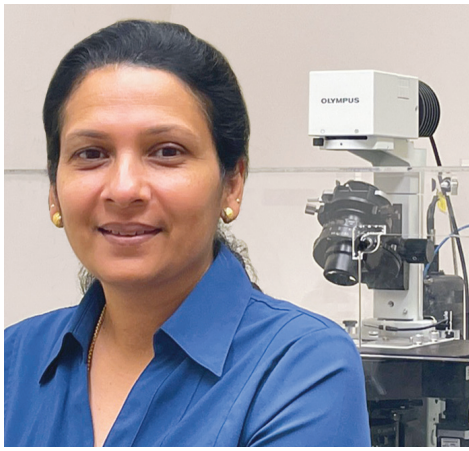
2023

DEPARTMENT OF CELL & DEVELOPMENTAL BIOLOGY

SCHOOL OF MOLECULAR & CELLULAR BIOLOGY

Letter from the Department Head



Welcome to the 2023 edition of our newsletter. In the Department of Cell & Developmental Biology, we explore fundamental questions, with a primary focus on understanding the complexities of cellular processes essential for multicellular organism development and function. I am delighted to highlight the recent accomplishments of our esteemed faculty, dedicated students, postdocs, and staff. Together, the department has sustained a tradition of excellence, achieving notable progress in research, instruction, and service.

CDB is pleased to introduce two new assistant professors: **Dr. Haiting Ma** and **Dr. Boxuan Zhao**. Dr. Ma, trained in Dr. Jaenisch's lab at MIT, leads a research group focused on investigating the epigenetic mechanisms governing stem cell differentiation and maturation. Dr. Zhao, who joins us from Stanford and trained in the labs of Alice Ting and Liqun Luo, is keen on exploring how the brain's connection diagram influences its overall function.

Celebrating another year of significant research progress! We spotlight the noteworthy contributions of **Dr. Yu Zhang** and **Dr. Xin Li**, whose research on neuronal temporal patterning and mechanisms for generating neural diversity was published as back-to-back articles. In a groundbreaking study, **Dr. Brian Freeman**'s lab demonstrated the support of a dynamic and healthy native protein landscape by a molecular chaperone. Additionally, we feature the exciting findings from **Dr. Jie Chen**'s work, unveiling a molecular mechanism that influences muscle weakness in a mouse model of Duchenne Muscular Dystrophy.

This year was truly special with multiple visits from CDB alumni. In a notable event, **Dr. Kannanganattu Prasanth** received the Horwitz Scholar award from our department's founding head, **Professor Rick Horwitz**, who also shared nostalgic insights into the early days of the department's creation. We had the privilege of hosting four former graduate students—**Christina Laukaitis**, **Shellie Kieke**, **Tho Troung**, and **Susan Kim**—who generously provided guidance and shared their diverse career paths with our students. Our CDB alumni speaker, **Dr. Tudorita Tumbar** from Cornell, a former graduate student of **Dr. Andrew Belmont**, presented her transformative work on the molecular mechanisms governing tissue stem cell function in skin development and homeostasis. Lastly, **Dr. Chris Doe**, now a professor at the University of Oregon and an Howard Hughes Medical Institute Investigator and National Academy of Sciences member, who began his career as an assistant professor in CDB (formerly called Cell and Structural Biology), was the keynote speaker at our retreat at Allerton Park. Dive into a delightful interview with Dr. Doe as we reflect on these enriching alumni interactions.

I would like to express my heartfelt gratitude to the graduate students in the department. Through their hard work, we successfully organized a department retreat that not only highlighted our scientific pursuits but also celebrated our collective research achievements.

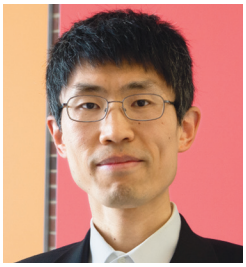
In this newsletter, you'll find interviews with **Ms. Aatiqa Nawaz**, the recipient of the Cycyota graduate award 2023, and **Mr. Aneek Mirza**, the recipient of the Cycyota undergraduate award. I am thrilled about the prospects for our department as we set forth into 2024. Our goal is to sustain connections with our alumni, encouraging their active involvement to bolster our research, teaching, and service endeavors. Additionally, I eagerly anticipate ongoing collaborations both within our department and extending beyond its boundaries. Here's to a promising year ahead!

Supriya Prasanth

2023

In This Issue

Meet Our New Faculty



Haiting Ma
Assistant Professor

We are pleased to welcome Haiting Ma as an assistant professor of cell and developmental biology. He joined us from the Whitehead Institute for Biomedical Research at Massachusetts Institute of Technology, where he completed his postdoctoral research.

Tell us about your lab and your research focus, including how you came to choose or specialize in this area.
My lab works in three directions: 1. Basic biology on epigenetic regulation of cell identity and state. 2. Application of the basic biological principles to understand and treat diseases. 3. Methods and technology platform development. We are interested in these areas because they are at a distance from the known domain and in the meantime, they could be tractable.

What is especially exciting about this particular area of research, at this time?
The potential to use powerful interdisciplinary approaches to ascribe physiological functions and disease to molecular mechanisms is astonishing and revolutionary.

What interested you the most about becoming a faculty member in the School of Molecular and Cellular Biology and the University of Illinois?
The culture for interdisciplinary collaborations necessary for research, and the opportunities to work with students from strong graduate and undergraduate programs are among the factors that interest me the most as a member of the community.

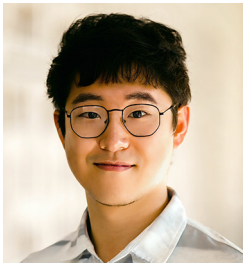
What are your teaching interests?
I am interested in teaching stem cells and developmental biology, epigenetics, and relevant topics in cancer biology and immunology.

