VOL. II | SUMMER 2019

CBP IN THE LOOP

Cover Story!

The Department of Cell Biology and Physiology can always be counted on for fantastic imaging! Recently, three CBP curriculum faculty had their work appear as journal cover art. Shown above is an image from the **Magness Lab** (left), whose study on high-throughput microinjection into organoids was published in *Cellular and Molecular Gastroenterology and Hepatology* (PMID: 30123820). The **Ribeiro Lab** (center) revealed how integrated mucin and fluid secretory responses contribute to hyperconcentrated mucus in CF airways, published in the *American Journal of Respiratory and Critical Care Medicine* (PMID: 29099608). The **Loeser Lab** (right) demonstrate a requirement for both JNK1 and JNK2 in the normal development of the axial skeleton in their latest *American Journal of Pathology* manuscript (PMID: 30664861). Check out these researchers and our other CBP faculty for more great images and high-impact publications!

Message from the Chair

Welcome back! This is the 2nd issue of the UNC Cell Biology and Physiology "In the Loop!" newsletter! We are pleased to provide updates on the new faculty joining our team! Look inside for more about our equipment and resources, new students, teaching faculty, and more! To our alumni, former colleagues and co-workers, I invite you to stay "*In The Loop*" by sharing with us your recent accomplishments, visiting our website www.med.unc.edu/cellbiophysio and following us on Twitter www.twitter.com/UNC_CBP! Your input, feedback and participation is welcome and appreciated!

DEPARTMENT MISSION

The Department of Cell Biology and Physiology follows the guiding principles of our School of Medicine: to be nationally recognized for excellence in our discipline by leading, teaching, and caring.

- **Leading:** to conduct cutting-edge, innovative research that advances the discipline of cell biology and physiology, with an emphasis on topics that contribute to the improvement of human health
- **Teaching:** to provide a rigorous and competitive educational experience for a diverse population of graduate and professional trainees which enables them to succeed in their future careers
- **Caring:** to serve the people of North Carolina, the United States, and the international community, by excelling in our research and education missions which advance the discipline of cell biology and physiology

Please visit our **Make A Gift** website to give:

https://www.med.unc.edu/cellbiophysio/make-a-gift/funding-opportunities

Current opportunities to support the Department of Cell Biology and Physiology:

CELL BIOLOGY AND PHYSIOLOGY GIFT TRUST

This fund is a general fund to help support invited experts, informative speakers, and events that foster collaboration, professional development, and scientific growth.

MAREN TRUST FOR GRADUATE STUDENTS

The Thomas P. Maren Graduate Student Fund is intended to provide CBP Curriculum graduate students with opportunities to learn new skills and gain experience with emerging technologies.

CELL BIOLOGY AND PHYSIOLOGY POST-DOC FUND

This fund is intended to provide CBP postdoctoral trainees with funds to support travel expenses and registration fees for scientific conferences and specialized training opportunities or workshops.

New Faculty

Dr. Robert Dowen will join Cell Biology and Physiology with a full joint appointment in the Department of Biology and the Integrative Program for Biological and Genome Sciences (iBGS) in July 2019. The goal of the Dowen Lab is to elucidate the molecular mechanisms that govern the storage, metabolism, and intercellular transport of lipids; as well as understand how these circuits interface with other cellular homeostatic pathways (e.g., growth and aging).

Appropriate allocation of cellular lipid stores is paramount to maintaining organismal energy homeostasis and is coordinated by a network of multi-tissue endocrine signals. Dysregulation of these pathways can manifest in human metabolic syndromes, including cardiovascular disease, obesity, diabetes, and cancer. We utilize C. elegans as a model system to interrogate these evolutionarily conserved pathways, combining genetic approaches (forward and reverse genetic screens, CRISPR) with genomic methodologies (ChIP-Seq, mRNA-Seq, DNA-Seq) to identify new components and mechanisms of metabolic regulation.

