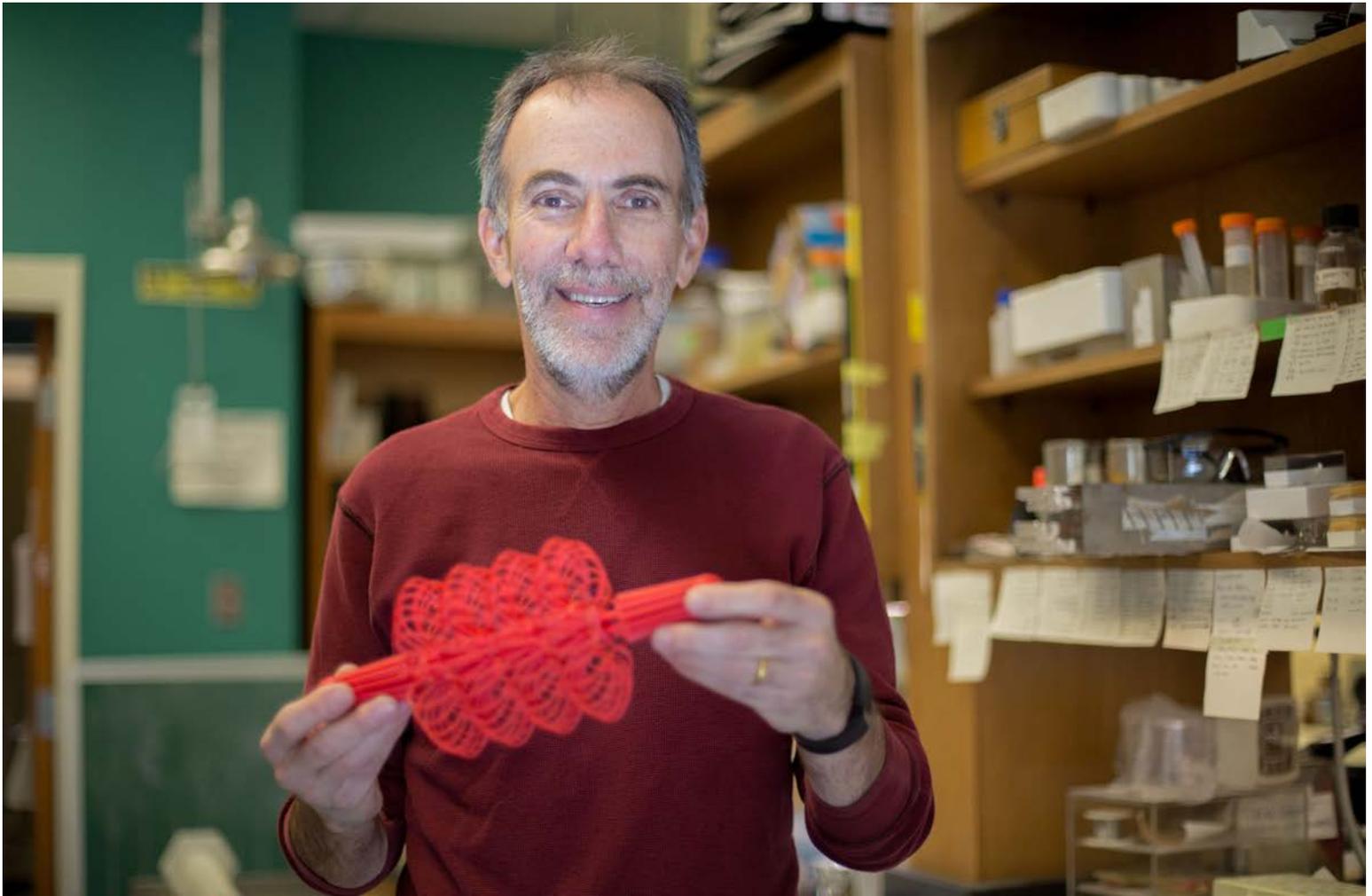




# UNC Biology News

Fall/Winter 2020



## Note From the Chair

I write to you near the end one of the most trying years in the history of the University. Between the pandemic, our attempts to continue the education and research mission of the department, the visceral impact of climate change on our nation, and upheavals in our society, it has been a challenge to balance our professional, personal and family lives. There will be considerable financial and emotional impact stemming from the pandemic and the quarantine. As Chair, I continue to advocate for positions and resources for our department, highlighting the acute need for a biologically-informed public. Educating the public

begins with providing our graduates a strong foundation in the biological sciences.