If any students (undergrad or PhD) are interested in working in your lab, what's your advice or how can they get in touch with you?
We welcome graduate, undergraduate, and postbaccalaureate students to bring in their creativity and explore research opportunities in the direction of epigenetics and stem cells in the lab. The most efficient way to connect is through email hm40@illinois.edu.

Tell us about someone who made a difference in your life, such as someone who sparked your interest in biology, who encouraged you to pursue a career in academia or challenged your thinking about a topic.

Many genuinely curious children are challenging us into questioning how much we really know about biology. My child is one of them and a constant reminder for me that we need to know more.

What do you like to do in your free time?
Exploring nature with family and friends is one of my favorite pastime activities.



Boxuan Zhao
Assistant Professor

We are pleased to welcome Boxuan Zhao as an assistant professor of cell and developmental biology. He joined us in November 2023 from Stanford University, where he completed his postdoctoral research.

Tell us about your lab and your research focus.
We center on the development and application of high-throughput technologies to study the molecular mechanisms of brain organization and function. Specifically, our team will track over time the mammalian brain's connectomic (brain-wide neuronal connection dynamics), transcriptomic, proteomic (spatiotemporal distribution of RNAs and proteins), and epitranscriptomic (dynamic RNA modifications) landscapes under different brain states.

Our lab will combine the interdisciplinary strengths of chemical biology, bioengineering, genetics, and neuroscience and investigate the relationship between mammalian brain structure and function, including memory formation and neurodegeneration. Through developing and applying quantitative methods at the systemic, cellular, and molecular levels, our ultimate goal is to contribute to the development of novel therapeutic interventions for brain disorders in humans. I can be reached at zbx@illinois.edu

What is especially exciting about this particular area of research, at this time?
Understanding the structure and functional mechanism of the human brain will revolutionize how we design and build the next generation of computation systems. Technology has advanced to the stage that we can dive into the molecular

events occurring within the brain, monitor neuronal activities in real time, and manipulate neural circuits to alter animal behaviors. Within decades, we may achieve more wonders like mapping out the entire blueprint of the human brain, curing neurodegeneration diseases and other brain disorders, and augment our cognitive capabilities to perform more complex tasks. In fact, with the inspiring news of the first conventionally approved FDA drug for treating Alzheimer's Disease, more exciting progresses are bound to come from translating basic research.

What are your teaching interests?
For my teaching, I intend to either incorporate new modules into existing courses or create new courses that will discuss cutting-edge molecular techniques that have been developed to enable new research avenues in biology. I'd like to incorporate authentic research experiences into the course, either in the form of hands-on wet lab experiments or dry lab bioinformatic computation on real experimental datasets, which will yield tangible results and may serve as the foundation for longer-term projects in research labs. I will strive to inspire the students' genuine interest in conducting interdisciplinary studies related to their specific passions by sharing with them my enthusiasm for RNA biology, technology development, and neuroscience.

Tell us about someone who made a difference in your life.
My undergraduate mentor is pivotal in my academic career, as he was the one who opened the door of scientific research for me during college. As the first person in my extended family to go to college, my first quarter of college was filled with self-doubt and confusion because my upbringing had not prepared me for independent college life. I was struggling with coursework because more than half of my classmates were accepted to the program through the Chemistry Olympiad competition, so the teachers frequently complied with their desires by going quickly in subjects they were familiar with, leaving other students like me confused yet afraid to speak up for fear of coming across as slow.

Fortunately, my path was redirected to academia when I attended a seminar given by my future undergraduate research mentor, who had just completed his postdoctoral studies at Scripps and returned to his alma mater to start his lab. I was astounded by how much fascinating life sciences research one can conduct with a chemistry background.

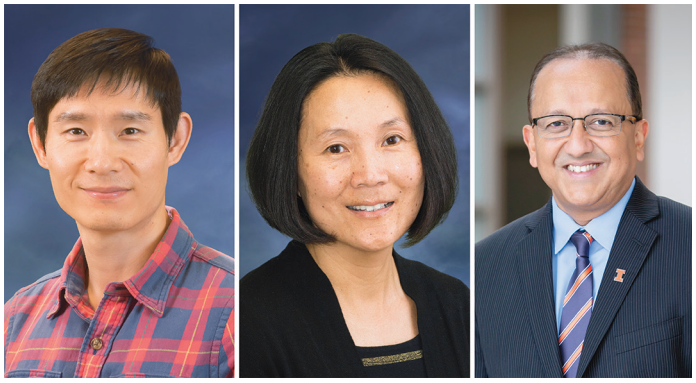
What do you like to do in your free time?
During graduate school, I joined the varsity triathlon team and instantly fell in love with this new "interdisciplinary sport" which is not too unsimilar to my research, and continued training to this day.

Scuba diving is another great passion of mine which fueled my obsession with marine biology. I am particularly fascinated by cephalopods including octopuses and squids.

RESEARCH

Research sheds light on molecular pathway driving muscle weakness in muscular dystrophy

By Quang Nguyen, School of MCB Communications



From left: Jae-Sung You, Jie Chen and Rashid Bashir

University of Illinois researchers have uncovered a molecular mechanism that influences muscle weakness in a mouse model of Duchenne Muscular Dystrophy, the most common inherited neuromuscular disease and one of the most severe forms of inherited muscular dystrophies.

The genetic disorder causes progressive muscle degeneration and weakness due to loss of or alterations in *dystrophin*, a protein that is essential for muscle contraction and integrity. Symptoms of Duchenne Muscular Dystrophy, or DMD, typically appear in early childhood; the disorder usually only affects males. The loss of muscle quantity and quality ultimately leads to premature death before the age of 30 years old. Many research efforts have been focused on developing gene

therapies to correct or replace the dystrophin gene or stem cell therapies to deliver healthy cells expressing a functional dystrophin to dystrophic muscles.

