

CARL E. HJELMEN, PHD

Assistant Professor
Department of Biology
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PROFESSIONAL POSITIONS

2021-Pres: **Assistant Professor**, Dept. of Biology, Utah Valley University, Orem, UT
Bioinformatics Degree Program Coordinator
Hiring Committee Chair

EDUCATION, RESEARCH, AND TRAINING

2019-2021: **Postdoctoral Research Associate**, Dept. of Biology, Texas A&M University, College Station, TX
PI: Heath Blackmon
2017-2018: **Postdoctoral Research Associate**, Dept. of Entomology, Texas A&M University, College Station, TX
PI: Aaron Tarone
Project Title: Proteomic and microRNA markers of fly development
Aug. 2017: **Ph.D.**, Entomology, Texas A&M University, College Station, TX
Advisor: J. Spencer Johnston
Dissertation Title: Phylogenetic analyses of genome size evolution in Drosophilidae
May 2013: **B.A.** in Biology, Augustana College, Sioux Falls, SD

SCHOLARSHIP

REVIEWED PUBLICATIONS: [†]Mentored Student, [‡]Undergraduate Author

25. [†]Motte RR, **Hjelmen CE**. DSCAM1 evolution and its relationship to sociality: Hymenopteran DSCAM1 exhibits accelerated evolution in variable exon regions. *Insect Systematics and Diversity*. Doi.org/10.1093/isd/ixaf031
24. Oakes J, Kuddus JN, Downs E, Oakey C, Davis K, Mohammad L, Whitely K, **Hjelmen CE**, Kuddus R. Isolation and Characterization of a Crude Oil-Tolerant Obligate Halophilic Bacterium from the Great Salt Lake of the United States of America. *Microorganisms*. doi.org/10.3390/microorganisms13071568
23. Copeland M, Landa S, Owoyemi AO, Jonika MM, Alfieri JM, Johnston JS, Sylvester TP, Kyre BR, Hoover Z, **Hjelmen CE**, Rieski LK, Blackmon H, Casola C. (2024). Genome assembly of the southern pine beetle (*Dendroctonus frontalis* Zimmeran) reveals the origins of gene content reduction in *Dendroctonus*. *R. Soc. Open Sci.* 11: 240755. doi:10.1098/rsos.240755
22. **Hjelmen CE**. (2024). Genome size and chromosome number are critical metrics for accurate genome assembly assessment in Eukaryota. *Genetics*. doi: 10.1093/genetics/iyae099
21. Sylvester T, Hoover Z, **Hjelmen CE**, Jonika MM, Blackmon LT, Alfieri JM, Johnston JS, Chien S, Esfandani T, Blackmon H. (2024). A reference quality genome assembly for the Jewel scarab *Chrysina gloriosa*. : *Genes, Genomes, Genetics*. doi: 10.1093/g3journal/jkae084
20. **Hjelmen CE**, Yuan Y, Parrot JJ, [‡]McGuane AS, Srivastav SP, Purcell AC, Pimsler ML, Sze, S-H, Tarone AM. (2022) Identification and Characterization of Small RNA Markers of Age in the Blow Fly *Cochliomyia macellaria* (Fabricius) (Diptera: Calliphoridae) Insects. doi.org/10.3390/insects13100948
19. Morelli MW[†], Blackmon H, **Hjelmen CE**. (2022) Diptera and *Drosophila* Karyotype Databases: A useful dataset to guide evolutionary and genomic studies. *Frontiers in Ecology and Evolution*. doi: 10.3389/fevo.2022.832378.
18. Pimsler ML, **Hjelmen CE**, Jonika MM, Sharma A, Fu S, Bala M, Sze S, Tomberlin JK, Tarone AM. (2021) Sexual dimorphism in growth rate and gene expression throughout immature development in wild type *Chrysomya*

