



Graduate student opportunities to start Fall 2021!

Southern Illinois University Edwardsville & Arizona State University

Part of the Behavioral Plasticity Research Institute (BPRI)

BPRI is an [NSF-funded virtual institute](#) consisting of a group of like-minded teacher-scholars with diverse disciplinary expertise from six institutions. The BPRI uses locust phase polyphenism as a model system to transform the way phenotypic plasticity is studied by linking sub-organismal processes to the whole organism, populations, and ecosystems, and ultimately to the tree of life.

The vision of the BPRI is predicated on integration through collaboration. We recognize the scientific and societal impacts are maximized when groups of people with diverse backgrounds and experiences come together to work towards shared goals and the common good. This philosophy will inform all BPRI activities.

Research Topic Overview

Phenotypic plasticity—the ability of a genotype to produce different phenotypes in response to environmental variation—is observed across living organisms and scales of biological organization. However, to fully understand its mechanisms, maintenance, and evolution, complete biological integration is needed. One of the most striking examples of coordinated phenotypic plasticity in nature is found in locusts. Locusts comprise a handful of species in the grasshopper family Acrididae capable of forming dense migrating swarms through an extreme form of density dependent phenotypic plasticity, in which cryptically colored, shy individuals (solitarious phase) can transform into conspicuously colored, gregarious individuals (gregarious phase) in response to increases in population density. This phenomenon, referred to as *locust phase polyphenism*, affects a myriad of locust traits, including molecular biology, physiology, behavior, morphology, and ecology. Locust swarms occur worldwide and can affect the livelihood and well-being of one in ten people on Earth. Thus, locust phase polyphenism is a powerful comparative system for understanding how gene expression and epigenetic regulation scale up to behavioral, physiological, and ecological interactions resulting in outbreaks, collective movement, and mass migration. Intriguingly, the syndrome of locust phase polyphenism has evolved multiple times within grasshoppers, with varying sets of mechanisms contributing to phase polyphenism between lineages, and thus the phenomenon can be compared across the phylogeny of Acrididae.

Graduate Student Positions (2)

BPRI is looking for a MS student to join the team of Dr. Brittany Peterson at Southern Illinois University Edwardsville (SIUE) and a PhD student to join the team of Dr. Arianne Cease, Dr. Rick Overson, and the Global Locust Initiatives Labs at Arizona State University to work at the intersection of locust ecology and microbiology

The students will be primarily based at one of these laboratories, but will collaborate with the other research team, as well as research groups from other BPRI institutes.

SIUE [The BugGuts Lab](#)— insect-microbe associations—the ecological interactions that take place in an insect’s gut, between host and gut microbial community, manifest as a host phenotype with specialized physiological capabilities and responses to the environment. For BPRI research, the SIUE MS student will be working to characterize the gut bacterial community in *Schistocerca* species. This project aims to dissect the relationship between host diet, bacterial community identity, and behavioral plasticity and involves a variety of microbial ecology techniques including amplicon (16S) sequencing. This student will work closely with collaborators at ASU, and other BPRI teams, to describe core microbiota unifying *Schistocerca*, identify ecological factors (diet, density, etc.) that predict gut community composition, and, ultimately, determine if locust gut bacteria are associated with phenotypic plasticity. Recruiting a MS student for fall 2021.

ASU Global Locust Initiative (GLI) Labs [GLI Labs](#) has projects spanning natural and social sciences, focused on understanding the systems in which locusts and grasshoppers exist, as well as supporting development of local solutions to the global challenge of locust plagues. For BPRI research, the ASU PhD student will conduct ecophysiology research to test the ecological factors that might constrain or promote the development of gregarious phenotypes. To test this the student will lead studies comparing traits such as aggregation, foraging, and migration across lab and field populations. Further, they will collaborate with the SIUE team to share samples for microbial analyses, an ASU postdoc to assess the environments using remotely-sensed data, and other BPRI institutes to look for genomic signatures involved in the expression of specific phenotypes associated with locust phase change. Recruiting a PhD student for fall 2021.

Preferred Qualifications:

- Applicants should be able to work independently, as well as part of a team, and be highly motivated. Some previous research and/or field experience is necessary.
- Bachelor’s Degree in related fields e.g. ecology, biology, entomology, genetics, microbiology, sustainability is required.

Application Requirements:

Applicants should contact the PI’s via email before applying to discuss the project and fit.

Dr. Brittany Peterson — Assistant Professor, Department of Biological Sciences
bripete@siue.edu

--SIUE applicants will [apply](#) to the [Department of Biological Sciences](#).

Dr. Arianne Cease—Associate Professor, Arizona State University
acease@asu.edu

--ASU applicants can apply either through the [Environmental Life Sciences](#) or [School of Sustainability](#)