Dr. Gregory Scherrer will join Cell Biology and Physiology and the Neuroscience Center in September 2019. Dr. Scherrer comes to UNC from Stanford University where he was an Assistant Professor. The **Scherrer Lab** investigates the neurobiology of pain perception and the mechanisms of action of opioids.

Pain is a complex and multidimensional experience with sensory and emotional components. The members of the **Scherrer Lab** aim to elucidate the mechanisms by which our nervous system generates the different dimensions of pain experience, at the genetic, molecular, cellular, neural circuit, and behavioral levels, using the mouse as a model system. We also seek to resolve the mechanisms of action of opioids and understand how these drugs alter activity in neural circuits to produce analgesia, but also deleterious side effects such as tolerance, addiction and respiratory depression. To this aim, we investigate the functional organization of our endogenous opioid system and the localization, trafficking and signaling properties of opioid receptors in neurons *in vivo*. Collectively, these studies expand our understanding of pain neurobiology and the mechanisms of action of opioids to develop solutions against chronic pain and the opioid epidemic, by identifying novel non-addictive drug targets to treat pain and strategies to disassociate opioid analgesia from side effects.

Studies conducted in the **Scherrer Lab** identify the different types of neurons that constitute pain neural circuits in nerves (left, dorsal root ganglion primary afferent neurons), spinal cord (middle, second order dorsal horn neurons), and brain (right, amygdalar neurons that encode pain unpleasantness), and the molecular mechanisms that control neural activity and behavior associated with pain perception and opioid analgesia.

Dr. Adam Hantman will join Cell Biology and Physiology and the Neuroscience Center in 2020. Dr. Hantman comes to UNC from HHMI, Janelia Research Campus. The **Hantman Lab** seeks to understand how the nervous system controls voluntary movements.

Dexterous movements serve the major functions of the brain, perception and manipulation of the world. Considering the range of possible actions and the complexity of musculoskeletal arrangements, control of the hand is an amazing achievement of the nervous system. Dexterous behavior involves understanding objects in the world, developing appropriate plans, converting those plans into appropriate motor commands, and adaptively reacting to feedback. The myriad of these underlying operations is likely performed by a diverse set of neural circuits. By combining anatomy, physiology, and specific (genetic and temporal) manipulations, my lab hopes to identify and understand the neural elements responsible for dexterous motor control. Currently, we focus on a skilled reach-grab-eat task in the rodent.

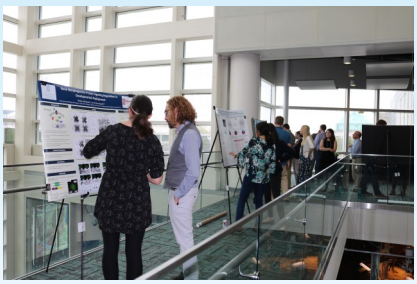
2019 Cell Biology and Physiology Retreat

Science and Comradery

Cell Biology and Physiology held the 2019 CBP Retreat on April 5th at The NC Museum of Natural Sciences. Dr. George Langford was this year's keynote speaker. Dr. Langford is a nationally know cell biologist and neuroscientist, as well as dean of Syracuse University's College of Arts and Sciences. He has helped build the Arts and Sciences into one of the nation's premier residential liberal arts colleges.

Oral presentations were given by Postdoctoral Research Associates, Duncan Mackie and Margeaux Wetendorf as well as Graduate Student, Hannah Wiedner and Research Technician, Trevor Henley.

The afternoon continued with 2 poster sessions and faculty talks. Faculty presenters included Assistant Professor, Jimena Giudice, Associate Professor, Stephanie Gupton and Professor, James Faber.

