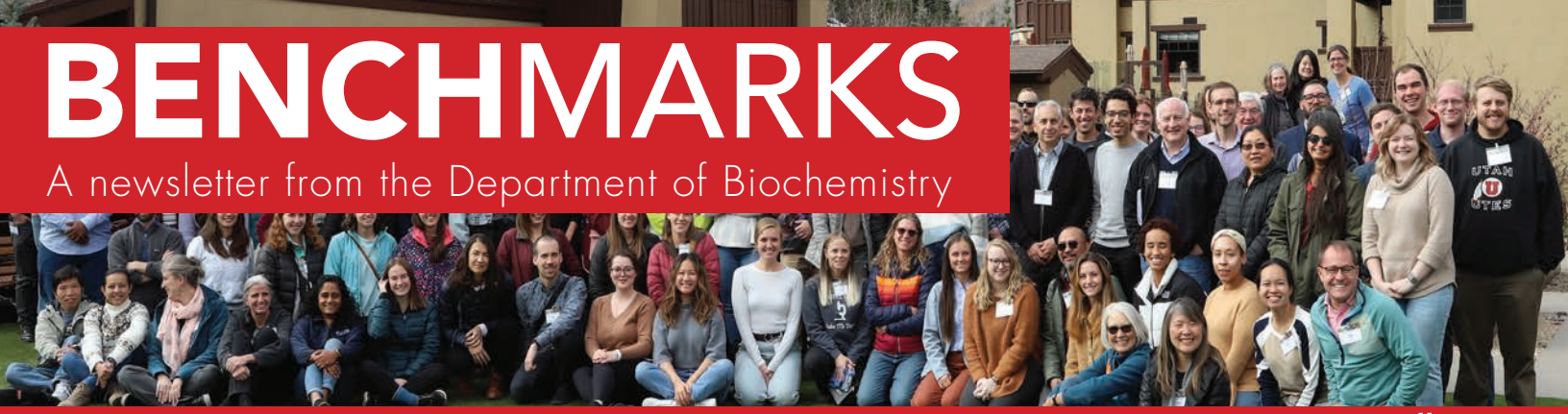
BENCHMARKS

A newsletter from the Department of Biochemistry



Fall 2024

STRATEGIC PLANNING Chair's Message from Wes Sundquist

"Everyone has a plan until they get punched in the mouth"

-Boxing champion "Iron Mike" Tyson

Our department has been growing and we've successfully recruited outstanding new faculty members and trainees who are enhancing our community and expanding our educational and research capabilities. The expansion has generally gone very well, but this still feels like a good time to take stock and plan our future. As part of that process, the Graduate School oversaw a comprehensive review of our department last academic year. We started with an extensive self-study (683 pages!) and were then site visited and reviewed by three distinguished faculty members from other leading universities and two distinguished faculty members from within the University of Utah. The external and internal reviews were generally very positive, as reflected in their summary statements:

External Review: *"By almost any metric that can be applied to a research-intensive department, the Department of Biochemistry is extremely strong."*

Internal Review: *"It is clear that (research, education, and community service) goals are being successfully achieved through effective leadership, an atmosphere of collegiality, and fiscal discipline."*

The reviews also contained a series of recommendations for how we can become even better, one of which was that we carefully consider priority areas for near term growth and investment. For context, we currently have 24 tenure line faculty members, and we plan to add ~5 more over the next 3-4 years, which will bring us to a total of ~27 faculty members once retirements are factored in. The tenure and research line faculty members that join us over the next few years will play important roles in shaping the department in the coming decades, so it is imperative that we recruit well.

Historically, we have pursued a strategy of creating dynamic "clusters" of outstanding researchers with complementary interests and skills within important subdisciplines of biochemistry. We viewed this as the best way to create scientific synergies, maximize programmatic funding opportunities, cover a broad swath of impactful biochemistry, and retain the flexibility to respond to an ever-evolving scientific landscape. Following this strategy, we have assembled mature clusters of excellence in Metabolism and Homeostasis, Nucleic Acids Biochemistry, Structural Biology, and Virology. As discussed below, we also have emerging clusters of excellence in other priority areas.

To facilitate thoughtful planning, we held a Research Strategic Planning Refresh Retreat on September 6. As always, it was fun to get together and hear everyone's insights. We identified three key areas for evaluating prospective faculty colleagues: 1) Research Excellence, 2) Potential for Community Contributions, and 3) Expertise in a Priority Research Area. It's a tall order for anyone to excel in all three areas, but we're looking for special people! Our broad priority research areas for hiring will be cell biology (our #1 priority), nucleic acids biochemistry, metabolism/homeostasis, chemical biology/engineering, and research that touches on infectious disease. We also committed to recruiting colleagues whose research employs quantitative and computational approaches, including using big data, machine learning, and AI; all of which are critical tools for the future (and present!).

Each of our target areas feels well justified. For example, cell biology was prioritized because the cell is the fundamental unit of biology and medicine, and advancing technology is increasingly allowing biochemistry to be studied in a cellular context. Our department already has emerging strength in cell biology and there are additional pockets of strength in other UU basic science and clinical departments, yet our campus lacks an organizing Department of Cell Biology. Cell biology also interfaces well with other department priorities, including imaging, structural biology, chemical biology, nucleic acids biochemistry, and commercialization/biotechnology. Finally, cell biology is a foundational science, yet contributes heavily to many important areas of medicine, including cancer, neurodegeneration, and aging. Thus, continuing to build strength in cell biology should position us to do great biochemistry, serve as an institutional hub that interfaces well with other important partners, and contribute to the advancement of medicine.

There are no hard and fast rules for identifying outstanding faculty candidates, but I think we have created a strong foundation for effectively evaluating future colleagues. I anticipate that we'll consider each candidate's major strengths (and any weaknesses) in the three categories and try to identify driving considerations as objectively as possible. This approach should help us follow our thematic goals, minimize unconscious bias, and focus us on the attributes we value most, which are excellence, impact, synergy, and community building.

In addition to creating a strong recruiting framework, our Retreat also allowed us to define specific goals and actions for each of our different subdisciplines. These include planning new NIH Training and Programmatic Grant applications, connecting better with our clinical colleagues and other external partners, creating new campus-wide interest groups, and enhancing our technical capabilities and commercialization efforts. I believe that our department is poised to rise to the next level of excellence and impact, and we now have strategic plans for getting there.

Below: Annual Biochemistry picnic. Photo by Tim Formosa.

Stay Tuned to Help Traveling Trainees with Child Care Costs during U Giving Day 2025!

U Giving Day has become a very important component of our departmental success. Thanks to your generosity over the past two years, we have raised the funds needed to establish and endow a Trainee Emergency Support Fund that will help our trainees cover unexpected expenses. We are delighted to report that we now have an endowment of more than $50,000, which should allow us to support, in perpetuity, trainees who find themselves in challenging financial situations. In a parallel effort, we also partnered with our award winning SACNAS chapter to help them establish their first ever endowment fund. YOUR GENEROSITY MADE THIS ALL POSSIBLE - THANK YOU!!!

Another major challenge faced by many trainees, staff, and faculty is the rising cost of child care. In addition to posing a financial burden, these costs can limit career training and advancement by causing parents, especially women, to forego valuable professional development opportunities that require supplemental childcare. Solving all of the challenges associated with childcare is beyond our current capabilities, but we can start to make a difference. For UGiving Day 2025, we plan to target a key component of this problem, which is additional childcare costs that often must be borne by trainees who are traveling to scientific meetings and workshops. That will be the theme of our next U Giving Day this coming spring - please stay tuned for more details!

