

Sean T. Bresnahan

Webpage: <https://seantbresnahan.com>

Email: sthomasbres@gmail.com

Phone: 814-321-5947

GitHub: sbresnahan

EDUCATION

Penn State University

Ph.D. Molecular, Cellular, & Integrative Biosciences: Huck Institutes of the Life Sciences **2024**

University of Nebraska, Omaha

B.S. Neuroscience: Department of Biology **2019**

RESEARCH EXPERIENCE

Penn State University, Doctoral Researcher **2019-present**

Huck Institutes of the Life Sciences; Drs. Christina Grozinger and Michael Axtell

- Constructed and sequenced mRNA, small RNA, and ChIP libraries on an Illumina NextSeq 2000
- Processed, analyzed and interpreted mRNA-seq, Nanopore direct-seq (RNA m6A), ChIP-seq, DNA-seq, and small RNA-seq data using bash, R, and python
- Identified transcriptional and epigenetic differences associated with phenotypic variation in honey bees
- Utilized SNP data to conduct allele-specific transcriptome and epigenome analyses
- Employed regression, network inference, and machine learning methods to explore gene regulatory networks associated with phenotypic variation
- Designed, optimized, and implemented software for metagenomics sequence database curation to assess species diversity in environmental samples

University of Nebraska, Omaha, Undergraduate Researcher **2017-2019**

Department of Biology; Dr. Ryan Wong

- Generated mutant zebrafish lines using CRISPR/Cas9 to study influence of candidate genes on stress-coping behavior, learning, and memory

Department of Mathematics; Dr. Jim Rogers

- Constructed and analyzed dynamic systems models of protein-protein interaction networks

ANALYTICAL SKILLS

- *Languages:* R; python; bash
- *Methods:* fixed, random, and mixed-effects models; general linear models; machine learning (support vector machines); dimensionality reduction (PCA, t-SNE); clustering (hierarchical, k -means); differential expression analysis (DESeq2, edgeR); gene network inference (WGCNA, LARS, ARCANe)
- *Tools:* read processing (fastQC, fastp, seqtk); alignment (BWA, STAR, bowtie); analysis (samtools, bedtools, freebayes, bcftools, GATK, ShortStack)
- *Reproducibility:* RMarkdown, Github

EMPIRICAL SKILLS

- *Library construction:* sRNA (in-house), mRNA (Illumina), ChIP (NEB)
- *Instrumentation:* nanodrop, qubit, bioanalyzer, tapestation, Illumina NextSeq 2000
- *Tools:* RNAi, CRISPR, molecular cloning
- *Assays:* ChIP, PCR, qPCR, AS-qPCR

AWARDS

- Graduate Research Fellowship Program - The U.S. National Science Foundation **2019**
- Integrative Pollinator Ecology Training Program - Penn State University **2019**
- Distinguished University Graduate Fellow - Penn State University **2019**

PUBLICATIONS

Bresnahan ST, Ma R, Galbraith D, Rangel J, Grozinger CM. (2023). Beyond conflict: kinship theory of intragenomic conflict predicts individual variation in altruistic behavior. *Molecular Ecology*. <https://doi.org/10.1111/mec.17145>

Bresnahan ST, Lee E, Clark L, Ma R, Rangel J, Grozinger CM, Li-Byarlay H. (2023). Examining parent-of-origin effects on transcription and RNA methylation in mediating aggressive behavior in honey bees (*Apis mellifera*). *BMC Genomics* 24:315. <https://doi.org/10.1186/s12864-023-09411-4>

Crone M, Boyle N, **Bresnahan ST**, Biddinger D, Grozinger CM. (2023, *in press*). “More than mesolectic: Are *Osmia cornifrons* nutritional generalists or specialists?” *Ecology and Evolution*.

