Program in Cellular and Molecular Medicine
at Boston Children's Hospital

HARVARD MEDICAL SCHOOL
TEACHING HOSPITAL

Volume 14

NOVEMBER 2026 NEWSLETTER

Greetings, PCMM,

As the temperatures are starting to cool down, we hope everyone's settling well into the new academic year.

In this issue we're introducing a new section where we're highlighting a PCMM faculty member, Dr. Michael Carroll, and his leadership and service at the Harvard Immunology Graduate Programs.

As always, if you have any suggestions for the newsletter, please contact us at vera.gaun@childrens.harvard.edu.

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PCMM Retreat 2026



Photo: courtesy of Dr. Shilong Yang

Introductions: Ziwen Song of the Wu Lab



Photo: courtesy of Dr. Song

Tell us about your role here at PCMM.

I am a postdoctoral fellow in Dr. Hao Wu's lab. I joined Boston Children's Hospital in June, and my research currently focuses on cellular mechanisms of innate immunity. I look forward to connecting with you all and exchanging ideas.

Where were you before HMS?

I'm originally from China. Before coming to HMS, I pursued my PhD at the Institute of Organic Chemistry, Chinese Academy of Sciences, in the Center for Interdisciplinary Research in Biology and Chemistry. My research focused primarily on innate immunity and neurodegenerative diseases, along with additional work exploring programmed cell death and related inflammatory diseases.

What's your favorite piece of lab equipment?

My favorite piece of lab equipment is the microscope. Different types of microscopes allow us to see beyond what we could otherwise, and they often lead to unexpected discoveries.

What's the best piece of advice you've ever received?

The best advice I've ever received was from one of my high school teachers: "Every experience is worth having, whether it's good or bad." It has helped me stay grounded and keep a balanced perspective, no matter what the outcome is.

What made you pursue a career in science?

I was driven by a curiosity about the unknown and a desire to understand and ultimately find solutions to human diseases.

If you could solve one scientific or medical mystery, what would it be and why?

I would want to understand the critical steps that bridge physical and chemical molecules to living organisms with consciousness. This question has fascinated and puzzled me ever since I began working in the life sciences, yet it remains almost impossible to answer with our current understanding. I hope I will be fortunate enough to witness the day we finally begin to solve this mystery.

What profession would you choose if you weren't a scientist?

I would choose to be a photographer—to travel the world, experience different places, and capture interesting moments and the beauty of nature through my lens.

What is your favorite book or a book you've enjoyed recently?

My favorite book is *The Three-Body Problem* by Liu Cixin. I find myself drawn back to it every time I read it, because it explores something I find fascinating: the underlying patterns of human behavior when people have to make choices as a group under extreme circumstances. In that sense, it reminds me of *Foundation*, which I also really enjoyed.

Faculty Highlight

Michael Carroll's service and leadership at the Immunology Graduate Programs

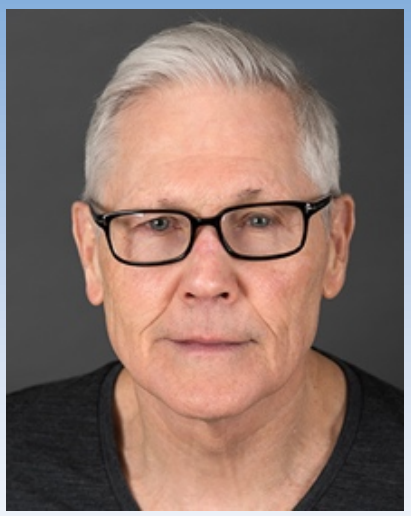


Photo: courtesy of Dr. Carroll

Dr. Michael Carroll, a Senior Investigator at PCMM and a Professor of Pediatrics at Harvard Medical School (HMS), is also a Co-Director of the Master of Medical Sciences in Immunology Program at HMS. We talked to him about his path of getting into science and to Harvard, as well as his experience of directing HMS Immunology Graduate Programs, both a Ph.D. and a Master's one.

On his path to and in science: Originally Dr. Carroll set out on a path in finance, but after having worked in banking, he decided to switch to science. He earned a master's degree, which motivated him to get a Ph.D. in Immunology, which he completed at the University of Texas Southwestern Medical School. Dr. Carroll then carried out his postdoctoral studies at Oxford University in England – originally from Texas, he appreciated interacting with people from other cultures who think about science differently. He was then recruited as an Assistant Professor to Boston Children's/HMS in 1985. From 2005 to 2016, Dr. Carroll served as the Director of the HMS Ph.D. Program in Immunology and facilitated further development of the program.