- ruffifacies* (Diptera: Calliphoridae Macquart). *Frontiers in Ecology and Evolution*, 9:696638. doi: 10.3389/fevo.2021.696638.
17. Tvedte ES, Gasser M, Sparklin BC, Michalski J, **Hjelmen CE**, Johnston JS, Zhao X, Bromley R, Tallon LJ, Sadzewicz, Rasko DA, Hotopp, JCD. (2021). Comparison of long-read sequencing technologies in interrogating bacteria and fly genomes. *G3: Genes, Genomes, Genetics*. doi: 10.1093/g3journal/jkab083
16. ¹Anderson NW, **Hjelmen CE**, Blackmon H (2020). The probability of fusions joining sex chromosomes and autosomes. *Biology Letters*. doi: 10.1098/rsbl.2020.0648
15. Sylvester TP, **Hjelmen CE**, Hanrahan SJ, Lehnart PA, Johnston JS, Blackmon H. (2020) Lineage-specific patterns of chromosome evolution are the rule and not the exception in Polyneopteran insects. *Proceedings B*, 287: 20201388. doi: 10.1098/rspb.2020.1388.
14. Malawey, AS, Zhang HY, ^{†1}McGuane AS, Walsh E, Rusch TW, **Hjelmen CE**, Delclos PJ, Rangel J, Zheng L, Cai M, Yu Z, Tarone AM, Zhang J, Tomberlin JK. (2020). Interaction of age and temperature on heat shock protein expression, sperm count and sperm viability of the Adult Black Soldier Fly. *Journal of Insects as Food and Feed*. doi: 10.3920/JIFF2020.0017
13. **Hjelmen CE**, [†]Holmes VR, ¹Burrus CG, ^{†1}Piron E, ^{†1}Mynes M, ^{†1}Garrett M, Blackmon H, Johnston JS. (2020). Thoracic underreplication in *Drosophila* species estimates a minimum genome size and the dynamics of added DNA. *Evolution*. doi: 10.1111/evo.14022
12. ^{†1}Jonika MM, **Hjelmen CE**, Faris AM, ^{†1}McGuane AS, Tarone AM. (2020). An evaluation of differentially spliced genes as markers for sex for forensic entomology. *Journal of Forensic Sciences*. doi: 10.1111/1556-4029.14461
11. Johnston JS, ¹Zapalac ME, **Hjelmen CE**. (2020). Flying High—Muscle specific underreplication in *Drosophila*. *Genes* 11, 246; doi: 10.3390/genes11030246.
10. **Hjelmen CE**, Parrott JJ, Srivastav S, ^{†1}McGuane AS, Ellis L, Stewart A, Johnston JS, Tarone AM. (2020). Effect of phenotype selection on genome size variation in two species of Diptera. *Genes* 11, 218; doi: 10.3390/genes11020218
9. **Hjelmen CE**, Blackmon H, [†]Holmes VR, ¹Burrus CG, Johnston JS. (2019). Genome size evolution differs between *Drosophila* subgenera with striking differences in male and female genome size in *Sophophora*. *G3: Genes, Genomes, Genetics* 9(10): 3167-3179.
8. **Hjelmen CE**, ^{†1}Garrett M, ^{†1}Holmes VR, ^{†1}Mynes M, ^{†1}Piron E, and Johnston JS. (2018) Genome size evolution within and between the sexes. *Journal of Heredity*. 110(2): 219-228.
7. Lower, SS, Johnston JS, Stanger-Hall K, **Hjelmen CE**, Hanrahan SJ, Korunes K, Hall D (2017). Genome size in North American fireflies: Substantial variation likely driven by neutral processes. *Genome Biol. Evol.* evx097.
6. **Hjelmen CE** and Johnston JS (2017). The mode and tempo of genome size evolution in the subgenus *Sophophora*. *PLOS One* 12(3), e0173505
5. Arnqvist, G, Sayadi A, Immonen E, Hotzy C, Rankin D, Tuda M, **Hjelmen CE**, Johnston JS(2015). Genome size correlates with reproductive fitness in seed beetles. *Proc. R. Soc. B*. 282(1815).
4. Rangel J, ¹Strauss K, ¹Seedorf K, **Hjelmen CE**, Johnston JS (2015). Endopolyploidy changes with age-related polyethism in the honey bee, *Apis mellifera*. *PloS one*, 10(4), e0122208-e0122208.
3. Ellis LL, Huang W, Quinn AM, Ahuja A, Alfnejd B, Gomez FE, **Hjelmen CE**, Moore KL, Mackay TFC, Johnston JS, Tarone AM. (2014) Intrapopulation Genome Size Variation in *D. melanogaster* Reflects Life History Variation and Plasticity. *PLoS Genet* 10(7): e1004522. doi:10.1371/journal.pgen.1004522
2. The DGRP Consortium. (2014). Natural variation in genome architecture among 205 *Drosophila melanogaster* Genetic Reference Panel lines. *Genome Research*: 1193-1208.
1. Larson MK, Tormoen GW, Weaver LJ, Luepke KJ, Patel IA, **Hjelmen CE**, Enszt NM, McComas LS, McCarty OJ. (2012). Exogenous modification of platelet membranes with the omega-3 fatty acids EPA and DHA reduces platelet procoagulant activity and thrombus formation. *Am J Physiol Cell Physiol* 304(3):273

IN REVIEW AND PREP:

- Abair A, Egan AN, ¹Bugg B, Rao, Hughes C, Banga K, Lopez M, Sermersheim H, Trujillo J, Houston J, Yang Y, Cronn R, Liston A, **Hjelman CE**, Bailey CD. A phylotranscriptomic investigation into patterns of divergence, reticulation, and genome size evolution in *Leucaena* (Fabaceae). **Manuscript in Prep for Submission**
- Zahn G, **Hjelman CE**, Wainwright BJ. Distinct temporal trajectories of bacterial and fungal networks during agricultural rewilding. **In Review**
- [†]Curnow SP, Olson M, **Hjelman CE**. Unraveling the Enigma: *Drosophila* Genome Size Evolution and Its Potential Environmental Correlates. **Manuscript in Prep for Submission**
- **Hjelman CE**, Fout S[†], Parrott JJ, McGuane AS, Jonika MM, Purcell AC, Srivastav S, Sing-Hoi S, Tarone AM. Characterization of miRNA in four forensically relevant species of Diptera. **In prep/data analysis**
- Sylvester T, **Hjelman CE**, Jonika MM, Blackmon LT, Alfieri JM, Hoover Z, Esfandani T, Blackmon H. Population structure of the Jewel scarab *Chrysina gloriosa*. **In Review**

BOOK CHAPTERS:

- J. Spencer Johnston, Angelina Bernardini, **Carl E. Hjelman** (2019). Genome Size Estimation and Quantitative Cytogenetics in Insects. *Insect Genomics: Methods and Protocols*

PROCEEDINGS PAPER:

- [†]Michelle M. Jonika, Ashleigh M. Faris, **Carl E. Hjelman**, Aaron M. Tarone. Transcriptional Markers of Sex Determination for Forensic Entomology (2019). Proceedings of the American Academy of Forensic Sciences. 71st Annual Scientific Meeting.

OTHER:

- Comparative phylogenetic lab activity on phylogenetic independent contrasts and phylogenetic generalized least squares for Spring 2016 ENTO 606 (Quantitative Phylogenetics)

SEMINARS AND CONFERENCE TALKS: *Presenting Author, [†]Mentored Student, ¹Undergraduate Author

2024

- Evolution of genome size and structures in the *Drosophila* genus. ***Hjelman CE**.
– Utah *Drosophila* Fall Symposium, University of Utah, Salt Lake City, UT
- Bugs in the system: A computational biologist's first semester teaching entomology. ***Hjelman CE**.
– Entomological Society of America Annual Meeting, Phoenix, AZ.
- Insect Genome Size Evolution: What Do We Know and Where Do We Go from Here?. ***Hjelman CE**.
– International Plant and Animal Genome Conference, San Diego, CA

2023

- Implementing bioinformatics and biotechnology in the classroom: An interdisciplinary approach for impacting first-year non-majors in a general education course. ***Hjelman CE**.
– Entomological Society of America Annual Meeting, National Harbor, MD.
- A Tale of the other guy: The story of Alfred Russel Wallace. ***Hjelman CE**.
– Utah Valley University, Department of Biology Colloquium Series
- Developing open-source databases for facilitating undergraduate research. ***Hjelman CE**.
– Bioinformatics and Computational Biology in the Liberal Arts Workshop, Reed College, Portland, OR
- Application of Phylogenetic Analyses. ***Hjelman CE**. (Virtual Workshop talk)
– Annual North American Forensic Entomology Association Meeting, Arizona State University
- Sifting through the mess of heterochromatin: An attempt at assembling heterochromatic *Drosophila* genomes. ¹Ohran M, ***Hjelman CE**.
– Pacific Branch of Entomological Society of America Annual Meeting, Seattle, WA

