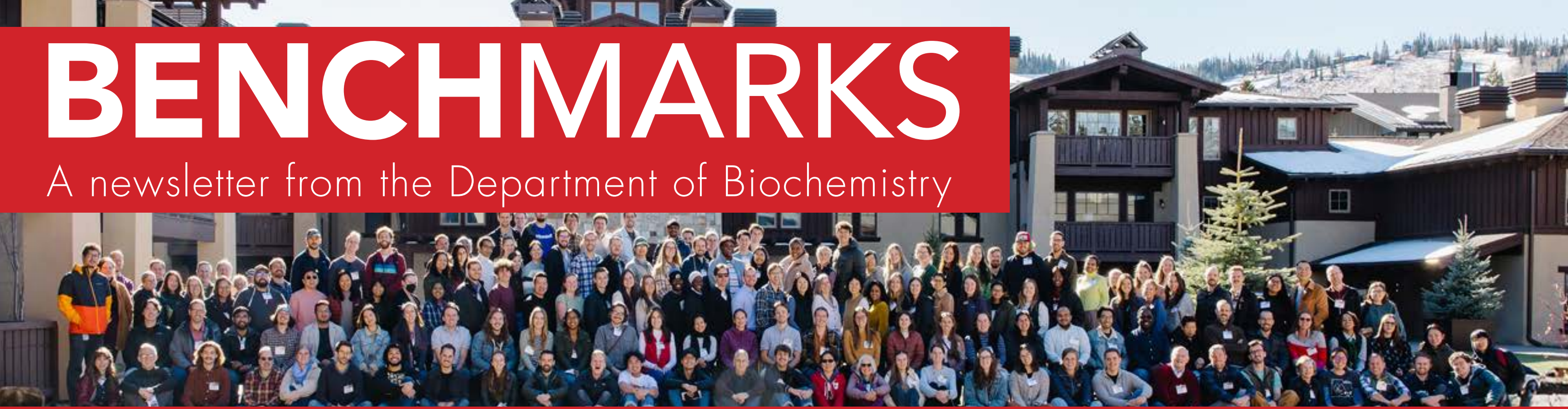
BENCHMARKS

A newsletter from the Department of Biochemistry



Fall 2025

YOU WERE VERY LUCKY Chair's Message from Wes Sundquist

This year's successful launch of the HIV prevention drug Lenacapavir by Gilead Sciences has provided me with new experiences beyond my normal comfort zone. One of those was a call from the New York Times asking me if I would write an essay on my personal experiences as a researcher and advocate for basic research and HIV prevention. I was flattered and worked hard on the essay, submitted it on time, and then received an email rejection ("You are a good writer and this is a very compelling story, but it's still a ways away from an argued opinion essay. Without a firmer news peg that would help structure the essay, I think it might be tough to make it work for us."). This is far from my first journal rejection, but since I found myself with a completed essay and an impending Newsletter deadline I've decided to "self-publish" it as my Fall Chair's message. I hope you enjoy it more than the Times did!

"You Were Very Lucky"
Reflections on the Road Toward Preventing HIV Transmission

I am a basic scientist. My colleagues and I try to understand how fundamental cellular processes work at the atomic level. We do that because it's fascinating to learn how nature has evolved the elegant little machines that perform nearly every important function in our cells. We also do it because drugs and other medicines act through molecular interactions with their biological targets, which means that our chances of identifying effective new drug targets and impactful new therapeutic strategies greatly improve as we determine the detailed shapes and functions of the molecules of life. We always build on advances from others, but our most interesting problems are cases in which we truly don't understand how something works, and therefore can't know in advance what we might discover or its ultimate impact on medicine. I've lived this all first-hand because my colleagues and I characterized a novel HIV structure that formed the basis for the development of a new drug called Lenacapvir (LEN) by Gilead Sciences. A single injection of LEN protects at risk individuals from becoming infected by HIV for six months (an approach called Pre-exposure Prophylaxis, or PrEP). This is important because 1.3 million people worldwide are still infected annually with HIV, and there are good reasons to believe that LEN will have a major impact in helping to end the worldwide AIDS epidemic. It's the dream of every basic scientist to have their work translated into products or medicines that improve human health, and it has been very satisfying for me to watch the success of LEN.