However, "this disease is very unpredictable with so many different mutations, manifestations as well as diverse responses in treatment," said Jie Chen, a professor of cell and developmental biology in the School of Molecular & Cellular Biology and the study's principal investigator. Identifying mechanisms underpinning muscle weakness common in DMD regardless of the specific mutations can lead to novel therapeutic strategies.

Autophagy: An important process for muscle quality

In the recently published article, "RhoA/ROCK signaling activated by ARHGEF3 promotes muscle weakness via autophagy in dystrophic mdx mice," Jie Chen and Jae-Sung You, the lead authors of the article, explored the role of autophagy on muscle quality and its molecular mechanism in a mouse model of the disorder.

Autophagy is a process in which cells remove cellular waste and promote cell survival. One of the inhibitors for this process is ARHGEF3, an upstream activator of RhoA/ROCK signaling. Elevated RhoA/ROCK activity is found in skeletal muscles of DMD mouse models, and inhibition of this pathway promotes muscle regeneration and increases muscle quantity. However, the role of RhoA/ROCK signaling in muscle quality is unknown.

"Past research from our lab has shown that activation of autophagy is really important in maintaining muscle function, but the molecular pathway that regulates this process in [DMD] context has not been well understood," said Jae-Sung You, a former postdoctoral researcher in Chen's lab.

The group found that by genetically deleting ARHGEF3 or pharmacologically inhibiting ROCK in mdx mice, a mouse model used for studying DMD, the muscle quality of the mice is restored.

3D muscle in a dish: an *in vitro* model

In this paper, Jie Chen lab collaborated with Rashid Bashir, professor of bioengineering, affiliate professor of molecular and integrative physiology, and dean of the Grainger College of Engineering, to use a method pioneered by the Bashir lab to test muscle quality in 3D in vitro.

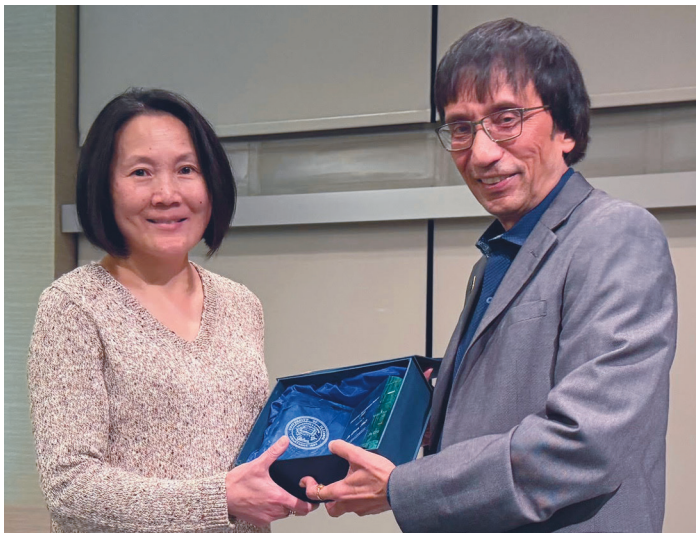
"We used a 3D printing approach to create a scaffold to help build muscles in vitro and to test out muscle contraction in normal as well as disease state," noted Jae-Sung You.

The authors found that muscle cells from mdx mice have a faulty expression of ARHGEF3 which affects the autophagy mechanism hence decreasing muscle quality.

"When comparing cells from wild-type and mdx mice, the difference in contraction is day and night and it's clear that the cells have different muscle strength," Chen said. Importantly, mdx muscle strength in the 3D culture was rescued by a small molecule inhibitor of ROCK. The researchers' observations in the 3D in-vitro experiments motivated them to perform animal experiments, which led to the conclusion that inhibiting the ARHGEF3-RhoA-ROCK pathway by genetically removing the ARHGEF3 gene or using the small-molecule inhibitor of ROCK can restore autophagy and improve muscle quality.

Based on this novel finding, the research group is hopeful autophagy-based therapies, by strengthening dystrophic muscles, could in the future improve quality of life for patients with Duchenne muscular dystrophy. "Every patient has a different type of mutation in DMD, and the way they respond to treatment is different. By targeting to restore autophagy, a common attribute in DMD, it [could become] a novel approach to improve overall health of all DMD patients," You said.

This work is supported by the Muscular Dystrophy Association, National Institutes of Health, and National Science Foundation.



Congratulations to Jie Chen, recipient of the School of Molecular & Cellular Biology's Research Excellence Award for 2023.

RESEARCH

Researchers identify new patterns of cell interactions with molecular chaperone

By Jennifer Lask, School of MCB Communications

Through a new approach of cross-linking cell proteins directly to a protein of interest, researchers have distinguished new patterns of cell interactions with a molecular chaperone.

Molecular chaperones serve to support the health of all proteins, including the folding of nascent protein chains. By doing so, molecular chaperones ensure proteins are properly created and utilized before they're dismantled at the ends of their lifespans. Thanks to their new approach of crosslinking cell proteins directly to their interaction partners, Professor Brian Freeman's lab in the Department of Cell & Developmental Biology has identified protein interaction features of the molecular chaperone called Hsp90.

The Freeman Lab's research, published in *Molecular Cell*, showed that Hsp90 associated with roughly one-fifth of the yeast proteome using its three structural domains. Intriguingly, the lab found that Hsp90 recognizes intrinsically disordered regions within target proteins, which serve as hubs for chaperone-binding. Scientists have long known about the existence of unstructured protein regions, but their perspectives on the role these regions play is shifting, said first author Janhavi Kolhe (PhD, cell and developmental biology, '22).

"The idea was, for the longest time, that structure guides function," Kolhe said. "Now we have all of these intrinsic disorders that were just thought to be linkers or not actually really having function, that can take up conformations depending on their environment, and they can also essentially serve as hubs for interaction."

