Email: isaac.vock@gmail.com

Isaac Vock

Email: isvock@stanford.edu | Website: https://isaacvock.github.io/

Education

Ph.D. in Molecular Biophysics and Biochemistry *August 2019 – August 2025*

Yale University, New Haven, CT

Adviser: Professor Matthew D. Simon

Bachelor of Science in Physics; Minor in Mathematics *August 2015 – May 2019*

Centre College, Danville, KY

Summa Cum Laude (4.0 GPA)

Publications

Vock I. W., Tang D., Giraldez A. J., Simon M. D. RNADecayCafe, a uniformly processed atlas of RNA half-life estimates across multiple human cell lines. *bioRxiv; in revisions at Genome Research.* **2025.**

Vock I. W., Mabin J. M., Zhang A., Machyna M., Hogg R.J., Simon M.D. Expanding and improving analyses of all nucleotide recoding RNA-seq experiments with the EZbakR-suite. *PLOS Comp. Bio*. **2025.**

Mabin J. M.*, **Vock I. W.***, Machyna M., Haque N., Zhang A., Rai G., Liebler I. N-M., Inglese J., Simon M. D., Hogg J. R. Uncovering the isoform-resolution kinetic landscape of nonsense-mediated mRNA decay with EZbakR. *bioRxiv*; *submitted to Genome Biology*. **2025**. *These authors contributed equally.

Scharfen, L., **Vock I. W.,** Simon M. D., Neugebauer K. M. Regulation of immediate RNA base pairing upon exit from eukaryotic RNA polymerases. *Molecular Cell.* **2025.**

Moon M. H., **Vock I. W.,** Streit A. D., Connor L. J., Senkina J., Ellman J. A., Simon M. D. Disfulfide teterhing to map small molecule binding sites transcriptome-wide *ACS Chem Bio.* **2024**.

Lu-Culligan W. J., Connor L. J., Xie Y., Ekundayo B. E., Rose B. T., Machyna M., Zimmer, J. T., **Vock, I. W.,** Bhanu, N. V., King, M. C., Garcia, B. A., Bleichert, F., Simon, M. D. Acetyl-methyllysine marks histone H4 in regulated chromatin. *Nature*. **2023.**

Zimmer J. T.*, **Vock I. W.***, Schofield J. A., Kiefer L., Moon M. H., Simon M. D. Improving the study of RNA dynamics through advances in RNA-seq with metabolic labeling and nucleotide-recoding chemistry. *bioRxiv.* **2023**. *These authors contributed equally.

Vock I. W., Simon M. D. bakR: Uncovering differential RNA synthesis and degradation kinetics transcriptome-wide with Bayesian hierarchical modeling. *RNA.* **2023**.

Email: isaac.vock@gmail.com

Sullivan M. C., Niederer R. O., **Vock I. W.**, Kiefer L., Gilbert W. V., Simon M. D. An internally normalized approach to comparing RNA levels between samples using nucleoside recoding chemistry. *NAR,* **2022**.

Joy S. T., Henle M. J., De Salle S. N., Beyersdorf M. S., **Vock I. W.**, Huldin A. J. L., Mapp A. K. A Dual-Site Inhibitor of CBP/p300 KIX is a Selective and Effective Modulator of Myb. *JACS.* **2021**.

Research Experience

Postdoctoral Scholar

Stanford University

Advisor: Anshul Kundaje, PhD *September 2025 - Present*

- Developing a framework by which to integrate predictions from specialized sequence-to-function models to accurately predict gene expression in a scalable and biochemically interpretable fashion.
- Investigating the sequence syntax of RNA degradation regulation through machine learning and advanced model interpretation methods.

PhD Student *August 2019 – August 2025*

Yale University

Advisor: Matthew Simon, PhD

- Developed computational tools to process and analyze nucleotide recoding RNA-seq (NR-seq; e.g., SLAM-seq, TimeLapse-seq, TUC-seq, etc.) data. Culminated in the EZbakR suite, an R package (EZbakR) and Snakemake pipeline (fastq2EZbakR).
- Developed statistical methods for performing well powered comparative analyses of kinetic parameters estimated from NR-seq data, fitting linear dynamical systems models to subcellular fractionation NR-seq data, etc.

Research Internship *Summer 2019*

Xavier University

Advisor: Justin Link, PhD

- Gained experience using and studied the underlying theory of circular dichroism spectropolarimetry, optical tweezers, and atomic force microscopy.
- Aided in Dr. Link's NSF funded research of cryptochromes in plants.

NSF REU *Summer 2017*

University of Michigan

Advisor: Anna Mapp, PhD

Mentors: Omari Baruti, PhD and Stephen Joy, PhD

- Designed and synthesized peptides with the goal of achieving differential binding affinities for two structurally similar proteins, p300 and CREB Binding Protein (CBP).
- Expressed and purified a domain of p300 (KIX domain) used for binding affinity analysis.

- Determined peptide binding affinity with a fluorescent polarization (FP) assay.

Undergraduate Research Assistant *May 2016 – August 2016 and January 2017*

Centre College

Advisor: Bruce Rodenborn, PhD

- Constructed two systems of stepper motors and aluminum structures to macroscopically model bacteria that locomote with a rotating helical flagellum.
- Used Matlab scripts to control several stepper motors as well as the DC motor of the robotic bacterial analog.
- Characterized flagellar propulsion with torque sensors and Fourier analysis.