THE 2024 MARJORIE RICHES GUNN AWARD FOR GRADUATE STUDENT EXCELLENCE

Adam Hughes

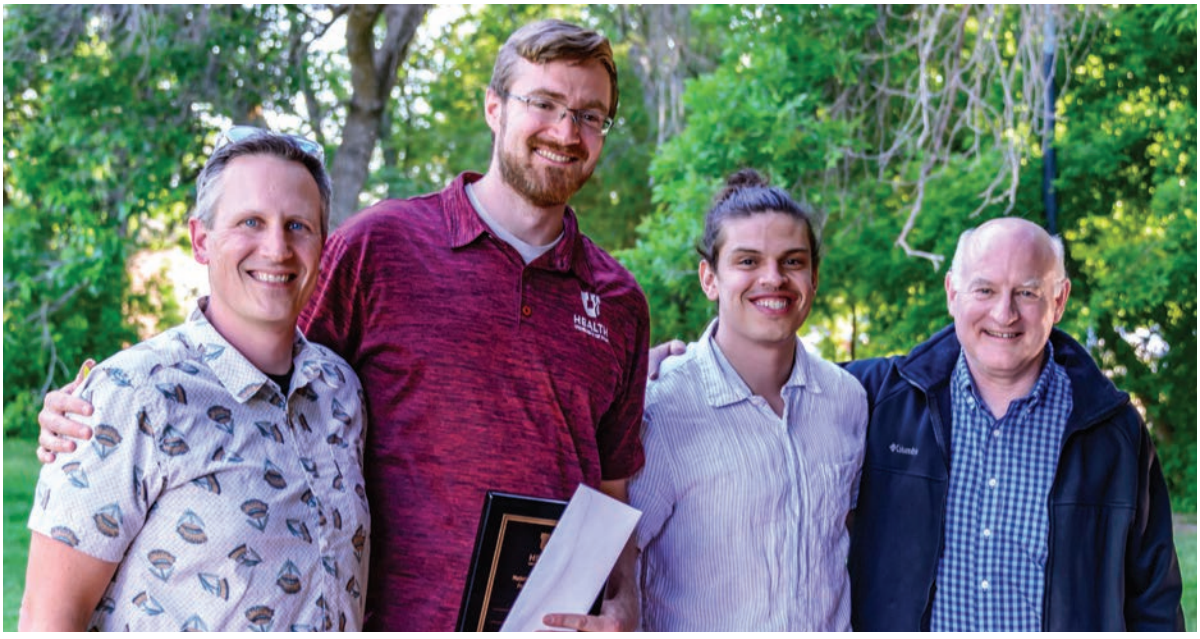
Marjorie (Marge) Riches Gunn was a long-time friend of the Department. She was secretary to Leo Samuels, who was the first chair of the Department Biochemistry. Marge was therefore a key personality in defining the culture of excellence and communal support that we continue to value. Marge's husband, Francis Gunn, was chair of the Department of Pathology, and it is fitting that laboratories in Biochemistry and Pathology currently share space in the Emma Eccles Jones Medical Research Building and have numerous productive interactions. Marge was a very generous friend to the department. We are delighted to honor her legacy of friendship and generosity with the Marjorie Riches Gunn Award for Graduate Student Excellence, which is given annually to the Biochemistry PhD candidate who is judged by the faculty to most exemplify our values of scientific excellence.

Like most years, we received a number of stellar applications, and the committee had a very difficult time deciding between a number of deserving candidates. Ultimately, they decided that the eighth annual Marjorie Riches Gunn Award for Graduate Student Excellence should be shared by two students: Michael Stewart from the Miller lab, and Julio Fierro Morales from the Roh-Johnson lab.

Over the past several years, both Julio and Michael have been tremendously generous and actively engaged members of our Biochemistry community. Both are well known as excellent scientists, mentors and friends to their student and postdoc colleagues, and both are wonderful community citizens, exhibiting consistent leadership in Biochemistry community events and serving as role models for their peers. Michael's thesis work has focused on dissecting the structure and function of the conserved kinetochore protein Stu2. In collaboration with the Harrison lab, Michael elucidated the structure of Stu2 bound to its binding partner at the kinetochore, Ndc80. He identified an important interaction between these proteins that is required for proper chromosome segregation. This work was published in eLife with Michael was co-first author. During his graduate tenure, Michael was awarded a Genetics T32 and an NIH F31, and he presented his work at several national and local meetings. In addition to his science, Michael has been a leader in the community—he spearheaded the organization of the annual yeast symposium with another student in the Miller lab, and has been an active member of SACNAS, serving as secretary from 2021-2023.

Julio's thesis work has focused on using *Dictyostelium* to investigate unique aspects of cell migration. Specifically, he pioneered the use of Dicty in the Roh-Johnson lab (being the only one on campus studying this organism), and made a key discovery of a unique and new way that the key focal adhesion protein paxillin regulates adhesion during migration. His thesis work has been posted on bioRxiv and is under review at Journal of Cell Biology. Julio has had the opportunity to present his work at a number of scientific meetings and conferences. In addition to his science, Julio is well known in the community as a passionate champion for diversity and an amazing community member, and his efforts in outreach and engagement in our Department and beyond have been truly impressive. Julio participates in and leads numerous efforts in the DEI space, including co-organizer and leader of a student led DEI interest group, a member and now leader in Cientifico Latino, and a member and education committee liaison of the ASCB COMPASS committee.

Congratulations to Julio and Michael for this honor!



Left to right: Adam Hughes, Michael Stewart, Julio Fierro Morales, and Wes Sundquist. Photo credit: Tim Formosa.

THE 2024 EVELINE BRUENGER AWARD FOR POSTDOCTORAL EXCELLENCE

Tyler Starr

The Eveline Bruenger award is given to a postdoctoral fellow who has shown outstanding research accomplishments, and to a person who not only strives for excellence in their own research, but also exemplifies community spirit, helping others around them achieve success. This year, the recipient of the 2024 Eveline Bruenger award was Dr. Ho Yan Yeung from the Safavi lab.

Ho Yan received her Masters in Pharmacy from University of Bath and her PhD in Pharmacology from University of Cambridge, supported by a Cambridge International Scholarship, before joining Helena's group at the University of Copenhagen in 2021. In both her PhD and postdoc work, Ho Yan has demonstrated her expertise in establishing new functional assays to screen and characterize novel GPCR agonists.

In the Safavi lab, Ho Yan has leveraged this expertise to discover and characterize a cone snail toxin mimic that selectively activates the somatostatin 2 receptor to stun its natural prey. Ho Yan showed immense creativity in following this work through the various bioinformatic, chemical biology, and proteomic directions that it took to understand not only this peptide's pharmacological properties, but also its natural biology in the cone snail. This work is in revision after a promising set of initial reviews that highlight the volume, rigor, and creativity of her work. Reflecting her boundless enthusiasm and ability to balance multiple lines of work, Ho Yan has simultaneously been expanding her search for interesting molecules across the animal kingdom, identifying promising peptide-hormone mimics from the venom of king cobra, octopus, frogs, and after a recent lab excursion to Palau, any other weird marine organism they were able to find and manage to open!

Beyond her adeptness in the lab, Ho Yan has proven to be an integral lab member, always going above and beyond to facilitate lab dynamics and success. This is particularly evident in her pivotal and brave decision to accompany Helena in her lab's move from Copenhagen to Utah, and the impact that Ho Yan had on re-establishing the lab's work in a new location cannot be overstated. Helena is immensely happy that Ho Yan was able to come here with the lab's move, as is everybody else who has gotten to know her!

So, in acknowledgement of her hard work, dedication to research, and commitment to team work and collaboration, we congratulate Ho Yan as the recipient of the Eveline Bruenger award for Postdoctoral Excellence!

Left to right: Dana Carroll, Ho Yan Yeung, Helena Safavi, and Tyler Starr. Photo credit: Tim Formosa.

FIRST ANNUAL PACE MENTORING AWARD

Tyler Starr

The Pace Mentoring Award was recently established to recognize outstanding students, postdocs, staff, and research faculty in the department who exemplify our community's commitment to positive mentorship and learning in the lab. The first annual Pace Mentoring Award was presented to Dr. John McCullough from the Sundquist lab.

John first came to Utah as a postdoc in the Sundquist lab before staying on as research faculty, where he's proven to be an absolute linchpin not only to the Sundquist lab but across the entire department and even other labs across the country through his role in facilitating numerous aspects of the massive CHEETAH center grant. Many of us can speak to the clarity and efficiency with which John helps every single one of us, whether it's a new lab like my own getting set up for freezer alarms or a structural biologist optimizing some new protocol. If you're pointed to John for something, you can expect a quick and informative response, accurate implementation, and careful follow-up.