2022

- Student driven data mining for freely available databases and “free” research projects. ***Hjelmen CE.**
 - Entomological Society of America Annual Meeting, Vancouver, Canada
- Come Together: Chemistry of the beetles—A story of acid and flashing lights. ***Hjelmen CE.**
 - Central Utah Section of the American Chemical Society, Earth Day Seminar
- So, you want to go to graduate school... ***Hjelmen CE.**
 - Utah Valley University, Department of Biology Colloquium Series

2021

- Working out the “bugs” in genome size evolution. ***Hjelmen CE.**
 - Utah Valley University, Department of Biology Colloquium Series

2020

- Working out the “bugs” in genome size evolution. ***Hjelmen CE.**
 - Rutgers University, Department of Entomology Invited Seminar

2019

- What does the rate of change in heterochromatin tell us about genome size evolution and the minimum DNA content of a fly? ***Hjelmen CE, Johnston JS, Blackmon H**
 - Biology Department Student Postdoc Research Conference. Texas A&M University
- How much DNA does it take to be a fly and what happens to the rest? ***Hjelmen CE, Johnston JS, Blackmon H**
 - Ecology and Evolutionary Biology Seminar Series, Texas A&M University, College Station, TX

2018

- Differential expression of proteins in species of forensically relevant Diptera. ***Hjelmen CE, Srivastav S, Parrott JJ, Dangott LJ, Tarone AM.**
 - Entomological Society of America Annual Meeting, Vancouver, Canada
 - Annual North American Forensic Entomology Association (NAFEA) meeting, Orlando, FL
- What amount of DNA is just right? ***Hjelmen CE, Holmes VR, Johnston JS**
 - Southeast Texas Evolutionary Genetics and Genomics Meeting, Houston, TX

2017

- What is underreplication and how does this phenomenon contribute to the enigma of genome size evolution in *Drosophila*? ***Hjelmen CE and Johnston JS**
 - Entomological Society of America Southwestern Branch Meeting, Austin, TX (1st place)

2016

- What’s the buzz in *Drosophila* genome size: A phylogenetic comparison of *Sophophora* and *Drosophila*. ***Hjelmen CE and Johnston JS**
 - International Congress of Entomology, Orlando, FL
- How does replication level contribute to genome size evolution in *Drosophila*? ***Hjelmen CE and Johnston JS**
 - 19th Annual Graduate Student Forum, Department of Entomology, Texas A&M University
- How do temperature differences relate to genome size variation? ***Hjelmen CE and Johnston JS**
 - Ecological Integration Symposium, Texas A&M University
 - Student Research Week, Texas A&M University
 - Entomological Society of America Southwestern Branch Meeting, Tyler, TX

2015

- Phylogenetic basis for understanding genome size evolution in *Drosophila*. ***Hjelmen CE and Johnston JS**
 - Entomological Society of America Meeting, Minneapolis, MN (1st place)
- Use of phylogenetic analysis to better understand genome size evolution in *Drosophila*. ***Hjelmen CE and Johnston JS**
 - 18th Annual Graduate Student Forum, Department of Entomology, Texas A&M University
- Size DOES Matter: Finding phylogenetic signal in *Drosophila* genome size. ***Hjelmen CE and Johnston JS**
 - Ecological Integration Symposium, Texas A&M University (1st place)
 - Student Research Week, Texas A&M University (1st place)

2012

- Beyond the Augie Borders: Student Research Off Campus (Texas A&M University). ***Hjelmen CE**
– Augustana College Biology Department—Invited Oral Presentation

COLLABORATOR AND STUDENT TALKS: *Presenting Author, †Mentored Student, †Undergraduate Author

2025

- Genome size evolution in Hymenoptera: Phylogenetic insights into social structure and genomic diversity. †*Frary O, †Jetton B, **Hjelmen CE**.
– Pacific Branch of Entomological Society of America Annual Meeting, Salt Lake City, UT
- Blow fly biodiversity and ecological roles in Utah's diverse landscapes. †*Beck H, Weidner LM, **Hjelmen CE**.
– Pacific Branch of Entomological Society of America Annual Meeting, Salt Lake City, UT
- Unpacking chromosomal evolution in Diptera: Insights from phylogenetic reconstruction and comparative analyses. †*Jetton B, **Hjelmen CE**.
– Pacific Branch of Entomological Society of America Annual Meeting, Salt Lake City, UT

2024

- A phylogenetic analysis of genome size evolution and social structure in Hymenoptera. †*Frary O, **Hjelmen CE**.
– Entomological Society of America Annual Meeting, Phoenix, AZ.
- Counting chromosomes: Exploring evolutionary insights from *Drosophila* karyotypes. †*French A, **Hjelmen CE**.
– Entomological Society of America Annual Meeting, Phoenix, AZ.
- The “fly”-logeny of *Drosophila* Chromosome Evolution. †*French A, **Hjelmen CE**.
– Utah Conference on Undergraduate Research 2024 Meeting, Utah Valley University, Orem, UT
- Accelerated Rates of Evolution in hymenopteran DSCAM genes. †*Motte R, **Hjelmen CE**.
– Utah Conference on Undergraduate Research 2024 Meeting, Utah Valley University, Orem, UT

2023

- The evolution of an undergraduate independent research project: Literature searches, data mining, and open-source programs to investigate a gene related to sociality. †*Motte R, **Hjelmen CE**.
– Entomological Society of America Annual Meeting, National Harbor, MD.
- Sifting through the mess of heterochromatin: An attempt at assembling heterochromatic *Drosophila* genomes. †*Ohman M, **Hjelmen CE**.
– Utah Valley University Showcase, Orem, UT
- Investigating the relationship between DSCAM evolution and arthropod sociality. †*Motte RR, **Hjelmen CE**.
– Pacific Branch of Entomological Society of America Annual Meeting, Seattle, WA

2020

- An evaluation of differentially spliced genes as markers of sex for forensic entomology. *†Jonika MM, **Hjelmen CE**, Faris AM, McGuane AS, Tarone AM
– Annual Meeting of the North American Forensic Entomology Association

2019

- Transcriptional Markers of Sex Determination for Forensic Entomology. *†Jonika MM, Faris AM, **Hjelmen CE**, Tarone AM
– American Academy of Forensic Sciences Annual Meeting, Baltimore, MD

2018

- Transcript-based sex determination for forensic entomology. *†Jonika MM, Faris AM, **Hjelmen CE**, Tarone AM
– Entomological Society of America Annual Meeting, Vancouver, Canada