Teaching Experience

Statistical Intuition for Modern RNA Biologists (MB&B 374/574) *January 2025 – May 2025*

Yale University

Role: Instructor on Record

- Course that Matt Simon and I developed and are co-teaching in the Spring of 2025.
- Introduces Yale undergraduates and first year graduate students to core concepts in statistics and how they can be applied to the analyses of modern high throughput biochemical datasets.
- Selected to run as a part of Yale's Associates in Teaching program.

Introduction to Physics in Living Systems I (MB&B 121L) *January 2024 – March 2024*

Yale University

Role: Teaching Fellow

- Half-semester course introducing biophysics majors at Yale to basic concepts in experimental physics.
- Ran discussion sections, helped students design and execute experiments in class, and answered questions about Jupyter notebooks, which students used to record results.

Advanced Eukaryotic Molecular Biology (MB&B 443b/743b) *January 2021 – May 2022*

Yale University

Role: Teaching Fellow

- Course on eukaryotic gene expression regulation for junior/senior undergraduates and 1st year graduate students.
- Ran discussion sections (weekly; discussed assigned paper) and graded assignments.

Physics Tutor *September 2016 – May 2019*

Centre College

- Provided homework help and explained difficult concepts to those in introductory physics classes.
- Helped students develop useful problem-solving techniques and skills.

Presentations

Oral Presentations:

"Extending and improving the study of gene expression regulatory mechanisms". Thesis Defense Seminar, Yale Universtiy. July 2025.

"Improved analyses of transcript isoform regulation and NMD". C-Wing Hall Seminar, Yale University. November 2024.

"The joy of bioinformatics". YBDIC computational biology lecture series, Yale University. November 2023.

"Extending and improving the study of transcript isoform dynamics". C-Wing Hall Seminar, Yale University. October 2023.

"Dissecting gene expression regulation mechanisms with bakR". RNA Club, Yale University. July 2023; Steitz lab joint lab meeting, Yale University. October 2023.

"Enhanced exploration of chemical probing RNA-seq data with HDProbe". C-Wing Hall Seminar, Yale University. September 2022

"Improved Statistical Modeling for Differential RNA Kinetics Analysis". IBDD RIP talk, Yale University. December 2021; C-Wing Hall Seminar, Yale University. December 2021

"Modeling Bacterial Swimming". Kentucky Academy of Science (KAS) Undergraduate Research Presentation, University of Louisville. November 2016

Poster Presentations:

"Uncovering transcript isoform regulatory dynamics with metabolic labeling and EZbakR". CSHL Systems Biology: Global Regulation of Gene Expression. March 2024.

"bakR: uncovering differential RNA synthesis and degradation kinetics transcriptome-wide". Cold Spring Harbor Laboratory Biological Data Science Conference, CSHL. November 2022; RNA Society Annual Meeting, Suntec Center, Singapore. June 2023

"Uncovering Differential RNA Metabolic Kinetics with Improved Statistical Modeling". MB&B departmental retreat. March 2022

"Differential Binding of c-Myb Mutants to CBP and p300-KIX". Undergraduate Research Symposium in the Chemical and Biological Sciences, University of Maryland Baltimore County. October 2017

Programming Languages

Github profile: isaacvock

Daily use:

- R (Example project: EZbakR)
- Snakemake (Example project: fastq2EZbakR)
- Bash

Email: isaac.vock@gmail.com

- Python (Example project: fastq2EZbakR scripts)
- Pytorch (Example repo)

Intermediate use:

- Stan (Example project: bakR)

Occasional use:

- C (Example repo)

Other Experience

PEB Discussion Group Coordinator and Moderator *September 2021 –May 2022*

- Invited speakers (mainly graduate students and postdoctoral associates; all at Yale) to present at monthly RIP talks associated with Yale's Integrated Graduate Program in Physical and Engineering Biology.
- Organized, advertised, and moderated the talks.

New Haven Science Fair (NHSF) Mentor *March 2020 – May 2021*

- Developed online science content for a second-grade class at Conte West Hills Magnet School, a local public elementary school.
- Worked with a 5th/6th grade enrichment class at FAME, a local multilingual elementary school, to develop and conduct a science fair project presented at the NHSF.

Physics Program Student Representative *August 2017 – May 2019*

- Attended meetings to discuss the Centre College physics program and offer student perspective about curriculum, budget, social events, etc.
- Answered questions from prospective physics majors about the program.

Honors and Awards

Yale Associates in Teaching	**2024**
Yale RNA Center Travel Award	**2023**
MB&B's Excellence in Teaching Award	**2022**
NIH Chemical Biology Training Grant	**2020-2022**
Centre College Class of 2019 Valedictorian Prize	**2019**
T. Hunton Rogers Memorial Scholarship Prize for a Junior Excelling in the Physical Sciences	**2018**
Marshall Wilt Physics Prize for an Outstanding Physics Major	**2018**
Induction into Phi Beta Kappa General Honor Society	**2018**
Induction into Sigma Pi Sigma Physics Honor Society	**2017**
Max P. Canves Award for Highest GPA Freshman Year	**2017**
1st prize Physics and Astronomy Oral Presentation KAS	**2016**