RIOS Mentors and Research Interests – 2009

Ken Able Studies range from the early life history of fishes to habitat use, fidelity and quality for juveniles and adults, particularly for estuarine fishes. Approaches include traditional sampling techniques that provide for long-term monitoring to state-of-the-art techniques such as acoustic telemetry and in situ video. These ongoing studies provide multiple opportunities for field-intensive student projects in the relatively unaltered Mullica River/Great Bay/Little Egg Harbor estuary.

Kay Bidle The oceans represent the oldest, evolving continuum on Earth with its evolutionary heritage being imprinted within the genes of resident microbes. Microorganisms (i.e., phytoplankton, bacteria, viruses) account for >90% of all oceanic biomass on Earth with their dynamic activities largely driving oceanic biogeochemical cycles. Still, we are faced with fundamental open questions about the activity, molecular diversity, and evolutionary development of their biochemical and molecular strategies. We remain largely ignorant of key cellular strategies, including stress response, cell communication, signaling, and defense. Many are directly relevant to issues of health and biotechnology, such as discovery of novel, active natural metabolites in relation to apoptosis and disease and the molecular control of fine-structured biomaterials. A fundamental objective of my research program is to elucidate the activity, diversity and evolution of microbial genes and link them to key oceanic ecosystem and biogeochemical processes, by merging biochemistry, molecular biology, and genome-based approaches with innovative instrumentation. My goals are to not only understand the function and evolution of important molecules/enzymes in an oceanic ecosystem context, but also to apply them to relevant medical and biotechnological initiatives.

Bob Chant My research focuses on estuarine and coastal processes. In recent years I have conducted numerous field efforts in our local estuaries and along the New Jersey inner shelf to characterize their dynamics and the role that these dynamics play in forming coastal and estuarine ecosystems. Data sets collected as part of these projects provide excellent research opportunities for focused projects for students with experience with MATLAB and an interest in coastal and estuarine processes.

During the summer of 2008 there will be opportunities to participate in shipboard surveys in New York Harbor that will include sediment coring studies throughout the Harbor.

Allison Franzese My research uses geochemical proxies measured in deep-sea sediments to study past oceans and climate. An overarching theme of my research is how the "Global Conveyor Belt" or thermohaline circulation (THC) was different in the past. This is an important component of the climate system, and is not fully understood. My current research is focused on the Pacific to Indian Ocean exchange through the Indonesian Seas, which is part of the surface return flow of the THC. My main project is to reconstruction the Indonesian Throughflow (ITF) using neodymium (Nd) isotopes measured in microscopic fossil shells and oxide coatings on the sediments. A second project will use the major and trace element geochemistry and grain size of terrigenous sediments to study the ITF as well as local precipitation, thereby reconstructing changes in the SE Asian monsoon. Summer interns may choose to work on either project, which can be tailored to their individual interests and background.

Scott Glenn My research focuses on the development of regional-scale coastal ocean observation networks including testing of new ocean color algorithms in coastal regions using data from the international constellation of satellites, development of dual-use multi-static HF radar networks for surface current mapping and ship-tracking, and development of systems to coordinate operation of fleets of long-duration autonomous underwater gliders. Coupled physical/biological scientific applications in New York Bight include topographic influences on recurrent coastal upwelling, the effect of coastal upwelling on seabreeze, and the atmospheric forcing of buoyant river plumes. This research provides many opportunities for student interns.

Judy Grassle My research uses field studies of benthic communities in the LEO-15 research area and parallel studies in laboratory flumes to examine the relationship between mesoscale and small scale flows and the settlement and recruitment of marine invertebrates, especially the dominant species of bivalves and polychaetes present in the sediment-specific communities on Beach Haven Ridge. The flume studies are particularly amenable to investigation during a 10-week student internship.

Thomas Grothues My research focuses on fish recruitment dynamics and migration. I am currently studying striped bass migration as a mechanism contributing to population subdivision and the establishment of new populations. Real-time monitoring of acoustically tagged fish throughout the Great Bay/Mullica River estuary is the starting point for this work. I am in the early stages of extending this tracking seaward using an autonomous underwater vehicle (AUV) as a platform for the acoustic receiver. Several aspects of the development, testing, and application of this capability are suitable for summer undergraduate interns in computer engineering (writing and modeling search algorithms), biology (tagging and tracking fish), and oceanography (matching an AUV's physical sensor data to fish distribution).

Mike Kennish I am actively involved in research on anthropogenic impacts on estuarine and coastal marine environments, including investigations of the effects of coastal development, dredging and dredged material disposal, nutrient enrichment, toxic chemicals, organic pollution, radiation and radioactivity, thermal discharges, entrainment and impingement of electric generating stations, and other factors. Much of my research is on bottom sediments, benthic communities, and benthic habitats such as seagrass beds. Most of this research is both interesting and appropriate for undergraduate summer interns.

