

Tyler Hansen

Postdoctoral Scholar

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EDUCATION

Ph.D. in Biochemistry • Vanderbilt University • Nashville, TN Aug. 2017 - May 2023

Advisor: Emily Hodges, Ph.D

Dissertation: Identifying Gene Regulatory Activity Divergence in *Cis* and *Trans* with ATAC-STARR-seq

Degree Conferral: May 12th, 2023

Bachelor of Science • University of Wisconsin • Madison, WI Aug. 2011 – May 2015

Major: Biochemistry

Advisor: Judith Kimble, Ph.D

RESEARCH EXPERIENCE

Postdoctoral Scholar • Vanderbilt University • Nashville, TN May 2023 – Present

Ph.D. Candidate • Vanderbilt University • Nashville, TN Aug. 2017 – Apr. 2023

- Molecular Biologist in Dr. Emily Hodges' Laboratory in the Department of Biochemistry.
- Developed a novel functional genomic technology—ATAC-STARR-seq—to measure regulatory element activity, chromatin accessibility, and TF occupancy throughout the human genome.
- Applied ATAC-STARR-seq and other functional genomic technologies to investigate *cis* and *trans* effects on human gene regulatory evolution.
- Collaborated with Dr. John A. Capra's Laboratory at University of California – San Francisco.
- I have expertise in both wet/dry lab techniques that enables me to both generate and analyze functional genomic data.

Post-Baccalaureate IRTA Fellow • NIDDK | NIH • Bethesda, MD 2015-2017

- Researcher in Dr. Andy Golden's Lab in the Laboratory of Biochemistry and Genetics within the National Institute of Diabetes and Digestive and Kidney Disease at the National Institutes of Health Intramural Campus.
- Used CRISPR/Cas9 genome editing to generate molecular models of rare human monogenic diseases in *C. elegans* for purposes of elucidating unknown disease mechanisms and developing potential drug treatments.
- Developed disease models for NGLY1 deficiency and four craniofacial disorders.
- Generated non-disease model CRISPR mutants for a variety of collaborations.

Undergraduate Researcher • University of Wisconsin • Madison, WI 2012-2015

- Researcher in Prof. Judith Kimble's Lab in the Department of Biochemistry.
- Investigated genetic regulation of stem cell fate using *C. elegans* as a model.

TEACHING AND MENTORING EXPERIENCE

Assistant Facilitator • Vanderbilt University • Nashville, TN Fall 2021

- Lead a first-year graduate student discussion group as a key contributor to the first-year IGP program.
- Teaching duties involved facilitating discussion of journal articles, assisting with problem set questions, and grading various assessments.

Undergraduate Mentor • Vanderbilt University • Nashville, TN 2018-2021

- Mentored two undergraduate researchers in relevant techniques, such as: ATAC-seq, electroporation transfection, flow cytometry, western blotting, human embryonic stem cell culture, and standard mammalian tissue culture.

Vanderbilt University

Hansen, T., Fong, S., Capra, J. A., & Hodges, E. (2023). Human gene regulatory evolution is driven by the divergence of regulatory element function in both *cis* and *trans*. *bioRxiv*, 2023.02.14.528376; doi: <https://doi.org/10.1101/2023.02.14.528376>

Grub, L., Held, J., Hansen, T., Schaffner, S., Canter, M., Malagise, E., and Patel, M. (2023). A role for N6-methyldeoxyadenosine in *C. elegans* mitochondrial genome regulation. *bioRxiv* doi: <https://doi.org/10.1101/2023.03.27.534452>

Scott, T., Hansen, T., McArthur, E., & Hodges, E. (2022). Cross-tissue patterns of DNA hypomethylation reveal genetically distinct histories of cell development. *bioRxiv* 2022.12.15.520535; doi: <https://doi.org/10.1101/2022.12.15.520535>

Hansen, T., and Hodges, E. (2022). ATAC-STARR-seq reveals transcription factor-bound activators and silencers across the chromatin accessible human genome. *Genome Research* 32, 1529-1541. doi: [10.1101/gr.276766.122](https://doi.org/10.1101/gr.276766.122). PMID: 35858748.

