Sequencing.
Hendel A*, Kildebeck EJ*, **Fine EJ***, JC, NP, Sebastiano V, Bao G, Porteus MH. *Cell Reports*, 2014

SAPTA: A New Design Tool for Improving TALE Nuclease Activity
Lin Y, **Fine EJ**, Zheng Z, Antico CJ, Voit RA, Porteus MH, Cradick TJ, Bao G. *Nucleic Acids Research*, 2014

TALENs facilitate targeted genome editing in human cells with high specificity and low cytotoxicity.
Mussolino C, JA, **Fine EJ**, RM, TJC, Lahaye T, Bao G, Cathomen T. *Nucleic Acids Research*, 2014

Codon Swapping of ZFNs Confers Expression in Primary Cells and In Vivo from a Single Lentiviral Vector
Abarrategui-Pontes C, AC, RT, **Fine EJ**, VT, LFLR, TJC, GB, LT, GP, Anegon I, Nguyen TH. *Current Gene Therapy*, 2014

COSMID: A Web-based Tool for Identifying and Validating CRISPR/Cas Off-target Sites
Cradick TJ, Qiu P, Lee C, **Fine EJ**, Bao G. *Molecular Therapy—Nucleic Acids*, 2014

Trans-spliced Cas9 allows cleavage of HBB and CCR5 genes in human cells: a step towards flexible AAV packaging.
Fine EJ, Appleton CM, White DE, Brown MT, Deshmukh H, Kemp ML, Bao G. *Scientific Reports*, in revision

Rapid Gene Targeting and Disease Gene Discovery in the Rat using Zinc-Finger Nucleases
Geurts AM, **Fine EJ**, et al. Submitted to *Physiological Genomics*

Enhanced endothelial cell functions on rosette nanotube-coated titanium vascular stents.
Fine E, Zhang L, Fenniri H, Webster TJ. *International Journal of Nanomedicine*, 2009

Review Articles

Quantifying On and Off-Target Genome Editing.
Hendel A*, **Fine EJ***, Bao G, Porteus MH. *Trends in Biotechnology*, 2015

Nanomedicine: Tiny Particles and Machines Give Huge Gains.
Tong S, **Fine EJ**, Lin Y, Cradick TJ, Bao G. *Annals of Biomedical Engineering*, 2013

*** These authors contributed equally to the work**

Book Chapters

Identification of Off-Target Cleavage Sites of Zinc Finger Nucleases and TAL Effector Nucleases Using Predictive Models, in *Gene Correction: Methods and Protocols* (Storici F, Ed.); Methods in Molecular Biology vol 1114:371-83 2014

Fine EJ, Cradick TJ, Bao G.

Strategies to Determine Off-Target Effects of Engineered Nucleases, in *Genome Editing: The Next Step in Gene Therapy* (Cathomen T, Hirsch M, Porteus MH, Eds.); Springer (in revision)
Fine EJ, Cradick TJ, Bao G.

Patents

Towards Delivery of CRISPR/Cas9 Systems via Adeno-Associated Viruses Using Protein Trans-Splicing
Fine EJ, Bao G. Provisional Patent Filed 2014

Systems and Methods for Improving Nuclease Specificity and Activity.
Fine EJ, Cradick TJ, Lin Y, Bao G. PCT Patent Filed 2013

Conference Presentations

A Comparison of Repair Pathway Choice between ZFNs, TALENs, and CRISPRs at Endogenous Loci via Simultaneous Measurement of NHEJ and HDR Using SMRT Sequencing. American Society of Gene & Cell Therapy. May 2014. Washington DC, USA. Poster Presentation.

A Comparison of Gene Targeting and Off-Target Cleavage Between ZFNs, TALENs, and CRISPRs. Biomedical Engineering Society. September, 2013. Seattle, WA, USA. Oral Presentation.

Quantifying Rates of Gene Targeting and Off-Target Cleavage of Engineered Nucleases Using SMRT Sequencing. American Society of Gene & Cell Therapy. May 2013. Salt Lake City, UT, USA. Oral Presentation

Identifying and Quantifying the Off-Target Cleavage Sites of Engineered Nucleases Using PROGNOS. Biomedical Engineering Society. October, 2012. Atlanta, GA, USA. Oral Presentation.

PROGNOS: An Online Tool for Predicting and Analyzing the Off-Target Sites of Engineered Nuclease. American Society of Gene & Cell Therapy. May, 2012. Philadelphia, PA, USA. Poster Presentation.

Running Red Lights: A Search for Stop Codon Readthrough in Drosophila and Human Genomes. RNA Society Annual Meeting. June, 2010. Seattle, WA, USA. Poster Presentation

Using Helical Rosette Nanotubes to Enhance Endothelial Cell Adhesion and Proliferation. Biomedical Engineering Society Annual Meeting. October, 2008. St. Louis, MO, USA. Poster Presentation.

Awards

Outstanding Poster Award – American Society of Gene & Cell Therapy	2014
Conference Travel Award – American Society of Gene & Cell Therapy (Top 10% of Abstracts)	2014
Selected for St. Jude National Graduate Student Symposium (46 selected from >1800 applicants)	2014
Conference Travel Award – American Society of Gene & Cell Therapy (Top 10% of Abstracts)	2013
National Science Foundation Graduate Research Fellowship ($161,000)	2011
Georgia Tech President's Fellowship ($22,000)	2010
Halpin Prize for Innovative and Interdisciplinary Engineering Senior Capstone Design Project ($3,250)	2009
National Science Foundation UBM Summer Research Fellowship ($4,500)	2009
"Research at Brown University" funding Award	2008
Eagle Scout	2004

Additional Presentations & Media Coverage

A comparison of endogenous gene correction and off-target effects between ZFNs, TALENs, and CRISPRs. Georgia Bio Innovation Summit. Oct 2014. Atlanta, GA, USA. Poster Presentation.

Interview featured at Health Connect South conference. Sept 2014.
https://www.youtube.com/watch?v=C2BfatHBamo

A comparison of endogenous gene correction and off-target effects between ZFNs, TALENs, and CRISPRs. St. Jude National Graduate Student Symposium. March 2014. Memphis, TN, USA. Oral and Poster Presentations.

Rapid and Precise Genome Modifications using Engineered Nucleases. Georgia Bio Life Sciences Summit. Oct 2013. Atlanta, GA, USA. Poster Presentation.

Student Research Breaks New Ground. Article by Michelle Valigursky. The EmoryWire. Dec 2012.
http://www.alumni.emory.edu/emorywire/issues/2012/december/of_interest/student_research/index.html

Tests & Certifications

Scholastic Aptitude Test (SAT): Total Score – 2380 2005
Math – 800, Critical Reading – 800, Writing – 780

Teaching Experience

- Teaching Assistant (Laboratory). BMED 3110 - Quantitative Engineering Physiology Lab I. Fall 2011
- Teaching Assistant (Laboratory). BMED 3110 - Quantitative Engineering Physiology Lab I. Spring 2012

References

Gang Bao, PhD
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Relationship to Eli Fine: PhD Thesis Advisor, 2010-Present

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Associate Professor, Department of Pediatrics, Stanford University
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(650) 725-6520
Relationship to Eli Fine: Collaborating Scientist, 2010-Present

Gabriela Denning, PhD
Chief Operating Officer, Expression Therapeutics LLC
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(770) 910-3341
Relationship to Eli Fine: Supervisor, Summer Internship 2014