

Nathan S. Catlin, PhD

CONTACT INFORMATION

Michigan State University
Department of Biochemistry and Molecular Biology
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TRANSFERABLE SKILLS

- Proficient in Unix shell, Python, R, and SQL
- Git version control
- High-performance computing data and job management
- Bioinformatics pipeline development and maintenance
- Genomic variant calling and filtering
- Next-gen and long-read sequence QC and processing
- Genome and transcriptome assembly
- GWAS
- Genomics software such as SAMtools, bedtools, bcftools, picard, gatk, IGV, hisat2, bowtie2, and BWA
- Gene family prediction
- Linear mixed modeling
- Survival analysis
- Comparative alternative splicing analyses
- Comparative genomics synteny software
- Sequence alignment, gene tree discordance, phylogenetics, and phylogenomics
- Wet lab techniques including PCR, DNA purifications, ligations, transformations, gel electrophoresis, and colony screening
- Computational biology course development

EDUCATION

- 2014-2020 **PhD**, University of Florida, Gainesville, FL
Dissertation: Alternative Splicing and Gene Duplication in *Oryza*
- 2014 **BS**, University at Buffalo, The State University of New York (SUNY UB), Buffalo, NY
Biological Sciences (Honors)
Concentration: Ecology and Evolutionary Biology

RESEARCH EXPERIENCE

- 2025-present **Postdoctoral Researcher**, Michigan State University
Advisor: Erich Grotewold
- Discovered transcription start sites (TSS) in maize using Cap Analysis of Gene Expression (CAGE) and Oxford Nanopore sequencing data
- Characterized alternate TSS and its impact on alternative splicing and subsequent protein diversity
- 2021-2025 **Postdoctoral Researcher**, Michigan State University
Advisor: Emily B. Josephs
- Determined polymorphic structural variants (SVs) in the Buckler-Goodman maize diversity panel

- Benchmarked short-read transposable element assembly methods for efficiency, precision, and accuracy in maize
- Characterized transposable element insertions in *Capsella bursa-pastoris*
- Modeled alternative splicing in polyploid *Capsella bursa-pastoris* to investigate effects of genome duplication on rate of alternative splicing per gene

2014-2020 **Graduate Student Researcher**, University of Florida

Advisor: W. Brad Barbazuk

- Characterized alternative splicing within rice and its wild relatives
- Identified the interplay of alternative splicing and gene duplication in rice
- Measured isoform expression and sex-specific splicing in the moss *Ceratodon purpureus*
- Compared gene family evolution in rice and maize
- Called genomic rearrangements and assembled the mt genome in *Acomys cahirinus*

2012-2014 **Research Assistant**, University at Buffalo

Advisor: Charlotte Lindqvist

- Modeled the biogeography and phylogenetic relationships in the mint tribe Synandreae
- Detected positive selection within the polar bear genome and other related ursine bears

2013 **NSF REU: Amborella Genome Project**, University at Buffalo

Advisor: Victor A. Albert

- Detected positive selection in *Amborella trichopoda*

PUBLICATIONS

Catlin, N. S., Agha, H. I., Platts, A. E., Munasinghe, M., Hirsch, C. H., & Josephs, E. B. "Structural variants contribute to phenotypic variation in maize." *Molecular Ecology* (2025): e17662.

Catlin, N. S. & Josephs, E. B. "The important contribution of transposable elements to phenotypic variation and evolution." *Current opinion in plant biology. Current Opinion in Plant Biology* 65 (2022): 102140.

Song, Qi A., **Catlin, N. S.**, Barbazuk, W. B., & Li, S. "Computational analysis of alternative splicing in plant genomes." *Gene* 685 (2019): 186-195.

Roy, T., **Catlin, N. S.**, Garner, D. M., Cantino, P. D., Scheen, A. C., & Lindqvist, C. "Evolutionary relationships within the lamioid tribe Synandreae (Lamiaceae) based on multiple low-copy nuclear loci." *PeerJ* 4 (2016): e2220.

In preparation

Menard, C. C., **Catlin, N. S.**, Munasinghe, M., Platts, A. E., Josephs, E. B., Springer, N. M., & Hirsch, C. N. "TIPs and tricks: identifying transposable element insertion polymorphisms in large genomes at the population-level."

Catlin, N. S., Wing, R. A., & Barbazuk, W. B. "Alternative splicing landscape in *Oryza* uncovers parallel splicing conservation in closely related taxa."

Catlin, N. S., Wing, R. A., & Barbazuk, W. B. "The relationship between alternative splicing and gene duplication in rice."

