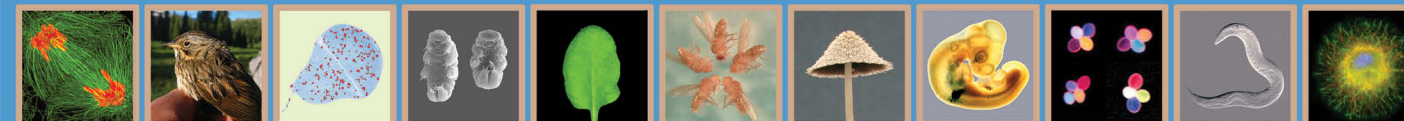




DEPARTMENT OF BIOLOGY
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Department of Biology
THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

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Karin Pfennig collecting tadpoles.

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

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A Note from the Chair

Welcome to the first issue of the *Department of Biology newsletter*. These are exciting times for Biology at Carolina. I became chair on July 1, after over 20 years as a faculty member. My research focuses on blood vessel formation, and I've taught and mentored numerous undergraduate and graduate students. This spring I learned more about the opportunities and challenges facing UNC Biology. This reinforced that our students and faculty are absolutely outstanding, and that our department is a true gem – it was recently described by outside colleagues as “by every metric... exceptional when ranked against the leading programs nationally”. One opportunity is to develop a new strategic plan that leverages our collaborative culture and forges partnerships within and outside of Biology. Another opportunity is to maintain connections with you – our former students and friends of the department - and keep you updated on our accomplishments, while seeking your insights and support. It is challenging to maintain excellence in tough fiscal times. One sign of success is that our faculty are highly recruited by other institutions, and successful retentions stretch our resources. We also work to teach the fantastic undergraduates that populate UNC Biology while exposing them to cutting-edge research, and to provide our graduate students with competitive stipends. Thank you for your interest and support!



- **Victoria Bautch**
Chair, Department of Biology

Biology Department News

* *Thad L. Beyle Distinguished Professor Kerry Bloom* was elected as a member of the “American Academy of Arts and Sciences”. This prestigious appointment places Dr. Bloom in the company of many distinguished fellows from diverse disciplines, including over 200 Nobel Prize winners.

* Biology has partnered with the School of Education to create the **UNC-BEST program**, which equips students with both educational techniques and biological expertise.

* **Dr. Jules Hoffmann**, a 2011 Nobel Laureate in Medicine or Physiology presented “*The Lawrence Gilbert Lecture in Biology*” on Wednesday, September 18, 2013. Dr. Hoffmann has made major contributions to revolutionize our understanding of the immune system. His talk was entitled “Innate Immunity: From Flies to Humans”.

* The Department of Biology is proud to announce a new Distinguished Lecture series established by **Paul and Mary Love Gabrielson**: “*The Max and Fran Hommersand Distinguished Lecture in Biology*”. The new lecture series honors **Dr. Max H. Hommersand** (*Professor Emeritus of Biology*) for his years of research and teaching service to the university and his wife **Fran Hommersand** for her years of service establishing and curating (along with Max), the Algal Herbarium.

* The journal “Behaviour” has just published a Special Issue on the Evolution of Communication based on a symposium in honor of *Professor Emeritus Haven Wiley* at the 2012 meeting of the Animal Behavior Society. The special issue is edited by two of Wiley's former doctoral students, **Marc Naguib** and **Jordan Price**.

Support the UNC Department of Biology

Biology at Carolina is a leader within the university, in the South, and across the nation. Our students and faculty continue to help define new directions for biology and to develop innovative connections with other disciplines. To strengthen and integrate the field, the department partners with multiple organizations across campus, including the Carolina Center for Genome Sciences, National Evolutionary Synthesis Center, Institute for Marine Sciences and the Lineberger Comprehensive Cancer Center. The National Research Council ranked the Biology department in the top 10% of its field in a 2010 nationwide evaluation, due to Carolina biology's cohesive structure and interdisciplinary nature. Its impressive scope, standards of excellence and future growth depend on the generous contributions of donors.

The last several years have seen significant reductions in the resources available to the department, as the state has reduced allocations to Carolina and federal grant funding is increasingly difficult to secure. Your generous support

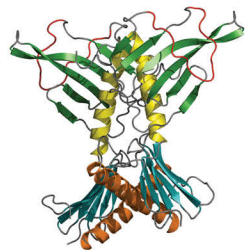
is vital to help retain our best faculty members, attract the nation's best students, and build on current top-level research. Gifts to our unrestricted fund allow me to respond quickly to the most pressing needs of the students and faculty in our department. Please consider making a contribution using the enclosed reply envelope, or go to our website (<http://bio.unc.edu>) and click on “Donate” at the top of the page. If you are interested in more information about giving opportunities in Biology including estate gifts, as well as professorships, graduate student fellowships, student travel awards and departmental lectureships/seminars, please contact Kelleigh Smith (Arts and Sciences Foundation at (919) 843-4454 or kelleigh.smith@unc.edu). We use all gifts, regardless of size, to further the goals and support the outstanding students and faculty of UNC Biology. Thank you for your continued support.