I started my independent lab at the University of Utah in early 1992, which was the height of the US HIV/AIDS epidemic. Magic Johnson had just announced that he was HIV positive, Americans were dying of AIDS in ever increasing numbers, and there were no effective therapies for HIV/AIDS. Fortunately, researchers had identified the Human Immunodeficiency Virus nearly a decade earlier so we knew the foe that had to be overcome, and leading labs and drug companies were already making significant progress in developing what would ultimately become the first miracle drug cocktails that targeted the viral enzymes and converted HIV from a death sentence into a chronic health challenge. It seemed like a bad idea for a newly minted assistant professor to jump into that fray, but I've always been intrigued by understanding how proteins assemble into functional structures so we decided instead to study how the virus forms a particle that can leave an infected cell and then go on to infect other cells.

Integral to that process is the virus' most iconic structure - the cone-shaped central capsid - a container that surrounds the viral genome and somehow assumes the shape of an ice cream cone. We found it fascinating to envision how this conical HIV capsid could be constructed from identical repeating units of the same protein building block and my scientific partner, Chris Hill, our dedicated collaborators and trainees, and I discussed the problem obsessively. Several of our experiments, together with studies from materials science, converged to indicate that the HIV capsids belonged to a class of geometric objects called fullerene cones, named for Buckminster Fuller, the architect who elucidated the relevant principles as he invented the geodesic dome. To make a fullerene cone, hexameric and pentameric protein building blocks must interlock like puzzle pieces, following the same basic assembly principles as the black and white panels that cover old fashioned soccer balls.

Our lab, and others, also made the unexpected and ultimately pivotal discovery that even very small changes to the capsid killed the virus. Although we had initially viewed the capsid as an inert container, our experiments indicated that it was instead both fragile and dynamic, and that it played critical roles at many different stages of viral replication. Those properties suggested that it might make an attractive drug target. That work took us about a decade to complete (1994-2004), and it was continuously funded by the National Institutes of Health (NIH). I point that out because competitive but ultimately reliable NIH funding was absolutely essential for tackling this challenging problem, and because such funding is now at risk owing to recent proposals to cut or restrict the resources that NIH provides for basic discovery science.

In 2005, we were contacted by Tomas Cihlar, Senior Vice President for Virology at Gilead Sciences, a leading HIV drug company. He had read our papers and was intrigued by the idea of developing a drug to target the HIV capsid. He visited our lab, became even more excited about capsid as a drug target, and was able to convince his colleagues at Gilead to initiate a capsid inhibitor program. I was a program consultant and I think it's fair to say that Gilead would not have proceeded without the curiosity-driven, publicly-funded research first done in our lab. Advances made by other academic and industrial labs also helped drug development. However, a small academic lab like ours had neither the expertise nor the massive resources required to develop an entirely new class of drug and all of the creation, optimization, formulation, and drug testing was done at Gilead. That required heroic efforts by scientists with expertise in drug development like Steve Yant, who led their inhibitor screening efforts, John Link, who led their medicinal chemistry efforts, and many others. It also couldn't have happened without a tremendous investment by Gilead, who funded their program for more than a decade (2006-2016) before they created the very potent inhibitor that ultimately became LEN. It then took them another six years of clinical testing before Lenacapavir was approved for use in individuals living with HIV (2022), and another three years of PrEP testing before the drug was approved for preventing HIV transmission this past June – more than 30 years after we started working on the HIV capsid. One of the impressive aspects of Gilead's large clinical trials in South Africa and Uganda was the involvement of community advocacy groups who pushed for the inclusion of teenage girls and pregnant women, which complicated the trials but helped to ensure that these critical target groups, including unborn babies, would now benefit from the drug.

As a lab scientist used to spending most of his time trouble shooting failed experiments, my range of experiences has expanded dramatically owing to the success of LEN. This summer, I had a deeply moving conversation with a woman who found her way into our locked building on a holiday to relay how her husband of 30 years, a hemophiliac, had become infected with HIV while serving a Mormon mission in Africa, and to tell me how grateful she is that the drug will help her to finish raising their family without becoming infected. Not to mention how amused our kids were to see Tomas and me in a rented tux stroll down the red carpet at the 2025 TIMES100 Most Influential People gala, right behind Snoop Dogg. I was also honored to share the 2025 Bhaumik Breakthrough of the Year Prize with Moupali Das, Executive Director for Clinical Research at Gilead Sciences, and Yvette Raphael, co-founder of the South African Advocacy for Prevention of HIV and AIDS (APHA) organization. I am grateful that Science magazine chose us to represent three of the key components and the many others who contributed along the "bench to bedside to community" drug development pipeline.