A particularly notable aspect of John's nomination described how he combines an immense attention to detail together with exceptional patience to enable learning and growth in his mentees. Although this first trait, attention to detail, is common to many scientists, patience is not always a defining trait for many of us. But despite its simplicity, patience is such a critical element of mentoring, where it is important to give time and space – together with structure and detail – to a mentee to facilitate their growth and learning. John's ability to wear 18 thousand different hats and yet still find the capacity to continue 'saying yes' while creating the time and space to build up those around him shows such selflessness and commitment to helping others grow in their roles. This makes him such a fitting recipient of this inaugural Pace Mentoring Award. Congratulations, John!

Left to right: Tyler Starr, John McCullough, and Wes Sundquist. Photo credit: Tim Formosa.

THE 2024 GRADUATE STUDENT RISING STARS SYMPOSIUM

Tyler Starr

The department held its 3rd annual "Graduate Student Rising Stars" symposium in May, 2024. This event builds off of the longer tradition of our department's Postdoctoral Rising Stars symposium. In both of these events, the Department of Biochemistry, in collaboration with other departments at the U of U, invites talented trainees to the department for scientific talks, networking, and professional development. For this year's Graduate Student Rising Stars symposium, we partnered with the Department of Nutrition and Integrative Physiology to invite ten incredible senior-level graduate students from across the country to share their research with our community. The resulting symposium featured fantastic talks spanning the fields of metabolism, protein structure, gene regulation, and immunology. Our symposium was held in parallel with the Department of Neurobiology's Rising Stars Symposium, with whom we held a joint Pace Keynote by Dr. Daniel Colón-Ramos from Yale University School of Medicine. The symposia also came together for joint coffee breaks, meals, and a wonderful evening celebration at the Red Butte Gardens, creating an energizing atmosphere crossing UU departments. Overall, the symposium was a great celebration of science, community, and collaboration.

For the second day of the Graduate Student Rising Stars event, our visitors participated in a series of career development workshops, including a group workshop on developing punchy "Elevator Pitch" descriptions of our work, and a workshop on figure design led by Dr. Janet Iwasa from the Department. Through these workshops, we hope to invest in the success of our Graduate Student Rising Star visitors while learning from their experiences. We finished the event with a lovely group dinner at the house of Dr. Matt Miller, where we continued to get to know our Rising Stars while relaxing to the sounds of Emigration Creek. The event ended with feelings of excitement and enrichment, and we look forward to continuing to build on the success of this event in 2025.

We would like to thank the entire Biochemistry community for contributing to this energizing event, with special thanks to Biochemistry postdocs Drs. Luis Cedeño-Rosario and Aldo García Guerrero for being the rock-solid "lead hosts" for our Rising Stars visitors, and Megan Hendrickson for administrative support,

2024 Rising Stars in Biochemistry and Metabolism:

- Annalise Bond, University of California, Santa Barbara (Meghan Morrissey lab)
- Kyle Flickinger, University of Wisconsin (Jason Cantor lab)
- Jennifer Gamarra, Columbia University (Rebecca Haeusler lab)
- Duc Huynh, Duke University (Mike Boyce lab)
- Heankel Lyons, University of Texas, Southwestern (Ben Sabari lab)
- Rebekah Nicholson, University of Utah (Scott Summers and Will Holland labs)
- Marissa Trujillo, University of Arizona (James Galligan lab)
- Gina Wade, University of Wisconsin (Judith Simcox [UU alum] lab)
- NyJaee Washington, University of Pittsburgh (Jon Boyle lab)
- Samantha Zepeda, University of Washington (David Veesler lab)

Graduate Student Rising Stars dinner held at Red Butte Gardens.

LEROY R. KUEHL 1931-2024

Dana Carroll

The Department of Biochemistry was saddened to learn of the death, on April 20, of Professor Emeritus LeRoy R. Kuehl.

LeRoy was a very popular teacher of first-year medical students in the years when the department offered a full-year course in Biochemistry. He made a point of learning the students' names and interacting with them in a very personal manner. In later years, he also taught Biochemistry in the Physician Assistant program.

When LeRoy was recruited to Utah in 1964 by then-chair Sid Velick, a shortage of space and start-up funds led to his sharing a lab with another Assistant Professor, Ollie Richards. Not surprisingly, they became fast friends and often went skiing together – two tall, thin figures on the slopes.

Much of LeRoy's research was focused on chromatin proteins, including histones and the protamines that replace them in mammalian sperm. A particular interest was the non-histone chromosomal proteins, and his identification of extended acidic amino acid sequences in these molecules may have foreshadowed the phase separation mediated by unstructured regions that is such a hot topic today. He retired in 1994.

LeRoy Kuehl teaching biochemistry (left) and celebrating his 92nd birthday (right).

We extend our sympathy and best wishes to LeRoy's wife, Barbara, and their extended family. A very nice obituary that features his love of international travel and the Utah out-of-doors can be found at the link below.

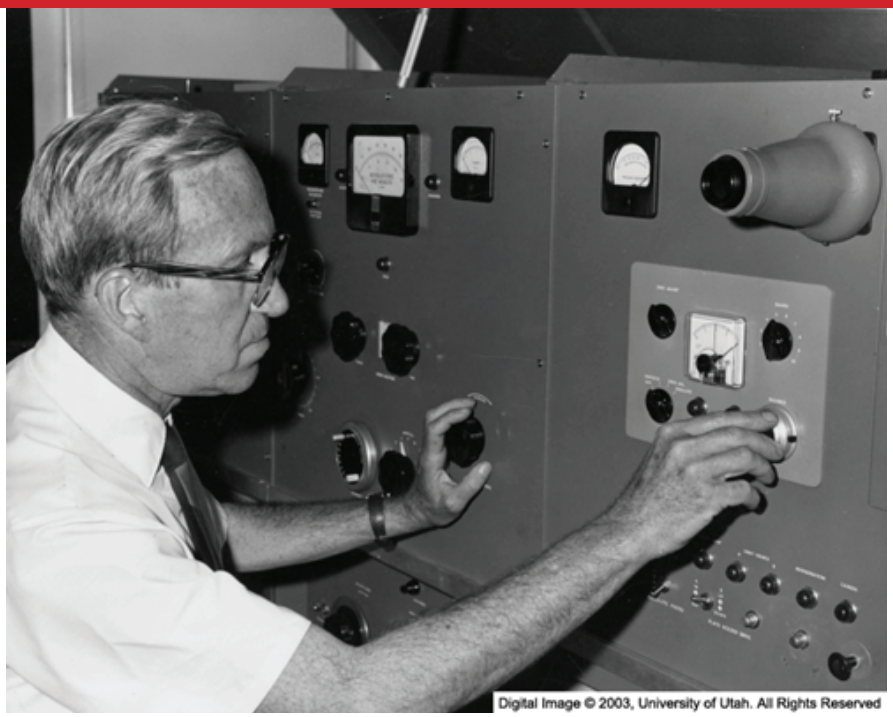
https://www.legacy.com/obituaries/name/leroy-kuehl-obituary?pid=206821254

A HISTORY OF THE BIOCHEMISTRY DEPARTMENT: PART 3 THE VELICK YEARS

Dana Carroll

Sid Velick initially thought he might have a career as a writer but discovered an affinity for science and graduated from Wayne State University with a degree in chemistry. He got his Ph.D. in biochemistry in 1938 at the University of Michigan for work on the metabolism of bile salts. As a postdoc at Johns Hopkins, Sid worked on metabolism in a malarial parasite and at Yale investigated the lipids of Agrobacterium (then called Phytomonas) tumefaciens. In 1945 he was recruited by Carl Cori, one of the world's most famous scientists at the time, to the Department of Biochemistry at the Washington University of St. Louis Medical School. There he switched his focus to proteins, including protein turnover and enzymology. It was during this period that he began to use fluorescence techniques in his research.

