

## **LUMCON's Research Experience for Undergraduates (REU) Program: *Interdisciplinary Research Experiences in Changing Coastal Environments***

### **2019 LUMCON REU Mentors and Project Opportunities**

Mentors and mentor teams will be selected from LUMCON faculty members, their post-docs and graduate students, and visiting scientists who have active research programs addressing basic and applied research questions in and around the Mississippi and Atchafalaya Rivers, their deltas, adjacent wetlands, and nearby shallow coastal or deep ocean waters.

In the summer 2019, REU opportunities are available in several research areas, including:

- ecosystem ecology and biogeochemistry
- behavioral and collective responses of fishes to environmental stressors
- invertebrate richness and diversity in coastal habitats
- coastal geology and hydrology
- microbial ecology and diversity
- aquaculture and fish physiological ecology
- impacts of oil spills on wetland biogeochemistry and ecology, plant ecology, microbial ecology, predator-prey interactions; behavioral ecology

The following mentors at LUMCON are accepting students for the 2019 LUMCON REU program (this list will change yearly).

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**Dr. Brian Roberts** is an ecosystem ecologist and biogeochemist. His research group studies how ecosystems along the freshwater-estuary-ocean continuum process and retain nutrients and energy and how this is altered as a result of human perturbations to the landscape. His research interests also include biogeochemical cycling, microbial ecology, plant ecology, and predator-prey interactions in wetlands and estuarine pelagic and benthic environments and involves field observations and controlled mechanistic experiments conducted both in field and laboratory settings. Dr. Roberts is interested in mentoring REU students with interests in working with a team of researchers to develop independent projects that fit within the context of our group's diverse, larger efforts. Some potential research projects include: wetland biogeochemistry; marsh plant ecological responses to oiling; controls on denitrification vs. dissimilatory nitrate reduction to ammonium (DNRA) rates; oil impacts on microbial communities and N-cycling rates in marsh soils; impacts of oiling and other stressors on marsh predator-prey interactions and animal behavior.

**Dr. Guillaume Rieucan** is a Marine Biologist and Animal Behaviorist. His research focuses on exploring the role of behavior in structuring fish communities and trophic interactions in marine and estuarine ecosystems. Dr. Rieucan is interested in understanding the fundamental processes that mediate predator-prey interactions, habitat use and aggregative tendencies of schooling fish in a fluctuating environment. He explores how fish schools (from forage fish to piscivorous species) form and collectively react as coordinated units to external factors such as predators, environmental conditions, anthropogenic disturbances, fishery activities and habitat structure. He addresses most of these questions by conducting laboratory, mesocosm and in situ behavioral experimentations using advanced technology and computational methods (multi-target computer tracking, video analysis) to quantify fine-scale dynamic behavioral responses in various ecological contexts. He is also using his experience at translating behavioral variations of marine and estuarine shoals to provide important information for conservation and management plans. Potential REU research

projects include: 1) Effects of abiotic factors on the behavioral repertoire, anti-predatory collective responses and information transfer of wild-caught schooling fish during in situ or controlled laboratory experiments, 2) Using unmanned aerial vehicles (UAV or drones) in the study of distribution, movement and behavior of schooling fish in coastal and estuarine systems.

**Dr. Craig McClain** and his benthic and invertebrate ecology lab seek active participants in the sorting, identification and enumeration of invertebrate infauna from coastal habitats in Louisiana. Productive marsh ecosystems support inshore and offshore natural resources, response of these shallow water ecosystems to changes in energy availability not only affect local diversity but also potentially influences much larger regional ecosystem structure. We will also be conducting shallow water investigations of soft bottom communities of oyster reefs, wood falls and marsh edges in coastal Louisiana. Students will learn or hone skills in invertebrate taxonomy and anatomy, benthic sample collection and processing, body size analysis, and other marine biological field work. Work will be conducted in the lab, within the bays, bayous, and barrier islands of southern Louisiana with frequent boat trips to sampling locations.

**Dr. Alexander Kolker** and his laboratory investigates the physical and geological processes that govern coastal systems, with a focus on the Mississippi River system. We seek to understand how water and sediment are transported across the coast, and how these processes fluctuate and shift during times of environmental change. For researchers in my lab, some of the most interesting causes of change include climate change, subsidence, and the large-scale restoration and protection projects that are part of Louisiana's Coastal Master Plan. Students in my lab typically use a combination of field, laboratory, and analytical tools to solve pressing geological, hydrological, and oceanographic problems. Possible projects for an REU student could involve studying the drivers and impacts of sea-level change in the lower Mississippi River Delta, examining the hydrological fluxes in Mississippi River crevasses, examining the environmental history of deltaic and non-deltaic wetlands, and determining sedimentation patterns in coastal restoration sites.

**Dr. Marshall Bowles** investigates the microbiology and geochemistry of salt marsh and deep sea environments. The ocean has a great abundance of microbes (e.g. bacteria), indeed they outnumber humans by much more than a million times! We know microbes, though small, change how chemical elements move on Earth. My goal is to understand how microbes in the coast and the ocean interact with the world around them. This means that I typically try to figure out how microbes actually change the chemistry in their environment or are themselves influenced by the chemical environment around them. REU projects in Dr. Bowles' lab will be field and lab based and utilize a variety of microbiological analytical tools, as well as analytical chemistry equipment. This summer we are looking for students interested in: exploring microbial diversity in salt marsh sediments; determining the viability of microorganisms in salt marsh sediment (living, dead, or dormant); describing nutrient fluxes, microbial diversity, and energy dynamics in salt marsh sediments.

**Dr. Abigail Bockus** is a fish biologist with a research focus on aquaculture development. Her and her team use comparative physiology to enhance production of key aquaculture species by characterizing the aquafeeds, feeding protocol, and environmental conditions for optimal growth. The Bockus lab is particularly interested in marine finfish (e.g. cobia and red drum), especially those species being targeted for offshore production or stock enhancement in the Gulf of Mexico. Dr. Bockus is looking for an REU student who is interested in the fields of aquaculture and fish physiology. The student will be involved in one, or multiple, ongoing projects and encouraged to develop a related research hypothesis of their own. A few of our current projects include, 1) using differences in fish digestion/energetics to inform diet formulation, 2) analyzing the use of novel

Single Celled Protein sources in aquaculture feeds for marine finfish, and 3) examining a feed additive and its ability to enhance soy utilization in salmonids. In addition to their summer research project, this student will gain experience with fish capture, husbandry, and recirculating aquaculture systems.