Life in Extreme Conditions
Research
Dr. Allen G. Gibbs
Professor
School of Life Sciences
Phone: 702-895-3203
Email: allen.gibbs@unlv.edu

Expertise
• Environmental physiology
• Insect physiology
• Experimental evolution
Environmental Physiology of Desert Invertebrates

Adaption to water stress:

Adaptation to high temperatures:
Experimental Evolution Research Using Fruit Flies

Starvation resistance:
- a fly model for obesity

Desiccation resistance:
- understanding responses to desertification

Pigmentation:
- phenotypic correlations of melanization
Astrobiology and Geomicrobiology

Dr. Elisabeth Hausrath
Associate Professor
Department of Geoscience
Phone: 702-895-1134
Email: Elisabeth.Hausrath@unlv.edu

Expertise
Geomicrobiology
Biological impacts on water-rock interactions
Astrobiology
Biological Impacts on water-rock interactions

Field studies (e.g. Baumeister et al., 2014)

Laboratory studies (e.g. Phillips-Lander et al., 2020)

Nutrient release (e.g. Adcock et al., 2013)

Signatures of biological alteration (e.g. Hausrath et al., 2009)
Astrobiology

Habitability

Hays et al., 2017
Potential biosignatures

Phillips-Lander et al., 2020

Mars 2020 and Mars Sample Return

NASA.gov
Integrative Physiology

Dr. Allyson Hindle
Assistant Professor
School of Life Sciences
Phone: 702-895-4521
Email: allyson.hindle@unlv.edu

Expertise
• molecular mechanisms of hypoxia tolerance in hibernating and diving mammals
• cardiovascular and blood pressure regulation
• comparative genomics, biomarker discovery and bioinformatics
• cell line resource development for non-model systems
Cardiovascular protection of deep divers
Metabolic control of small hibernators

**Body Temperature (°C)**

- **SUMMER**
- **WINTER**

**Plasma Lipids**

- Reference
- Squirrel 1
- Squirrel 2

**Samples:**
- Cy2
- Cy3
- Cy5
Geomicrobiology

Dr. Aude Picard
Assistant Research Professor
School of Life Sciences
audeamelie.picard@unlv.edu

Expertise
• Anaerobic microbiology
• Biomineralization
• Astrobiology and biosignatures
• Microscopy & spectroscopy
Biogeochemistry of Fe, S and C in anoxic environments

Iron sulfide mineral formation in anoxic environments

1. Properties of biominerals

Minerals produced with microorganisms have unique physical and chemical properties

- What is the reactivity of biominerals?
- What are the applications of biominerals?

2. Microbe-mineral interactions in anoxic environments

- Do minerals play a role in the physiology of bacteria?
- How do bacteria cope with mineral encrustation?

3. Can we use biominerals for the search of life on Mars?

- Are properties of biominerals unique enough to record life in anoxic environments?

Credits: NASA/JPL-Caltech/MSSS
Extremophiles

Dr. James Raymond
Adjunct Research Professor
School of Life Sciences
Phone: 702-895-3268
Email: raymond@unlv.nevada.edu

Expertise
Adaptations to cold environments
Snow algae
Ice-binding proteins
Horizontal gene transfer
Much of the Earth’s surface is exposed to extreme conditions such as freezing, high temperature and hypersalinity.

Organisms living in these regions have developed some remarkable adaptations that not only reveal the beauty of Nature, but also may have commercial applications (e.g., low-calorie ice cream) as well as provide clues to the presence of life in other worlds.

Ice-binding proteins. Above, from a snow alga from the Austrian Alps.\(^1\) Below, from a grass growing on the coast of the Arctic Ocean.\(^2\)

An unusual enzyme found only in a few species of algae. This one is from an alga that lives in a saline lake in Antarctica. The alga uses the enzyme to make glycerol so that it can remain in osmotic equilibrium with the lake water.\(^3\)

Demonstration of how many proteins produced by microorganisms affect the growth of ice by binding to its surface. Here, proteins from a polar cyanobacterium distort the growth of a growing ice crystal.