- Let's Talk About Sex: Identifying Female and Male Markers in Blow Flies. *†Jonika MM, Faris AM, **Hjelmen CE**, Tarone AM
 - Ecological Integration Symposium, Texas A&M University
 - Undergraduate Research Presentation, Student Research Week, Texas A&M University
 - Department of Entomology Mentorship Symposium, Texas A&M University
- Genes as Markers of Sex for Forensic Entomology. *†Jonika MM, Faris AM, **Hjelmen CE**, Tarone AM
 - Undergraduate Research Scholars Symposium, Texas A&M University

POSTER PRESENTATIONS: *Presenting Author, †Mentored Student, †Undergraduate Author

2025

- Oxford Nanopore Technology sequencing and identification of fly gut content. *†Jannuzzi B, Meeds A, Weidner LM, **Hjelmen CE**
 - Pacific Branch of Entomological Society of America Annual Meeting, Salt Lake City, UT

2024

- Decoding Diptera: Unraveling chromosome evolution across fly families. *†Jetton B, **Hjelmen CE**
 - Entomological Society of America Annual Meeting, Phoenix, AZ
- Preliminary survey of blow fly species (Diptera: Calliphoridae) across Utah. *†Beck H, **Hjelmen CE**
 - Entomological Society of America Annual Meeting, Phoenix, AZ
- Do the differences in size between heteromorphic sex chromosomes influence organism longevity? *†Frery O, **Hjelmen CE**
 - Utah Conference on Undergraduate Research 2024 Meeting, Utah Valley University, Orem, UT
- Creating a universal framework for reconstructing phylogenies: Building trees at your fingertips using R. *†Jetton B, **Hjelmen CE**
 - Utah Conference on Undergraduate Research 2024 Meeting, Utah Valley University, Orem, UT
- Survey of Blow Fly (Diptera: Calliphoridae) Species Across Utah and Salt Lake Counties *†Beck H, Weidner LM, **Hjelmen CE**
 - Utah Conference on Undergraduate Research 2024 Meeting, Utah Valley University, Orem, UT
- Investigating the relationship between natural environment and drosophilid genome size. *†Curnow S, **Hjelmen CE**
 - Utah Conference on Undergraduate Research 2024 Meeting, Utah Valley University, Orem, UT

2023

- Morphometrics of Jewel Scarabs of the Southwest. *Blackmon LT, Jonika MM, Sylvester T, Alfieri J, **Hjelmen CE**, Blackmon H
 - Evolution Annual Meeting, Albuquerque, NM
- Time flies: Chromosomes number changes in the evolutionary history of *Drosophila*. *†French A, **Hjelmen CE**
 - Utah Valley University Showcase, Orem, UT
- Comparing highly heterochromatic cactophilic *Drosophila* genome assemblies. *†Ohran M, **Hjelmen CE**
 - Utah Conference on Undergraduate Research 2023 Meeting, University of Utah, Salt Lake City, UT
- Time flies: Chromosomes number changes in the evolutionary history of *Drosophila*. *†French A, **Hjelmen CE**
 - Utah Conference on Undergraduate Research 2023 Meeting, University of Utah, Salt Lake City, UT
- Environmental factors have little influence on drosophilid genome size. *†Curnow S, **Hjelmen CE**
 - Utah Conference on Undergraduate Research 2023 Meeting, University of Utah, Salt Lake City, UT
- Smart animals and social critters: the relationship of Protocadherin evolution and neuronal diversity and the impact of DSCAM evolution on sociality. *†Motte RR, **Hjelmen CE**
 - Utah Conference on Undergraduate Research 2023 Meeting, University of Utah, Salt Lake City, UT

2022

- Assembly of highly heterochromatic cactophilic *Drosophila* genomes. *†Ohran M, **Hjelmen CE**
 - Entomological Society of America Annual Meeting, Vancouver, Canada (2nd Place)

- Do environmental factors impact drosophilid genome size evolution. *[†]Curnow S, **Hjelmen CE**
– Entomological Society of America Annual Meeting, Vancouver, Canada

2020

- Heterochromatin profiles and sex chromosomes of desert *Drosophila*. ***Hjelmen CE**
– Arthropod Genomics 2020—Virtual meeting
- Rates of Change in Heterochromatin and Estimating the Minimum Genome Size of a Fly. ***Hjelmen CE**, [†]Holmes VR, [†]Burrus CG, [†]Piron E, [†]Mynes M, [†]Garrett MA, Blackmon H, Johnston JS.
– Life Sciences PhD Recruiting Event, Texas A&M University, College Station, TX

2019

- Genome size evolution differs between *Drosophila* subgenera with striking differences in male and female genome size in Sophophora. ***Hjelmen CE**, Blackmon [†]H, Holmes VR, [†]Burrus CG, Johnston JS
– Society for the Study of Evolution Annual Meeting, Providence, RI
– Southeast Texas Evolutionary Genetics and Genomics Meeting, College Station, TX
- Thoracic underreplication predicts minimal *Drosophila* genome size. ***Hjelmen CE**, Holmes VR, [†]Burrus C, Johnston JS
– Texas Genetics Society Annual Meeting, College Station, TX (Postdoc Poster Winner)
– 60th Annual *Drosophila* Research Conference, Dallas, TX
- DNA replication stalls during S-phase in the longitudinal flight muscle of *Drosophila* spp. **Hjelmen CE**, [†]Novak M, [†]Holmes VR, Czajkowski E, *Johnston JS.
– 60th Annual *Drosophila* Research Conference, Dallas, TX

2018

- Markers of Sex Determination in Blow Flies. *[†]Jonika MM, Faris AM, **Hjelmen CE**, Tarone AM
– LAUNCH Undergraduate Research Summer Poster Session, Texas A&M University
- Transcript-Based Sex Determination for Forensic Entomology. *[†]Jonika MM, Faris AM, **Hjelmen CE**, Tarone AM
– International Association for Identification, San Antonio, TX
– Southeast Texas Evolutionary Genetics & Genomics Symposium, Rice University

2017

- The impact of regional climate variables on genome size evolution in *Drosophila* species. ***Hjelmen CE**, Johnston JS.
– 58th Annual *Drosophila* Research Conference, San Diego, CA
- Lessons learned from an examination of genome size variation in inbred lines of *D. melanogaster*. *Johnston JS, Tarone AM, **Hjelmen CE**, Kelleher E, MacDonald S.
– 58th Annual *Drosophila* Research Conference, San Diego, CA