Our University has approved the recruitment of a cluster of 6 outstanding tenure track faculty to deepen and expand research and teaching related to racial equity. One of these will be a Biologist working in the general area of microbiology as it pertains to health, wellness, and equity in communities of color. We are very excited to begin interviews in the new year.

Our classes are largely remote and while the new modality does not replace in-person learning, our Teaching Faculty continue to lead us with the most effective tools and strategies for the “Zoom” classroom. The creativity in videos and youtube clips that faculty are putting together give me hope and confidence in our ability to deliver the material and keep our students fully engaged.

Several of the impressive accomplishments this semester include Dr. Kelly Hogan, recipient of the [National Association of Biology Teaching](#) award and two UNC Biology faculty cited in the NYTimes Science News section. [Dr. Amy Gladfelter's lab](#) is making major contributions in understanding the physical attributes of coronavirus RNA , and [Dr. Alan Weakely's lab](#) on plant extinction .

As we move beyond our current crises, the department will rely on our alumni and supporters to continue their

support as we instill the wonder and complexity of the natural world to the next generation.

## 2020 Awards

***Stephen Brantley Award : COLLIN HILL and MAX***

***BAZIL*** - The Brantley Award is given to a senior biology major for excellence in research in molecular, cell, and developmental biology.

***Robert Coker Award: SOPHIA CHIZHIKOVA*** - The Coker Award is given to a senior biology major for excellence in research in organismal biology and ecology.

***John Couch Award: OLUWATOSIN OLAYINKA and ANDREW YOBLINSKI*** - The Couch Award is given to a senior biology major with interests in plant biology who has demonstrated the highest ideals of scholarship and research.

***Lawrence Gilbert Award: GRACE TAN and LEAH OSWALT*** - The Gilbert Award is given to two senior biology majors for excellence in serving as a supplemental instructor, peer mentor, or tutor in a biology class.

***Irvin Hagadorn Award: NIKOLAS TSIUPLIS*** - The Hagadorn Award is given to the top junior biology major

based on academic and research excellence.

***Frances LeClair Award: AUBREY KNIER*** - The LeClair Award is given to a senior biology major for academic excellence in biology with an emphasis in plant sciences.



PhD Student, Emily Harmon, 2020 NSF Graduate Research Fellowship  
Program recipient



[Dr. Kelly Hogan, Teaching Professor](#) in the Department of **Biology** is the recipient of this year's National Association of Biology Teachers (NABT) [Teaching Award!](#) NABT awards recognize teachers for their expertise in specific subject areas, for contributions to the profession made by new teachers, and to recognize service to NABT, life science teaching, or leadership in learning communities.

Please join the department in congratulating Kelly for the incredible impact she has on her students, our department, and UNC. In Kelly's own words, "One teacher can make a difference. One teacher can help invite more students into a discipline. One teacher can help retain a more diverse group of scientists in their discipline. One teacher can help graduate a more diverse group of scientists. It begins with

an inclusive mindset around course structure and facilitation.”



[Dr. Gregory Copenhaver, Professor](#) in the Department of **Biology** has been named Fellow of the American Association for the Advancement of Science ([AAAS](#)). He is one of three in the College of Arts & Sciences at UNC-Chapel Hill. Other recipients include James Anderson (Computer Science) and Richard Smith (Statistics and Operations Research)

Dr. Copenhaver was selected for his distinguished contributions to the field of plant molecular genetics, particularly for novel insights into plant reproductive biology.