Michèle LaVigne My research uses coral geochemistry to reconstruct seawater conditions and interpret climate changes in the past. Similar to tree rings; the skeleton of shallow water corals contain annually-resolved density bands. As corals grow older, they incorporate trace elements into their skeleton in proportion to the elemental composition of the seawater around them. Recently, my research has focused on the development and application of a novel proxy in corals (P/Ca ratios) to reconstruct seasonal to centennial scale changes in the concentration of seawater phosphate (an essential nutrient for primary productivity in the oceans). My summer 2009 research will take advantage of the ability for reef building corals to act as recorders of local seawater chemistry to construct century-long records of nutrients in the Florida Keys. The nutrient pollution histories that we will extract from coral cores covering the last century will document recent variations in local nutrient loading. Evaluated in the context of coral reef health, these unique records will

provide quantitative targets for future nutrient regulation and coral conservation policies.
See more:
http://marine.rutgers.edu/main/Featured-Student/Featured-Student-Michele-Lavigne.html
http://www.imcs.rutgers.edu/~lavigne/Main.html

Rich Lutz Current research is focused on the ecology of deep-sea hydrothermal vents throughout the world's oceans. Of particular interest has been documentation of biological and geological succession in these hydrothermal systems. As part of an NSF-funded initiative, we have produced, in conjunction with commercial filmmakers, an IMAX-format film entitled "Volcanoes of the Deep Sea." Molluscan ecology represents another major research area, with an emphasis on identification of bivalve larvae isolated from plankton samples.

Rose Petrecca and Charlotte Fuller

Our project involves sampling the subtidal benthic community at several stations in Great Bay and Barnegat Bay, NJ. A summer intern will assist in sample collection, processing and identification of benthic infaunal organisms. Some sediment analyses will also be made. The data will be compared with data from these Bays collected 35 years ago. Aspects such as community structure, abundance, species evenness and richness will be explored. An intern may explore in more detail a component of this study.

Patricia Ramey Coastal organisms and their interactions with habitat and co-occurring species exhibit a degree of complexity that challenges our ability to test simple non-confounding hypotheses. One way to approach such complexity is to conduct controlled experiments addressing specific research questions based on "field" observations. My research in Benthic Ecology has focused on investigating patterns in benthic community structure (species composition and abundance) at several spatial

and temporal scales on the inner continental shelf at the Long-term Ecosystem Observatory in 15-m of water (LEO-15). Ongoing research examines species behavior, and habitat selection for food resources in the racetrack flume at the Institute of Marine and Coastal Sciences.

One potential project (co-supervised by J. Grassle and P. Field) will be to determine the effects of temperature and food concentration on growth rate and banding patterns of juvenile surfclams (*Spisula solidissima*). This will be accomplished through controlled laboratory experiments, and microscopic analysis of growth bands on clams collected off Tuckerton, NJ. There is a possibility of using geochemical analyses (i.e., trace metal to Ca ratios) of shells through high resolution Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) to gain insight into applications of such techniques to interpret environmental factors affecting surfclam growth rates and banding patterns in different habitats.

The surfclam is a valuable commercial resource in the Mid-Atlantic Bight and in some areas has been in decline since the early 1990's. Management practices routinely use growth bands laid down in the shell (like tree rings) for assessing age structure and population dynamics of this species. However, many environmental factors can influence the formation of these bands and this can obscure age determinations. Thus there is a need to better understand the causes and timing of growth band formation.

Gary Taghon I study how marine organisms utilize organic matter as food and energy source. Currently, my research focuses on unicellular organisms: bacteria and protozoa. Marine bacteria are important for transforming dissolved organic matter into biomass, some of which can be subsequently eaten by protozoa, and act as agents for recycling nutrients to inorganic forms that can be taken up by phytoplankton. I am interested in how the diversity of communities of microbes affects the rate and extent of these kinds of transformations of organic matter. I am also interested in how habitat complexity affects community diversity. Summer interns interested in these topics will gain experience in culturing bacteria and protozoa, microscopic analysis, experimental design, and chemical analysis.

Costa Vetriani Fields of Interest: Deep-Sea microbiology, Extremophiles, Molecular Ecology, Adaptations to Extreme Environments. Research in my laboratory focuses on the diversity, ecology, and evolutionary relationships of deep-sea prokaryotes, with an emphasis on deep-sea hydrothermal vents and cold seeps. More specifically, we isolate and characterize novel organisms from deep-sea, reducing environments, with an emphasis on thermophilic Archaea and Bacteria, and investigate community dynamics along

chemical and physical gradients in deep-sea environments. Undergraduate students in my laboratory are exposed to a variety of experimental techniques, including enrichment cultures/isolations, and molecular ecological approaches, such as PCR, clonal library construction and screening, sequencing, DGGE, and FISH.