

Statement of Research and Professional Works

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My research integrates conservation biology, animal physiology, physiological ecology, and the study of how animals interact with their physical environment—including aspects of the solar spectrum invisible to humans. Across all projects, my guiding principle is that research should advance both scientific understanding and student learning. I approach each study as a collaborative enterprise in which students are full participants in formulating questions, collecting data, analyzing results, and presenting findings.

Current and Ongoing Research

1) Conservation of Great Basin Amphibians

I continue long-term research on the population structure and conservation of rare toads in the Great Basin, including the narrowly endemic black toad (*Anaxyrus exsul*) of Deep Springs Valley. This species, which occurs only in a handful of spring systems near the College, presents outstanding opportunities for student involvement in population monitoring, genetics, and habitat assessment. Prior research revealed significant size differences among black toad populations (e.g., Corral vs. Antelope Springs). Future work will examine genetic and environmental drivers of these patterns and establish a long-term monitoring program that Deep Springs students can help design and implement. I also contribute to regional conservation planning as an expert reviewer for the Clark County Multi-Species Habitat Conservation Plan and have served on federal recovery teams, experiences that bring policy relevance and collaborative networks to student projects.

2) Toxin Ecology and Evolution

My lab investigates the occurrence and ecological function of tetrodotoxin (TTX) in salamanders and newts, focusing on its production, distribution among tissues, and evolutionary significance. With undergraduate collaborators, I quantified TTX levels in red eft (*Notophthalmus viridescens*), finding concentrations high enough to deter most predators. Future work at Deep Springs will expand this research to California newts (*Taricha torosa*), exploring how predator-prey dynamics shape toxin levels and collaborating with external partners. This project merges biochemistry, physiology, and evolutionary ecology and provides training in lab techniques and experimental design.

3) Animal Perception and the Non-Visible Spectrum

A third research direction examines how animals perceive and exploit ultraviolet (UV) and infrared (IR) radiation, challenging the human-centered view of “color.” Many vertebrates possess visual capabilities beyond the human range, and my preliminary data show striking differences in UV and near-IR reflectance among species. Understanding how non-visible solar radiation influences heat balance, visual communication, and ecological interactions opens fertile ground for experimental field studies in the Deep Springs desert environment.

Research Philosophy and Student Engagement

My research is deliberately collaborative and student-centered. Undergraduates have co-designed studies, conducted fieldwork, analyzed physiological data, and presented at professional meetings. I encourage students to see themselves as partners in discovery, not merely assistants. This approach aligns naturally with Deep Springs’ mission of academics, labor, and self-governance: students gain technical skills while learning to ask meaningful questions, evaluate evidence, and work responsibly in a scientific community.

Professional Works and Future Directions

Beyond amphibian conservation and physiological ecology, I engage in professional service that bridges science and policy. My work with the U.S. Geological Survey produced a 500+ page statewide species distribution report for Nevada reptiles and amphibians, providing managers with critical tools for land-use decisions. I plan to continue producing applied research of this kind while mentoring students in the preparation of manuscripts, technical reports, and public presentations. At Deep Springs, the black toad and the surrounding desert ecosystem offer extraordinary opportunities for research that is place-based, interdisciplinary, and impactful.