



DEPARTMENT OF BIOLOGY
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Support the UNC Department of Biology

UNC Biology is a leader within the university, in the South, and across the nation. Our students, faculty, and alumni consistently define new directions for biology and develop innovative connections with other disciplines.

To strengthen and integrate the field, the department partners with numerous departments and units in the College and the School of Medicine. The National Research Council recently ranked UNC Biology in the top 10% of its field. This past year your generous support contributed to programs such as summer undergraduate research, and allowed us to initiate several seed-grants to support new cutting-edge biology research from faculty and students.

Our department's impressive scope, standards of excellence and future growth depend on generous contributions of alumni, parents, and friends. Please make your donation by returning the enclosed reply card, or by visiting:

bio.unc.edu/donate. Remember, the **25 bi 25** challenge from the Board will double your contribution to UNC Biology this fall!



To learn more about supporting UNC Biology through estate gifts, professorships, or student awards, please contact Stephen Keith (919-843-0345 or stephen.keith@unc.edu). Thank you for supporting outstanding students, faculty, and innovation in UNC Biology.

Victoria Bautch
Chair, UNC Department of Biology



BIOLOGY Newsletter

Department of Biology
THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

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Peer mentoring:
Undergraduates tutor their fellow biology students in the Genome Science Building Cafe. (Photo by Kelly Hogan)



For more information,
please visit our website:
<http://www.bio.unc.edu/>

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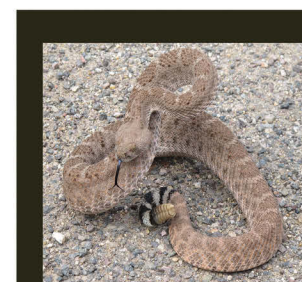


A Note from Victoria L. Bautch - Chair, Biology Department

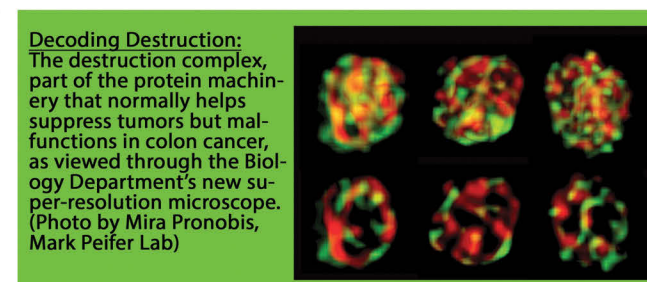
In this new issue of the UNC Biology newsletter, we celebrate the numerous accomplishments of our students and faculty and look eagerly to the future. In May, 492 undergraduates (the most of any UNC department) turned their tassels, and 2 Ph.D. students donned their hoods - we are so proud of them and look forward to their fantastic futures. We also welcomed 2 new faculty: Dr. Celia Shiao (developmental neurobiology and immunology), and Dr. Amy Gladfelter (cell biology). We were thrilled that Dr. Gladfelter was named a Howard Hughes Medical Institute Faculty Scholar, a highly prestigious national appointment (see feature in newsletter). We are busily at work on plans to renovate/replace the aging Wilson Annex Building to assist both our research and teaching missions. We also continue to set the national bar for best teaching practices in science, and are involved in all aspects of a university-wide Quality Enhancement Plan to improve the teaching mission at Carolina. This past year we set up the Biology External Advisory Board, a small but active group of alums and friends who support UNC Biology (and have a special challenge for you this fall). We value maintaining and strengthening connections with you - our former students and friends of the department. Your support enables the hard work of our world-renowned faculty, brings opportunities in cutting-edge research to our undergraduate and graduate students, and builds on the strong and vibrant teaching mission of the department. Thank you!



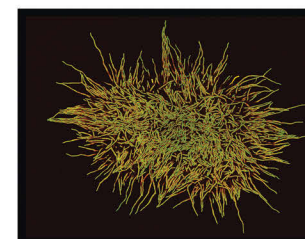
Images of UNC Biology



Snake Signals: Research in David Pfennig's lab suggests that rattlesnake rattling behavior - and hence the rattle - evolved from a simple behavior found in many species of snakes: vibrating the tail when threatened. (Photo by David Pfennig)



Decoding Destruction: The destruction complex, part of the protein machinery that normally helps suppress tumors but malfunctions in colon cancer, as viewed through the Biology Department's new super-resolution microscope. (Photo by Mira Pronobis, Mark Peifer Lab)



