



DEPARTMENT OF BIOLOGY
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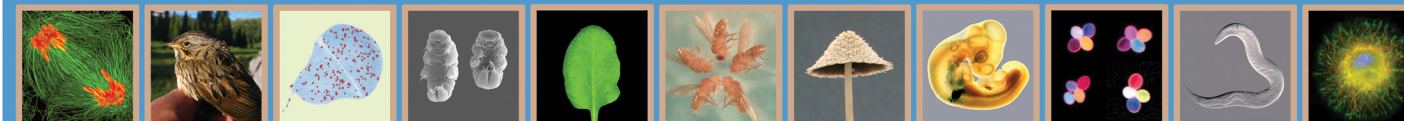
To strengthen and integrate the field, the department partners with numerous campus units, including the Program for Integrated Biological and Genome Sciences, the Curriculum for the Environment and Ecology, and the Lineberger Comprehensive Cancer Center. This past year, your generous contributions contributed to efforts such as Undergraduate Research and Interdisciplinary Seed Grants. Our department's impressive scope, standards of excellence, and future growth depend on generous contributions of alumni, parents, and friends.

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Victoria Bautch
Chair, UNC Department of Biology



BIOLOGY Newsletter

Department of Biology
THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

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A longfin inshore squid
photographed by Dr. William Kier

For more information,
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A Note from Victoria L. Bautch - Chair

Welcome to the 5th issue of the Department of Biology Newsletter. Our spring departmental graduation was amazing as we wished 567 undergraduates a fantastic future. We welcomed new faculty who recently joined UNC Biology: Assistant Professors Caroline Tucker (ecology), Toshi Hige (neurobiology), and Dr. James Umbanhowar as Teaching Assistant Professor/Consultant in statistical ecology. The department put together a 4-year strategic blueprint whose callout is *inquire, innovate, integrate*. We continue to maintain and strengthen strong connections with you - last year we were able to use funds donated by you, and matched by our External Advisory Board, to support 3 new interdisciplinary faculty seed grants to move new research forward in intersecting areas. We continue to set the national bar for best teaching practices. Looking forward, we plan to send Dr. Jean DeSaix off in style as she retires after 50 years of teaching our undergraduates - details will be announced. Finally, we have learned of the passing of Dr. Larry Gilbert, who was the first Chair of UNC Biology when Botany and Zoology merged in 1982. He will be missed, but his legacy lives on in our world-renowned faculty, our excellent students, and our wonderful alums. Thank you for your continued interest and support!



In Memory of Dr. Lawrence I. Gilbert - 1929-2017



Professor Larry Gilbert, a longtime member of the UNC Faculty and former chair of the biology department, died on October 31, 2017. He lived a long, full life, both as an accomplished academic scientist, and as a loving son, husband, father, grandfather, and great grandfather. Gilbert grew up in New York City, earning a B.S. from Long Island University. After military service, he earned an M.S. from NYU and a Ph.D. in Zoology from Cornell, joining the faculty of Northwestern in 1958. He did groundbreaking research in insect endocrinology, studying the role of hormones in development. In 1980, Gilbert moved to UNC, and in 1982 he was named Chair of the newly formed biology department (1982-1992). He subsequently held several other administrative positions at UNC. Gilbert won numerous awards, including election to the American Academy of Arts & Sciences, the Mentor Award for Lifetime Achievement from the American Association for the Advancement of Science, and the Thomas Jefferson Award, UNC's highest faculty honor. After retirement, he remained active as an emeritus professor, continuing to mentor and support the faculty and students of UNC Biology. He set up funds to support visits from distinguished scientists to the department and also established an award for undergraduate mentors. Dr. Gilbert "grew" UNC Biology in numerous ways large and small. He was an inspirational and visionary leader who recruited many current biology faculty members, built the reputation of the department, and fostered excellence in research and teaching. He is deeply missed by the UNC Biology community, where he left a wonderful legacy that we continue to build upon.

Alumni Spotlight

Zena Cardman, Class of 2010, Selected by NASA

Zena Cardman, who graduated from UNC-Chapel Hill in 2010 with a B.S. degree in Biology, has been chosen by NASA as one of a new group of 12 astronauts, drawn from an initial pool of more than 18,000 applicants. She has begun her training at the Johnson Space Center in Houston.

Cardman's experience as an undergraduate at UNC provided her with several formative opportunities to combine biological research and travel. In 2008, with support from a Burch Fellowship, she spent a summer in British Columbia and the Canadian Arctic studying



Cardman as a UNC undergraduate in the Antarctic, 2009

astrobiology - an interdisciplinary field of science that involves the origin, evolution, and distribution of life in the universe. The following year, as part of a separate project, she traveled for five weeks on an icebreaker in the West Antarctic Peninsula gathering data for a long-term ecological study.

After graduation, she earned a master's degree in marine science from UNC and eventually enrolled in the Ph.D. program in geoscience at Penn State University, where she is currently a graduate student. She has also participated in a project known as BASALT (Biologic Analog Science Associated with Lava Terrains), which involved a team of astronauts and support crew simulating a mission to Mars while based in the Hawaii Volcanoes National Park.

Cardman's adventurous spirit and diverse interests were evident during her time at UNC. In addition to her biology degree, she earned minors in marine science, creative writing, and chemistry as well as Honors in poetry. As an astronaut, she will give new meaning to the UNC Honors slogan of "Come here, go anywhere."