Dr. Brian Freeman (top) and Dr. Janhavi Kolhe (bottom)

The Freeman Lab's latest research could also have significant implications for treating cancer. In the past, researchers tried using Hsp90 as a therapeutic target in clinical trials for cancer. The trials all failed around the same point, during which the chaperone was inhibited. That prompted a heat shock response, allowing cancerous cells to retake lost ground.

"Previously it wasn't known why inhibiting Hsp90 would cause a heat shock response," Kolhe said. "Our hypothesis was that inhibiting Hsp90 essentially makes translation go a little haywire, and that results in a lot of aberrant proteins being generated. When they are generated or the translation machinery is affected, the cells automatically think of it as a stress response and upregulate chaperones in response to it."

The Freeman Lab ultimately found that the heat shock response triggered by Hsp90 inhibition was dependent on active protein translation. The team is hopeful that their findings will help future therapeutic trials for cancers and pathogen infections move forward without triggering responses.

UIUC to co-lead new CZ Biohub in Chicago

Earlier this year, the University of Illinois Urbana-Champaign was chosen to lead the Chan Zuckerberg Biohub Chicago–a new biomedical hub–along with the University of Chicago and Northwestern University.

The Chicago site is the first expansion of the Chan Zuckerberg Biohub Network, modeled after the first CZ Biohub in San Francisco. The plan provides for state-of-the-art laboratories, meeting space, faculty-in-residence, a biofoundry and other sophisticated instrumentation.

"All big breakthroughs start with basic research. The Biohub will be a destination that unites the brightest minds with one another and with the tools and resources improve human health," said Martha Gillette, Alumni Professor of Cell and Developmental Biology, who served as a biologist on the official planning committee.

"Through advances in genomics, molecular biology, and single-cell biology, scientists have made great strides in understanding the structure and function of individual cells. But our organs are made up of specialized tissues that contain billions of cells whose interactions are much less understood. The vision of this initiative is to address the grand challenge of inflammation and immunity in tissues. How do healthy tissues stay healthy? How does inflammation cause tissue damage and disease? How can they be made to recover?," Gillette said.

RESEARCH

Navigating Neuronal Pathways: Li and Zhang discover the role of Netrin and Notch pathways in Drosophila axon guidance

By Maaz Bashir, MCB undergraduate student

Axon guidance is a fundamental process in neural development that controls the wiring of neuronal circuits. Axon targeting must be precise for neurons to form connections and establish neural networks. In *Drosophila*, projection neurons in the optic lobe extend over long distances to accurately communicate with other regions in the brain. However, the molecular mechanisms regulating this process still need to be fully understood.

Dr. Xin Li, an associate professor of cell & developmental biology, and research scientist Dr. Yu Zhang have been at the forefront of this research. Their work aims to investigate the role of the conserved Netrin signaling pathway in axon targeting of *Drosophila* medulla projection neurons during development. By uncovering the mechanisms that guide the development of these neural circuits, Zhang and Li have deepened our understanding of axon guidance and more importantly, illustrated how axon guidance is regulated by upstream neural specification programs.

This year the Li lab published in the journal *Cell Reports* two important research articles in the field of neurobiology.

In their study, "**Axon Targeting of *Drosophila* Medulla Projection Neurons Requires Diffusible Netrin**," the researchers focused on the role of the Netrin pathway in neural development. Their work revealed that the Netrin signaling pathway is vital in regulating the axon targeting of projection neurons in the *Drosophila* visual system. They found that diffusible Netrin proteins and their receptor "Frazzled" are important in guiding transmedullary projection neurons to target their axons correctly. These findings helped establish the Netrin pathway's role in axon guidance in *Drosophila* medulla and provided insights into how Netrin pathway is utilized reiteratively in different steps of axon targeting during neural circuit formation.

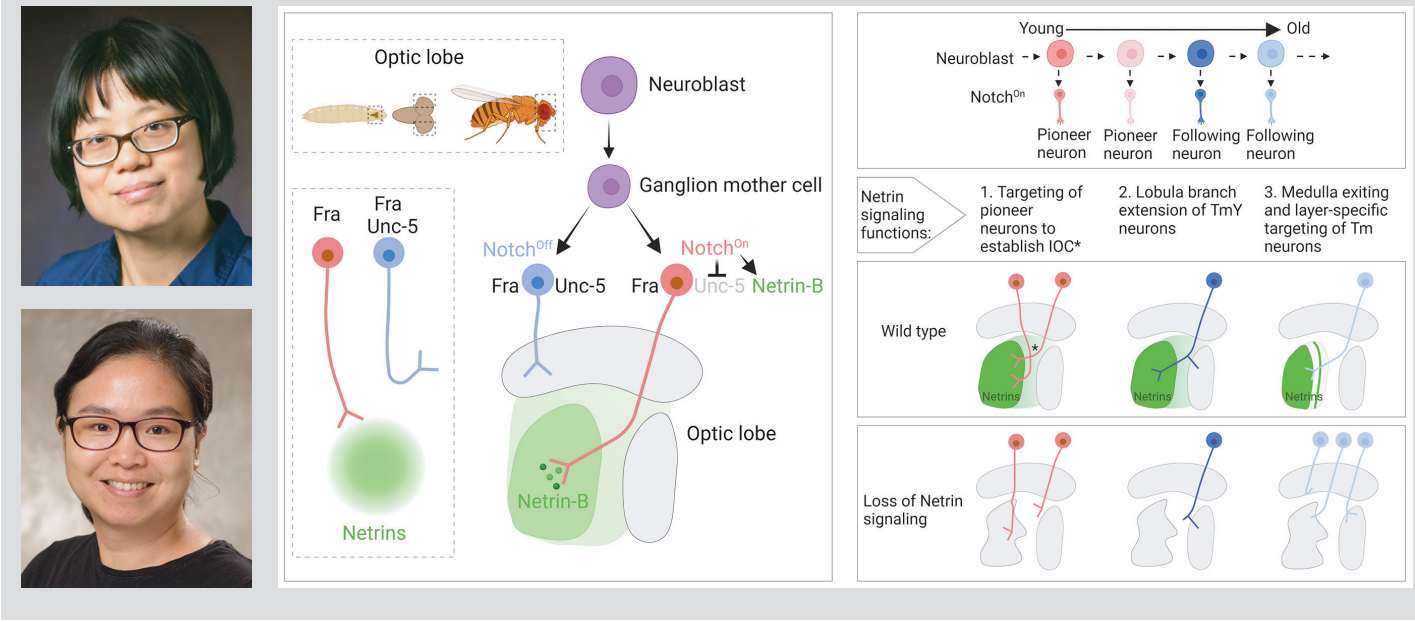
One of the most surprising findings in this study was that knocking down Frazzled in later-born projection neurons within a column does not affect their targeting path, while knocking down Frazzled in early-born projection neurons, that they call pioneering neurons, affects the targeting path of later born neurons non-autonomously. This was unexpected because they initially thought Frazzled would be functioning autonomously for guiding all projection neurons. This finding showed that temporal patterning of Drosophila medulla neural progenitors may determine early-born pioneer versus later-born follower neurons during the axon targeting process.