The Bhaumik ceremony included a public magazine signing, where I scrambled to keep scrawling my name next to the elegant flourishes from Yvette and Moupali. Two of our visitors were particularly noteworthy. One spilled a glass of wine on Moupali's beautiful dress during what she called the fog of war. The other said to me, rather uncharitably, "You were very lucky". He's right. We were fortunate to work in a wonderful research environment and that our observations coalesced to reveal the capsid structure and its importance. We were also lucky that the capsid defied conventional wisdom and turned out to be an unexpectedly good drug target, that Tomas and his Gilead colleagues had the vision and talent to develop a capsid inhibitor, that LEN has amazing potency and longevity, that Gilead scientists realized that these properties were ideal for PrEP applications, and that Gilead and community advocacy groups worked so well together to test the drug effectively in the communities who need it most. But that string of lucky breaks belies the more fundamental truth that basic research has time and again provided breakthroughs that underlie major advances in medicine and biotechnology, often in very unexpected ways. Indeed, the most innovative and impactful current new therapies in cancer, gene therapy, vaccine science, and weight loss all have deep roots in basic research programs, primarily funded by the NIH, that evolved in surprising ways and included lucky twists. Some research projects fail, many simply provide useful new information on important natural systems, but history teaches us that basic research also reliably delivers innovative new concepts with therapeutic, competitive, and financial benefits.

There is still much more to do. LEN is spectacularly effective, but it needs to be broadly and effectively distributed, especially in locations in the developing world where HIV is most prevalent. To Gilead's credit, they are generously allowing LEN to be provided as a license-free generic drug to the 120 poorest and hardest hit countries. Some middle-income countries like Brazil may still struggle to afford non-generic LEN, but the Gilead decision is a great advance. However, even generic drugs are beyond the financial means of the poorest countries. The major source of funding for HIV drugs and treatment in those countries has come from a US government program called the President's Emergency Plan for AIDS Relief (PEPFAR). PEPFAR is a highly successful President George W. Bush program that has saved more than 25 million lives and prevented nearly six million babies from becoming infected with HIV since its inception in 2003. Fortunately, Congress recently resisted efforts to claw back PEPFAR funds from the FY25 budget and the PEPFAR program has agreed to treat 2 million needy people with the drug by 2028. Nevertheless, PEPFAR and USAID funding remain at risk at a time when even more funding is needed because it is estimated that 40 million treatments may be required to end HIV transmission worldwide. It is not an exaggeration to say that millions of lives, including unborn babies, will be affected by the decisions made by US PrEP and other public and private funding agencies.

Looking ahead, the HIV community still awaits two transformative breakthroughs: a vaccine that provides lifelong protection and a cure that allows people already living with HIV to eliminate, or permanently suppress, the virus without daily medication. More broadly, we must continue to overhaul the way we discover and deliver medicines so a "breakthrough of the year" no longer takes three decades to reach patients. Momentum is finally building on all these fronts, yet we can and must move faster. We stand at an inflection point. I am hopeful that LEN will fulfill its promise to reshape the course of the HIV pandemic. Just as important, we need the collective wisdom to strengthen the collaborative pipeline that turns basic science into real-world solutions, ensuring each of us can remain a vital link in a chain of discovery that benefits humanity.

Wes Sundquist is Chair of Biochemistry, and the views expressed are his own.

Thank you for making our 2025 Biochemistry Giving Day such a smashing success!

We are delighted to report the success of our 2025 Giving Day, which was focused on raising funds to provide financial assistance to trainees, helping to offset childcare or other necessary related expenses while they attend professional events and opportunities.

Thanks to your generosity, we raised a total of $25,160 (including matching funds), which has allowed us to endow a Biochemistry Trainee Childcare Fund in perpetuity. Our trainees often face challenges in balancing their academic and professional aspirations with their family responsibilities. Attending conferences and professional training is critical for career advancement, networking, and staying current in their fields. However, for students with children, the cost of childcare can be a major barrier, preventing them from fully participating in these essential opportunities. The Trainee Childcare Support Fund will bridge this gap by providing financial assistance to trainees to help offset childcare, or other necessary related expenses while they attend professional events. By alleviating this burden, the fund will empower students to advance their education and careers without creating financial stress. Thanks to your support, this fund will directly impact the lives of trainees, foster their success, and ensure they can fully engage in opportunities that enhance their future.

THE 2025 MARJORIE RICHES GUNN AWARD FOR GRADUATE STUDENT EXCELLENCE

Greg Ducker

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 Marge's 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. This year, the ninth annual Marjorie Riches Gunn Award for Graduate Student Excellence was shared by two students: Erica Hastings and Sangeetha Balasubramaniam.