Barnett, K. R., Decato, B., Scott, T., Hansen, T., Chen, B., Attalla, J., Smith, A., & Hodges, E. (2020). ATAC-Me Captures Prolonged DNA Methylation of Dynamic Chromatin Accessibility Loci During Cell Fate Transitions. *Molecular Cell*. 77(6), 1350–1364. doi: <https://doi.org/10.1016/j.molcel.2020.01.004>. PMID: 31999955.

Guarnaccia, A. D., ... Hansen, T., ... Tansey, W. P. (2021) Impact of WIN site inhibitor on the WDR5 interactome. *Cell Reports*. 34(3), 108636. doi: [10.1016/j.celrep.2020.108636](https://doi.org/10.1016/j.celrep.2020.108636). PMID: 33472061.

NIDDK | NIH

Eustice, M., Konzman, D., Reece, J.M., Ghosh, S., Alston, J., Hansen, T., Golden, A., Bond, M.R., Abramowitz, L.K., and Hanover, J.A. (2022). Nutrient sensing pathways regulating adult reproductive diapause in *C. elegans*. *PLoS One*. 17, e0274076. doi: [10.1371/journal.pone.0274076](https://doi.org/10.1371/journal.pone.0274076). PMID: 36112613.

Rourke, C.K., Murat, D., Hansen, T., and Jaramillo-Lambert, A. (2021) Endogenous localization of TOP-2 in *C. elegans* using a C-terminal GFP-tag. *microPublication Biology*. doi: [10.17912/micropub.biology.000402](https://doi.org/10.17912/micropub.biology.000402). PMID: 34095779.

Fernando, L., Nguyen, V., Hansen, T., Golden, A., & Allen, A. (2020). Loss of proteasome subunit RPN-12 causes an increased mean lifespan at a higher temperature in *C. elegans*. *microPublication Biology*. doi: [10.17912/micropub.biology.000234](https://doi.org/10.17912/micropub.biology.000234). PMID: 32550497.

Iyer, J., Devaul, N., Hansen, T., & Nebenfuhr, B. (2019). Using Microinjection to Generate Genetically Modified *Caenorhabditis elegans* by CRISPR/Cas9 Editing. *Methods Mol. Biol.*, 1874, 431–457. doi: [10.1007/978-1-4939-8831-0_25](https://doi.org/10.1007/978-1-4939-8831-0_25). PMID: 30353529. (Invited book chapter).

Kim, S., Twigg, S. R. F., Scanlon, V. A., Chandra, A., Hansen, T. J., Alsubait, A., ... Corsi, A. K. (2017). Localized TWIST1 and TWIST2 basic domain substitutions cause four distinct human diseases that can be modeled in *Caenorhabditis elegans*. *Human Molecular Genetics*, 26(11), 2118–2132. <https://doi.org/10.1093/hmg/ddx107>. PMID: 28369379.

Jaramillo-Lambert, A., Fabritius, A. S., Hansen, T. J., Smith, H. E., & Golden, A. (2016). The Identification of a Novel Mutant Allele of topoisomerase II in *Caenorhabditis elegans* Reveals a Unique Role in Chromosome Segregation During Spermatogenesis. *Genetics*, 204(4), 1407–1422. <https://doi.org/10.1534/genetics.116.195099>. PMID: 27707787.

University of Wisconsin

Kershner, A. M., Shin, H., Hansen, T. J., & Kimble, J. (2014). Discovery of two GLP-1/Notch target genes that account for the role of GLP-1/Notch signaling in stem cell maintenance. *Proceedings of the National*

PRESENTATIONS

ORAL PRESENTATIONS:

