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About

I am a doctoral candidate researcher at Harvard University in the Department of Chemistry and Chemical Biology. My laboratory affiliations are primarily at the Broad Institute of Harvard and MIT and the Department of Molecular Pathology at Massachusetts General Hospital. I am co-advised by Professor Gad Getz and Professor Luca Pinello. I also spent the first two years of my PhD under the guidance of Professor Brian Liau in the Harvard University Department of Chemistry and Chemical Biology.

I am generally interested in the role of chromatin as a signaling network platform and in my research, I am working to elucidate the molecular mechanisms that underlie biological phenomena in various cellular contexts in both healthy and diseased tissues. To do this, I have used various functional genomics, biochemical, and chemical biology techniques as well as single-cell genomic and epigenomic analyses. As of current, my research focus is exclusive to computational biology. To that end, I am working in pipeline development to make sense of complex, high-dimensional datasets and integrative data analysis to inform biological mechanisms.

Education

Doctor of Philosophy, Chemistry and Chemical Biology — In Progress
Harvard University (Cambridge, MA)

Bachelor of Arts, Chemistry *with distinction and honors in chemistry* — May 2016
University of Iowa (Iowa City, IA.)

Research Experience

Graduate Research Assistant, Broad Institute of Harvard and MIT, Harvard Medical School, and Massachusetts General Hospital Department of Molecular Pathology, 02/2019 – Present

Research Advisors: **Professor Gad Getz** and **Professor Luca Pinello**

Research Description: I am currently exploring the dynamic cellular landscape that is produced upon genomic and epigenomic variation in cells. To do this, I am employing analyses that make use of state of the art single-cell data as well as developing algorithms to fit a unique three-dimensional surface, representative of cell state or identity to a particular cell or population of cells. This approach makes use of various modern cancer genomics tools as well as cutting-edge transcriptomic and epigenomic data analysis. Analyses are performed primarily in Python, R, and bash. As part of my ongoing work, I have maintained various collaborations, including pipeline-development work to visualize and analyze the results of CRISPR-screening experiments.

Graduate Research Assistant, Harvard University Department of Chemistry and Chemical Biology, 12/2016 – 02/2019

Research Advisor: **Professor Brian B. Liau**

Research Description: My studies in the Liau Lab focused both on elucidating the biological mechanisms of chromatin regulators as well as adapting and advancing CRISPR-Cas9 technology to investigate such problems. We profiled the interactions between lysine-specific histone demethylase 1 (LSD1) and chemical inhibitors using CRISPR-Cas9 mutagenesis in the context of acute myeloid leukemia (AML). We elucidated drug mechanism of action by disproving the existing notion that LSD1 enzyme activity is required for the propagation of AML. Further, we demonstrate that LSD1 inhibitors function by disrupting an interaction between LSD1 and the transcription factor, GFI1B on chromatin. I additionally discovered that the poorly-studied, intrinsically-disordered N-terminal region of LSD1 participates in the drug mechanism of action; this finding is currently being studied further in the lab.

Undergraduate Research Assistant, University of Iowa Department of Chemistry, 08/2012-05/2016

Research Advisor: **Professor Hien M. Nguyen**

Research Description: Developed a series of α-fluoromethylated amines via rhodium-catalyzed kinetic asymmetric transformations of racemic allyic trichloroacetimidates. These fluoromethylated amines are formed in high enantiomeric excess and subsequently functionalized to known, previously difficult to access inhibitors of amino acid decarboxylases required for formation of the neurotransmitter, GABA. This is a validated drug target as GABA is frequently upregulated in various cancers and diseases of the central nervous system.

Snyder Summer Research Scholar, University of Illinois Urbana-Champaign, 05/2014 – 08/2014
Research Advisor: **Professor Paul J. Hergenrother**
Research Description: Generated, in collaboration with a graduate student, Robert Hicklin (now a postdoctoral fellow with Prof. Tim Jameson, MIT) a library of small, complex molecules that were subsequently screened in phenotypic assays for loss of proliferation effects in various cancers. These molecules were synthesized as part of a novel methodology for rapidly generating complex and diverse libraries suited for high throughput screening drug discovery efforts.