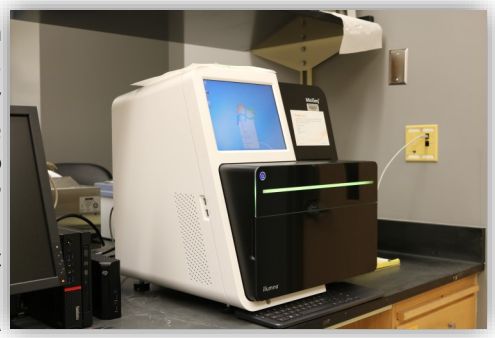


NEW! CBP Shared Equipment

APPLIED BIOSCIENCE QUANTSTUDIO 7 FLEX REAL-TIME PCR SYSTEM: Real-time quantitative PCR (qPCR) is a highly sensitive and specific method for the quantification of nucleic acid targets. This technology is a cornerstone in an enormous amount of biomedical studies. The **QS7** is an upgrade in sensitivity, versatility, and analysis capabilities over our existing qPCR equipment. Data accuracy is improved due to updated excitation source and filter sets, impacting rigor and reproducibility. Some users have remarked that increased sensitivity in qPCR would improve microRNA quantification. The QS7 is currently outfitted with the 96-well "Fast" block, and the potential for future upgrades could open new avenues of investigation using high-throughput automation or the custom and pre-configured TaqMan array cards. This instrument was purchased in early 2019 and is housed in the common equipment room on the 5th floor of MBRB. An overview of the QS7 can be found on the Thermo Fisher website:

https://www.thermofisher.com/order/catalog/product/4485693

"Science knows no country, because knowledge belongs to humanity, and is the torch which illuminates the world" -Louis Pasteur



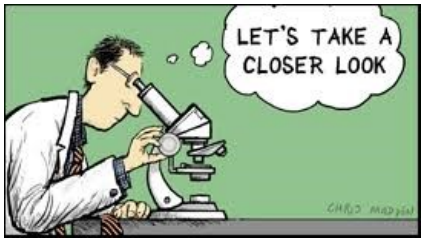
ILLUMINA MINISEQ: Next-generation deep sequencing (NGS) represents a powerful and innovative technology that now, approximately 10 years after its advent, has evolved to include benchtop sequencers that are quickly becoming everyday research tools. Current benchtop NGS instruments are flexible, high-throughput systems that are more cost-effective and easy to use than larger, production-scale sequencers (e.g. HiSeq). The CBP department **Illumina Miniseq** benchtop sequencer allows for less expensive, small-scale sequencing to be performed by individual labs. This is a great advantage for our faculty, such as Dr. Doug Phanstiel, who is recognized as an expert in the development and application of new techniques to study DNA sequence-dependent structures and how they impact gene regulation and disease-specific variants. For investigators like Dr. Phanstiel, the ability to quickly prototype new ideas and techniques without the higher cost and longer wait times is of great scientific and financial benefit. Similarly, our other faculty have recognized the value of a benchtop sequencer in allowing them to perform efficient diagnostics, small genome sequencing, targeted gene sequencing and expression profiling, and quality control pilots that could lead to larger, more in-depth studies performed through the UNC High-Throughput Sequencing Facility (HTSF). The **CBP Illumina Miniseq** was installed in early 2018 and is available for use by CBP labs and is located on the 5th Floor of MBRB. Find out more about the Miniseq at Illumina:

https://www.illumina.com/systems/sequencing-platforms/miniseq.html

Histology Research Core Facility

The Histology Research Core Facility has moved! We are now located in Taylor Hall, Rooms 212-216. We have finally settled in and are excited to be closer to the department and our customers. The HRCF continues to serve the histology needs of the CBP community and beyond. We take pride in providing high-quality paraffin and frozen sectioning and staining, fluorescent and chromogenic single- and multi-label immunohistochemistry and *in situ* hybridization using RNAScope technology.

Pictured (left to right):
Curtis Connor, Ashley Ezzell (Director), Kara Clissold



"Scientists have become the bearers of the torch of discovery in our quest for knowledge"

-Stephen Hawking

HCRF is equipped with two Leica CM1950 cryostats and a CryoJane Tape Transfer system, which are used to produce high quality frozen tissue sections.