When Leo Samuels stepped down in 1964 after 20 years as Chair of Biochemistry, Sid was recruited as his successor. Upon arrival, he was told by the Medical School Administration that he would be provided only half the space and half the funding he had been promised. This meant that his first two faculty recruits – LeRoy Kuehl and Ollie Richards – had to share a lab. The department was also a bit spread out, and apparently there was little interaction among research groups, although there were regular poker nights involving some faculty and students.



Sidney F. Velick, 1913-2007
Valuable prize to anyone under the age of 50 who can identify the instrument he is operating.

At that time each basic science department was responsible for a year-long course for first-year medical students. As soon as he arrived, Sid insisted on giving all the lectures in the biochemistry course, so he would know what was being presented and how the course might be improved. The offerings for graduate students were rather meager, consisting of a year-long basic biochemistry course and special topics in areas of individual faculty interest. Sid maintained his research program at a modest level, with a focus on glyceraldehyde-3-phosphate dehydrogenase.

Several faculty members who preceded Sid to Utah had active research programs. Steve Kuby was a protein physical chemist, who claimed he never worked on a protein he couldn't crystallize. That was less a boast about his technique than a demand for a high level of purity so as not to waste good experiments on bad preps. Steve was also famous for asking questions in graduate student committee meetings. If anyone mentioned ATP, he would demand to know whether that was magnesium-ATP. Not an idle question, since not everyone understood that ATP is a metal chelator and high levels of the nucleotide could deplete the free Mg++ in the sample.

Hans Rilling was an outstanding lipid biochemist, who was particularly interested in prenyl transferase and polyprenyl compounds. He collaborated frequently with Dale Poulter and Bill Epstein in the Chemistry Department. Joe Goldstein was known to cite Hans's work in presentations on his own Nobel Prize-winning steroid research. Hans had a nice coda to his career when he independently discovered prenylation of proteins in 1989 while on sabbatical at the Jackson Lab in Bar Harbor, Maine. During that stay, he also acquired a new wife, Alison Baker, who subsequently wrote a book of short stories called "How I Came West and Why I Stayed."

Other faculty included Sherm Dickman, who had variable interests that included amino acyl-tRNA synthetases, ribonucleases, aconitase, and more. Fred Linker, who had a primary appointment in Pathology, was an excellent carbohydrate biochemist at a time when almost no one was interested in carbohydrates. He identified and isolated a number of enzymes of carbohydrate metablolism.

LeRoy Kuehl was interested in what goes on in the cell nucleus, including non-histone proteins and the possibility that the nucleus contains ribosomes that support protein synthesis. Floyd Sweat, who was also added to the faculty during Sid's reign, was interested in adenyl cyclase and the role of cAMP in glycolysis. Ollie Richards studied chloroplast DNA from Euglena, but in the 1980's he joined Ellie Ehrenfeld's lab as a senior scientist and became an important fixture in that group working on poliovirus.

Speaking of Ellie, she arrived in Utah in 1974 along with her husband, Don Summers, who was the new chair of the then Department of Microbiology. Ellie took a primary appointment in Biochemistry to avoid the appearance of nepotism while her lab space was adjacent to Don's in Microbiology. She was, and still is, a very productive poliovirus researcher. The level of activity in Biochemistry prior to her arrival was, by one report, "sleepy", and her presence definitely livened things up. (By the way, the Microbiology Department changed its name to Cellular, Viral and Molecular Biology in 1977, and then became Oncological Sciences when the Huntsman Cancer Institute was formed.)

When he reached the age of 65 in 1978, Sid Velick resigned the chairmanship and, being more interested in research than in administration, became a "postdoc" in Ray Gesteland's lab in Human Genetics. He began to work toward an understanding of celiac disease, from which he suffered. Later he did a second "postdoc" with John Roth in the Biology Department, where he helped the geneticists develop biochemical assays for NAD, etc. He earned the U's Distinguished Research Award in 1976 and was elected to the National Academy of Sciences in 1981, principally for his work on the physical biochemistry of enzymes using fluorescence methods.

Sid and his wife Bernadette were also active in the community. Their daughter suffered from serious mental illness, which both occupied their time and led to their co-founding the Utah Alliance for the Mentally Ill. They were also instrumental, along with Sherm Dickman, in the founding of the Chamber Music Society of Salt Lake City in 1966. This organization, which brings world-class musicians to Utah from all over the world, is still going strong (with me as a board member).

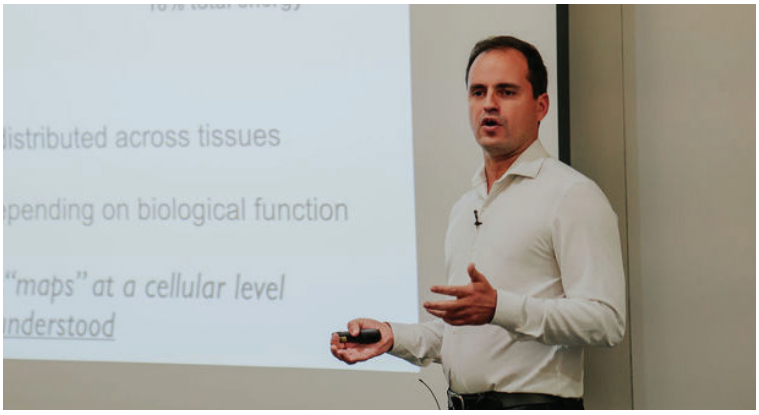
I remember Sid as a deeply thoughtful scientist and a genuine human being with a wry sense of humor. His focus was on the realities of science and the world, not the hype and the hullabaloo. His son Bill is a generous donor to our department.

Dana Carroll is Distinguished Professor Emeritus of Biochemistry and is one year older than the Department.

DANIEL COLÓN RAMOS GIVES A 2024 PACE LECTURE

Jim Heys (Dept of Neurobiology)

On May 21, Professor Daniel Colón Ramos, the Dorys McConnell Duberg Professor in the Department of Neuroscience and Department of Cell Biology at Yale University, School of Medicine, presented one of the two 2024 J.W., Wanda, Nick, and Sheryl Pace Distinguished Lectures to the University of Utah. In his lecture, Daniel presented a novel framework for understanding neural synapse development and plasticity, incorporating previously overlooked metabolic processes. Using the nematode C. elegans as a model system, Daniel presented a series of experiments that combined classical neural physiology, genetics, and biochemical approaches to reveal a key role for glycolytic proteins in regulating synaptic physiology. They discovered that during energy stress, glycolytic proteins, which are normally uniformly distributed across neural processes, gather into a punctate structure near synapses, forming a specialized glycolytic complex essential for the synaptic vesicle cycle and overall synaptic function. This glycolytic compartment, a liquid-like membraneless organelle, opens new avenues for exploring how local metabolic processes influence synaptic plasticity and function in vivo.



Daniel Colón Ramos presents the 2024 Pace Lecture.

VISHVA DIXIT PRESENTS A 2024 PACE LECTURE

Jared Rutter

On May 29, Dr. Vishva Dixit presented the other 2024 J.W., Wanda, Nick and Sheryl Pace Distinguished Lecture to the Department of Biochemistry and University of Utah colleagues. Dr. Dixit is currently a Senior Fellow and Vice President-Research at Genentech, but titles do not properly reflect his impact on biomedical research. His lab, first at the University of Michigan and then at Genentech, have made seminal discoveries about the regulation and initiation of apoptosis, as well as the control of immune activation and inflammation. For this work, he has been recognized by several international awards and election to the U.S. National Academy of Sciences in 2013. In his seminar, he described new and unpublished work that is sure to carry on this legacy of discovery. Specifically, he talked about the very surprising observations about the innate immune factor Gasdermin D and its role in LPS-induced inflammation, including how it is activated by caspase 11 cleavage to poke holes in membranes and induce pyroptosis and interleukin-1β secretion. In addition to his lecture, Dr. Dixit spent the day talking to department faculty, colleagues and trainees. We greatly appreciate his kind and wise approach to science and life. He had great insights regarding how to focus on the most important problems and to navigate the increasingly complex world of biomedical research.