Their subsequent study, "***Notch-Dependent Binary Fate Choice Regulates the Netrin Pathway to Control Axon Guidance***," focused on the interaction between the Notch signaling pathway and the Netrin pathway. They found that Notch signaling can regulate components of the Netrin axon guidance pathway. Specifically, they discovered that Notch signaling can repress the expression of the Unc-5 receptor in Notch-on neurons during axon targeting, while Unc-5 is expressed in Notch-off neurons.

The regulation of Unc-5 expression by Notch signaling plays an essential role in neural circuit development because it determines whether neurons are attracted to or repelled by Netrin, they said. This process ensures that sister neurons follow distinct paths and provides organization and structure to these neural networks.

Notch signaling is also integral in activating the expression of Netrin-B while simultaneously repressing the expression of Unc-5. This not only determines the directionality of axonal growth but also coordinates the assembly and connectivity of these neuronal circuits.

Throughout their research, the scientists faced some challenges, particularly with the complexity of the *Drosophila* brain/neuronal structure. Zhang, however, took this as an opportunity to develop better immunostaining and mounting protocol for the brain. After taking the time to research and understand what methods and techniques she needed to utilize, Zhang said she was "able to optimize the protocols, and the project went smoothly after that."



Dr. Xin Li (top) and Dr. Yu Zhang (bottom) In Drosophila optic lobe, the Notch pathway regulates the expression of Netrin axon guidance pathway components, and the Netrin pathway plays multiple roles in axon targeting of transmedullary projection neurons.

Their studies have laid the groundwork for future research in basic and applied neurobiology by providing a better understanding of the molecular mechanisms involved in neuronal development. Their findings will be informative to other studies in axon guidance and may help further understand the neuronal mechanisms of neurological diseases and neurodevelopmental disorders.

Looking to the future, Li and Zhang are committed to exploring the molecular mechanisms of the Notch and Netrin pathways further. They aim to understand whether Notch signaling regulates the expression of Netrin pathway components directly or through other molecules. They also aim to understand how temporal patterning of neural progenitors determines the pioneer neuron properties to contribute to the coordinated assembly of neural circuits.

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The generation of neural diversity by neural progenitors, called neuroblasts, is regulated in two distinct ways: spatially, where neuroblasts at different locations make different neuron types, and temporally, by which the same neuroblasts generate different neuron types as they age.

“We are focused on the temporal patterning of neuroblasts, and we use the Drosophila medulla, which is a part of the visual processing center, as a model” said Xin Li, assistant professor of cell and developmental biology.

Li’s postdoctoral work had revealed that there is a cascade of Temporal Transcription Factors in Drosophila medulla neuroblasts where some factors are expressed early on and they successively activate others. However, gaps were observed in this original cascade, and it was also not known how the temporal cascade progression was regulated. To solve these problems, the Li group, in collaboration with Sihai Dave Zhao, an associate professor of statistics, used single-cell RNA sequencing technology to examine how gene expression changes as medulla neuroblasts age.

“We used two markers to label the cells. One was expressed in all the neuroblasts and the other was expressed specifically in the medulla part of the optic center,” Zhu said. “We then sorted the cells and sequenced

NEURONAL PATHWAYS, continued

the RNA in single medulla neuroblasts."

Single cell RNA sequencing adds specific barcodes to the transcripts that are formed when the information in the DNA is converted to RNA. As a result, each cell has a different barcode and at the end the researchers can identify the transcripts in every single cell. The sequenced cells were then grouped based on the similarity in their gene expression.

The researchers found that the TTFs that had previously been identified by Li's postdoctoral work were expressed in specific cell clusters. These results demonstrated that medulla neuroblasts were indeed clustered according to their age, from the youngest to the oldest. Furthermore, the researchers identified nine more transcription factors that are expressed in temporal patterns in medulla neuroblasts.

The group confirmed their findings using mutant Drosophila. They found that early transcription factors are required to activate late transcription factors, while late transcription factors repress early ones, forming a temporal cascade.

"We used mutants that lacked these transcription factors to test whether they're required in the cascade. We were able to find some TTFs that were missing in the previous studies, allowing us to develop a more complete temporal patterning gene network," Zhu said.

They also discovered that the speed of the cascade progression is regulated by transcription factors that are not TTFs.

"We found that although the transcription factor Lola is not expressed in a specific stage, without it the cascade slows down," Zhu said. "It's very interesting and it's different from what we've seen before."

The researchers are interested in further examining the transcriptional mechanisms regulating the TTF network. "The interactions between the transcription factors inferred from the mutant analysis are not necessarily direct. The next step is to see whether they act directly," Li said. "We also want to examine how these TTFs control the downstream specification of different neuron types."