HRCF is equipped with two Leica RM2335 microtomes, microscopes and waterbaths, which are used to produce high quality paraffin tissue sections.

Benchtop hoods and an extensive inventory of dyes are used for performing awide variety of special stains.

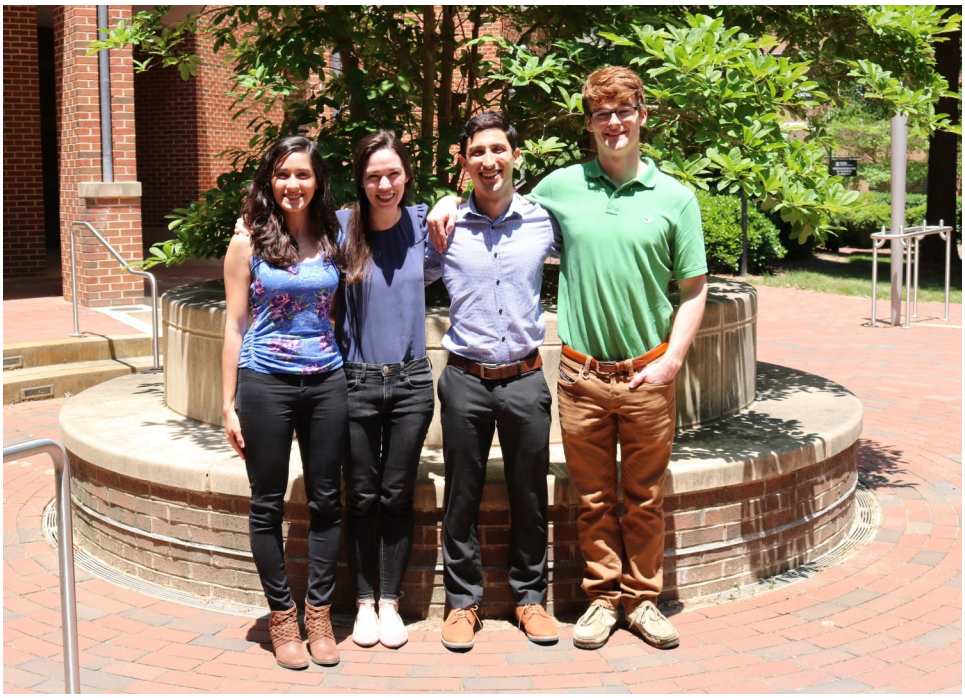
Our lab houses an extensive slide catalogue for our customer's use, provides access to our decloaking chambers for heat-induced epitope retrieval, and offers the CryoJane Tape Transfer system to improve the morphology of difficult frozen samples. We offer all services at competitive rates and strive for a quick turn-around time—typically within 2 to 3 weeks of sample submission. We are here to talk with you at any stage in the research process about your specific research aims and the best way to achieve the results you need. Stay tuned as we will host an Open House this Fall. In the meantime, feel free to stop by, say hello and check out our new space. **Contact us anytime at (919) 966 – 1202 or e-mail Ashley Ezzell at jezzell@email.unc.edu.**

Humidity trays, decloaking chambers, steamers and hybridization ovens are used for customized immunohistochemistry and in situ hybridization.

Curriculum in Cell Biology and Physiology

2019-2020

GRADUATE STUDENT CORNER



The CBP Curriculum welcomed 5 new students into the program; four PhD students and one MD/PhD student. Cole Edwards (UNC undergrad) and Priya Stepp (Duke undergrad) will be joining the lab of Dr. Channing Der. Rhianna Lee (Duke Undergrad) will be joining Dr. Scott Randell's lab and Hernan Mendez (undergrad University of Puerto Rico) will be joining Dr. Kathleen Caron's lab. Julie Necarsulmer (MD/PhD student, Pomona College undergrad) will be joining Dr. Todd Cohen's lab. Please welcome these students into CBP when you see them! They were presented with care packages from older students to help them prepare for upcoming preliminary PhD qualifying exams.