Fabulous Fungus: *Ashbya gossypii*, shown here under a microscope, is used by Amy Gladfelter's lab as a model system for investigating fundamental questions about cellular organization. (Photo by Drew Bridges, Amy Gladfelter Lab)

UNC Biology Professor Named HHMI Faculty Scholar

Associate Professor Amy Gladfelter has been named a Howard Hughes Medical Institute (HHMI) Faculty Scholar, a designation awarded to “early career scientists who have great potential to make unique contributions to their field.” She is among 84 faculty scholars from 43 institutions to receive this prestigious award, which will provide partial funding for her research program for 5 years. Results were announced in September by HHMI, the Simons Foundation, and the Bill & Melinda Gates Foundation. The three philanthropies joined forces to create the program in response to concerns about the growing challenges faced by early-career scientists.

Dr. Gladfelter joined UNC Biology in July 2016 after previously serving on the faculty of Dartmouth College. Her research focuses on how the physical properties of molecules lead to cell organization and function. The work has been funded largely by grants from the National Institutes of Health.



Alumni Spotlight

Introducing Linda Anderson Bruton, '63 - Inaugural Member of the UNC Biology Advisory Board



Following in the footsteps of Dr. William Chambers Coker, Linda came to Chapel Hill from Darlington, South Carolina, to further study botany, agriculture, and the environment. She spent her first summer as a graduate student at UNC exploring fields and roaming forests in Dr. Henry Totten's dendrology course focused on woody plants. After earning her master's degree in biology and science education, Linda did research at the USDA's Agricultural Research Service in the entomology division, studying insect behavior. She next taught science and math for many years to gifted students in Hendersonville, NC, where she inspired them to become geneticists, microbiologists, neurobiologists, and research chemists. She is now an active volunteer in her community and resides in Flat Rock, NC.

Linda continues to inspire students through her service on the recently created Biology Advisory Board. “When I heard about Vicki Bautch's plans for the future, I knew I wanted to be part of this vision for the Biology Department,” Linda explains. “It's exciting to see the various disciplines collaborating to address practical or clinical questions.”

Linda recently made a gift commitment to ensure that faculty and graduate students in the field of genetics have the needed resources to conduct and participate in cutting-edge research. Linda serves with six other enthusiastic biology alumni on the UNC Biology Advisory Board. Founded in November of 2015, the group meets twice a year with department leadership to provide advice, advocacy, and philanthropy. You will soon receive information on how you can participate in the UNC Biology Board's new challenge match program, **25 bi 25**. A goal of this challenge is to provide resources for faculty and students to initiate research combining different approaches to biological problems.

A Message from the Biology Graduate Student Association (BGSA)

The Biology Graduate Student Association (BGSA) continues to foster community and collegiality between graduate students and the Biology Department. Major initiatives include organizing and hosting department-wide events such as the Research Symposium and the Fall Picnic, along with many smaller events such as hikes and happy hours. We have recently created new resources to help graduate students prepare for their oral exams and find community outreach opportunities in the Research Triangle area. This year the BGSA is also emphasizing graduate student professional development and is eager to hear from alumni willing to offer career advice. Interested alumni can email Anaïs at anaïs@live.unc.edu. Additional information about the BGSA is available at bgsa.web.unc.edu. Alumni are welcome at all events!

Anaïs Monroy-Eklund
BGSA President 2016-2017



Biology News

✦ Assistant Professor **Zachary Nimchuk** and his lab were awarded a 5-year NIH MIRA grant totaling 1.2 million dollars.

✦ Assistant Professor **Jill Downen** was selected as a 2016 Kimmel Scholar for The Sidney Kimmel Foundation for Cancer Research.