PRESENTATIONS

- Catlin, N. S.**, Platts, A. E., Munasinghe, M., Spinger, N. M., & Josephs, E. B. "Structural variants contribute to phenotypic diversity in maize." 2023 Evolution: Albuquerque, NM. 25 June 2023. *Talk*.
- Catlin, N. S.**, Platts, A. E., Munasinghe, M., Spinger, N. M., & Josephs, E. B. "Methods for detecting TE PAVs in a maize diversity panel." 2023 Maize Genetics Meeting: St. Louis, MO. 17 March 2023. *Poster*.
- Catlin, N. S.**, Platts, A. E., Munasinghe, M., Spinger, N. M., & Josephs, E. B. "Methods for detecting TE PAVs in a maize diversity panel." 2023 PAG: San Diego, CA. 16 January 2023. *Poster*.
- Catlin, N. S.**, Platts, A. E., & Josephs, E. B. "Methods for detecting TE PAVs in a maize diversity panel." 2022 Evolution: Cleveland, OH. 27 June 2022. *Poster*.
- Catlin, N. S.**, Wing, R. A., & Barbazuk, W. B. "Conserved alternative splicing across rapidly evolving taxa." 2019 Evolution: Providence, RI. 22 June 2019. *Talk*.
- Catlin, N. S.**, Wing, R. A., Soltis, D. S., Soltis, P. S., & Barbazuk, W. B. "The interplay of alternative splicing and gene duplication in *Oryza*." 2018 Botany: Rochester, MN. 24 July 2018. *Talk*.
- Catlin, N. S.**, Wing, R. A., & Barbazuk, W. B. "Evolutionary conserved alternative splicing in the rice genus *Oryza*." 2017 Evolution: Portland, OR. 24 June 2017. *Poster*.
- Catlin, N. S.**, Roy, T., & Lindqvist, C. "Phylogenetic Analyses of New World Mints Using Nuclear and Chloroplast DNA Datasets." 2014 Celebration for Academic Excellence: Buffalo, NY. 23 April 2014. *Poster*.
- Catlin, N. S.**, Roy, T., & Lindqvist, C. "The Origin and Diversification of Synandreae Using Low Copy Nuclear Markers." Undergraduate Honors Research Symposium: Buffalo, NY. 6 May 2013. *Talk*.

HONORS AND AWARDS

- 2020 **Genetics Society of America Travel Award** - \$425
- 2019 **Graduate Student Council Travel Grant**, UF - \$350
- 2017 **Graduate Student Council Travel Grant**, UF - \$350
- 2016 **NSF Graduate Research Fellowship Program** – Honorable Mention
- 2015 **John Paul Olowo Memorial Fund Research Grant**, UF Biology - \$300
- 2014 **Graduate Student Fellowship**, UF - \$100,000
- 2013, 2014 **Undergraduate Research Award**, SUNY UB - \$1000
- 2011 **Undergraduate Academies Student of the Year**, SUNY UB

TEACHING EXPERIENCE

- University of Florida**
- 2020 Teaching Assistant, PCB4043: General Ecology
- 2019-2020 Teaching Assistant, BSC2005: Biological Sciences for Non-Majors
- 2020 Teaching Assistant, BSC4936: Critical Analysis of Biological Research
- 2018-2019 Teaching Assistant, PCB3063: Genetics
- 2017 Teaching Assistant, ZOO4926: Genomics and Biotechnology
- 2015-2016 Teaching Assistant, BSC2010: Integrated Principles of Biology
- University at Buffalo**
- 2015 Teaching Assistant, BSC2005: Biological Science for Non-Majors
- 2013 Teaching Assistant, BIO200: Evolutionary Biology

SERVICE AND OUTREACH

- 2023-present **Institute for Cyber-Enable Research (ICER) User Advisory Board**, Michigan State University (MSU)
- Provide feedback on MSU's high performance computing cluster and other ICER supported systems, and policies
- 2023-present **Retreat Planning Committee**, Michigan State University
- 2023-2025 **Outstanding Postdoctoral Award for Plant Biology Committee**, Michigan State University
- 2019 **The Carpentries**, Carnegie Mellon University
- Designed 2-day course on Python and Unix Shell to professors and research staff.
- 2019 **Great Teaching Certificate**, Center for Teaching Excellence, UF
- Attended teaching and mentorship training sessions and participated in discussions and coursework to improve pedagogy and andragogy.
- 2018 **Suds and Science**, First Magnitude Brewing Co., Gainesville, FL
- Displayed scientific techniques and hypothesis testing to the general public, including DNA extractions with youth scientists.
- 2017-2018 **Biology Graduate Student Association Curriculum Rep**, UF Biology
- Met with departmental curriculum reps to design and discuss improvements for undergraduate curriculum.
- 2015 **Talk Science with Me: Department of Agricultural Education and Communication**, UF
- Conversed with the public about my research and answered questions involving plant genetics and crop improvement.
- 2015 **Science Quest: Center for Precollegiate Education and Training**, UF
- Devised curriculum and a laboratory activity to educate 10th graders about genetic engineering and its role in crop improvement.

- Featured on University of Florida's Genetics Institute Website:
<http://ufgi.ufl.edu/serving-the-public-grad-students-host-workshop-at-science-camp/>
- 2013 **Guest Lecturer**, Brockport, NY
- Discussed current topics in evolution and bioinformatics to AP Biology students at Brockport High School, Brockport, NY.
- 2012-2014 **Interdisciplinary Science and Engineering Partnership (ISEP)**, SUNY UB
- Implemented developmental biology teaching protocols for Buffalo public schools using zebrafish with funding from the NSF.

MENTORING

- 2021 **NSF REU**, Michigan State University
- Mentored one student interested in the dynamics of alternative splicing and polyploidy in *Capsella bursa-pastoris*
- 2016-2017 **Comprehensive Support for STEM Students with Learning Disabilities (CS³LD)**, UF Occupational Therapy
- Served as graduate mentor and advocated for neurodiverse scholars.