Enjoying a celebratory post-lecture dinner are (left to right): Jared Rutter, Vishva Dixit, Wes Sundquist, Randy Peterson, Keren Hilgendorf, and Minna Roh-Johnson.

A NEW ERA FOR ACADEMIC BIOMEDICAL RESEARCH POWER IN PARTNERSHIP

Jared Rutter

I'm confident that every "experienced" person in any human situation thinks that the world is irreversibly changing from the "good old days". Most of us think that these changes are problematic. So, here we are again, and I am going to claim that the world of academic biomedical research is irreversibly changing. The costs of doing research are increasing at a somewhat alarming rate. Many of us are very enthusiastic about the fact that PhD student stipends and postdoctoral fellow salaries are increasing. These talented and passionate young scientists certainly deserve to earn a living wage. However, the size of the average NIH grant that funds an individual lab is not increasing, and hasn't substantially increased in the last twenty years. We can hope and advocate for increased federal funding for research, but it seems unlikely that there is an adequate solution coming from the government anytime soon. It is my personal opinion that this is not a temporary situation from which we will "recover"; I believe that this is the new normal. I also believe that the sky is not falling. In fact, I view this as something of an opportunity for us to do things differently, thrive, and have an even greater societal impact despite these challenging circumstances.

I could write pages and pages of commentary on the strategies that could be part of "doing things differently". This would include the observation that laboratories of 10-15 PhD students and postdocs are already rare and are going to attain unicorn status in the coming years. If a successfully funded laboratory has 4-5 people, how do we have the critical mass and unstoppable momentum that we all envision when we take a job as a faculty member and lab head? This will, at least partially, come from learning how to do more with less. I believe that those labs, departments and institutions that learn how to develop synergistic research efforts will be those that thrive in the coming decades. Think of the power of several labs bringing their complementary expertises together to tackle a biomedically important problem, and do so across the disciplinary spectrum, from biochemistry and cell biology to disease physiology and to clinical

Biochemistry trainees and faculty interacted with industry leaders during the 2023 Biochemistry Department retreat. Left: Mike Grey, right, Marion Dorsch. Photo credit: Rachel Merrill.

medicine. Another component of "doing things differently" should also include more effectively interacting with the private sector, and this is the focus of the essay you are reading.

I have recently been appointed as the Director of Commercialization and Industry Relations for the Department of Biochemistry. I was happy to take on this role because I believe deeply that private sector relations will be one of the factors that differentiates success from failure for departments like ours. To be clear, the Department of Biochemistry at the University of Utah is a basic science department. The majority of scientists working in the department are focused on answering questions about how proteins, cells and organisms work, and how that goes awry in disease. Although there are notable exceptions, most of us are not primarily focused on diagnosing, treating or curing disease. At the same time, however, most of us are also doing work that has significant implications for human disease. One of my tasks in my new role is to help all of us to recognize and then seize the opportunities that we have to translate our research for the ultimate benefit of patients. In the vast majority of cases, this will involve connections with the private sector. Therefore, we have taken several steps to try to develop the relationships that can help us to move our work forward. The expectation is that taking such a path toward clinical impact will have profoundly positive consequences on our academic research laboratories by opening new funding and collaboration opportunities. More importantly, it will also enable us to contribute to the creation of new knowledge-based therapeutic approaches that improve human lives. While being basic scientists, many of us have a burning desire that our work will build toward improving the human condition. I will discuss a few of the activities that we have arranged or supported over the last year.

On May 29, Dr. Vishva Dixit presented one of the 2024 J.W., Wanda, Nick and Sheryl Pace Distinguished Lectures. In addition to wonderful science (see previous page), Dr. Dixit also inspired us to better in navigating the interface of academia and industry to do impactful basic science while also developing therapies that impact patients.

In a similar vein, our departmental retreat last fall was like no previous one. We invited leaders from the private sector to attend the retreat, interact with faculty and trainees, and hold a panel discussion describing their experiences and the opportunities they see for us. The guests included Brandon Probst (Recursion), Kate Lansu (Eli Lilly), Leo Lin (ARUP), Marion Dorsch (Atavistik Bio), Mike Grey (Biotech Entrepreneur), and Leah Frautschy (Denali). The feedback on this experiment was universally positive. We all enjoyed and benefitted from meeting these insightful leaders, and appreciate them taking time out of their busy lives to spend with us. We hope this is the first of many such interactions.

In January 2024, I hosted a visit from Tim Kutzkey, Managing Partner at The Column Group (TCG), which is an industry leading therapeutics-focused venture capital group. Tim has had an illustrious career of starting and leading companies that have changed biotechnology. I had the great pleasure of working with Tim and others from academia and TCG to found Atavistik Bio. This experience and others since have convinced me that Tim is an unusually insightful and creative scientist and leader. It was clear that the University of Utah community could benefit from that insight. During his visit, Tim met with students and faculty. He also gave a stimulating seminar, in which he described the innovative science behind two of his companies that are rapidly moving toward clinical impact, sometimes after many twists and turns. Tim's visit led to the idea of TCG working with the University of Utah to augment the therapeutics company landscape in the Salt Lake City area. Jim Hotaling, in his role as Associate Vice President for Research Innovation and Translation, worked closely with us to host a pitch competition, focused around commercializing therapeutics concepts, that was led by the TCG investment team. They received ~50 applications and selected 10 of them for in-person pitches to the TCG team at the University of Utah. This event has led to ongoing conversations that could have substantial impact on the translation of University of Utah science. Returning to the theme with which I started this essay, it also has led to at least one academic lab receiving substantial funding to pursue their innovative research. We anticipate this is just the beginning of cascading positive outcomes.

These are just a few of the activities that we hope are building the culture and relationships that will enable labs and scientists in the Department of Biochemistry to synergize more effectively with the private sector. This effort is ongoing and will take many forms in the future. We hope to engage our current and future trainees in this effort, including the possibility of PhD training that is optimized for scientists and leaders in biotechnology. In fact, our focus in this area dovetails beautifully with the Life Science Initiative announced by President Randall and discussed by Wes Sundquist in our last departmental Newsletter, which is focused on training a life science workforce for the burgeoning life science sector in Utah. There is no one way to "do things differently", but I am convinced that working ever more effectively across disciplines and across the public-private interface is a key component of our strategy.

Industry leaders talked about their work and shared tips during a panel discussion at the 2023 Biochemistry Retreat at Deer Valley. Left to right: Leah Frautschy, Mike Grey, Kate Lansu, Leo Lin and Brandon Probst. Photo credit: Rachel Merrill.

KEREN HILGENDORF PRESENTS AT VITAE 2024

Keren Hilgendorf

I recently had the honor of presenting at Vitae 2024, an annual symposium featuring junior faculty across all University of Utah Health departments. It was truly inspiring to share the stage with so many talented new faculty and learn about their diverse journeys and amazing science. From suicide prevention to elucidating the underlying genetics of stillbirths, researchers from across the globe are performing cutting-edge, important science here at the University of Utah.

My own scientific journey started as an undergraduate at the University of Texas at Austin, where I first learned about scientific research as a profession and where I had my first research experience in a biomedical laboratory. I then moved across the country to pursue my graduate work at MIT with Dr. Jackie Lees. During my PhD, I discovered a novel function of a commonly deregulated tumor suppressor, the retinoblastoma protein, in triggering cell death. This experience was instrumental in my scientific development because it unveiled my fascination with inter- and intracellular signaling, how information is transmitted from one cell to another, and how this information is transferred within the cell from the cell surface to different cellular compartments to elicit the appropriate response. I decided to once again move across the country, this time to Stanford University to pursue my postdoctoral training with Dr. Peter Jackson, a scientific leader in an antenna-like signaling organelle called the primary cilium. During my postdoctoral training, I discovered that fat stem cells and muscle stem cells express this cellular antenna, and that this ciliary antenna is required for stem cells to sense extracellular signals and make more fat cells and muscle cells in adult mice. Building on these discoveries, I now lead my own research laboratory in the Department of Biochemistry since the fall of 2020, studying how obesity changes the signaling network within our body and how this causes diseases such as type 2 diabetes and breast cancer.