# Update from the Biology Graduate Student Association

Despite the COVID-19 pandemic, the BGSA has continued to provide opportunities to connect and collaborate. While our traditional large-scale events had to be cancelled, we still held weekly online coffee hours and in-person, distanced social hours. We also celebrated “Friendsgiving” with trainees whose holiday travel plans were disrupted due to the pandemic. This year we continued to advocate for trainees, conducting surveys about the effects of COVID-19 on our graduate student body and gathering data on wages and the cost of living in the Triangle. These surveys informed policy changes that include degree-time extensions for trainees affected by the pandemic and work towards a guaranteed, 12-month stipend for graduate students in the department. We hope to continue this work, in collaboration with groups such as the Safe Spaces Committee and the Graduate Studies Committee, to make our department a more equitable and inclusive place. Find out more on our [website](#), especially about our upcoming virtual Spring Symposium!



Anna Parker, BGSA President



## Alumni Stories

*"You can't have a light without a dark  
to put it in" - Arlo Guthrie*

[Sönke Johnsen](#), Ph.D. '96, Kier Lab; Professor of Biology, Duke  
University

In the deep sea, there is little light left from the sun, but many of the animals living there produce their own bioluminescent light. Bioluminescence is used by deep-sea

animals to illuminate prey, startle attackers, camouflage, and find mates. For animals looking to remain hidden, however, reflecting even a tiny fraction of this bioluminescent light may reveal them to potential predators or prey. To be maximally camouflaged against the pitch-black background, an animal must absorb almost all the light that hits it. In other words, it must be ultra-black.



*[Alexander Davis](#), Class of '18; Graduate student, Johnsen Lab*

To investigate whether any deep-sea animals are indeed ultra-black, Dr. Sönke Johnsen and his trainee Alex Davis captured dozens of fishes in the Gulf of Mexico and Monterey Bay using a trawl net. When they measured their reflectance, they found that 16 species from distantly related groups of fishes reflected less than 0.5% of the light that hit them, with the blackest species reflecting less than 0.05%. A reflectance between 0.05% and 0.5% is 10-100x darker than everyday black objects and places these fishes among the blackest objects on the planet. The question remained – how did they do it? Using electron microscopy, they found that all 16 species achieved low reflectance with a continuous layer of melanosome

(pigment containing organelles) in their skin and found the melanosomes are larger and more oblong than those in other fishes. Our computational modeling confirmed that the unusual size and shape of the melanosomes in these fishes reduced reflectance by up to 50% compared to typical melanosomes. All told, they calculated that ultra-black skin in deep-sea fishes reduces the distance they can be seen from by up to 6-fold, providing excellent camouflage in a world where every photon counts.



Top left: Ultra-black fish species *Anoplogaster cornuta*; Top right, bottom left, bottom right: Ultra-black Pacific blackdragon (*Idiacanthus antrostomus*);



# Dr. Derek Applewhite

**Associate Professor, Reed College,  
former Postdoctoral Fellow in the  
Rogers Lab**

*Pictured with his office mate, Des*

I left UNC in 2014 to take a position at [Reed College](#), which is a small liberal arts school located in Portland, Oregon. While my primary appointment is teaching, I also run a research lab where I get to teach and mentor students in a lab setting.

I have continued my exploration of the cytoskeleton, and my lab has two main foci, identifying novel regulators of non-muscle myosin II contractility (funded by a National Science Foundation grant) and exploring the role of Split Discs, which is homologous to human SPECC1L, a protein identified in cranial-facial disorders (funded by a National Institute of Health grant). In addition to these two main arms of research, my lab also studies neuronal-ECM interactions using *Drosophila* primary neurons, and actin-microtubule cross-linking proteins, a project I worked on while I was a postdoc at UNC with Steve Rogers.

In 2018 I was promoted to Associate Professor with tenure and with tenure comes more responsibility in the larger cell biology community. I have been working to promote equality and diversity through co-chairing the LGBTQ+ Task Force of the American Society of Cell Biology (ASCB). I have also served on a couple subcommittees which focused on ways to increase diversity amongst ASCB award winners and in leadership positions. I have also been a member of the Diversity, Equity, and Inclusion committee for the Genetics Society of America. This past spring has been a tumultuous one with the combination of global pandemic and world-wide civil rights movement, but it has brought some clarity and

purpose and I am more resolved than ever to work for equity for minoritized people in STEM.