Victoria Bautch
Chair, UNC Department of Biology
bautch@med.unc.edu

A Profile of Faculty Research: Dr. Kevin Slep

How do cells obtain different structures in time and space? Underlying every cell in your body is a dynamic network of polymers that grow and shrink. These polymers, called microtubules, exert forces within cells that change cell shape, segregate DNA during cell division, serve as molecular highways transporting components across the cell, and create cellular antennae that facilitate cell-cell communication. Microtubules are central to human life, enabling cell division, differentiation and development, wound healing and sensation. Accordingly, microtubule polymer dynamics are tightly regulated by a conserved set of proteins. When these systems become unchecked and aberrant, they result in neurological disorders, developmental defects, and drive the rapid cell division harnessed in cancer to drive tumor growth and metastasis. How these regulatory proteins control polymer dynamics is an emerging area of study; elucidating their mechanism is critical and will enable us to develop next-generation drugs that target these components to stop cancer.

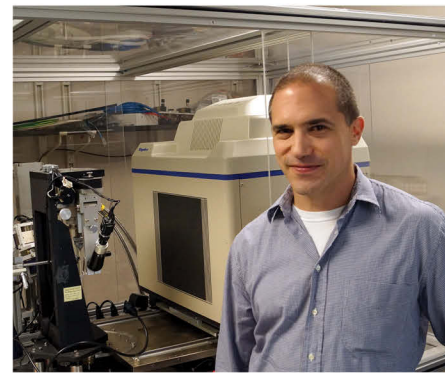
Research in the Slep laboratory investigates how microtubules are regulated to form structures within cells such as the mitotic spindle and cilia. Combining advanced cellular imaging techniques with x-ray crystallography and biochemistry, the lab determines atomic-level three-dimensional mechanisms for microtubule regulation. The mitotic spindle is a bipolar structure made up of microtubule polymers. The polymers are focused at two poles and at the center of each pole is a unique organelle called the centriole. From these poles, the polymer reaches out and attaches to the duplicated chromosomes that comprise our genome. The laboratory examines fundamental questions about this process such as: 1) how the cell limits the number of centrioles to two and 2) how the microtubule polymer facilitates dynamic chromosome attachment. To address these questions, the laboratory is currently investigating a kinase called Plk4 that limits the number of centrioles as well as key factors that link microtubules to chromosomes called +TIPs. Both sets of factors work to ensure proper chromosome separation during cell division, preventing the miss-segregation events that yield Down Syndrome.



Molecular, three-dimensional structure of the kinase, Plk4, a key regulator of centriole duplication and a target for cancer therapeutics.

Cilia are microtubule-based antennae-like structures that project from the cell. They are used to detect light in your retina (rods and cones) and also exist throughout your body to move mucus, detect fluid flow, sense mechanical stress, heat, and signaling molecules in the extracellular space. Defects in cilia structure result in a growing list of diseases, collectively termed ciliopathies that include retinal degeneration, cystic renal disease, Bardet-Biedl syndrome, primary ciliary dyskinesia, and situs inversus where an individual's organs are anatomically reversed. The laboratory is currently investigating a novel set of microtubule regulators that drive polymer formation, creating the cilia.

Research in the laboratory is performed by teams of talented undergraduate, graduate, and postdoctoral students, driving investigations to determine the molecular structure and function of cytoskeletal regulators. Undergraduates in the laboratory publish peer reviewed articles, advancing science and laying the foundation for their own careers in research and academic medicine. 🐾



Kevin Slep at the Macromolecular X-ray Crystallography core facility where diffraction data is collected to determine the three dimensional atomic structures of cytoskeletal regulators.

Biology Teaching & Student News

* Biology Senior Lecturer & Advisor **Kelly Hogan** and the UNC-CH Biology Department (along with the Physics and Chemistry Departments) received a STEM Education Grant from the Association of American Universities (AAU) that will significantly advance the use of innovative teaching techniques in Science, Technology, Engineering and Mathematics (STEM).

* **Kathryn Kohl** (Jeff Sekelsky lab) won the "Harold M. Weintraub Graduate Student Award", which recognizes outstanding achievement during graduate studies in the biological sciences.

* Graduate student **Sophia Tintori's** work for a science communication video project that she helped start at Brown University was featured in "The New York Times" (science section). The New York Times will continue releasing short videos from this project on a weekly basis, including new animations made by Sophia.