2016

- How does replication level contribute to genome size evolution in *Drosophila* species? ***Hjelmen CE**, Johnston JS.
– The Allied Genetics Conference, Orlando, FL

2015

- Transcriptomics must take into account unexpected levels of endoreduplication and underreplication. ***Hjelmen CE**, [†]Mynes M, Johnston JS.
– Arthropod Genomics Symposium, Kansas State University
- The rate and pattern of genome size evolution in Drosophilidae and Formicidae. ***Hjelmen CE** and Johnston JS
– Entomological Society of America Southwestern Branch Meeting, Tulsa, OK(1st place)

2014

- Genome size variation within and among the sexual and asexual generations of the gall wasp *Belonocnema treatae*, and the putative role of tannins: Further comparisons of sexual and asexual forms. ***Hjelmen CE**, Ott JR, Egan SP, and Johnston, JS
– Entomological Society of America Meeting, Portland, OR
- The rate and pattern of genome size evolution in Drosophilidae and Formicidae. ***Hjelmen, CE** and Johnston, JS
– Arthropod Genomics Symposium, University of Illinois at Urbana Champaign

- Genome size evolution in *Drosophila melanogaster*. *Johnston JS, **Hjelman CE.**, Tarone AM
– Arthropod Genomics Symposium, University of Illinois at Urbana Champaign
- Sex, ecology, and the genome: How a novel sex determination mechanism interacts with genome evolution during ecological speciation in the gall wasp *Belonocnema treatae*. ***Hjelman CE**, Ott JR, Egan SP, and Johnston JS.
– Ecological Integration Symposium, Texas A&M University (2nd place)

2013

- Extensive variation in genome size among populations and a novel sex determining mechanism in the gall wasp, *Belonocnema treatae*. ***Hjelman, CE**; Ott, JR; Egan, SP; Johnston, JS.
– Arthropod Genomics Symposium, University of Notre Dame
– Entomological Society of America Meeting, Austin, TX

TEACHING

TEACHING EXPERIENCE:

DEPARTMENT OF BIOLOGY, UTAH VALLEY UNIVERSITY

- **INTRODUCTION TO BIOINFORMATICS** (Utah Valley University, BIOL 1011)—Instructor of Record
Instruct students in introductory biology topics and their applications in the field of bioinformatics.
Instruct the use of introductory bioinformatic tools and basic R coding
 - Fall 2021—2 sections, 22 students
 - Spring 2022—2 sections, 17 students
 - Fall 2022—1 section, 35 students
 - Spring 2023—2 sections, 70 students
 - Fall 2023—2 sections, 49 students
 - Spring 2024—2 sections, 37 students
 - Fall 2024—2 sections, 39 students
 - Spring 2025—2 sections, 34 students
 - Fall 2025—2 sections, 24 students
- **GENETICS** (Utah Valley University, BIOL 3500)—Instructor of Record
Instruct students in upper-level genetics, including central dogma, regulation of gene expression, genome organization and population genetics
 - Fall 2021—31 students
 - Spring 2022—39 students
 - Summer 2022—32 Students
 - Fall 2022—41 Students
 - Spring 2023—52 students
 - Summer 2023—30 students
 - Fall 2023—47 Students
 - Summer 2024—38 students
 - Summer 2025—33 students
- **GENOMICS** (Utah Valley University, BIOL 3500)—Instructor of Record
Instruct upper-level students in genomics topics, including sequencing, assembly, annotation, phylogenomics, comparative genomics, and population genomics. Weekly discussion of current literature and student driven final project presentations.
 - Fall 2022—15 students
 - Fall 2023—13 students
 - Fall 2024—13 students
 - Fall 2025—12 students
- **PHYLOGENETICS** (Utah Valley University, BIOL 4300)—Co-instructor with Dr. Heath Ogden
Instruct upper-level students in phylogenetic reconstruction and comparative methods. Tree reconstruction methods from parsimony, to maximum likelihood and Bayesian methodologies. Students generate novel datasets and construct accessible, detailed, and repeatable pipelines for analysis
 - Fall 2025—18 students
- **S-STEM INTRODUCTION TO UNDERGRADUATE RESEARCH** (Utah Valley University, BIOL 2900)—Instructor of Record
Instruct students in foundational information on success as an undergraduate research student. Topics include professional development, time management, grant budget management, research rotations, and more. Specifically designed for NSF S-STEM scholarship fellows.
 - Fall 2025—6 students

- **PRINCIPLES OF EVOLUTION** (Utah Valley University, BIOL 4500)—Instructor of Record
Instruct upper-level students in the principles of evolution, including the mechanisms of evolution, sexual selection, Hardy-Weinberg and speciation. Weekly discussion of classic literature and student driven final project presentations
 - Spring 2023—10 students
 - Fall 2023—20 students
 - Spring 2024—19 students
 - Spring 2025—27 students
- **MOLECULAR EVOLUTION AND BIOINFORMATICS** (Utah Valley University, BIOL 4550)
Instruct upper-level bioinformatics and biotechnology students on the principles of molecular evolution, including population genetics and genomics, Hardy-Weinberg, neutral theory, and genome sequencing. Semi-weekly discussions of primary literature and student-driven final proposal projects
 - Spring 2024—15 students
- **BIOINFORMATICS CAPSTONE** (Utah Valley University, BIOL 4600)
Guide upper-level bioinformatics students on implementing and critiquing bioinformatic pipelines. Students complete independent projects and compose a written and oral presentation of their work.
 - Spring 2024—1 student
 - Spring 2025—7 students
- **ENTOMOLOGY** (Utah Valley University, ZOOL 3430, ZOOL 3435)
Introduce the study of insects, including insect diversity and classification, anatomy and physiology, etc. Students curate museum quality collections with identifications to family level
 - Fall 2024—10 students
- **EVOLUTION OF SEX** (Utah Valley University, BIOL 490R-1, Co-Instructor with Dr. Jessica Cusick)
An upper-level seminar style course in which students learn and discuss the evolution sex from the prospective of both the molecular and behavior. This course challenges students to critically engage with the latest research, discuss emerging questions, and reflect on the broader implications of sex in biology.
 - Fall 2024—10 students
- **STUDENT SEMINAR** (Utah Valley University, BIOL 494R)—Instructor of Record
Upper-level seminar course. Students focus on writing a term paper of their interest.
 - Fall 2022—12 students