## Faculty: In Their Own Words

"We are fascinated by the spatial organization of the genome, the "DNA blueprint" of a cell. In textbook images, pairs of chromosomes are shown to form an "X" shaped structure. While this classic shape is visible for a brief time during cell division, we now know that chromosomes tend to adopt a different spatial pattern most of the time; imagine long continuous strings of hairballs! How does this pattern of DNA folding arise and is it important for how the genome is read? As a team of biologists, biochemists and computational biologists, we use a combination of

cutting-edge genomics and genome editing tools to study the form and function of the genome.

Our current research focuses on the proteins and DNA sequences responsible for the spatial folding of DNA. One protein complex we study forms a ring that can pull DNA through its center, creating a loop in the DNA strand, or link two different DNA strands together like a clamp. We now know that the hairball structure is formed by many protein rings acting on a stretch of DNA. In this way, genes can be brought close to multiple regulatory DNAs that influence their activity. Changing the activity of genes can alter the state of a cell. This work is relevant for human health since these proteins and DNA sequences can be mutated in cancers and developmental syndromes. It is important to understand how these molecular processes normally work and how their loss leads to disease, so that we could one day create therapies to treat these defects."

- [Dr. Jill Downen](#), *Assistant Professor, Biochemistry & Biophysics, Biology*



"My research is at the interface of neurobiology, biomechanics, and behavior and seeks to understand the role timing plays in controlling animal movement. Timing is crucial to the nervous system; the ability to rapidly detect and process subtle environmental disturbances determines whether an animal can attain its next meal or successfully navigate complex, unpredictable terrain. Previous work on a number of animals, has made tremendous strides elucidating uncovering how the nervous system resolves timing differences with nanosecond resolution. But, a remaining gap in our understanding is how movement and behavior are structured by detecting these tiny timing differences.

The work in my lab aims to close this gap by focusing on the flight behavior of the fruit fly *Drosophila melanogaster*. Studying this problem in fruit flies allows us to combine the powerful genetic tools available for labeling and manipulating neural circuits with cutting-edge imaging in awake, behaving animals. Moreover, Flies perform steering maneuvers in less time than it takes us to blink, in part by using specialized mechanosensory organs known as the halteres. The long-term goal of my work is to provide insight into how animals' sensory structures and neural circuits have evolved with their locomotor body dynamics to finely control behavior. These tiny, club-shaped structures are evolved from the hindwings and beat during flight, regulating the timing of the wing steering system with exquisite, sub-millisecond precision. Additionally, halteres serve as gyroscopic sensors by detecting Coriolis forces [HKP1] body rotations. Understanding how this deceptively simple insect is capable of performing the impressive aerial feats we observe in the natural world, or around our wine glasses, demands an integrative approach that combines physics, muscle mechanics, neuroscience, and behavior. We believe this work will not only fundamentally reshape our understanding the evolution of insect flight, but will also highlight the tremendous importance of timing in the context of locomotion." - [Dr. Bradley Dickerson](#), Assistant Professor and Kenan Honors Fellow

## Research At a Glance



[Dr. Brian Taylor's lab](#) employs tools such as computer simulations, mobile robots, tethered robots, and motion capture to advance the cutting edge in both the understanding of animal navigation, and the development of autonomous navigation systems.

# Biology Staff Updates



# Logan Brackett

## Associate Chair for Business Administration

This year introduced some exciting changes in our departmental leadership. Marie Fholer, our department manager for the last ten years, transitioned to a position in the Dean's Office. We appreciate her years of dedication and service; she will be missed! With this change, we converted our managerial position to that of Associate

Chair, which would allow for some additional oversight and long-term strategic planning for our future.