* Five UNC-CH undergraduate biology majors were selected as *Phillips Ambassadors* for summer and fall study abroad in Asia: **Neelesh Dewan, Evonne McArthur, Abraham Sterling, Lauren Toppin and Kou Xu.** The *Phillips Ambassadors Scholarship Program* combines an Asian study award with an academic course that challenges students to share their experiences upon their return.

* During the Spring 2013 semester, thirteen UNC-CH students enrolled as Biology majors or minors were inducted into *Phi Beta Kappa*, the nation's oldest academic honor society: **Yash Neeraj Agrawal, Aiden Joy Berry, Chelsea Elizabeth Earley, Michael A. Gonzalez, Kai Kang, Rachel Lynn Kaplan, Molly Anne Laux, Nicole Lawing, Maheer Muhammad Masood, Jennifer Elizabeth Neal, Chelsea Elizabeth Steele, Michelle Marie Thompson, and Georgia Catherine Titcomb.**

A Note about Undergraduate Research from Dr. Karin Pfennig

I am an evolutionary biologist who aims to understand why some individuals and populations are more sensitive to their environment than others. Members of my lab and I work with natural populations of several species of spadefoot toads. One of our interesting discoveries is that when spadefoots are brought into the lab and fed a natural, but regular and rather rich diet, they become obese and start suffering from obesity-related diseases – fatty liver disease in particular. We hypothesize that spadefoot toads develop this disease on the regular, rich diet because they have evolved the ability to store fats with high efficiency during feast times to take them through the times of famine. This kind of evolved response in food metabolism is also hypothesized to account for variation in obesity and obesity-related disease among human populations.

* Spotlight on Sofia De La Serna Buzon

Sofia De La Serna Buzon, a 2011 graduate from UNC, has been critical to this research. As an undergraduate, Sofi did independent research in my lab, receiving course credit in Biology for her work. As a student in my lab, Sofi amazed us with her incredible work ethic and dedication to research. As one person put it: "She is always in motion! Doesn't she EVER take a break from work?"

Despite her love of science and research, Sofi was under the impression that a research career was out of reach: she thought that only students with the highest GPAs could go on to graduate school and into research careers! Yet, students who shine in the lab are not always those who receive the top grades in lecture-based courses. UNC undergraduates stand out in their dedication to their work. Because successful research can be built on skills that are not necessarily acquired in textbooks, it is important to give all students the opportunity to gain hands-on experience in the lab. Such experience also enables students to discover their interests and determine their ultimate career goals.

When we discovered that our toads suffered from fatty liver disease, Sofi jumped on the possibility that we could use the toads to make contributions to understanding this disease. She has remained in my lab as a research technician spearheading our work in this field. Her ideas and passion for the work have motivated entirely new research directions, which is a testament to her talent as a researcher. I am pleased and honored that she has decided to apply to the Ph.D. program at UNC Biology to develop the projects she has initiated into her doctoral thesis work. I have no doubt that she has already embarked on a successful research career!

- Dr. Karin Pfennig



UNC Genome Sciences Building Opens

The new Genome Sciences Building at UNC Chapel Hill opened in the fall of 2012. The facility boasts a modern, energy efficient design with state-of-the-art laboratory space, a rooftop greenhouse, classrooms and auditoriums, and core facilities. Designed as an interdisciplinary research facility, the UNC Genome Sciences Building brings together faculty from many different departments, including Biology, Chemistry, Statistics, Operations Research and Computer Science. The opening of the building was marked by a symposium highlighting the cutting edge genomics research ongoing at UNC-Chapel Hill.

New Plant Species Named by UNC Biology Researchers

Alan S. Weakley, Biology faculty member and Herbarium Director, and biology graduate student **Derick B. Poindexter**, have named a new rare plant species, *Marshallia legrandii*. The new species was identified at sites in the piedmont of north-central North Carolina and south-central Virginia, and was named for Dr. Weakley's colleague Harry E. LeGrande, Jr. Their taxonomic discovery was published in the journal "Phytoneuron".



A Message from the Biology Graduate Student Association (BGSA)

It is an exciting time to be a Biology graduate student at UNC. Constant opportunities for discovery and technological advancement allow us to forge ahead into the unknown of our respective fields. Wonderful new resources on campus such as the recently constructed Genome Sciences Building, foster collaboration amongst scientists across disciplines. Enthusiastic student peers are regularly honored for their research and mentorship. The Biology Graduate Student Association (BGSA) enhances the graduate student experience by creating community outreach opportunities, organizing social events that encourage departmental camaraderie, and advocating for the needs of graduate students within the Biology Department. As president of the BGSA, I feel proud and fortunate to be in the midst of this vibrant and collaborative research environment. With three years left to go, the daunting task of graduating seems a bit less formidable with the wonderful colleagues, professors, and friends I have within the UNC Biology Department.

- Kayla Peck, BGSA President