DEPARTMENT OF ENTOMOLOGY, TEXAS A&M UNIVERSITY

- **THE SCIENCE OF FORENSIC ENTOMOLOGY** (Texas A&M University, ENTO/FIVS 431)—Lecture TA
Assist in classroom instruction of Forensic Entomology, specifically in the application of collection and identification of insects for courtroom depositions.
– Spring 2017—100 Students
- **APPLIED FORENSIC ENTOMOLOGY** (Texas A&M University, ENTO/FIVS 432)—Laboratory TA
Instruct upper-level Forensics and Entomology students in collection, identification, and curation of entomological materials for forensic investigations.
– Spring 2017—12 Students
- **FORENSIC INVESTIGATIONS** (Texas A&M University, FIVS 123)—Online/Distance Learning TA
Assist in online/distance education of students in the field of forensics. Specifically in their ability to identify ability to evaluate evidence, critically analyze information, and implement scientific methods for problem solving
– Spring 2017—250 Students
– Fall 2016—250 Students
– Spring 2016—430 Students
- **FORENSIC IMPLICATIONS OF INHERITANCE** (Texas A&M University, FIVS 308)—Laboratory TA
Instruct upper level Forensics majors in basic genetics, including laboratory techniques, such as DNA extraction, PCR, and gel electrophoresis.
– Fall 2016—13 Students
- **BIOLOGY OF INSECTS** (Texas A&M University, ENTO 313)—Laboratory TA
Instruct non-major students on important biological aspects of insects, stressing biodiversity. Teach how to correctly curate and identify insects to order and family level.
– Fall 2015—30 Students
- **INSECT BIODIVERSITY AND BIOLOGY** (Texas A&M University, ENTO 301)—Laboratory TA
Instruct upper-level undergraduate entomology majors to correctly curate and identify insects to family using morphological information.
– Spring 2015—30 Students
- **GENERAL ENTOMOLOGY** (Texas A&M University, ENTO 201)—Laboratory TA
Instruct primarily non-major students in multiple lab sections on the evolutionary and biological importance of insets and related arthropods as well as the ability to identify insects to the order level.
– Fall 2014—30 Students

GUEST LECTURES

2021

- Genetic Drift.
– Evolution (BIOL 4500), Utah Valley University, Department of Biology
- Evolution of Sex Chromosomes
– Evolution (BIOL 4500), Utah Valley University, Department of Biology
- Website Design and Professional Presence Q&A
– BIOL 3100, Utah Valley University, Department of Biology
- Genome Size Evolution. *Hjelman CE. (Synchronous Online)
– Biotechnology, Rutgers University, Department of Entomology
- Whole Genome Sequencing Projects (Synchronous Online)
– Biotechnology, Rutgers University, Department of Entomology
- Molecular Techniques in Forensic Entomology (Asynchronous online)
– Forensic Entomology, Texas A&M University, Department of Entomology

MENTORED STUDENTS AND DIRECTED LEARNING

RESEARCH STUDENTS MENTORED—(THEIR CURRENT POSITION):

- Beth Larsen (current student)
- Bailey Jannuzzi (current student)
- Haylee Beck (current student)
- Olivia Frary (PhD Student at University of Rochester)
- Barbara Shelley (PhD Student at University of Utah)
- Sarah Fout (Pharmatech Labs)
- Sam Curnow (Quality Assurance Tester at Caselle)
- Audrey French (Specimen Processor at Myriad Genetics)
- Erick Alvarez (MS Student, U. of Utah)
- Remington Motte (PhD Student at U. of Arkansas)
- Marissa Ohran (NSF RAMP Post-Bacc Scholar)
- Alex McGuane— (Data Analytics and Visualization)
- Michelle Jonika—(Postdoctoral Researcher in Heath Blackmon Lab, Texas A&M University)
- Elizabeth Piron—(MPH, Epidemiologist)
- V. Renee Holmes—(Research Scientist at Lab+ Certified Group)
- Melissa Mynes—(Laboratory Technician for Aqua Solutions)
- Margaret Garrett—(Medical Student at McGovern Medical School)
- Zoe Ward—(Substitute Teacher)
- Anika Sharma-Fulbright PhD Scholar —(Received PhD)
- Alli Konstantinov— (Current Undergraduate)

STUDENT THESIS COMMITTEES

- Cyrus Nielsen
 - 2025-2026 Honors Project Committee Chair
 - Title: Contributing to UVU's Insect Teaching Collection and Entomology Student Resources
- Austen Miller
 - 2025-2026 Honors Thesis Committee Chair
 - Title: Simulacra and Speciation
- Amaya Roberts
 - 2025-2026 Thesis Committee Member
 - Title: Field Guide to Grasses of CRNP
- Kate Hickman
 - 2022-2023 Honors Thesis Committee Member
 - Title: Metagenomic Tools for Microbiome Analyses in Non-Model Systems
- Kelsey Stone
 - 2022-2023 Senior Thesis Committee Member
 - Title: Exploring Insect Diversity in Capitol Reef National Park: The Creation of a Field Guide
- Avery Larsen
 - 2022-2023 Senior Thesis Committee Member
 - Title: A Phylogenomic Analysis of Baetidae (Ephemeroptera)
- Ernie Vilela
 - 2022-2023 Senior Thesis Committee Member
 - Title: A Bioinformatic Workflow for Transcriptome Analysis of Opsin genes in Ephemeroptera (Mayflies)
- Jeremy Jensen
 - 2021-2022 Senior Thesis Committee Member
 - Title: The Insects of Capitol Reef; The Creation of a Field Guide

PROFESSIONAL DEVELOPMENT

CERTIFICATIONS, TRAININGS, AND PROFESSIONAL DEVELOPMENT:

- **ONLINE TEACHING ACADEMY (25 HOUR CERTIFICATION)**
Develop instructor presence, peer-to-peer interaction, meaningful learning activities, and secure assessments. This is the official preparation program for online instructors at UVU.
– Fall 2022. Office of Teaching and Learning, Utah Valley University
- **ANTI-RACIST PEDAGOGY (25 HOUR CERTIFICATION)**
Review the history of racism, explore ways the instructor can support anti-racism in the classroom.
– Summer 2022. Office of Teaching and Learning, Utah Valley University

- **EVIDENCED-BASED TEACHING PRACTICES FOR HIGHER EDUCATION (25 HOUR CERTIFICATION)**

Principles of good practice in undergraduate education including learner-centeredness, backwards design, metacognition, inclusive teaching, assessment and feedback, and active learning strategies.