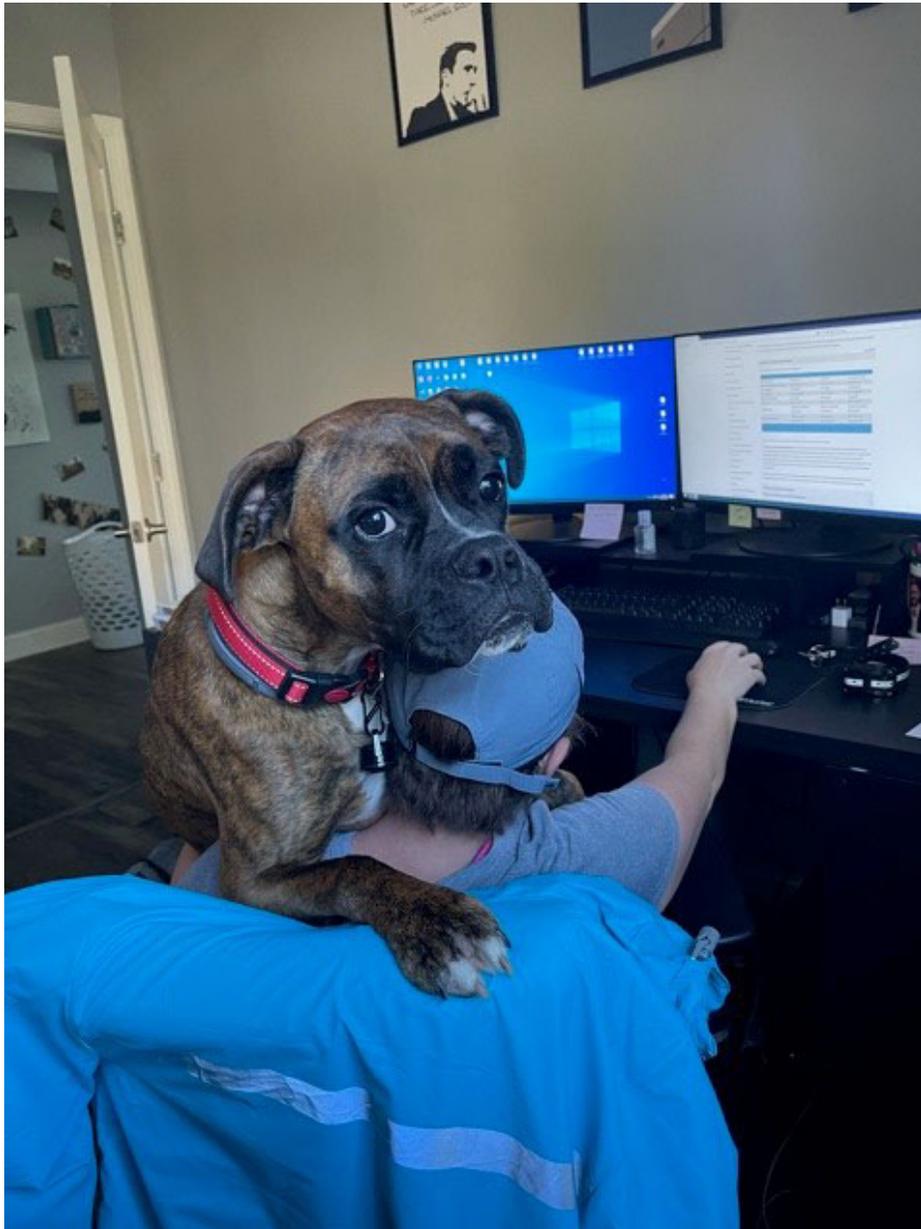
Logan Brackett joined the Department of Biology as the Associate Chair for Business Administration in October 2020. Prior to Biology, he served as the Department Manager in Romance Studies since March 2017, and prior to that he served as an Accounting Technician and Assistant to the Chair in the same department since starting at UNC in 2013. His Tar Heel roots go back even further, having earned his Bachelor's degree in Religious Studies here in 2011. He currently lives in Mebane with his husband, Caleb, where they raise several houseplants and enjoy taking fresh coffee and aged tawny port on the patio.

“The thought of starting a new position mid-semester while most of the team was working remotely seemed daunting to say the least, but I couldn't pass up on this exciting opportunity! Everyone in the department has been incredibly welcoming from Day 1, helping me get settled and oriented to the many different facets of the operation. I'm so excited to be here and cannot wait to see what we can all accomplish together going forward!”

We hope you will all join us in welcoming Logan to the department!