Globally, 50% of adults are obese or overweight, and in the USA, this number has reached 70%. Unfortunately, obesity is linked to a long list of diseases, ranging from depression to cardiovascular disease, to type 2 diabetes, and to several types of cancer. Obesity is defined as an expansion of fat tissue due to caloric imbalance between consumption and utilization, and my lab is studying how obesity changes the signaling landscape within the expanded fat tissue to lead to type 2 diabetes and breast cancer. We recently discovered that fat stem cells in obese fat tissue do not have functioning ciliary antenna, which we previously showed prevents these stem cells from making more fat cells. This may explain why individuals with obesity do not have sufficient fat cells to store excess calories appropriately, which results in fat tissue inflammation and loss of insulin sensitivity. We are also investigating which extracellular signals that regulate fat stem cell activation are lost in obese fat tissue, and how this contributes to diabetes. In addition, my lab is studying how obesity predisposes to breast cancer. Studies have shown that obesity is linked to a 30-50% increase in post-menopausal breast cancer. Breast cancer cells are surrounded by the expanded fat tissue in obesity, and my lab is studying how obesity changes the reciprocal communication between cancer cells and the surrounding fat tissue. We are starting to identify targetable secreted factors, which we hope will one day lead to the treatment of obesity-accelerated breast cancer. Above all, I feel privileged to mentor a new generation of scientists in my lab, whose scientific curiosity and endless enthusiasm inspire me every day to keep exploring.

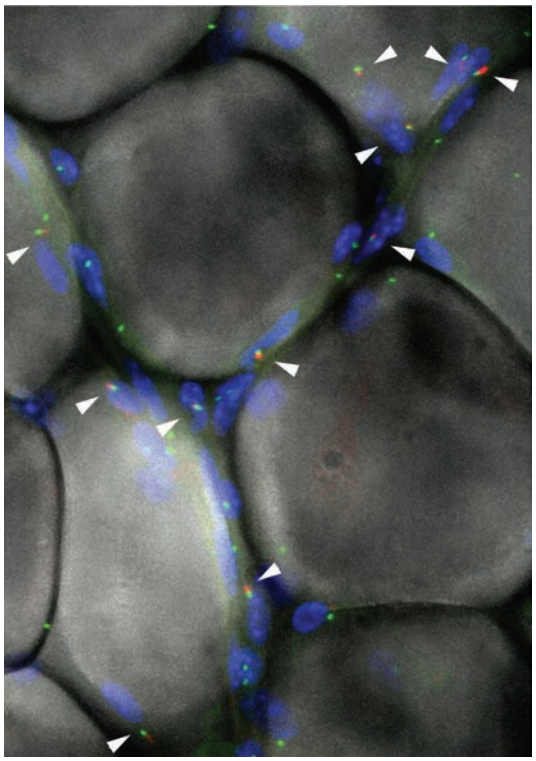
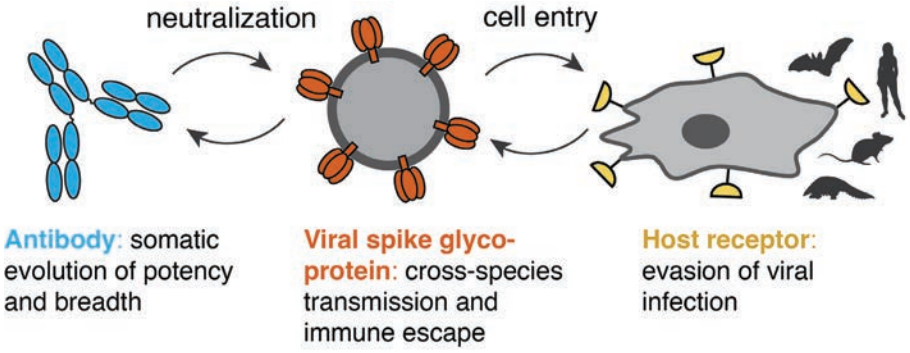


Image of mouse fat tissue showing ciliated fat stem cells (white arrows) dotted along the vasculature. Nuclei in blue, centrosomes in green, ciliary antenna emerging from centrosome in red, phase image showing lipid-laden fat cells in grey.

TYLER STARR NAMED 2024 SEARLE SCHOLAR

Many viruses that currently circulate in humans and make us sick trace their origins to wild animals, with recent "spillovers" from these wild animal reservoirs driving human epidemics like COVID-19. The frequency, magnitude, and cost of these spillover events is projected to continue increasing into the future. It is therefore critical to understand the processes by which wild animal viruses evolve the capacity to infect and spread in humans, and correspondingly, how we can develop monoclonal antibody drugs and vaccines with prospective breadth of coverage against the range of viruses that might seed these future epidemics. Tyler Starr's lab studies the molecular evolution of viruses and antibodies, and in his recent Searle Scholars award, Tyler's group is approaching these questions of viral spillover.



The Starr lab studies protein evolution at the host-virus interface.

Tyler's research program centers on high-throughput experimental measurements of protein function to study the molecular evolutionary forces at the host-virus interface. This work focuses largely on the viral spike glycoproteins that decorate membrane-enveloped viruses. These spike proteins bind to specific receptor ligands on host target cells to enable cellular infection. These viral spikes are also the dominant target of host neutralizing antibodies, which bind to this spike and block receptor interaction or entry. Because of these strong and focused selective pressures, these viral spikes are often the most variable portion of a viral genome, and they drive counteracting variation in the antibodies and host receptors with which they interact. Tyler's lab performs high-throughput measurements of the impacts of mutations on these interactions between viral spikes, host

receptors, and immune antibodies, querying how the large space of possible mutations in each of these proteins constrains and enables their evolutionary trajectories toward interesting outcomes.

In his Searle Scholars award, Tyler proposes to use this molecular evolutionary framework to study the origins of epidemic and pandemic coronaviruses like SARS-CoV-2 and MERS-CoV from a broader set of related viruses found primarily in bats across the world. In the first part his award proposal, Tyler's group will uncover the molecular evolutionary forces that drive the animal relatives of SARS-CoV-2 and MERS-CoV to acquire the latent capacity to bind the human versions of the receptors that they naturally engage in their wild animal hosts. In the second part of this project, his group will characterize and engineer monoclonal antibodies with corresponding breadth of protection against these diverse bat coronaviruses that could cause future spillovers. Through the two arms of this work, Tyler's group hopes to inform ongoing efforts to predict the trajectories of future viral spillovers and pre-emptively design therapeutics to respond to such events.

For more details, check out more descriptions of the Starr lab's research (including a short outreach video!) at https://starr.biochem.utah.edu/research

STAFF HIGHLIGHT: MEET LAUREN DROUBAY

Lauren with Milo (left) and traveling with a friend (right).

As a child, Lauren Droubay lived in a variety of places. Born in Germany to an Airforce family, she lived in Hawaii and Virginia before moving to Utah for high school. Her time in Virginia gave her an appreciation of American history and a love of visiting historical sites and museums.

While at Utah Valley University, Lauren studied anthropology and graduated 2021. Before joining the Biochemistry Department, Lauren worked for the United Way where she "wore a lot of hats" and was involved in organizing events and participating in diverse programs.

For the last year, Lauren has enjoyed working with Amity Mower on different aspects of data management, onboarding, and program management. She has appreciated the opportunity to learn more about how academia works, and the challenge of coordinating work around the ebbs and flows of the academic calendar.

Lauren has many diverse interests outside of work. She is a writer of fiction, and is currently working on two books. She says that she hopes to be able to publish her books someday, but for now she is just enjoying the process of writing and participating in a monthly writers group. She is also training her Aussidoodle, Milo, to be become a certified therapy dog, allowing him to accompany Lauren on volunteer visits to hospitals, schools, and nursing homes. Lauren also enjoys traveling, and recently returned from a trip to Wales, Ireland, and Scotland.