– Spring 2022. Office of Teaching and Learning, Utah Valley University

- **TEACHING FIRST YEAR STUDENTS (12.5 HOUR CERTIFICATION)**

Best practices for teaching the first-year student including making early and often connections with students, learning to learn strategies, growth mindset, metacognition, and embedding FYS content into your course

– Fall 2021. Office of Teaching and Learning, Utah Valley University

LEARNING CIRCLES:

- **A VOICE IN THE WILDERNESS (CO-LEADER)**

- Fall 2023 Learning Circle, Utah Valley University

- **UNRAVELING FACULTY BURNOUT**

- Spring 2023 Learning Circle, Utah Valley University

- **EVERYONE IS AFRICAN**

- Fall 2022 Learning Circle, Utah Valley University

- **ON BEING A MENTOR**

- Spring 2022 Learning Circle, Utah Valley University

- **INTRODUCTION TO CRITICAL RACE THEORY**

- Fall 2021 Learning Circle, Utah Valley University

SERVICE

SYMPOSIA ORGANIZED:

2024

- How to Be a Vector for Entomophilia: Infecting the Future

- Entomological Society of America Annual Meeting, Phoenix, Arizona (Nov. 2024)

- Co-Organized with: David Serrano (Broward College)

2023

- Entomology Education and Experience: How Insects Impact, Inform, and Influence People and Policy

- Entomological Society of America Annual Meeting, National Harbor, Maryland (Nov. 2023)

- Co-Organized with: David Serrano (Broward College) and Ashleigh Faris (Texas A&M University)

2022

- Inspiring the Next Scientists: Entomology as an Educational and Research Tool for Undergraduates

- Entomological Society of America Annual Meeting, Vancouver, Canada

- Co-Organized with: David Serrano (Broward College), Delano Lewis (Burman University, Canada), Leah Flaherty (MacEwan University, Canada)

WORKSHOPS LED

- **WEBSITE WORKSHOP FOR DEPARTMENT OF BIOLOGY, UTAH VALLEY UNIVERSITY**

General overview of importance of personal and lab websites for online presence. Instruct and guide faculty and staff through development of html coding and implementation of GitHub Pages website development

- Oct. 9, 2024

- Feb. 19, 2025

- **OPEN SOURCE FOR OPEN SCIENCE 2020, TEXAS A&M UNIVERSITY (ONLINE)**

Basic Statistical Analysis and Visualization in R—Developed and instructed online module for introduction to R. Covered statistics such as T-tests, ANOVA, MANOVA, Regression, PCA and their non-parametric alternatives. Visualization for data using Base R and ggplot package

- 274 students, faculty, and staff registered for event

- **OPEN SOURCE FOR OPEN SCIENCE 2019, TEXAS A&M UNIVERSITY**

Basic Statistical Analyses in R—Developed and instructed module for introduction to R. Covered statistics such as T-tests, ANOVA, MANOVA, Regression, PCA and their non-parametric alternatives

- 292 students, faculty, and staff registered for event

EDITOR EXPERIENCE:

- Guest Editor for special issue of Genes: Genetics of Phenotypic Variation in *Drosophila* and Other Insects (10 articles)

PEER REVIEW (NUMBER OF REVIEWS)

- | | |
|---|---|
| • Agricultural and Forest Entomology (2) | • International Journal of Molecular Sciences (1) |
| • Biology (2) | • Journal of Heredity (1) |
| • BMC Genomics (2) | • Journal of Insect Science (1) |
| • Cells (3) | • Journal of Medical Entomology (1) |
| • Communications Biology (1) | • Mitochondrial DNA Part B (4) |
| • Diversity (1) | • Molecular Biology and Evolution (2) |
| • Evolution (1) | • Molecular Ecology Resources (4) |
| • Frontiers in Genetics (1) | • Plants (1) |
| • Genes (5) | • Systematic Entomology (2) |
| • Genetics (1) | • Wellcome Open Research (3) |
| • Genome (3) | • Western North American Naturalist (1) |
| • Insectes Sociaux (1) | • PLOS Computational Biology (1) |
| • Insects (3) | • PLOS Genetics (1) |
| • International Journal of Acarology (1) | • G3: Genes Genomes Genetics (1) |
| • International Journal of Environmental Research and Public Health (1) | |

GENERAL SERVICE:

PROFESSIONAL LEVEL

- 2023-Pres. Entomological Society of America FIT (Formal and Informal Teaching) Program Subcommittee
- 2024 Entomological Society of America Panelist for Early Career Professional workshop on Networking
- 2023 Entomological Society of America Graduate Student Talk Judge
- 2023 NSF Reviewer
- 2019 Southeast Texas Evolutionary Genetics and Genomics 2019—Planning Committee
- 2016-2017 Chair of SW Branch ESA Student Affairs Committee
- 2014-2016 Chair of Photo Salon -SW Branch of ESA

UNIVERSITY LEVEL

- 2024 Speaker for UVU “STEAM – CON”—Finding your Role Model in STEAM
- 2024 SCULPT Panelist for Workshop on Mentoring and Researching with Undergraduate
- 2023 Co-leader for Faculty and Staff Learning Circles (“A Voice in the Wilderness”)
- 2023 Faculty Panelist for New Faculty Orientation, Utah Valley University
- 2022 Faculty Panelist for New Faculty Orientation, Utah Valley University
- 2020 Open Source Open Science Workshop 2020—instructor and assistant 274 students
- 2019 Open Source Open Science Workshop 2019—instructor and assistant 292 students

COLLEGE LEVEL

- 2024 College Day—Faculty and Student Panel
- 2024-2025 Darwin Day Committee, Utah Valley University
- 2023-2024 Darwin Day Committee, Utah Valley University
- 2022-2023 Darwin Day Committee, Utah Valley University
- 2021 Dean’s Day—Volunteered at Biology Table, Utah Valley University

DEPARTMENT LEVEL

- 2025-2026 Search Committee Member—Bioinformatics Tenure-Track Position, Department of Biology, Utah Valley University