# Staff Reflections: Working through a pandemic

This eventful year has impacted members of the Department of Biology in a variety of ways. Our administrative and support staff have learned to quickly adapt in order to keep the department running smoothly, even amid a shut down and transition for some to remote work. The following are some thoughts from these incredible staff about they have handled the transition.



“From day to day the productivity of working from home changes. It largely depends how your dog is feeling” - *Trish Brittenham, Administrative Support Associate, with her dog Tater*



"From the perspective of IT support, working remotely has been a great learning experience. Increasing our capability to provide remote support is something I think will benefit the department now, and in the post-pandemic future." - *Trisden Coughlin, Technical Support Technician; pictured: Ellie*



“Because I can’t work remotely, I have been working on campus since the start of the pandemic. Being on campus without my fellow coworkers has been very lonely, and makes for a long day. I can’t wait to see and talk to everyone in person again!” - *James (Jimmy) Garzoni, Greenhouse Manager* pictured: Lower center, Jimmy; L to R, Kayden Harris, Work Study; Daniella Hall, Work Study; Alycin Ray, Work Study; John Ward, Greenhouse Research Technician



"I miss going into the office and having that social interaction with colleagues and students, but I am very grateful that I am able to work remotely. Also, I have the most helpful assistant who reminds me when its playtime." - *Kenlyn Merritt, Graduate Student Services Manager; pictured: her assistant, Kona*



"As E. O. Wilson said: 'Just being surrounded by bountiful nature, rejuvenates and inspires us,' there has never been a better time spending more (appropriately social distanced) time outside in nature to mitigate stress, frustration and feelings of isolation." - *Hínár Polczer*; picture: *White Pocket, Vermilion Cliffs National Monument, Arizona*



"While working remotely has really increased my work productivity, it has also made me recognize the importance of taking a moment or two away from the computer screen during the day to work in our

gardens, or visit with our fowl friends and family." - *Lori Shamblin, Executive Assistant to the Chair; pictured: a neighbor's peacock who likes to visit our chickens*



"At least traffic isn't bad!" - *Jason Worrell, Facilities Manager; pictured: his dog, Shadow*



# Danielle (Dani) Shirilla

## Work Study Office Assistant, 2017- 2021

Working VERY hard behind the scenes is the Department of Biology's administrative work study assistant, Dani Shirilla. Dani started with our department in the fall of 2017, her first year at UNC. As a first generation college

student, Dani's enthusiasm and committed work ethic have been absolutely amazing.

Each year, Dani was able to pick up more responsibilities far beyond what she was hired to do. Starting out making routine copies in 2017, by 2019 she was helping to maintain our website, manage our social media content, and provide additional support to other teams in the department.

This is Dani's last year at UNC, and as our trusty departmental work study assistant! She will leave huge shoes to fill. We are excited to see what the future holds!

"I am a senior in the English and Information Science programs here at UNC and I am currently applying to graduate programs pertaining to Information and Library Sciences. Throughout my undergraduate career, I have been a work-study in the UNC Department of Biology in which I made some amazing connections with the faculty and staff and learned countless skills (enough skills to land me an internship at the North Carolina State Archives). I hope to go into museums and archives as an outreach coordinator or curator to ensure that my institution promotes inclusive messages and is accessible to all members of my community. But wherever I end up, I will always be grateful to my Biology family for taking a chance on a clueless first-year student four years ago and teaching me how to become a valued team member!"

# In Memoriam



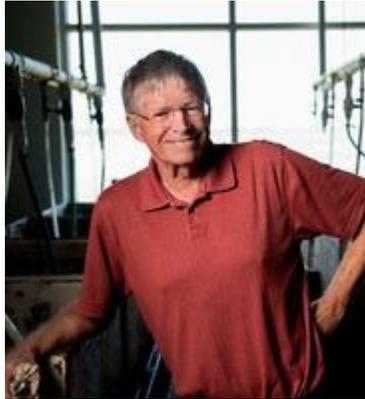
Helmet Mueller, 1931-2020

Helmut Mueller was a professor in the former Zoology Department and Ecology Curriculum and in the current Biology Department from about 1962 to 1995. After serving in the Army, obtaining his Ph.D. at the University of Wisconsin, and completing post-doctoral study at the University of Toronto, he came to Chapel Hill, where he taught Animal Behavior and Behavioral Ecology, conducted research on animal behavior, especially predator-prey interactions, and supervised many doctoral students.