FACULTY HIGHLIGHT: MEET AMY BARRIOS

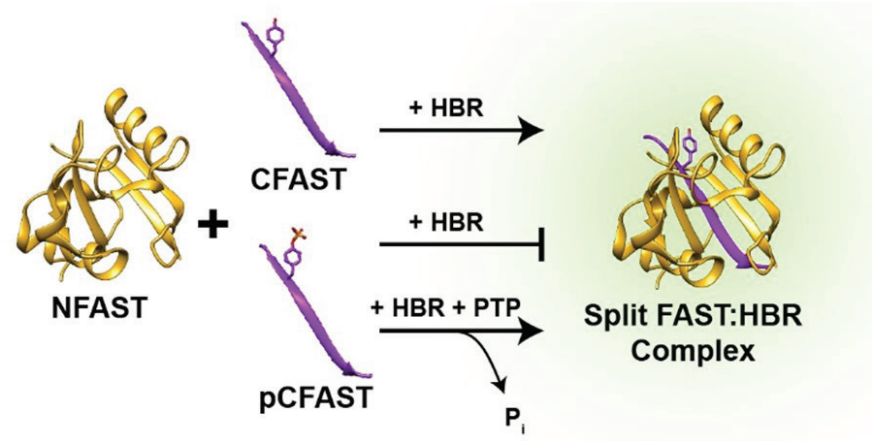
Amy (center front) with her family.

Amy Barrios, the newest faculty member in Biochemistry, is perhaps our only Salt Lake City native. Inspired at a young age by her grandfather, a chemical engineer who helped develop solid rocket fuel for the space shuttle and sponsored her first membership in the AAAS, Amy's interest in chemistry grew while she was a student at Highland High School. She loved the AP Chemistry labs and summer programs at the U, so it was an easy decision to accept a full-ride scholarship from the Department of Chemistry. As an undergraduate at the U, she worked in the Department of Radiobiology synthesizing chelators that would bind to plutonium and other radioactive metal ions and remove them from the body.

In graduate school at MIT, Amy's interest in understanding the roles of metal ions in biology grew and she joined Steve Lippard's lab studying metalloenzymes and functional synthetic metalloenzyme model complexes. Her dinuclear nickel complexes were the first to hydrolyze urea and served as a functional model for the enzyme urease. During her time at MIT, she lived in a dorm as a residential advisor where her main job was to hold "study breaks" and use treats to entice the students to come out of their rooms. The students were a lot of fun to interact with and always coming up with ambitious side projects. One year, after the first snowfall in Boston, she found a snowman outside of her door inside the dorm. Towards the end of graduate school, after having worked on enzymatic mechanisms without working on actual proteins, Amy decided to pursue protein design and engineering for her postdoc.

Amy spent the next three years in Northern California, where she worked in Charly Craik's lab at UCSF to develop methods to understand the substrate specificity of protease enzymes. At the conclusion of her postdoc, she accepted a faculty position in the Department of Chemistry at the University of Southern California, where she was awarded a Gabilan Assistant Professorship and began to build her own independent research program centered around developing chemical tools to study protein phosphatase biology. Although she enjoyed being part of the Trojan Family at USC, she was interested in moving her lab into a biomedically focused environment and decided to join the Medicinal Chemistry Department at the U.

As a faculty member in the Department of Medicinal Chemistry for the past 17 years, Amy has enjoyed working in an inherently interdisciplinary environment, being a part of the Health Sciences, and biomedical teaching. Academic service has also been a major focus. Amy was co-director of the Women in Health, Medicine, and Science



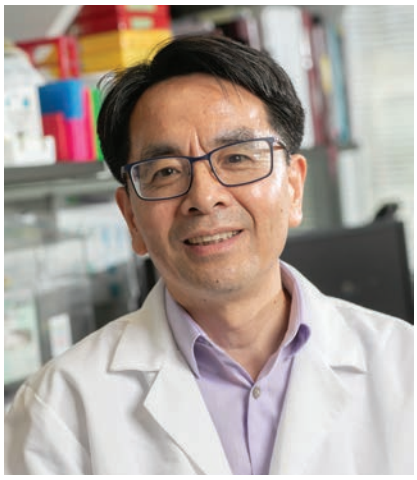
The Fluorescence-Activating and absorption Shifting Tag (FAST) can be split into an N-terminal protein and a C-terminal peptide that come together in the presence of a small molecule dye (HBR) to form a fluorescent ternary complex. If the tyrosine residue of the C-terminal peptide is phosphorylated, the fluorescent complex cannot be formed. Tyrosine phosphatase mediated dephosphorylation restores the fluorescence and the system provides a sensitive readout of tyrosine phosphatase activity.

(WiHMS) for 5 years, working to build an inclusive and supportive environment for women across the Health Sciences Campus. She is currently serving as the Associate Dean for Postdoctoral Affairs and loves working with people throughout the University to advocate for postdocs and enhance postdoctoral training across campus. Coming full circle from her early days, she was honored with a Distinguished Alumni Award from the Department of Chemistry last fall and was elected a Fellow of the AAAS in the spring.

Outside of the lab, Amy enjoys hiking, cooking, and traveling with her family, including kids Abby (18, and just starting at the U this fall), Spencer (16), and David (10). They enjoyed a trip to Europe this summer including a visit to Paris before the Olympics and a point to point hiking trip in the Swiss Alps.

ALUMNUS HIGHLIGHT: MEET ZHIGUO ZHANG

Born to a farming family in a rural village in South Central China, Zhiguo Zhang excelled in school as a child. Initially planning on attending a school that would allow him to become an elementary school teacher after graduation from middle school, his middle school teacher convinced Zhiguo's parents that he should attend a competitive high school far from home with the goal to get into a college. Although the high school experience was stressful, he enjoyed his science classes, particularly physics and chemistry, and it paved the way for him to attend a university.

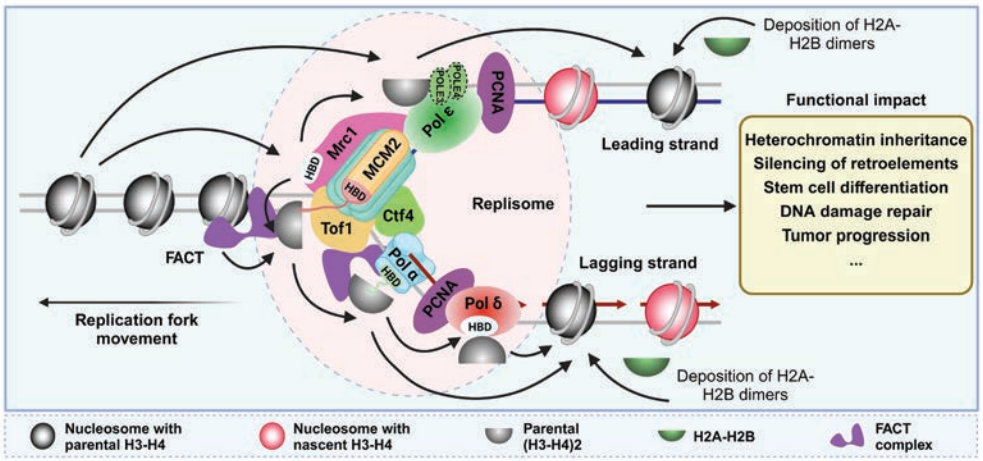


Zhiguo Zhang

At the National University of Defense Technology in Changsha, Zhiguo learned chemistry and began preparations to become a teacher in military colleges after graduation. However, by the time he graduated, China had started major reductions to the number of military personnel, and many of his classmates found jobs in non-military posts. His good grades earned him a recommendation to go to graduate school, and in 1989 he began his graduate career at the Dalian Institute of Chemical Physics. His project focused on discovering inorganic catalysts converting methane to methanol. The large-scale student protests in China in 1989 left Zhiguo disillusioned, leading him to consider attending a graduate school in the U.S. After studying and taking the TOEFL and GRE, he applied to many graduate programs, but only received one offer, from the Chemistry Department at Texas Christian University (Fort Worth, TX). Even though he was about to graduate from the Dalian Institute with a PhD, he decided to leave for TCU in 1993. Upon arrival at TCU, Zhiguo passed a series of exams that allowed him to test out of chemistry courses that other first-year graduate students were required to take. As a result, Zhiguo had extra time to "wander around" and ended up sitting in on a biochemistry course for pre-med students. Realizing that "biochemistry is more interesting than chemistry," he decided to change directions and pursue a degree in biochemistry rather than chemistry. After applying for programs across the US, he received one offer -- this time from the University of Utah.