- 2025 Search Committee Chair—Bioinformatics one-year Lecturer Position, Department of Biology, Utah Valley University
- 2024-2025 Search Committee Chair—Animal Biology/Zoology Tenure Track Position, Department of Biology, Utah Valley University
- 2024-2025 Search Committee Chair—Invertebrate Collections Technician Position, Department of Biology, Utah Valley University
- 2023-2024. Affinity Groups Mentor—Atheist and Agnostics, Department of Biology, Utah Valley University
- 2023 Search committee for permanent lecturer position, Department of Biology, Utah Valley University
- 2021-current Hiring Committee—Department of Biology, Utah Valley University
 - (Chair 2022-ongoing)
- 2021-current Engagement Committee—Department of Biology, Utah Valley University
 - (2022- current) Inclusion Committee Networking Subcommittee
 - (2022-current) Mentor for Department Affinity Groups—Agnostic/Atheist in Science
- 2021-current Bioinformatics Degree Program Committee, Utah Valley University
 - (Coordinator 2023-ongoing)
- 2021-2022 Search committee for Anatomy tenure-track position, Department of Biology, Utah Valley University
- 2020 Deposition Panel for Texas A&M University Forensic Entomology Final Project
- 2019 Deposition Panel for Texas A&M University Forensic Entomology Final Project
- 2018 AWE (Aggie Women in Entomology) Mentor Panel: The Next Chapter
- 2018 Postdoctoral Judge for Entomology Mentoring in Research Symposium
- 2017 AWE (Aggie Women in Entomology) Mentor Panel: The Next Chapter
- 2017 Postdoctoral Judge for Texas A&M Entomology Graduate Student Forum
- 2016-2017 President-Entomology Graduate Student Organization—TAMU
- 2016-2017 Graduate Student Representative for Department Faculty Meetings
- 2015-2017 New Graduate Student Panel
- 2015-2016 Vice President-Entomology Graduate Student Organization—TAMU
- 2015-2016 Entomology Representative for Graduate and Professional Student Council
- 2014-2015 Social Activities Chair-Entomology Graduate Student Organization—TAMU
- 2014-2017 Texas A&M University Linnaean Games Team

COMMUNITY OUTREACH:

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- | | |
|--|---|
| • Mar. 2025, Pleasant Grove Library | • Feb. 2020 “Why are there so many insects in Texas?” For 100 2 nd grade students. |
| • Feb. 2025, Darwin Day, UVU Biology | • Apr. 2017 SWB ESA Insect Expo |
| • June 2024, Salt Lake Oasis talk | • Mar. 2017 Family Fun Night Creek View Elem. |
| • Feb. 2025, Darwin Day, UVU Biology | • May 2015 Creek View Elementary Event |
| • June 2023, Springville Library Outreach | • May 2015 Be the Match Found. Fundraiser |
| • June 2023, Spanish Fork Library Outreach | • Feb 2015 SWB ESA Insect Expo |
| • Feb 2023 Darwin Day, UVU Biology | • Oct. 2014 “Trunk or Treat” Ento. Halloween Event |
| • Mar. 2023 SHE-roes Event, Thanksgiving Point | • Oct. 2014 “Boonville Days” Outreach Event |
| • Feb 2022 Darwin Day, UVU Biology | • May 2014 Covenant Presbyterian Church Preschool Event |
| • Oct. 2021 Dean’s Day, UVU College of Science | |

MEMBERSHIPS AND AWARDS

MEMBERSHIPS:

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- | | |
|---|---|
| • Society for Molecular Biology and Evolution (Active) | • Entomological Society of America (Active) |
| • North American Forensic Entomology Association (Active) | • Texas Genetics Society (Former) |
| | • Pacific Branch of ESA (Active) |

- Southwest Branch of ESA (Former)
- Society for the Study of Evolution (Former)
- Genetics Society of America (Former)
- American Society of Naturalists (Former)
- Southwest Association of Naturalists (Former)
- Beta Beta Beta Biological Honor Society
- Phi Sigma Tau Philosophy Honor Society
- Gamma Sigma Delta Agriculture Honor Society

AWARDS (NOT INCLUDING STUDENT GRANTS):

- 2025 UVU Grants for Engaged Learning 2-year Grant--\$29,987
- 2025 Capitol Reef Field Station Colorado Plateau Grant--\$7,489
- 2025 UVU College of Science Dean's Distinguished Faculty Scholarship Award
- 2024 UVU Scholarly Activities Committee Dissemination Grant \$1953
- 2023 UVU Office of Teaching and Learning Travel Award \$700
- 2022 UVU Office of Teaching and Learning Travel Award \$700
- 2022 UVU Grants for Engaged Learning (GEL)--\$9,766
- 2019 Texas Genetics Society Annual Meeting Postdoctoral Poster Award Winner
- 2017 Entomological Society of America Southwestern Branch 1st Place PhD Oral Presentation
- 2017 Department of Entomology: Award for Outstanding Ph.D. Student
- 2016 Single-Cell and Gene Expression Grant Award provide by Fluidigm and the TIGGS Shared Molecular-genomics workspace
- 2016 Department of Entomology: Award for Outstanding Ph.D. Student
- 2015 Entomological Society of America National Meeting 1st place graduate student talk in SysEB: Citizen Science, New Methods, and Physiology section
- 2015 Vice President for Research: Excellence in Research Award Nomination
- 2015 Ecological Integration Symposium 1st place graduate student oral presentation
- 2015 Student Research Week 1st place graduate student oral presentation
- 2015 Entomological Society of America Southwestern Branch 1st place Ph.D. poster
- 2014 Theodore Roosevelt Memorial Fund
- 2014 Induction into Gamma Sigma Delta Agriculture Honor Society
- 2014 Ecological Integration Symposium 2nd place graduate student poster
- 2013 Texas A&M Merit Fellowship
- 2013 Induction into Phi Sigma Tau Philosophy Honor Society
- 2012 Will Rosine Memorial Biology Scholarship
- 2012 Texas A&M REU EXCITE
- 2012 Council on Undergraduate Research (CUR) Biology Travel Award
- 2011 BRIN Research Fellowship
- 2011 Induction into Beta Beta Beta Biological Honor Society
- 2010 Sven G. Froiland Biology Scholarship

SKILLS:

- Flow Cytometry
- Genome Size Estimation
- Phylogenetics
- Western Blots
- DNA and RNA Extraction
- Model insect husbandry
- Insect Curation and Identification
- R for statistics and data visualization
- Genomic analyses using local and HPC resources
 - Genome assembly
 - Transcriptomic Analysis
 - Sequence Alignments
 - Comparative Phylogenetics

References:

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