The work was funded by NSF-Simons Center for Quantitative Biology at Northwestern University and the National Eye Institute.

Congratulations to Xin Li on her promotion to associate professor and being named a Helen Corley Petit Scholar!

The Helen Corley Petit Scholar recognizes the scholarship and teaching of early career faculty members. Recipients may use the title for one academic year and receive $10,000 to support their research and teaching.

Xin Li joined our faculty in 2014 as an assistant professor. Her promotion to associate professor was effective in August 2023. Her lab's goal is to elucidate the molecular mechanism controlling the sequential temporal transitions in medulla neuroblasts to generate different neural types, using both genetics and genomics approaches. Li is also affiliated with the Carl R. Woese Institute for Genomic Biology.

She received her PhD from Northwestern University and completed her postdoctoral research at New York University.

Congratulations to Anna Sokac, associate professor of cell and developmental biology. Sokac was presented with the School of Molecular & Cellular Biology's Teaching Excellence award for 2023.

Sokac, who joined the department in 2019, teaches MCB 250, a core course in Molecular Genetics, and MCB 529, a graduate development course. MCB 529 is tailored for PhD students in biomedical, bioengineering, or biophysical sciences, and emphasizes critical skills such as oral research presentation, career navigation, and effective teamwork. The culminating project involves creating a personalized Individual Career Development Plan aligned with each student's goals.

STUDENT FEATURE | Aatiqa Nawaz

Meet Aatiqa Nawaz, the 2023 recipient of the Tom and Cynthia Cycyota Research Scholarship.

Tell us where you grew up and what had an influence on your education..
I grew up in Lahore, Pakistan. It is the second largest city of the country and a huge cultural and educational hub as well. Being the first person from my family to graduate from high school and go in pursuit of higher education, I was oblivious to the various branches of biological sciences, other than medical sciences.

After my plan of getting into medical school failed, my father recognized my love for biology and encouraged me to pursue an undergraduate degree in Zoology instead, from the University of the Punjab. One day in class, my developmental biology professor put forward a simple yet very complex question: "How do our cells, which carry the same DNA, function so differently in our body"? My response at the time was "I don't know but I would really like to find out," and here I am.

What made you want to pursue a PhD in CDB?
After my undergraduate, I went for a master's degree in molecular biology at Lahore University of Management Sciences (LUMS). This was a completely different level of detail in science as my course work and research added the layer of epigenetics, to address the dilemma of how gene expression is controlled in a spatio-temporal manner to orchestrate the process of development. At the end of the program, I had come a little bit closer to answering the question my undergraduate professor first asked, but I wanted to keep pursuing a career that delves deeper into the mechanisms driving development.

What lab are you in and what research projects are you pursuing?
I am in Dr. Stephanie Ceman's lab. The overarching goal of the lab is to understand neuronal development and differentiation in mice. We found that an RNA helicase protein, MOV10, which associates with the miRNA pathway proteins is elevated in the mouse brain during early development.

We have developed a conditional knockout mouse, that has 90% reduction of MOV10 in brain. We are using this mouse to decipher the role of MOV10 in early neurogenesis. We recently published that MOV10 is phosphorylated at its C-terminus and my project is to study the regulation and role of this post-translational modification in the context of neuronal development.

What is your favorite place on campus or in Champaign-Urbana and why?
My favorite place to go to is my apartment, where I have my cat, Mano, waiting for me at the end of the day.

How do you find fulfillment or joy outside of the lab and classroom?
I am somewhat of a foodie, so I enjoy going to some of my favorite restaurants. Kofusion, Noodles & Company, Naf Naf Grill and Meatheads are a few to name. In addition, I play badminton sometimes with my friends. I am very fortunate to have a very understanding advisor and a special group of friends who are accompanying me through this journey of pursuing a PhD degree.

Congratulations to Aatiqa! She was presented with the Outstanding Graduate Student Award by the School of Molecular & Cellular Biology at the school's annual holiday party. Here she is with her advisor, Stephanie Ceman, professor of cell and developmental biology. Nawaz and Ceman's paper, "Serine 970 of RNA helicase MOV10 is phosphorylated and controls unfolding activity and fate of mRNAs targeted for AGO2-mediated silencing," was published in the Journal of Biological Chemistry this year.

UNDERGRADUATE STUDENT FEATURE | Meet Aneek Mirza

A recipient of the 2023 Tom and Cynthia Cycyota Summer Undergraduate Research Fellowship, Aneek Mirza and has been a member of Dr. Supriya Prasanth's lab. In November he presented his research at the school's Undergraduate Research Symposium and won a School of MCB Outstanding Research Presentation Award for "Interaction of Chromatin Remodelers with the Origin Recognition Complex." Mizra graduates in December with Highest Distinction. Congratulations, Aneek!

Tell us where you grew up. Are there any people or events that had an influence on your education?
I grew up in Minnesota for the first thirteen years of my life before moving to Bloomingdale, Illinois. I think my biggest support group has been the friends I made as a freshman that were two-three years older than me. Having older students around you to share advice about what they would do differently/same is something that I recommend underclassmen to take advantage of. I met a lot of these people in the extracurricular experiences I joined, such as RSOs, my research lab, and the clinic I volunteer at.

What made you want to pursue a degree in MCB and at UIUC?
Entering college, I was unsure of what I wanted to major in. I knew that I wanted to end up going to medical school but I was initially a mathematics major. After hearing about the opportunities that came alongside being an MCB student, I decided that it was the program that would be most beneficial for my career endeavors.

I think choosing MCB was one of the best decisions I've made in college as it opened the door to research that I'm passionate about and also helped me tremendously for the MCAT due to the in-depth coursework. (Shout out to MCB 252!)