Left to right: Greg Ducker, Erica Hastings, Sangeetha Balasubramaniam, and Wes Sundquist. Photo credit: Tim Formosa.

Erica Hastings was a Ph.D. candidate in Dr. Paul Sigala's lab, where she developed quantitative imaging tools to investigate motion dynamics of hemozoin crystals in malaria parasites. Erica's thesis work revealed a novel biological model of self-propelled nanoparticles and unpacked the biophysical underpinnings of parasite metabolism and drug sensitivity. Her rigorous interdisciplinary approach—spanning microscopy, Brownian dynamics simulations, and CRISPR genome editing—produced a body of work that is both elegant and impactful. Erica's ability to integrate engineering precision with biological insight is rare, and her generosity as a mentor and communicator has helped bring complex science to broader audiences. Erica's record includes invited talks at APS, awards for best talk in the department, and sustained mentoring in the Genomics Summer Research for Minorities program. Her scientific creativity, leadership, and commitment to service reflect the values of this award beautifully.

Sangeetha Balasubramaniam is a Ph.D. candidate in Dr. Adam Hughes' lab, where she has led creative work on the role of the mitochondrial AAA+ protease Yme1 in the formation of mitochondrial-derived compartments (MDCs). Using a powerful combination of genetics, proteomics, and lipidomics, Sangeetha showed that Yme1 regulates the proteolytic turnover of key lipid regulators and components of the MICOS complex to coordinate outer membrane remodeling during stress. Her work has not only expanded our understanding of mitochondrial quality control but also raised exciting possibilities for conserved regulation of MDCs in mammalian cells. Alongside her research, Sangeetha has shown deep dedication to equity and support in science: she co-founded the Biochemistry Trainee Support Fund, has served on recruiting and career committees, and is a passionate science communicator through outreach and museum fellowships. Sangeetha's scholarship, vision, and values made her a fitting recipient of this award.

THE 2025 EVELINE BRUENGER AWARD FOR POSTDOCTORAL EXCELLENCE

Tyler Starr

The Eveline Bruenger award is given to a postdoctoral fellow who has demonstrated excellence in research as well as leadership and positive contributions to our department community, emulating the standards of excellence that Eveline Bruenger held in her numerous contributions to the U of U Health sciences and educational enterprises. This year's recipient of the 2025 Eveline Bruenger award was Dr. Aldo García-Guerrero.

Aldo received his Bachelors and PhD in Biochemistry from the prestigious Universidad Nacional Autónoma de México in Mexico City, before joining Paul Sigala's group as a postdoctoral fellow in 2020.

Through both his PhD and postdoctoral work, Aldo built a research program focused on the convoluted pathways by which respiratory cytochrome complexes assemble. During his PhD, his work focused on cytochrome b biogenesis in the budding yeast model organism. For his postdoc, Aldo took this expertise on respiratory chain biogenesis and made the bold move to approach related questions in the complex Plasmodium parasite, where a detailed understanding of its divergent cell biology has direct utility in therapeutic development. Aldo's work here has focused on c-type cytochrome biogenesis, and the enzymes that are needed to hemylate these cytochromes for proper function. Aldo made the surprising finding that, in contrast to other model organisms, the paralogous enzymes that hemylate c-type cytochromes are not functionally redundant, highlighting these pathways as a prime candidate for the development of novel antimalarial drugs. This work also raises interesting evolutionary questions about the origin and diversification of these assembly pathwaypathways across the tree of life, work that Aldo is primed to continue into the future with his research trajectory. The first part of Aldo's postdoctoral work was published last year in ACS Infectious Diseases, where it was featured on the issue's cover.

Left to right: Wes Sundquist, Aldo García-Guerrero, Tyler Starr. Photo credit: Tim Formosa.

Beyond his research, Aldo has proven to be an integral pillar of his lab and a true leader in our department community. I myself am personally indebted to Aldo as he steps up year after year alongside Luis and now Alvaro to serve as a "lead host" for our Graduate Student Rising Stars symposium, where he freely volunteers his time to ensure the success of this important event. He has also contributed to our department mission in medical school teaching where he has relished in facilitating Case Based Learning sessions with an enthusiasm, skill and expertise that likely surpasses that of many of the tenure-line faculty who facilitate these sessions. But by far the most important contribution Aldo makes as a leader in our community is via his mentorship, where he seamlessly blends friendship, mentorship and leadership in a way that is hard to describe – and I don't need to, because those he has impacted directly say it best when they write, "Dr. Garcia-Guerrero cares just as much about the people in the lab as he does the science that comes out of it." I can think of no better quality of our 2025 Bruenger Awardee than what is captured in that sentiment.