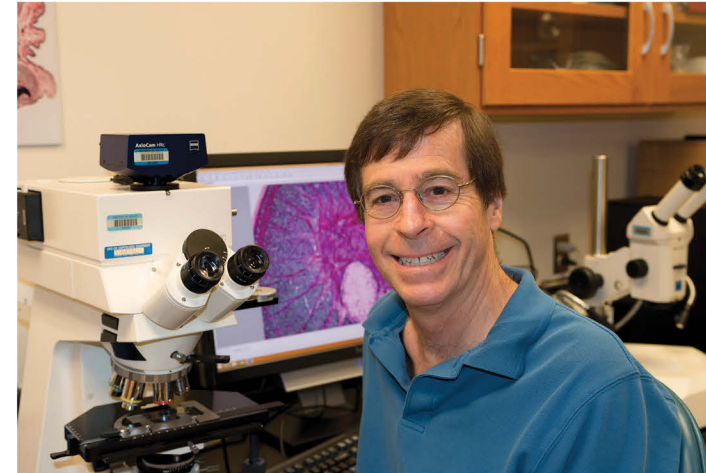
✦ UNC Biology Professors **Charles Mitchell**, **Corbin Jones**, Research Assistant Professor **James Umbanhowar**, and NC State University's **Ignazio Carbone** were awarded a \$2.5M USDA NIFA grant.

✦ Kenan Distinguished Professor **Joseph Kieber** received the 2016 Silver Medal Award for Distinguished Research from the International Plant Growth Substances Association (IPGSA).

✦ Professor **Maria Servedio** was elected Vice President of the American Society of Naturalists for 2018

✦ Associate Professor **Todd Vision** received a 3-year \$762K grant from NSF Advances in Bioinformatics.

Faculty: In their own words ...



William Kier
Professor, Biology

I am fascinated by how animals work - how they move, how they support themselves and why they have evolved to have the diverse forms that we see. In my field, comparative bio-mechanics, we apply principles of physics and engineering in the analysis of both the structure and function of organisms.

My interest in marine invertebrate animals was kindled early in life when, as a child, I worked as a field assistant and underwater photographer for my father, a paleontologist at the Smithsonian Institution. Much of my research has been focused on an amazing

group of invertebrates, the cephalopod molluscs, including octopus, squid, cuttlefish and the chambered nautilus. Cephalopods are notable because their bodies lack the skeletons observed in other animals and instead consist of a complex three-dimensional array of muscle fibers. I have explored how they use this musculature to perform wonderfully complex and diverse movements. I discovered that the same biomechanical principles apply not only to the arms and tentacles of squid and octopus, but also to the tongues of mammals and lizards and the trunk of the elephant. The remarkable movements of an octopus arm exploring the seafloor, the human tongue during speech, or that of an elephant trunk all depend on this special form of skeletal support.

Although my primary interest in these structures is in the basic question of how they work, I have also collaborated with robotics engineers to build robotic arms inspired by these animal examples, because highly dexterous and flexible soft robots would have distinct advantages over conventional robotic arms. While in the past we were successful in designing and building robotic arms inspired by cephalopods, the “artificial muscle” available at the time limited their capabilities. I am thus excited about several new collaborations with engineers who are exploiting the latest 3-D printing technologies and electroactive polymers to produce artificial muscle arrays that approach the performance of real muscle. Future applications might include surgery, search and rescue tasks following disasters, hazardous material handling, and a wide range of industrial uses.

Anyone who has seen a newborn baby is struck by the almost miraculous fact that just nine months before she started as a single fertilized egg cell. Somehow the genome information encoded in the DNA inherited from her parents and some important things her mother built into the egg allowed that single cell and its cellular descendants to self-assemble into all the complex tissues and organs needed to sustain life. Our lab team explores the three things that initial cell needs to accomplish in order to build the body of an animal. One cell has to become many cells through regulated cell proliferation, each cell has to choose fate-in other words whether it will be a kidney cell, a skin cell or a neuron-and the cells have to physically assemble into the correct architecture that underlies each organ.

We combine genetic tools, allowing us to manipulate the cellular machines cells use, with state-of-the art microscopy, that allows us to look inside cells and watch these cellular machines do their work. We apply these tools to a whole animal model-the fruit fly *Drosophila*-and to cultured human cells. The cellular machines we study are key for normal embryonic development in all animals, including ourselves, and genetic changes in these machines underlie many human diseases. For example, one focus of our lab is to define how cells communicate with one another using a cell-cell signaling pathway called the Wnt pathway. Reductions in the function of this cell signaling pathway lead to defects in bone structure, while inappropriate activation of the pathway is the first step in most colon cancers. We hope our basic science studies will provide the understanding needed to allow clinicians to develop more targeted treatments for disease. Our research project has also provided an introduction to research to more than 70 undergraduates, many of whom are now physicians, scientists and teachers around the state and nation.



Mark Peifer

Michael Hooker Distinguished Professor of Biology