On the evolution of the Ph.D. Program in Immunology: Originally, there was a limited Immunology Program at HMS, and a limited group of students studying immunology was part of the HMS Department of Pathology program in the 90's. Students would take immunology classes at the Harvard School of Public Health next door. Eventually, the Dean agreed to allocate funds to support an Immunology Program at HMS, so that, for starters, administrative staff could be hired to operate the program.

During his tenure as the Program Director, Dr. Carroll added a few initiatives, as influenced by his scientific training and experience. For example, along with Fred Alt and Harvey Cantor, he facilitated the creation of new Immunology classes, such as Immunology 201 and 202, and invited Immunology faculty to teach sections of the class. Frequently, the lecturers were the ones who made the discoveries in the topic discussed. Dr. Carroll sat in on most classes at one point, to see which aspects were working and which ones weren't, and he also ended up enjoying learning about different topics of immunology.

Additionally, Dr. Carroll found it helpful to co-direct the PhD program with Dr. Shannon Turley, since the leader's gender does play a role in how comfortable students feel asking questions. He also appreciated working with Dr. Shiv Pillai at the time when they were Program Co-Directors – Dr. Pillai was excellent with the teaching and administrative business side, and is currently the Director of the Program.

Dr. Carroll initiated a program called Global Exchange Opportunity which provides an

opportunity for students to conduct research in Sweden, France, or Germany during the summer after their first year. Students get a chance to meet researchers from other countries and see how people can approach scientific problems differently and have a different scientific culture. This program reflects Dr. Carroll's value of different perspectives in science, which he experienced during his postdoctoral work overseas in England.

Another creative initiative started by Dr. Carroll, along with Dr. Shannon Turley and other faculty, is the Immunology Undergraduate Summer Program, where students conduct research at a chosen laboratory, as well as attend a summer-long general Immunology course, with stipends available. This program was started back when Dr. Carroll noticed that some small liberal arts colleges didn't have Immunology classes.

On HMS Master's Program in Immunology: Dr. Carroll's own experience of switching to science prompted him to facilitate the establishment of a Master's of Science in Immunology program at HMS in 2015, along with Dr. Shiv Pillai. The Master's program is intended for students who either might not be quite ready for a Ph.D. program, or for students who would like to solidify their decision to pursue research. Dr. Carroll enjoys working with students and appreciates that the program allows them to make a very informed decision on pursuing research. Curiously, in the years prior, the majority of students were international and, upon graduation, returned to their home country with their enhanced research skills, while others pursued a Ph.D., and others went into biotech industry. Currently, the trends are different in that the majority of students now choose to enter a Ph.D. program upon graduation, and many go on to top programs. Additionally, the tuition revenue from the Master's program mostly contributes to stipends in the Immunology Ph.D. Program, which is a very valuable support especially now, given the current challenging funding situation.

We thank Dr. Carroll for sharing insights on his leadership, creativity, and dedication to HMS Immunology Graduate programs!

PCMM Researchers Win Prestigious Fellowships

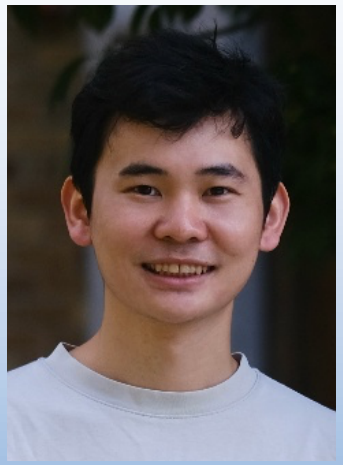


Jhullian "J" Alston, PhD of the Ha Laboratory and co-mentored by Angela Koehler (MIT/Broad), received a Young Investigator Grant from Alex's Lemonade Stand Foundation (ALSF) to target PAX3–FOXO1, the fusion transcription factor that drives an aggressive form of childhood alveolar rhabdomyosarcoma. The fusion contains intrinsically disordered regions that sample a heterogeneous ensemble of conformations. This heterogeneity makes it difficult to design a structured binder against any single conformation. Dr. Alston will design peptides that can remain dynamic in the bound state, making contacts with the fusion as its disordered regions shift among conformations. He will pair high-throughput *in vitro* binding affinity measurements with deep learning to identify peptide sequence features that predict binding. The goal is to determine whether these dynamic interactions can disrupt PAX3–FOXO1-dependent transcription.