THE 2025 PACE MENTORING AWARD

Amy Barrios

The Department of Biochemistry is proud to recognize Emily Parnell, Senior Research Associate in the Miller Lab, as this year's recipient of the Pace Mentoring Award. Emily earned her B.S. in Biochemistry from Marietta College in Ohio and her Ph.D. in Pamela Geyer's lab at the University of Iowa, where she investigated the role of genomic insulators in transcriptional regulation. She later trained as a post-doctoral researcher in David Stillman's lab (Pathology, University of Utah), studying mechanisms of complex gene regulation in yeast, before joining the Miller Lab in 2020.

Since arriving in Biochemistry, Emily has become an indispensable member of the department through her outstanding mentorship, scientific expertise, and collegial spirit. She is widely regarded as a generous and patient teacher who goes out of her way to support colleagues—whether troubleshooting experiments, introducing new reagents and techniques, or guiding project strategy. Her mentorship extends beyond the technical: she leads by example in fostering a positive, collaborative lab culture and in navigating the challenges of balancing life as a scientist and parent.

Emily's colleagues describe her as "the epitome of what a good scientist is and we all aspire to be like her," and note that she has had a profound influence on the professional growth of nearly every member of the lab. Her impact also extends beyond the Miller lab, where she has helped organize shared departmental resources and offered guidance across research teams.

Left to right: Wes Sundquist, Emily Parnell, and Amy Barrios. Photo credit: Tim Formosa.

The Pace Mentoring Award celebrates individuals who exemplify exceptional mentorship, and Emily's record of generosity, leadership, and excellence makes her a truly deserving honoree.

THE 2025 GRADUATE STUDENT RISING STARS SYMPOSIUM

Tyler Starr

The department held its 4th annual "Graduate Student Rising Stars" symposium in May, 2025. For this event, the Department of Biochemistry, in collaboration with other departments at the U, invites talented graduate students from across the country to the U for scientific talks, networking, and professional development. For this year's Graduate Student Rising Stars symposium, we invited seven incredible senior-level graduate student guests, who were joined by two "local" Rising Stars selected from our own U of U graduate student community. The resulting symposium featured fantastic talks spanning fields including metabolism, cancer biology, and protein structure and function.

Graduate Student Rising Stars. Photo credit: Tyler Starr.

Our symposium was held in parallel with the Department of Neurobiology's Rising Stars Symposium, with whom we held a joint Pace Keynote talk by Dr. Toto Olivera from the School of Biological Sciences. The symposia also came together for joint coffee breaks, meals, and a wonderful welcome picnic at Sunnyside Park, creating an energizing atmosphere across U of U 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. Through these workshops, we hope to invest in the success of our Graduate Student Rising Stars while simultaneously learning more from their experiences. The group was particularly lively and interactive, and we look forward to continuing to build on the success of this event in 2026.

We would like to thank the entire Biochemistry community for contributing to this energizing event, with special thanks to Biochemistry postdoc "lead hosts" Drs. Luis Cedeño-Rosario, Aldo García Guerrero, and Álvaro Narbona Pérez, in addition to the rest of the student, postdoc, and faculty hosts for welcoming our Rising Stars visitors, and Megan Hendrickson for administrative support.

2025 Rising Stars in Biochemistry:

- María Ayala-Hernandez, University of California, Davis (James Letts lab)
- Fernando Banales Mejia, University of Washington (Dustin Maly lab)
- Nico Ciobu Zubenco, Columbia University (Viraj Sanghvi lab)
- Meghan Curtin, University of Utah (Keren Hilgendorf lab)
- Jess Davidson, University of Wisconsin, Madison (Judith Simcox lab)
- Julio Fierro, University of Utah (Minna Roh-Johnson lab)
- JP Flores, University of North Carolina, Chapel Hill (Douglas Phanstiel lab)
- Lindsey Meservey, Stanford Lab (Paul Khavari lab)
- Owen Ouyang, University of Illinois Urbana-Champaign (Nicholas Wu lab)

TOTO OLIVERA GIVES THE 2025 PACE LECTURE

Helena Safavi

Left to right: Helena Safavi, Toto Olivera, Wes Sundquist, and Tyler Starr.

Dr. Toto Olivera presented the 2025 Pace Lecture, entitled "From Venomous Cone Snails to Drugs for Pain: Strategies for Integrating Multiple Biological Levels", in May, 2025 during the Graduate Student Rising Stars Symposium.