Clifford Parks, 1936-2020

[Clifford Parks](#), Professor Emeritus, Biology died July 18, 2020. Cliff was a member of initially the Botany, then Biology Dept. His research was varied but centered on the genetics and population biology of plants; he is well known and respected for his early work on the genetics of cotton, and later for his study of Camellia varieties. Cliff developed numerous hardy Camellia species, many based on species he originally collected in China. Cliff influenced many undergraduates who were enrolled in his horticulture and botany courses, while mentoring his graduate trainees, many of whom have gone onto their own academic careers investigating a variety of genetic/biogeographical topics. Some of his former students now work at the [UNC Arboretum](#) and [Duke Gardens](#), both of which established a memorial fund to honor the memory of Dr. Parks.



Charles Peterson, 1946-2020

[Charles Peterson](#) (Pete) was one of his generation's most influential coastal ecologists and conservation biologists. Pete led the scientific assessment of the ecological impacts of the Exxon Valdez oil spill. He was among the first people to recognize that we are over-harvesting the ocean, and he led the development of solutions to this and many other environmental problems. His main legacy could be the impact he had on many hundreds of undergraduate students that took courses or worked in his lab at UNC-CH's Institute of Marine Sciences (where Pete was based).

Having caught the science bug from Pete, so many went on to improve the world and the protection of natural environments at state and federal agencies, at NGOs, and within academia.

# Why I Donate



Dr. David Lyerly, UNC Class of '75, Biology Advisory Board member

Research is the basis for how we increase our knowledge about our world. I have been fortunate to have a career as a research scientist, and the courses and labs I took at UNC helped me decide to look into research as a possible career. For this reason, I am a strong advocate for undergraduate research. So many students come out of college with a major in science, but don't know where to go from there. Undergraduate research can help a student decide if science is going to be their career path. If so, then it gives the student an opportunity to determine which type of science really gets their attention. When I talk to students about a career in science, I try to point out the

huge number of possibilities that are open to them. It is not simply sitting at a bench mixing test tubes --- although that can be part of it. It is about learning from experts who are trying to solve many of the problems our society faces. It is about digging deeper into efforts to understand a problem. These problems that face today's society are not going to disappear by themselves. We need the bright young minds in schools such as UNC to help solve them. Otherwise, they simply become a problem for the next generation to solve.

In my opinion, the fun part begins when you try to find a solution for your problem. As an undergraduate student, you will be doing this under the guidance of a mentor. Not only that, but you may also even be encouraged to disagree with others on the lab team if you can see a better way to solve a problem (these disagreements are better referred to as scientific discussions). Your mentor will make sure your approaches are not too "off the wall" - -- although this is not saying that "off the wall" ideas cannot be successful.

So now, you have been tasked with a problem and are busy trying to solve it. What's next? Part of what you will accomplish doing undergraduate research will depend on your creativity and willingness to learn by reading scientific articles that may challenge you with their jargon. Also, there is the possibility of participating in an interdisciplinary approach to your problem. This really opens up your way of thinking and solving a problem. Think about SpaceX and getting Dragon (the capsule) to

the international space station. This wouldn't have been possible without an interdisciplinary approach. Very importantly, you will learn how to communicate your ideas, your solutions, and benefits of your work to your peers and to lay people. You may be able to get your name on a scientific article, something that will help your resume and may even impress your friends. To do this last step, you'll have to be able to write coherently (something that you'll continually work on throughout your career) and learn to take criticism without getting too upset (although you don't have to be overly happy about it).

In today's COVID world, the scientists, physicians, healthcare workers, and others who have made so many contributions to our knowledge about this virus and how we can battle it, continue to encourage all scientists to speak out and communicate the importance of science that can help improve the quality of lives around the world. Undergraduate research starts this process by issuing a challenge and along the way, opens many paths - -- a way forward that is strongly recommended and supported by UNC.

Support Undergraduate Research

Support Biology