- *Investigating cis-to-trans mechanisms of gene regulatory divergence among primates*. 2023 Leon W. Cunningham Award Lecture, Frontiers in Biochemistry Seminar Series, Vanderbilt University, Nashville, TN, May 2023.
- *Identifying Gene Regulatory Activity Divergence in Cis and Trans with ATAC-STARR-seq*. Dissertation Defense, Vanderbilt University, Nashville, TN, March 2023.
- *Identifying transcription factor-bound activators and silencers in the chromatin accessible genome using ATAC-STARR-seq*. 2022 Biochemistry Retreat, Chattanooga, TN, April 2022.
- *Investigating gene regulatory mechanisms of human evolution with ATAC-STARR-seq*. Biochemistry Student Association Colloquium, Vanderbilt University, TN, April 2022.
- *Simultaneous profiling of regulatory activity, chromatin accessibility, and transcription factor occupancy with ATAC-STARR-seq*. The 23rd Annual Vanderbilt University Program in Developmental Biology Retreat, Lake Guntersville State Park, AL, September 2021.
- *Investigating gene regulatory differences in primate immune cells with ATAC-STARR-seq*. Stem and Progenitor Cell Interest Group (SPRING) seminar, Vanderbilt University, TN, March 2021.
- *Using ATAC-STARR-seq to identify core units of transcriptional enhancers*. Biochemistry Student Association Colloquium, Vanderbilt University, TN, November 2019.

POSTER PRESENTATIONS:

- *Divergence in both cis and trans drives human gene regulatory evolution*. The 2022 American Society of Human Genetics Conference, Los Angeles, CA, October 2022.
- *A genome-wide reporter assay reveals human specific gene regulation in both cis and trans*. Keystone Symposia: Gene Regulation: From Emerging Technologies to New Models – RESCHEDULED, Santa Fe, NM, June 2022.
- *A genome-wide reporter assay reveals human specific gene regulation in both cis and trans*. The 2022 Biochemistry Retreat, Chattanooga, TN, April 2022.
- *Genome-wide reporter assay reveals human specific gene regulation in both cis and trans*. The Cold Spring Harbor Laboratory Meeting on Systems Biology: Global Regulation of Gene Expression, Cold Spring Harbor, NY, March 2022.
- *ATAC-STARR-seq to quantify the regulatory potential of chromatin accessible genomes*. The 5th Annual Cold Spring Harbor Laboratory Meeting on Epigenetics and Chromatin, Virtual Conference, September 2020.
- *Assaying Enhancer Activity with ATAC-STARR-seq*. The 22st Annual Vanderbilt University Program in Developmental Biology Retreat, Pickwick Landing State Park, TN, September 2019.
- *A Functional and Unbiased Approach to Measure Global Enhancer Activity Dynamics During Cell Fate Transitions*. The 4th Annual Biochemistry Department Retreat, Vanderbilt University, February 2019.
- *A Functional and Unbiased Approach to Measure Global Enhancer Activity Dynamics During Cell Fate Transitions*. The Epithelial Biology Center & Center for Stem Cell Biology Symposium, Vanderbilt University, April 2019.

- *Measuring enhancer activity dynamics during human pluripotent stem cell differentiation using ATAC-STARR*. The 21st Annual Vanderbilt University Program in Developmental Biology Retreat, Montgomery Bell State Park, TN, September 2018.

AWARDS AND HONORS

- 2023 Leon W. Cunningham Award for Excellence in Biochemistry, Annual Award Given to the Most Outstanding Graduate Student in the Department of Biochemistry at Vanderbilt University, Received February 2023
- Keystone Symposia Travel Scholarship, Gene Regulation: From Emerging Technologies to New Models, Santa Fe, NM, June 2022
- Best Poster Award, The 2022 Biochemistry Retreat, Chattanooga, TN, April 2022
- Best Poster Award - Honorable Mention, The 22nd Annual Vanderbilt University Program in Developmental Biology Retreat, Pickwick Landing State Park, TN, September 2019

SERVICE AND LEADERSHIP EXPERIENCE

- Officer, Diversity, Equity, and Inclusion Committee, Department of Biochemistry, Vanderbilt University, 2021-2023
- President, Biochemistry Student Association, Vanderbilt University, 2020-2021 Academic Year
- Officer, Qualifying Exam Prep Committee, Biochemistry Student Association, Vanderbilt University, 2019-2020 Academic Year