Getting to know our new students

Cole Edwards (Channing Der Lab)

I grew up just down the road in Winston Salem, NC, and I did my undergrad here at UNC where I graduated with a BS in Biology. After undergrad, I got my Master's degree in Neuroscience from the University of Bonn in Germany. Having transitioned my interests since returning to UNC, I am truly excited to devote my thesis research to the fundamental challenge of understanding cancer biology and the translational potential of such research. It is for this reason that I joined the Cell Biology and Physiology graduate program here at UNC. Outside of the lab, my interests include playing the guitar, playing soccer and sitting around doing nothing. I look forward to joining a community of like-minded scientists interested in the field of cell biology.

Rhianna Lee (Scott Randell Lab)

I am originally from Irmo, South Carolina. I moved to North Carolina for undergrad to study biomedical engineering at Duke University. My research interests include cystic fibrosis and regenerative medicine. Some of my favorite things include reading, college basketball, coffee, dogs, and my little brother.

Priya Stepp (Channing Der Lab)

I grew up in Frederick, Maryland and moved to North Carolina for college at Duke University where I majored in biology. Outside of lab I enjoy baking, painting, hiking, and the Durham food scene. I am interested in cancer biology, especially cell motility and metastasis. I'm excited to join CBP and continue to merge my cell biological interests with translational research projects.

Hernán G. Méndez (Kathleen Caron Lab)

I was born and raised in Puerto Rico, a fascinating small island (100 miles from E to W and 35 miles from N to S) in the Caribbean. But please, do not take its small size for granted, the island is rich in biodiversity, characteristic of its numerous strikingly different ecosystems. Where else can you experience a tropical rain forest full of coquís or a dry forest full of butterflies in less than 100 miles apart? The natural wonders of Puerto Rico instilled in me the inherent fascination for the biological world. This fascination directed me into pursuing a degree in Biology at the University of Puerto Rico at Cayey. During my time at the University of Puerto Rico at Cayey, I had the opportunity to explored different research areas thanks to research fellowships and three summer research internships. I did two out of the three summer research internship in cardiovascular focused labs. Both experience defined my scientific identity as cardiovascular researcher in training with hopes to become an independent cardiovascular researcher. After joining UNC-Chapel Hill for graduate school I rotated in various cardiovascular focused labs where I learned invaluable knowledge that will help me during my scientific career. I ultimately joined the Cell Biology and Physiology department and Dr. Kathleen Caron's lab where I will work on my thesis project elucidating distinct aspect of cardiac lymphatics. As a side note, an advice for future students that may be reading this is: be grateful about what you have and do not have, plan with the intention to be happy, approach life as a challenge that you have chosen to live and be positive about the journey.

Julie Necarsulmar (Todd Cohen Lab)

Julie Necarsulmer is a MD/PhD student who is excited to join Todd Cohen's lab in the Fall. She is a Pennsylvania native who got her undergraduate degree at Pomona College near Los Angeles before working at the NIH in Baltimore for a couple years and then starting medical school at UNC. In her free time, she enjoys hiking, running, playing lacrosse, cooking, and hosting potlucks and enjoying wine and cheese.

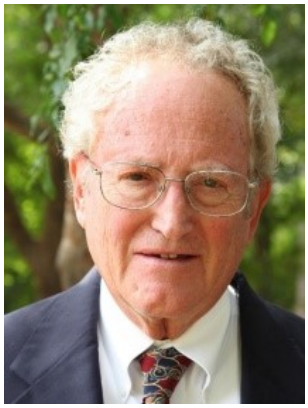
Postdocs and Pets

Caron Lab Postdoc, Kelsey Quinn, volunteers and fosters for an animal rescue called Lending Paws a Hand. Kelsey is fostering Hunter (pictured below). Please contact Kelsey if you are interested in adopting Hunter.