UNC Biology Goes Global



UNC Biology students visit organic coffee farm, Costa Rica

Until recently, undergraduate UNC Biology majors who wanted to participate in study abroad programs faced an unpleasant reality: very few of the programs included core biology classes or other basic science prerequisites required for the major. As a result, many students chose to forego study abroad programs to avoid slowing progress toward graduation. To help make study abroad more compatible with student needs, the biology department has now expanded its offering of classes for UNC students studying in foreign countries. During the summer of 2017, UNC faculty taught core biology

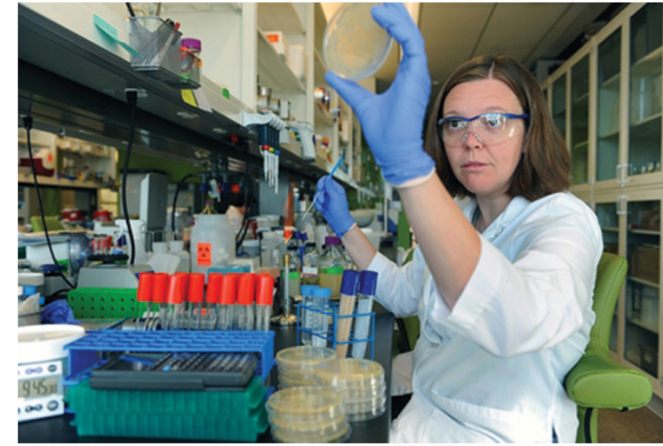
classes in Ireland, France, and Costa Rica. All three locations provided students with the opportunity to combine rigorous science instruction with an international experience.

Dr. Kevin Slep, who taught in Dublin, Ireland, reported that his class visited local theaters and museums, attended a hurling match, and trekked to Northern Ireland. Dr. Brian Hogan, who taught in San Jose, Costa Rica, reported that students enjoyed the sloths living in trees on campus as well as an 18-mile raft trip down the Pacuare River and visits to a volcano, an organic coffee farm, waterfalls, and Pacific beaches. Meanwhile, Dr. Greg Matera taught in Grenoble, France, where the class went on several outings, including a memorable trip to the Alps that involved a scenic drive along a mountain road with sharp turns and occasional tunnels. Navigating through France proved to be a recurring adventure for the class. As Matera noted, "The genetic code is universal, but it's too bad we couldn't use it to figure out the French transit system."



UNC Biology students in Dublin, Ireland

Faculty: In their own words...



Elizabeth Shank Dr. Shank examines a culture of microbes
Assistant Professor, Biology

To survive and grow in the world, all creatures must sense and respond to their external environment. This is as true for humans and plants as it is for the tiny bacteria that live on them. In fact, bacteria have a tremendous capacity for this type of sensory chemistry: they secrete a broad range of structurally complex metabolites. Many of these compounds are clinically used as antibiotics, and so historically, there has been significant interest in identifying these metabolites. In spite of their importance, however, amazingly little is known about the functions of these compounds in the natural world. My lab is focused on trying to understand this question.

Robert Peet

Professor of Biology

My lab group and I have always shared a fascination with patterns in biodiversity at all scales ranging from local natural areas to the globe. Much of our work has focused on understanding these patterns and how they are changing.

One research theme that we developed early in my career at UNC is change in vegetation through time. Toward this end, we maintain permanent research plots that in some cases date back 80 years. These data help us in creating a general theory of forest development based on tree population dynamics. In addition, we continue to discover and investigate other, often unexpected changes, such as dramatic reductions in species diversity resulting from increases in deer populations, invasive exotic plant species, and climate change. One recent study focused on the changing forest composition of the Roanoke River floodplain and led to a decision by the Army Corps of Engineers to dramatically change the management of dams along the river to allow continued tree regeneration.

Over the last 20 years, there has been a major increase in availability of large datasets, which we are exploiting to study global patterns of biodiversity. In one collaborative project, we have documented the distributions of all New World plants and have generated range maps for over 110,000 species. This is allowing us to better understand variation in plant diversity across the hemisphere. In another collaboration, we have compiled records of plant species co-occurrences at millions of places across the globe to examine patterns in the assembly of plant community. My favorite large-data project is the Carolina Vegetation Survey, a 30-year collaboration in which we have acquired vegetation inventory plots

We take the approach of 'considering the lives of microbes'; in other words, we think about how we can better capture the features of the environments in which bacteria exist in the natural world. For instance, bacteria frequently live as members of complex multispecies communities, and so other microbes are an important component of their local microenvironments. Rather than taking the traditional approach of growing microbes in isolation, much of our work involves growing multiple bacterial species together. Using this approach, we have identified new biological roles for microbial metabolites as interspecies chemical signals that influence bacterial physiology - changing the transcription, metabolism, and behavior of neighboring cells.

We primarily focus on the interactions of soil and plant-associated bacteria, and so, another way we attempt to capture the native environments of bacteria is by creating artificial microcosms that include plant roots and soil-like substrates. These experiments are allowing us to dynamically visualize bacterial interactions and the functions of their secreted metabolites both at realistic cell numbers (which are low relative to those typically studied in the lab) at the relevant (microscopic) spatial scales.

Overall, understanding how microbes chemically communicate with one another in more native-like conditions will provide us with insights not only about the role of microbial metabolites in shaping microbial communities but also potentially allow us to identify novel bioactive compounds as potential therapeutics.

covering the breadth of the Carolinas and, in the process, have involved over 1,000 volunteer field workers. We are currently using the resultant data for multiple projects, perhaps the most important of which is development of a classification of Carolina vegetation for use in inventory, conservation, and management planning. In the process, we are leading the way in formulating protocols for the ongoing development of a scientifically credible National Vegetation Classification.



Sampling vegetation of Croatan National Forest