Additionally, Dr. Alston has recently won the Alex's Lemonade Stand Foundation Shark Tank Competition and was awarded a grant to study TCF3-HLF, a fusion transcription factor that drives a rare, aggressive subtype of childhood B-cell acute lymphoblastic leukemia. He will use machine learning to guide the design of proteins that selectively bind TCF3–HLF. Because the fusion shares much of its sequence with wild-type TCF3 and HLF, a central challenge is to distinguish the leukemia-driving protein from its normal counterparts. Dr. Alston will combine computational design with single molecule spectroscopy to evaluate candidate binders and test their effects on the fusion's ability to bind DNA. The goal is to disrupt TCF3–HLF activity while sparing the functions of wild-type TCF3 and HLF.



Hans Bergal, PhD (Wong Laboratory), has been awarded a T32 Ruth L. Kirschstein National Research Service Award (NRSA) from the National Institutes of Health. The blood protein von Willebrand factor (VWF) is essential for preventing bleeding, but its dysregulation contributes to von Willebrand disease, Heyde's disease, and thrombotic thrombocytopenic purpura. VWF is a force-responsive molecule: blood flow can change its shape, enhance its ability to capture platelets at sites of vascular injury, and expose sites for enzymatic cleavage that limit clotting. Key questions remain about how these competing mechanical processes regulate VWF in health and disease. As an NRSA Fellow, Hans will combine single-molecule biophysics, high-throughput force measurements, and microfluidic flow experiments to determine how physiological forces and disease-associated mutations alter VWF structure and function. This work will improve interpretation of disease-associated variants and lay the groundwork for therapies targeting VWF mechanics.

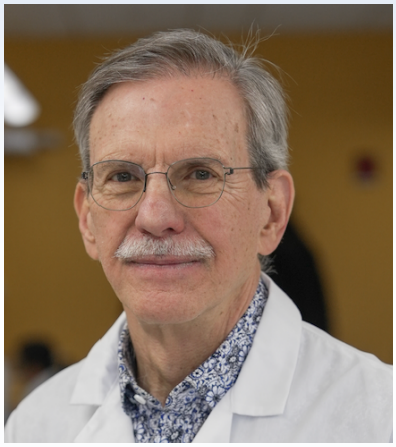


Guoguang Xie, PhD, (Zhang Laboratory) has been awarded a NARSAD Young Investigator Grant from the Brain & Behavior Research Foundation. Chronic pain and major depressive disorder frequently co-occur and represent a pervasive, treatment-resistant clinical challenge. Guoguang is investigating the neural mechanisms linking persistent nociceptive signaling to affective dysfunction, focusing on the insular cortex, a critical brain region for both pain and emotion processing. Using spatial transcriptomics, neural tracing, and *in vivo* functional studies, Guoguang will systematically delineate the cellular and circuit architecture of the insular cortex and reveal the cell-type-specific functions in pain-comorbid depression. This work will be valuable for understanding the neurobiological mechanisms and developing therapeutic interventions of pain-comorbid depression.



Dalia Fantini, a G2 Biophysics PhD student (Ha Laboratory), has recently won the NSF Graduate Research Fellowship from the U.S. National Science Foundation. Her proposal centers around quantifying CTCF boundary permeability. She is passionate about exploring aging biology at the single-molecule level and is excited to dive into this research. She is looking to apply Condense-seq, a protocol established by the lab, to probe aging-related changes in DNA condensability and genome organization. She is also interested in looking at the epigenome in relation to aging and disease.

PCMM Faculty Member Receives a High Honor and a Prestigious Award



Timothy Springer, Ph.D. has been selected as a Citation Laureate in Physiology or Medicine by the Institute for Scientific Information (ISI) at Clarivate. The official announcement states: “Each year, the Institute for Scientific Information honors a select group of researchers whose work reflects extraordinary influence and global impact. These individuals have made groundbreaking contributions that resonate across disciplines -- work considered to be of Nobel class. Their pursuit of knowledge continues to shape the future of research and inspire generations to come.” Dr. Springer was cited for “identifying key adhesion receptors in the immune system", which in turn "revealed a pathway to a new class of drugs to treat autoimmune diseases, including inflammatory bowel disease, multiple sclerosis, and cancer.”

Additionally, Dr. Springer will be awarded the 2027 Bert and Natalie Vallee Award in Biomedical Science. The official announcement elaborates: “The Bert and Natalie Vallee Award in Biomedical Science was established by The Vallee Foundation (formerly known as the Bert and N. Kuggie Vallee Foundation) in 2012 to recognize international achievements in the sciences basic to medicine", and it honors “an established scientist for outstanding accomplishments in basic biomedical research.”