References
1. Raymond and Remias (2019)
2. Sformo and Raymond (2020) (Submitted)
3. Raymond, Morgan-Kiss and Stahl (2020) (Submitted)
Dr. Jeffery Shen  
Professor, 
School of Life Sciences  
Phone: 702-895-4704  
Email: jeffery.shen@unlv.edu

Expertise
• Big Data Analysis to Study Biology, Agriculture and Medicine
• Molecular Mechanisms Controlling Plant Responses to Drought, Heat, and Salinity
• Seed Germination, Tissue Culture and Plant Transformation
• Molecular Basis of Leukemia (in collaboration with Dr. J. Cheng at the University of Chicago Medical School)
• Nutrition of Cereal Crops (in collaboration with Dr. Christine Bergman, Ph.D. and R.D. at UNLV)
Molecular Basis of Drought Stress Responses and Seed Germination

**BMC Genomics**, 2016, 17:102
**Plant Science**, 2015, 236:214-222
**Front. Plant Science**, 2015; 6: 1145

Gene Gun
Yeast Two Hybrid
Confocal

Short Read Assembly Algorithm
for Genome and Transcriptome Analysis
http://shenlab.sols.unlv.edu/shenlab/software/Tiling_Assembly/tiling_assembly.html
**DNA Research**, 2015, 22: 319-329
**Genomics**, 2014, 103:122-134

Promoter and Coding Region Structures
http://shenlab.sols.unlv.edu/shenlab/software/TSD/transcript_display.html
**Bioinformatics**, 2016, 32:2024-2025

Signaling network Analysis

Molecular Basis of Leukemia
(in collaboration with Medical School, University of Chicago)

Cytogenetically normal refractory cytopenia with multilineage dysplasia (CN-RCMD)

**Nature Communications**, 2018, 9:1163
**Leukemia**, 2013, 27: 1291-1300
Dr. Jenifer C. Utz
Associate Professor in Residence
School of Life Sciences
Phone: 702-895-3386
Email: jenifer.utz@unlv.edu

Expertise
• Undergraduate STEM education
• Digital learning resources
• Mammalian hibernation
Facilitating academic achievement for a diverse undergraduate population

- Effects of self-testing:

  Voluntary Web-Based Self-Assessment Quiz Use is Associated With Improved Exam Performance, Especially for Learners with Low Prior Knowledge

  Jennifer C. Utz, PhD and Matthew L. Bernacki, PhD
  1School of Life Sciences, College of Sciences, University of Nevada Las Vegas, 4505 S. Maryland Parkway, Las Vegas, NV 89154
  2Learning Analytics Initiative, College of Education, University of Nevada Las Vegas, 4505 S. Maryland Parkway, Las Vegas, NV 89154
  jennifer.utz@unlv.edu, matt.bernacki@unlv.edu

  Abstract
  This study examined students’ voluntary use of digital self-assessment quizzes as a resource for learning in a large anatomy and physiology lecture course. Students (n = 238) could use 16 chapter quizzes and four analogous unit quizzes to rehearse and self-assess knowledge. Most students (75%) engaged in occasional use of self-assessment quiz items; repeated use was uncommon (12%), as was lack of use (13%). Exam performance differed between quiz use groups. Quiz use improved exam performance more among students who entered the course with low prior knowledge of concepts from the prerequisite course. Cumulatively for all students and all exams, repeated self-assessment quiz users significantly outperformed occasional users (+7.3%) and non-users (+11.9%) on course exams. Incorporation of optional learning resources can enhance the learning success of students.

- Effects of skill training:

  Can a Brief, Digital Skill Training Intervention Help Undergraduates “Learn to Learn” and Improve Their STEM Achievement?

  Matthew L. Bernacki
  University of North Carolina, Chapel Hill

  Iacie Virovick and Jennifer C. Utz
  University of Nevada, Las Vegas

  Students who drop out of their science, technology, engineering, and math (STEM) major commonly report that they lack skills critical to STEM training and career pursuits. Many training programs exist to develop students’ learning skills and they typically achieve small to medium effects on behaviors and performance. However, these programs require large investments of students’ and instructors’ time and effort, which limits their applicability in large lecture courses. Findings from early undergraduate STEM courses suggest that a brief, digital skill training module designed to help students apply learning strategies and self-regulated learning principles effectively in their STEM course can impact students’ behaviors and performance in a large lecture course. Results indicate that a brief skill training module had significant effects on students’ use of
Developing the Skill and Will to Succeed in STEM Scholarship Program

A primary goal of this scholarship program is to diversify and increase the number of students entering STEM professions

• The School of Life Sciences welcomed the first cohort of 17 Succeed in STEM Scholarship recipients in 2019
• Over $420,000 of scholarship support will be distributed across the lifetime of this 5-year program
Hibernation physiology

- Rewarming from torpor:

- Resistance to bone disuse atrophy:
School of Life Sciences

Dr. Frank van Breukelen
Professor and Director
School of Life Sciences
Phone: 702-895-3944
Email: frank.vanbreukelen@unlv.edu

Expertise
- Metabolic depressions like mammalian hibernation
- Life in extreme environments
Areas of research
• Hibernation in tenrecs and ground squirrels
• Paradoxical anaerobism in pupfish
• We use a variety of approaches from whole animal physiology to biochemistry to understand how animals live in extreme environments