Peer-Reviewed Publications

1. Chen, H., Lareau, C. Andreani, T., **Vinyard, M.E.**, et al. (2019) ***Genome Biology***. Under review.
2. **M.E. Vinyard**, *et al*. (2019) CRISPR-suppressor scanning reveals a nonenzymatic role of LSD1 in AML. ***Nature Chemical Biology***. DOI: 10.1038/s41589-019-0263-0

Teaching Experience

1. **CHEM27 – The Organic Chemistry of Life**, Spring 2018
   Teaching Fellow, Harvard University; supervised by Professor Brian. B. Liau
2. **CHEM:27 – The Organic Chemistry of Life**, Spring 2017
   Teaching Fellow, Harvard University; supervised by Professor Brian. B. Liau
3. **CHEM:1120 – Principles of Chemistry II**, Spring 2015
   Teaching Assistant, University of Iowa; supervised by Professor Amy Strathman and Professor Nicole Becker

Selected Presentations and Posters

1. **Michael E. Vinyard** et al. "CRISPR-Suppressor Scanning reveals non-enzymatic requirements of LSD1 in AML" 2019 Dana Farber/Harvard Cancer Center Cancer Genetics. Boston, MA. (06/2019).
2. **Michael E. Vinyard** et al. "CRISPR-Suppressor Scanning reveals non-enzymatic requirements of LSD1 in AML" 2019 Landry Cancer Biology Spring Symposium. Boston, MA. (05/2019).
3. **Michael E. Vinyard** and Brian Liau. "Interrogating the Role of LSD1 in AML through CRISPR-Cas9-Mediated Structure Activity Relationship Mapping" 2018 Harvard Department of Chemistry and Chemical Biology Annual Symposium. Cambridge, MA. (03/2018).
4. **Michael E. Vinyard**. "Undergraduate Research and Graduate School." Honors Lecture Series for Undergraduate Students. (04/2016).
5. **Michael E. Vinyard**. "The Undergraduate Research Experience." Honor Lecture Series for Undergraduate Students. (10/2015).
6. **Michael E. Vinyard** and Hien M. Nguyen. "Rapid Access to α-Fluoromethylated Amino Acids via Rhodium-Catalyzed Amination." American Chemical Society National Organic Symposium, College Park, MD. (06/2015).
7. **Michael E. Vinyard** and Hien M. Nguyen. "Enantioselective Synthesis of α- Fluoromethylated Amino Acids." University of Iowa, Department of Chemistry Awards Ceremony. (05/2015).
8. **Michael E. Vinyard**, Robert W. Hicklin, Evijola Llabani, and Paul J. Hergenrother. "Synthesis of Stereochemically Complex Azide Derivatives of Pleuromutilin." University of Illinois Champaign-Urbana, Summer Poster Symposium. (08/2014).
9. **Michael E. Vinyard** and Hien M. Nguyen. "Synthesis of α-Fluoromethylated Allylic Amines." University of Iowa, Department of Chemistry Awards Ceremony. (05/2014).

Honors and Distinctions

2016: Elected to Phi Beta Kappa
2015 – 2016, President of the American Chemical Society, University of Iowa Chapter
2015 ACS Division of Organic Chemistry Travel Award
2015 Big Ten Postgraduate Scholarship Recipient
2015 Robert F. Ray Faculty Athletics Representative Award
2015 Russell K. Simms Scholarship – University of Iowa Department of Chemistry
2015 NCAA Postgraduate Scholarship Nominee
2015 NCAA Walter Byers Scholarship Nominee
2014 – 2015, Secretary of the American Chemical Society, University of Iowa Chapter
2014 NASA Iowa Space Grant Consortium Scholarship Award

2014 Snyder Summer Research Fellowship – University of Illinois Champaign-Urbana
2014 Chemistry Alumni Award for Juniors
Captain of the 2012-2013 University of Iowa Men's Swimming & Diving Team
University of Iowa National Scholars Award
University of Iowa Tuition Scholarship
University of Iowa Honors Student (seven consecutive semesters)
Presidential Committee on Athletics Award (five consecutive semesters)
Captain of the 2010-2011 State Champion Carmel High School Men's Swimming & Diving Team

Athletic Distinctions

United States Olympic Trials Qualifier
2015 Nile Kinnick Memorial Scholarship Recipient
2011-2015 Member of the Top-10 ranked University of Iowa Men's Swimming & Diving Team
2011-2015 Varsity Letter Winner at the University of Iowa (Men's Swimming)

References

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Additional references available upon request.