Tell us about the research projects you've been involved with as a student researcher. How does being a student researcher have an impact on your education?
Doing research in Dr. Supriya Prasanth's lab has been a wonderful experience for me. My first few semesters consisted of learning different experimental techniques and learning more about the projects being done in the lab. However, under the mentorship of a very helpful graduate student, I was given my own research project about the interaction between chromatin remodeling proteins and the origin recognition complex.

I learned a lot about the research process when working on my own project as I gained more of an appreciation over each piece of data I obtained after realizing how much time and effort went into these individual experiments. Not every experiment is going to work, and that was the hardest part to get used to about research. Success in a research lab comes with patience and resilience!

What was your proudest moment while a student at UIUC?
Receiving the Outstanding Research Presentation Award was one moment that made be very proud. Public speaking is something I really enjoy and having the opportunity to talk about something I've put so much effort and passion into was an enjoyable experience as it is, but then also obtaining the reward on top of that is something I'm tremendously thankful for.

How do you find fulfillment or joy outside of the classroom or lab?
Throughout college, I regularly lifted and played basketball. It's something I feel like I need to do to have an accomplished day the same way I have to do homework. I played in two different rec leagues which would each run twice a week. On the days I have even more free time, my friends and I love playing Super Smash Bros. on the Nintendo Switch.

What are your post-graduation/career plans?
In my upcoming gap year, I will be working as a medical assistant in an ENT clinic and also as an MCAT teacher part-time. I plan to apply to medical school this next cycle and hope to stay in Chicago for school so I can be close to my family. This may change in medical school, but at the moment, I am very interested in becoming an ENT doctor.

Rick Horwitz returns for visit; KV Prasanth named Horwitz Scholar

We were pleased to welcome back to campus Dr. Rick Horwitz in May 2023. Dr. Horwitz was here to recognize Kannanganattu V. (KV) Prasanth as the department's inaugural Horwitz Scholar and to meet with graduate students and faculty.

The Inaugural Executive Director, Emeritus of the Allen Institute for Cell Science in Seattle, Horwitz has led impactful research in cell adhesion, migration, and signaling and synapse formation. He served as the first head of the Department of Cell & Developmental Biology at UIUC.

Prior to the Allen Institute, he was a Harrison Distinguished Professor and University Professor with the Department of Cell Biology at the University of Virginia School of Medicine, where his lab investigated the mechanisms of cell migration and dendritic spine morphogenesis. He also served as the Director of the Cell Migration Consortium: an NIH-funded multi-institutional, multi-disciplinary collaboration for studying cell migration in its many biological and pathological contexts. Previously, he chaired the undergraduate Biophysics Program and served as the Associate Director of the Medical Scientist Training Program at the University of Pennsylvania School of Medicine. Horwitz completed his undergraduate education at the University of Wisconsin and received his PhD in biophysics at Stanford University.

The named scholar recognition celebrates mid-career faculty who conduct outstanding research programs. KV Prasanth joined the CDB faculty in 2007 and has become a leader in uncovering the roles of long noncoding RNAs in gene regulation and their involvement in cancer progression. He received his PhD from the Cytogenics Laboratory at Banaras Hindu University and conducted postdoctoral research at Cold Spring Harbor Laboratory in New York. In addition to his faculty appointment in the Department of Cell & Developmental Biology, he is an affiliate with the Cancer Center at Illinois.

Rick Horwitz with former heads and the current head of CDB. From left: Supriya Prasanth, Jie Chen, Andrew Belmont, Martha Gillette, Rick Horwitz

Dr. Tudorita Tumbar delivers CDB Alumni Seminar

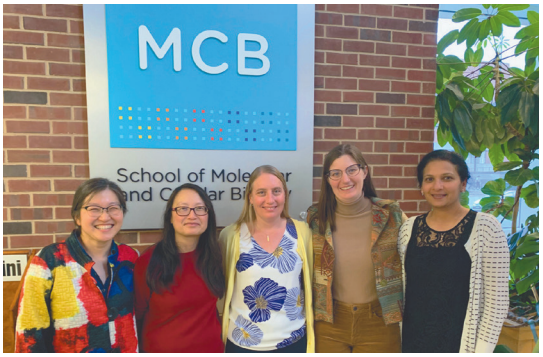
We were delighted to host a spring visit from Dr. Tudorita Tumbar, a professor in the Department of Molecular Biology and Genetics at Cornell University. Her Alumni Seminar was entitled, "Molecular mechanisms of tissue stem cell function in skin development and homeostasis."

After completing her undergraduate education at the University of Bucharest in Romania, Tumbar received her PhD in cell biology in 2000 from UIUC. She was a member of Professor Andrew Belmont's lab, where she explored large-scale chromatin folding. She conducted postdoctoral research at University of Chicago and Rockefeller University in New York. She joined the Cornell faculty in 2004.

The overall driving question of her career is what really makes a stem cell, a stem cell? Her lab focuses on both cell intrinsic mechanisms that include transcriptional control as well as cell-extrinsic factors that involve cross-talking with the micro-environment. Elucidating these mechanisms will help one day to build viable tridimensional organotypic cultures for tissue and organ replacement therapies.

Career advice from alumni

Many thanks to alumni who visited campus either in person or virtually this year to talk with our students about their career journeys and offer their insights.



In October, we welcomed back (in photo on left, from left)) Susan Kim, Editor/Technical Communications Professor at Washington University in St. Louis; Christina Marie Laukaitis, Clinical Associate Professor in Medical Genetics with Carle Illinois College of Medicine in Urbana; Shellie Kieke, Lead Laboratory Genetic Counselor at Regions Hospital in St. Paul, Minnesota; and Tho Truong, Physician with Kaiser Permanente.

Department welcomes Dr. Chris Q. Doe as keynote speaker for 2023 retreat

This year, the Department of Cell & Developmental Biology held its annual retreat on November 11, 2023, at Allerton Park in Monticello. The keynote speaker was Dr. Chris Q. Doe, director of the developmental biology program at the University of Oregon and a former faculty member at the University of Illinois Urbana-Champaign.

