

Samuel R. Hirst

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Education & Experience

Postdoctoral Associate	Columbia University , New York, NY, USA	2026 –
• Kira Delmore Lab		
Ph.D.	University of South Florida , Tampa, FL, USA	2021 – 2025
• Integrative Biology • <i>Summa cum laude</i> • Advisor: Mark J. Margres		
B.S.	Brigham Young University , Provo, UT, USA	2017 – 2021
• Major: Genetics, Genomics, and Biotechnology • Minors: Spanish, Business, and Music • Undergraduate Research Advisor: Paul B. Frandsen		

Funding

National Science Foundation Graduate Research Fellowship (GRFP) in the amount of \$167,000	2023 – 2026
The Theodore Roosevelt Memorial Fund of the American Museum of Natural History in the amount of \$2,600	2025
Western North American Naturalist Natural History Research Grant entitled "Testing for life history changes in venom composition in the Baja California Rattlesnake (<i>Crotalus enyo</i>)" in the amount of \$2,500	2023
University of South Florida Department of Integrative Biology Graduate Research Fellowship in the amount of \$21,276	2021 – 2022
BYU Life Sciences College Undergraduate Research Award entitled "Sequencing, Assembly, and Annotation of the Red Diamond Rattlesnake Genome" in the amount of \$1,500	2021

Publications (Corresponding author*, contributed equally†, undergraduate mentee§)

5. **Hirst SR***, VanHorn CM§, Franz-Chávez H, Vásquez-Cruz V, Kelly-Hernández A, Rosales-García RA, Castañeda-Gaytán G, Borja M, Parkinson CL, Strickland JL, Margres MJ. Accepted. Lack of an Ontogenetic Shift in *Crotalus enyo cerralvensis* Venom Supports Integration of Cranial Morphology and Venom Expression in Rattlesnakes. *Western North American Naturalist*.
4. **Hirst SR***, Beer MA, VanHorn CM§, Rautsaw RM, Franz-Chávez H, Lopez BR, Ramirez Chaparro R, Rosales-García RA, Vásquez-Cruz V, Kelly-Hernández A, Salinas Amézquita SA, López Martínez DE, Perez Fiol T, Rubio Rincón A, Whittington AC, Castañeda-Gaytán G, Borja M, Parkinson CL, Strickland JL, Margres MJ*. 2025. Area-Induced Changes in Competition Drive Rapid Venom Complexity Evolution Across Island Rattlesnakes. **Editor's Choice and Cover Article**. *Evolution*. 79(8):1419-1432. 10.1093/evolut/qpaf074 ↗; USF Press Release ↗; The St. Pete Catalyst ↗; The Guardian ↗
3. Mochales Riaño G*, **Hirst SR**, Talavera A, Burriel-Carranza B, Pagone V, Estarellas M, Busschau T, Boissinot S, Hogan

- MP, Tena-Garcés J, Pla D. 2025. Chromosome-level reference genome for the medically important Arabian horned viper (*Cerastes gasperettii*). *GigaScience*. giaf030. 10.1093/gigascience/giaf030 ↗
2. Neri-Castro E*, Borja M, Castañeda-Gaytán G, Alagón A, Strickland JL, Parkinson CL, Gutierrez-Martínez A, Rodriguez-López B, Zarzosa V, Lomonte B, Saviola AJ, Fernández J, Smith CF, Hansen KC, Pérez-Robles A, Castañeda-Pérez A, **Hirst SR**, Olvera F, Fernández-Badillo L, Sigala J, Jones J, Montaño-Ruvalcaba C, Ramírez-Chaparro R, Acosta-Campaña G, Margres MJ. 2025. Venom variation and ontogenetic changes in the *Crotalus molossus* complex: insights into composition, activities, and antivenom neutralization. *Comparative Biochemistry and Physiology, Part C*. 290, 110129. 10.1016/j.cbpc.2025.110129 ↗

1. **Hirst SR***, Rautsaw RM, VanHorn CM\$, Beer MA, McDonald PJ, Rosales-García RA, Lopez BR, Rubio Rincón A, Franz-Chávez H, Vásquez-Cruz V, Kelly-Hernández A, Storfer A, Borja M, Castañeda-Gaytán G, Frandsen PB, Parkinson CL, Strickland JL, Margres MJ*. 2024. Where the ‘Ruber’ Meets the Road: Using the Genome of the Red Diamond Rattlesnake to Unravel the Evolutionary Processes Driving Venom Evolution. *Genome Biology and Evolution*. 16(9). 10.1093/gbe/evae198 ↗

Publications in Review & Preparation

3. Farleigh K*, Highland DK, Alderman MG, Francioli YZ, **Hirst SR**, Faber EM, Perry BW, Holding ML, Castañeda-Gaytán G, Borja M, Franz-Chávez H, Parkinson CL, Strickland JL, Margres MJ, Mackessy SP, Meik JM, Castoe TA, and Schield DR*. *In review*. Evolution of genome-wide barriers to gene flow during complex speciation in rattlesnakes. *PNAS*.
2. Guedouar EG*, **Hirst SR**, Solis SS, Chaput D, Margres MJ. *In review*. Ontogenetic Co-option of Myotoxin Expression Variation in Island Eastern Diamondback Rattlesnake (*Crotalus adamanteus*) Venoms. *Toxicon*
1. Margres MJ*, **Hirst SR**, Gallinson DG, Rautsaw RM, McDonald PJ, Guedouar EG, Nystrom GS, Hogan MP, Ellsworth SA, Wray KP, Rokyta DR. *In review*. Truncated Life History Underlies Rapid Local Adaptation in Island Rattlesnake Venom Expression. *Molecular Ecology*.