In science, we are often asked "what is your hobby?" or "what are your soft skills?". For my PhD in animal science, I explored the functions of chemokine and cytokine signaling at the maternal-fetal interface—*in sheep and cattle*—which means that I spent countless hours outside working and feeding livestock. Now as a postdoc in the Caron lab, I am utilizing genetic engineering and molecular biology tools, but it did not take long to realize that I missed working with animals. I set out to find a hobby outside of science that incorporated my passion for helping animals. I began volunteering and fostering with a local 501(c)(3) animal rescue called *Lending Paws a Hand*. Not only does this volunteer experience allow me to interact with animals, but I have also developed additional soft skills, such as writing foundation grants, communicating with the public on pet health awareness, and marketing web design. I also acquire patience by being a proud foster parent of a 64 lb. male "goof ball" lab mix named Hunter (check out his profile at lpah.org/Hunter).

One thing I have realized from this experience is that there are so many local organizations that can benefit from having scientists on their teams. We know how to solve problems, write, and effectively communicate the importance of complex topics to the public. The rescue I volunteer with does not have its own shelter, so it must rely on foster homes to help cats and dogs from over-crowded county shelters. They are constantly in need of temporary, full-time or hospice fosters, and volunteers to help with animal transport, fundraising, and local adoption events. It is extremely rewarding to know I can make a difference in my local community by helping animals. It is also fulfilling to watch my current foster dog flourish and develop into an amazing companion, which will eventually lead to him finding his perfect home. To learn more about *Lending Paws a Hand*, you can follow them on Facebook, Instagram, or visit their webpage: lpah.org. If you would like to volunteer with me, or add a wonderful pet to your home, please feel free to reach out to me. I'm happy to discuss anything related to animals!

Featured Publication



Dr. Kenneth Jacobson, Kenan Distinguished Professor of Cell Biology and Physiology, published the article entitled "*The Lateral Organization and Mobility of Plasma Membrane Components*" as a Leading Edge: Perspectives review in the May 2nd, 2019 edition of the prestigious journal **Cell** along with his colleagues Ping Liu (UNC and Huazhong University of Science and Technology) and B. Christopher Lagerholm (University of Oxford, UK). In this Perspective, Jacobson, et al. present current views on the organization of plasma membranes based on nearly 50 years of research performed by the authors and their peers, collaborators, and predecessors.

Perspective articles in Cell include more personal analysis of a field or topic. These focused reviews provide a critical overview of past research, current knowledge and challenges, and also some speculative content to stimulate new approaches and debate. Dr. Jacobson highlights models of lateral diffusion of membrane proteins and dynamic regulation of plasma membrane organization, and presents expert commentary on future directions for the field. Ken has had an extraordinary career investigating membrane proteins and microdomains and their functional roles in cells. This comprehensive review and prospectus belongs on all of our summer reading lists!

Vote for your favorite Chapel Hill Pizzeria:

Top Suggestions:

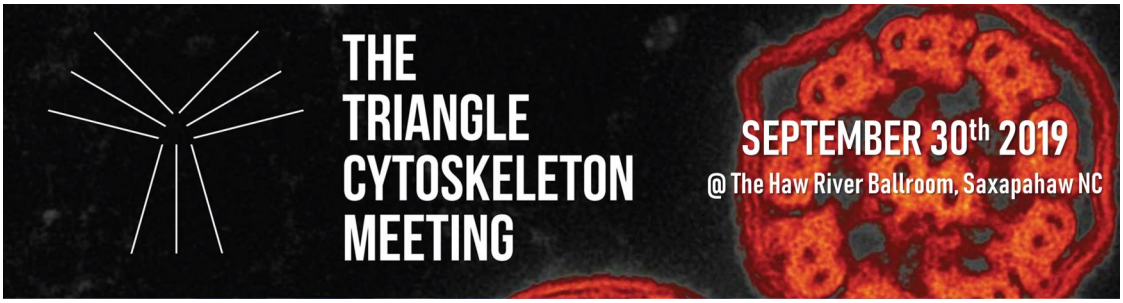
- Amante
- IP3
- Brenz
- Dominos

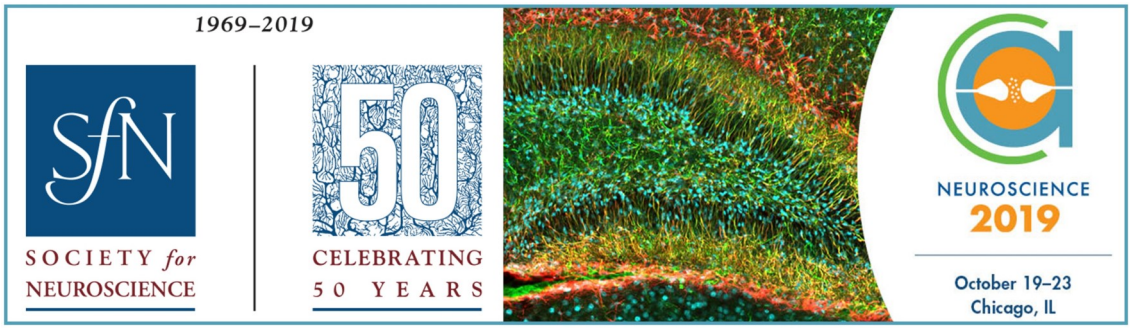
Visit CBP Twitter to vote! https:/twitter.com/UNC_CBP

In Memoriam

Barry Lee Whitsel, 1937 - 2018. Dr. Whitsel was an active member of our research community since his initial appointment in Cell & Molecular Physiology Department in 1972. His functional, mechanistic and comparative anatomy research into the role of the somatosensory cortex in the coding of pain continued throughout his retirement, through collaborations with his colleagues in the Department of Biomedical Engineering at UNC-CH.

Upcoming Meetings





Teaching Accolades

Dr. Emily Moorefield was selected to the UNC Academy of Educators in 2018.

Dr. James Alb participated in the UNC Teaching Scholars Program in 2018.

Dr. Ben Major and **Dr. Kathleen Caron** won Excellence in Basic Science Mentoring Awards in 2019.

Dr. Carol Otey was awarded Instructor of the Year, selected by the first-year students in the PharmD doctoral program.

Dr. Edward Kernick was selected by students to deliver the UNC School of Medicine Commencement Address in 2019 and received the highly-distinguished "Professor Award" at graduation May 2019 for the 2nd year in a row!! This award, selected by the senior class, is given in recognition of a faculty member who by his or her willingness, understanding and ability, has contributed the most to our students' medical education!

Professional Development Resources

Faculty and staff are invited to register for and attend organization and professional development courses offered by the UNC Office of Human Resources Organization and Professional Development team. Upcoming courses, webinars, and other resources include:

Effective Communication Webinar: Tuesday, August 6, 2019: 10:00am-11:00am

Time Management Tools*:* Thursday, August 8, 2019: 2:00pm—3:00pm

Mindfullness: Being Present in Your Work & Life*:* Monday, August 26, 2019: 3:00pm-4:00pm

Ethics in the Workplace: Thursday, September 5, 2019: 8:30am-12:00pm

NCTraCS R-Writing Groups*:* https://unc.live/2EE7zKa

Career Navigation (Office of Faculty Affairs), APT Cheat Sheets: https://unc.live/2yprkQ9

Tuition Waiver Program

Employees with the University of North Carolina at Chapel Hill are eligible to receive a tuition waiver for three courses per academic year. See the **Tuition Waiver Program Site** for information.

Gene therapy could treat rare brain disorder in unborn babies! Zylka Lab research featured in The Guardian:

https://bit.ly/2DYuIDx

Watch the UNC Science Short on Youtube!
https://bit.ly/2mgeehQ

Stay Connected to Cell Biology and Physiology

https://www.med.unc.edu/cellbiophysio

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