"I was delighted to invite Dr. Chris Doe to our retreat this year. I am interested in building a strong relationship with CDB alumni, from students and postdocs to faculty," said Dr. Supriya Prasanth, professor and head of the department.

"Chris Doe is a preeminent scholar in our field who has expanded our understanding of the central nervous system," she said. "Specifically, his work has shed light on the intricate processes by which neural stem cells produce a diverse array of neurons. Moreover, he has elucidated how these precisely generated neurons establish neural circuits, contributing to our understanding of motor behavior."

In his remarks to retreat attendees, Doe provided an overview and update on his research advances in developmental neurobiology, and he reflected on his time at Illinois. In 1989, when Doe joined the department, then called the Department of Cell and Structural Biology, the head at the time was Dr. Rick Horwitz. Doe credits Horwitz with helping him launch a successful research lab.

During his time as an assistant professor at Illinois, Doe identified the essential factors and mechanisms involved in asymmetric cell division and neural lineage specification and pioneered the field of neural stem cell development. In 1990, he was awarded the National Science Foundation's Presidential Young Investigator Award for his groundbreaking work on the molecular mechanisms controlling the determination and interactions of developing neurons. His work has pushed our understanding of lineage specification further. In 1993, his research on the role of the wingless gene in neuroblast diversity was featured on the cover of Science magazine. In 1994, Dr. Doe named a Howard Hughes Medical Institute Investigator.

At the University of Oregon, Doe and members of his lab continue to advance their brain development research. He was the first to discover the cascade of temporal transcription factors in neural stem cells that are crucial for embryonic and larval neuronal identity specification. His lab has been making high-impact discoveries in a broad aspect of neural stem cell biology, neural fate specification and neural circuit assembly. Dr. Doe has won numerous prestigious awards, including elected fellow of the American Academy of Arts and Sciences and elected fellow of the National Academy of Sciences.

Meet Chris Q. Doe, keynote speaker at the 2023 department retreat

By Quang Nguyen, School of MCB Communications

Where did you grow up and what sparked your interest in biology?
I grew up in Seattle in the Pacific Northwest and I was interested in marine biology. I watched [the TV show], "The Undersea World of Jacques Cousteau" as a youngster, and I fell in love with the ocean. I thought I would be an oceanographer. I spent some time volunteering at the National Oceanic and Atmospheric Administration in Seattle. However, when I went to college, I was more interested in biology than oceanography and that's how I started in science.

When did you know you wanted to study developmental biology? Can you tell us a little backstory about your middle initial "Q"?
So, I went to undergraduate at New College, a small private college in Florida. This was where I got excited about developmental biology. Developmental biology was the strength in the college's faculty pool, and I felt in love with the field.

For the middle initial "Q," that was an inaugural "Q." [Developmental biologist] Mark Q. Martindale and I went to New College together and we were in a group of undergraduate biologists that took on a "Q" as middle initial. We have been publishing with it ever since. For me, I have a generic last name, Doe, so the idea of having extra distinguisher to my name in publication to be unexpected. But turns out that was a big help because there were several Chris Does in biology. I am the only Chris Q. Doe

When did you start working in neurodevelopment of fruit flies?
When I went to Stanford as a graduate student, and I did my three rotations. One was a plant biology lab, one was in immunology lab, and one was a neuroscience lab. I actually did a fourth [rotation] in marine biology lab. The main core and consistent theme of all the rotation labs were development. But I fell in love with neurodevelopment, and I did my PhD in that area.

Do you have a favorite moment that stands out in your memory?
I really appreciated Rick Horwitz, who was the chair of the Cell and Structural Biology department then. Rick made me apply for Howard Hughes Medical Institute which I resisted because I did not like writing grants. That success really changed my career and boosted me in a big way. In my first year [at UIUC], Rick recommended two new graduate students to join my lab and they got my lab off to an extremely fast start and I still keep in touch with them. I was thankful for Rick Horwitz for pointing them in my direction.

When you were named HHMI investigator on campus, what was that like?
It was amazing. By the time I got the news, I had been told how important and how special this award was and I was very excited. I remember walking around the main Quad with the head of HHMI program because they'd never been on campus before.

Regarding your career, what are you most proud of?
That is a very easy question. I'm most proud of the postdocs, graduate students, and undergraduate students that have come through my lab. My career depends on their work, and they are such an amazing group of scientists. Many of my trainees stayed in science, and they all have jobs at faculty positions or STEM jobs. I feel really lucky to have such a great group of scientists in my lab. One hundred percent the most important thing about my career is to be a mentor to a big pool of students.

What are your future plans?
Looking ahead, we are interested in trying to understand how developmental mechanisms generate neural circuits and navigational behavior. So, we are switching focus a little bit from development to connectivity and circuit and from circuit to behavior. This is a new area for us and it's going to be fun.

Congratulations to the graduate students who won research presentation awards at our 2023 department retreat!

Research Poster Award Recipients

Tejas Mahadevan Padmanabhan
(Anna Marie Sokac Lab)

Andrew Riley
(William Brieher Lab)

Anish Bose
(Rachel Smith-Bolton Lab)

Research Talk Award Recipients

Tejas Mahadevan Padmanabhan
(Anna Marie Sokac Lab)

Temirlan Shilikbay
(Stephanie Ceman Lab)

Neha Chetlangia
(Supriya Prasanth Lab)

Eli Lilly CDB Graduate Student Seminar Award Recipients

Madhura Duttagupta (William Brieher Lab) | **You-Jin Song** (KV Prasanth Lab) | **Natalie Biel** (Anna Marie Sokac Lab)
Hailun Zhu (Xin Li Lab) | **Pradeep Kumar** (Andrew Belmont Lab)

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