Natural History Notes & Range Expansions

3. McDonald PJ*, Margres MJ, Gallinson D, Guedouar E, **Hirst SR**, Mulla A, Gardner CR, McCargar G. 2025. *Plestiodon Egregius* (Mole Skink) Geographic Distribution. *Herpetological Review*. 56(2):162-163.
2. **Hirst SR***†, Vásquez-Cruz V†, Kelly-Hernández A, Franz-Chavez H, Rincon AR, Salinas Amézquita AS, Grunwald C, Borja M, Castañeda-Gaytán G, Strickland JL, Margres MJ. 2023. Hunchback of Isla Piojo: First Record of Putative Kyphosis in the Spiny Chuckwalla (*Sauromalus hispidus*). *Bulletin of the Chicago Herpetological Society*. 58(11):177-178.
1. Franz-Chavez H, Ramirez-Chaparro R, Perez-Fiol T, Lopez-Martinez D.E, Rautsaw RM, **Hirst SR**, Rodriguez-Lopez B, Borja M, Castaneda-Gaytan G, Strickland JL, Parkinson CL, Reyes-Velasco J, Margres MJ. 2023. Mexican Geographical Distribution Notes 6: New Herpetological Records for Islands in the Gulf of California. *Bulletin of the Chicago Herpetological Society* 58(8):129-130.

Awards & Honors

University of South Florida Annual Graduate Student Research Symposium	2025
Best poster award, Health and Life Sciences category, "Venomous Archipelagos: Integrating Adaptability and Island Biogeography Theory to Assess Persistence in the Anthropocene" in the amount of \$500.00	
Natural Toxins e-Conference	2022
Bronze award for oral presentation “Neutral or not: identifying drivers of venom evolution” in the amount of \$75.00	

Invited Talks

3. Hirst SR. 2025. Venomous Archipelagos: Using Island Biogeography to Predict Functional Trait Evolution in Fragmented Landscapes. Departmental Seminar. University of South Alabama. Mobile, AL, USA.
2. Hirst SR. 2025. Connecting pattern and process: Using rattlesnake venoms to integrate evolution with foundational ecological theories of species richness. Integrative Biology Graduate Open House. University of South Florida. Tampa, FL, USA.
1. Hirst SR. 2023. Venenos en víboras de penínsulas y archipiélagos: Determinando los factores que contribuyen a la evolución de veneno. Departmental Seminar. Universidad Veracruzana, Veracruz, MX. Virtual.

Presentations

5. Hirst SR, Margres MJ. 2025. Island biogeography and competition drive rapid venom complexity evolution across rattlesnakes. Evolution Conference. Classic Center, Athens, GA, USA.
4. Hirst SR, Margres MJ. 2025. Venomous Archipelagos: Integrating Adaptability and Island Biogeography Theory to Assess Persistence in the Anthropocene. University of South Florida Annual Graduate Student Research Symposium. Poster Session. University of South Florida, Tampa, FL, USA.
3. Hirst SR, Margres MJ. 2023. Complex problems need complex solutions: polygenic trait evolution from multiple evolutionary mechanisms in the Red Diamond Rattlesnake (*Crotalus ruber*). Evolution Conference. Albuquerque Convention Center, Albuquerque, NM, USA.
2. Hirst SR and Margres MJ 2022. Neutral or not: identifying drivers of venom evolution. Pathogens and Natural Toxins e-Conference. Virtual.
1. Hirst SR[†], Tolman E[†], and Frandsen PB. 2020. Comparing the effectiveness of eDNA sampling of water to bulk sample ethanol supernatant for the assessment of freshwater macroinvertebrate communities. Entomological Society of America Meeting. Poster Session. Virtual.

Teaching

University of South Florida, Tampa, FL, USA

2021 – 2023

- General Physiology Lab – Laboratory Instructor (Spring 2023)
- Principles of Biology – Teaching Assistant (Fall 2021, Spring 2022, Spring 2023)

Brigham Young University, Provo, UT, USA

2018 – 2021

- Introduction to Jazz – Teaching Assistant (Summer 2018, Winter 2021)

Guest Lectures

3. Global Lizard Diversity: BSC 4933/6932, Herpetology. 2025. University of South Florida. Tampa, FL, USA
2. Community Ecology and Island Biogeography. BSC 2011, Bio II. 2024. University of South Florida. Tampa, FL, USA
1. Global Snake Diversity: Caenophidia. BSC 4933/6932, Herpetology. 2022. University of South Florida. Tampa, FL, USA

Mentorship

Ethan Weinstock (B. S. student, University of South Florida.)	2024 – 2025
Grace Mandese (B. S. student, University of South Florida.)	2024 – 2025
Cameron M. VanHorn (B. S. student, University of South Florida; Joined Ph.D. program at University of Florida.)	2022 – 2024

Manuscript Review

BMC Genomics, PeerJ Life & Environment, npj Biodiversity, Genome Biology, Toxicon

General Service

"How did venom evolve?" Interview on <i>Science Talks</i> by Deanna Soper. Podcast episode 2 .	2025
Scientific expert for U.S. Fish and Wildlife Services: Species status assessment of the Eastern Diamondback Rattlesnake (<i>Crotalus adamanteus</i>)	2023

Technical Skills

Field	Laboratory	Computational
International field work	Dissection/tissue collection	Unix, R, Python scripting
Spanish fluency	DNA/RNA purification	Supercomputing
Venomous snake handling	DNA/RNA quantification	Bioinformatics
Snake venom extraction	DNA/RNA library prep	Statistics
Rodent trapping	ATAC-Seq prep	
Invertebrate sampling	Next-generation sequencing	
	RP-HPLC	