Bresnahan ST, Döke MA, Giray T, Grozinger CM. (2021). Tissue-specific transcriptional patterns underlie seasonal phenotypes in honey bees (*Apis mellifera*). *Molecular Ecology* 31, 174-184. <https://doi.org/10.1111/mec.16220>

CONFERENCE PRESENTATIONS

Poster - International Conference on Pollinator Biology, Health, and Policy, “Kinship Theory of Intragenomic Conflict Predicts Altruistic and Selfish Behaviors in Honey Bees (*Apis mellifera*).” 2023

International Invited Talk - Entomological Societies of America, Canada, and British Columbia Joint Annual Meeting, “Intragenomic Conflict and its Epigenetic Basis in Honey Bees.” 2022

Invited International Talk - International Union for the Study of Social Insects, “Intragenomic Conflict and its Epigenetic Basis in Honey Bees.” 2022

Invited Talk - Plant and Animal Genomics Annual Meeting, “Evaluating piRNAs as a Mechanism of Intragenomic Conflict in Honey Bees.” 2022

Invited Talk - Penn State University, Center for Pollinator Research Symposium, “Tissue-Specific Transcriptional Patterns Underlie Seasonal Phenotypes in Honey Bees.” 2021

Oral Presentation - Cold Spring Harbor Laboratory, Biology and Genomics of Social Insects Meeting, “Evaluating Intragenomic Conflict in Altruistic, Pheromone-Mediated Honey Bee Behaviors.” 2021

Poster - Cold Spring Harbor Laboratory, Regulatory and Non-Coding RNAs Meeting, “Evaluating the Role of PIWI/piRNAs in Intragenomic Conflict in Honey Bees (*Apis mellifera*).” 2020

Poster - University of Nebraska Research and Creative Activity Fair, “A Large Scale Dynamical Model of Macrophage-HIV Interactions.” 2019

Poster - University of Nebraska Research and Creative Activity Fair, “Investigating COMT Influence on the Proactive-Reactive Stress Coping Axis in Zebrafish.” 2019

Poster - University of Nebraska Research and Creative Activity Fair, “Utilizing the CRISPR/Cas9 System in Zebrafish.” 2017

LEADERSHIP AND SCIENTIFIC ACTIVITIES

Teaching & mentoring

- 2023 (June-present) - Graduate student mentor - Avi Eliyahu, Hebrew University of Jerusalem. NGS library preparations, sequencing, and bioinformatics.
- 2022-present - Undergraduate student mentor - Owen Christopher, Penn State. Molecular biology, honey bee husbandry, and data analysis.
- 2022 - Undergraduate student mentor - Mariam Tananibe, Penn State. Honey bee husbandry.
- 2021 (August-December) - TA for ENT 222, Honey Bees and Humans (general ed course for undergraduates, approx. 100 students). Instructors: Christina Grozinger, Harland Patch.
- 2020 (February-March) - organized and co-instructed with Briana Ezray Wham (Penn State) a short virtual course on introductory bioinformatics to 12 graduate students.

Professional Development

- 2023 - European Molecular Biology Laboratories (EMBL) & European Bioinformatics Institute (EBI) short course: “Systems biology: from large datasets to biological insights”.
- 2017 - NSF EPSCoR Developmental Chronnecto-Genomics Summer Scholars Program.

Management

- 2018-2019 - Trained and managed team of undergraduate researchers to assist in construction of dynamical systems models in the laboratory of Dr. Jim Rogers at the University of Nebraska, Omaha.
- 2017-2018 - Co-founder and Director: Community Science Table. 501(c)(3) non-profit and campus organization at the University of Nebraska, Omaha, that organized public speaking and engagement events related to science communication.

Collaborations

- 2023 - Hebrew University of Jerusalem - post-transcriptional viral immune response in bees
- 2019-2023 - Central State University and Texas A&M University - intragenomic conflict in honey bees

Peer Review

- Genome Biology & Evolution; Genes, Brain & Behavior; Insect Molecular Biology; Molecular Ecology; Scientific Reports; Heredity; PeerJ

Non peer-reviewed articles

- 2021 (January-April) - Penn State Department of Entomology Newsletter. Entomologist of the Month.
- 2020 - Penn State Department of Entomology Newsletter. “Mind the Bees - Ralf Nauen and Colleagues Protect Pollinators.”
- 2020 - Penn State Department of Entomology Newsletter. “The ‘Hidden’ World of Colony-Level Impacts of Neonicotinoids on Social Pollinators.”

Outreach

- 2022 - The Arboretum at Penn State. Exhibit on honey bee behavior.
- 2021 - East Richmond Beekeepers Association. Oral Presentation.
- 2019 - The Great Insect Fair at Penn State. Exhibit on educational game regarding pollinator health.
- 2017 - NeuroWOW at The University of Nebraska, Omaha. Exhibits and activities related to neuroscience and behavior for K-6 grade students.