Arriving in Salt Lake City in 1994, Zhiguo completed rotations with Marty Rechsteiner, Dana Carroll, and Darrell Davis. In the Rechsteiner lab, Zhiguo focused on the 11S regulator of the proteasome, which stimulates the enzymatic activity of the proteasome for the generation of peptides for MHC class I molecules. In the years spent working on characterizing dozens of site-specific mutants of 11S REG, Zhiguo discovered a love of American football, and would watch almost every game on Sunday. He recalls living in University Village, and the long walks he would take in the winter to avoid driving to lab in the snow. Zhiguo completed his PhD in less than four years after publishing 3 first-author papers, and decided to head to the east coast for a postdoc with Bruce Stillman at Cold Spring Harbor Lab.

The first six months in the Stillman lab did not go well. Utilizing the SV40 DNA replication system, Zhiguo's first project aimed at understanding mechanisms of epigenetic inheritance using biochemical approaches. He worked "day and night" without much success. When Bruce suggested addressing the question using budding yeast, Zhiguo hesitated initially since it seemed that learning yeast genetics was "too complicated." Feeling as though he had no choice, however, he learned "yeast things" and was delighted when the project took off.



The Zhang lab developed "eSPAN" technology which can measure the relative distribution of parental histones to the leading and lagging strands of DNA replication forks in vivo. Using this approach, they established that most parental H3-H4 tetramers are transferred equally to the leading and lagging strands, and identified key factors that direct parental histone transfer to either the leading or lagging strand.

In six months, he found three mutants in PCNA, which is essential for DNA replication and DNA repair, that impacted epigenetic inheritance. This resulted in a Nature paper that was published in 2000.

After a couple of additional years in the Stillman lab, Zhiguo left for the Mayo Clinic (Rochester, MN) to set up his own lab in early 2003. His lab struggled in its early years to get funding, but his small lab of three people eventually made an important discovery -- they found a unique histone acetyltransferase, Rtt109, which acetylates histone H3 lysine 56 and they described the function of this modification in the regulation of nucleosome assembly of newly synthesized H3-H4. Over the course of his 13 years at the Mayo clinic, the Zhang lab grew and expanded its research into onco-histone mutations found in pediatric brain tumors and chondroblastoma. His laboratory has also pioneered a method called eSPAN which enables the study parental histone transfer. Parental histones contain epigenetic modifications, which must be copied onto newly synthesized histones to maintain chromatin structures and gene expression states. However, the process by which parental histones are transferred onto replicating DNA strands following DNA replication was unknown. A series of studies from his laboratory have uncovered mechanistic insights into this previously intractable process critical for epigenetic inheritance. In 2016, Zhiguo moved to the Irving Medical Center at Columbia University, where his lab continues research on epigenetic inheritance and cancer epigenetics.

In his free time, Zhiguo loves playing badminton, and can often be found at the local community center on weekends where he plays doubles. Towards the end of his graduate studies in Utah, Rechsteiner lab mates took Zhiguo skiing, which he now loves despite the fact that he's "not good." Since taking up skiing on the east coast, he regrets not having learned to ski earlier during his time in SLC. Zhiguo also enjoys spending time with his family, including his wife, Hui, and son Ray, who was born in Utah and is currently a MD-PhD student at Penn State.

Zhiguo enjoys playing badminton at the local community center.

HONORS, GRADUATIONS, AND TRANSITIONS

MAJOR FACULTY AWARDS & RECOGNITIONS

Keren Hilgendorf was selected as a featured speaker at the UU HSC Vitae Event "celebrating six rising-star faculty who are on the forefront of their professions".

Tyler Starr was named a 2024 Searle Scholar, as an "exceptional young faculty in the biomedical sciences and chemistry". Tyler is the 11th Searle or Pew awardee from our department.

John McCullough received the University of Utah Department of Biochemistry Pace Mentoring Award as "an exceptional mentor to another member in the lab or department".

Minna Roh-Johnson was promoted to Associate Professor with tenure as of July 1, 2024.

Peter Shen was promoted to Associate Professor with tenure as of July 1, 2024.

Minna Roh-Johnson was selected to receive the WICB Junior Award for Research Excellence from the American Society for Cell Biology for "making exceptional scientific contributions to cell biology".

Janet Iwasa was appointed Director of the award-winning Genetic Science Learning Center (while retaining her appointment in our department).

Wes Sundquist was selected to receive the 2024 Horwitz Prize from Columbia University for "groundbreaking work in medical science".

MAJOR GRADUATE STUDENT & POSTDOC AWARDS

Mark Lee (Hilgendorf Lab) was awarded an F31 fellowship.

Sangeetha Balasubramaniam (Hughes lab)was awarded the Utah Graduate Research Fellowship.

Undergraduate researcher **Austin Bender** (Ducker lab) was selected to present at the 2024 Honors College Awards Night.

Nathan Patchen (Liu lab) was awarded the Goldwater Scholarship for 2024-2025.

Shai-anne Nalder (Sigala lab) received a Native Excellence at the U Award.

Sara Wong (Hughes lab) was awarded a 3rd year on her cardiovascular T32 award.

Julio Fierro (Roh-Johnson lab) was selected as a recipient for the John Weis travel award and the Marge Gunn award.

Ahmed Abouelghar (Miller lab) was awarded both the Dickman Graduate Student Travel Award and the John Weis Memorial Graduate Student Award.

Michael Stewart (Miller lab) was a co-awardee of the Marjorie Riches Gunn Award for Excellence.

Abby Jackson (Hilgendorf lab) was awarded a slot on the T32 Cancer training grant

Aaron Ferrell (Shen lab) received an NIH F31 fellowship.

Ashish Toshniwal (Rutter lab) was awarded an AHA postdoctoral fellowship.

David Tafoya (Starr lab) was awarded a slot on the Molecular Pathogenesis Training Grant.

Daniel Greiner (Roh-Johnson lab) was awarded the Melanoma Center Trainee Award from the Huntsman Cancer Institute.

Grant Schaluderaff (Liu lab) was awarded a T32 Genetics Training Grant.

GRADUATIONS & TRANSITIONS

Ahmad Cluntun (Rutter lab) started a new faculty position at Rutgers University

Kevin Hicks (Rutter lab) started a new faculty position at UU in the Department of Nutrition & Integrative Physiology

Taylor Stevens (Roh-Johnson lab) was accepted to graduate school at WSU.

Margot Riggi (Iwasa lab) started a new faculty position at the Max Planck Institute of Biochemistry in Martinsried, Germany.

Hayden Low (Ducker lab) departed for Medical School at Kaiser Permanente School of Medicine in Pasadena, CA.

Yongxiang Zhao (Cao lab) started his own lab at the Wuhan Institute of Physics and Mathematics of the Chinese Academy of Sciences in Wuhan, China.

Mark Paine (Sundquist lab) started dental school at USC.

Zach Wilson (Hughes lab) will be starting a new faculty position at Pitzer/Scripps in the Claremont Colleges consortium.

The following students completed their degrees since the last publication of the newsletter in Fall/Winter 2023-2024: Tanya Espino-Sanchez (Sigala lab), Claudia Consalvo (Bass lab), Amanda Mixon Blackwell (Sigala lab), Jennifer Madrigal (Hill lab), Nidhi Raghuram (Hughes lab), Paul Spaltenstein (Kay lab), Daniel Greiner (Roh-Johnson lab), and Jesse Velasco-Silva (Ducker lab).

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Photos from the 2024 Biochemistry Picnic. Credit: Tim Formosa