Dr. Olivera began his scientific journey in the Philippines, inspired by early teachers who recognized his passion and potential. A pivotal moment came when, encouraged by his high school zoology teacher, he applied - on a leap of faith - to a single graduate program: Caltech. Fortunately for all of us, he was accepted.

At Caltech, Toto made a transformative and courageous decision to join the lab of Norman Davidson - this, despite being advised against it, as Norman had recently been diagnosed with cancer, a consequence of his earlier work on the Manhattan Project, a top-secret research effort during World War II to develop the first atomic bombs. Toto chose scientific vision and mentorship over convenience or caution, and it was in Norman's lab that he became immersed in the birth of molecular biology. There, he contributed to pioneering work on the biophysics of DNA, helping lay the foundations of a field that would redefine biology. His postdoctoral training at Stanford, under the mentorship of Bob Lehman, further cemented his early successes. While at Stanford, he made landmark contributions to enzymology with the discovery and characterization of E. coli DNA ligase, a key enzyme now central to recombinant DNA technology.

And yet, in a move that few with such a trajectory would dare, Toto made a bold pivot. Returning to the Philippines, he launched an independent research program without modern equipment or funding - and turned to a subject from his childhood: cone snails. He decided to investigate their venom, not knowing he was about to establish a new field of science.

From this leap into the unknown came a cascade of groundbreaking discoveries. Toto's research transformed our understanding of the molecular biology of venomous animals, neuropharmacology, and ion channel biology. His work uncovered a rich pharmacopeia of venom-derived peptides - so called conotoxins - which became essential tools for studying nervous system function. Notably, his research led to the discovery of the most widely used compound to study calcium channels and the FDA-approved drug ziconotide used for the treatment of intractable pain.

His career has exemplified the power of Discovery Science - of venturing where few have looked, often as a self-described novice, and turning naive questions into transformative insights.

THE 2025 POSTDOCTORAL RISING STARS SYMPOSIUM

Paul Sigala & Jared Rutter

Left: Postdoctoral Rising Stars. Photo credit: Paul Sigala. Right: Keynote speaker Ryan Watts. Photo courtesy of Denali Therapeutics.

On Oct. 2-3, the Departments of Biochemistry and Medicinal Chemistry co-hosted the 2025 Postdoctoral Rising Stars Symposium that featured 15 highly accomplished speakers in three half-day sessions in the areas of Cell Biology, Chemical Biology, and Computational and Multiscale Analysis in Biochemistry. These sessions were planned and chaired by Minna Roh-Johnson and Owen Pornillos from Biochemistry and Yuru Wang from Medicinal Chemistry. This symposium, which featured an outstanding array of speakers from different backgrounds and institutions across the country, marked the 14th year of this event. Since the first Rising Stars Symposium in 2011, over 200 postdoctoral speakers have visited the University of Utah and presented their science at this event! We are pleased that 13 prior speakers at this symposium have joined the University of Utah as faculty. The keynote address for this year's symposium was given by Dr. Ryan Watts, who is an alumnus of the University of Utah and the founder and Chief Executive Officer of Denali Therapeutics.

Ryan received his B.S. in Biology from the U, followed by a Ph.D. from Stanford. After a successful stint at Genentech, Ryan founded Denali, a company aptly named as the goal was to "defeat neurodegeneration", which is arguably the set of diseases that present the biggest challenge to drug hunters. Denali has been impressively successful, with multiple drugs in late-stage clinical trials that are likely to be approved for patient use. The company has also done this while exhibiting a passion for leadership in the basic science of disease.

In his talk, Ryan gave a personal story about his mother that explains his passion about treating neurodegenerative disease. He then spent the balance of the lecture discussing the technology developed by Denali that is providing optimism regarding upcoming therapies. The founding technology of the company centered on the delivery of molecules across the blood-brain barrier, which typically restricts access of drugs delivered elsewhere to access the brain. Using this technology, Denali has shown very impressive results in trials with patients suffering from Hunter Syndrome. Ryan also showed earlier data on Alzheimer's disease and others that was incredibly exciting. His beautiful talk combined personal stories and ground-breaking science, and was a perfect conclusion to an excellent day of listening to the best and brightest young scientists from around the world.

We look forward to the 15th year of the Postdoctoral Rising Stars Symposium in 2026!

COMMUNITY SHOWS THEIR LOVE FOR SCIENCE AT SUMMER SCIENCE DAY

Paul Gabrielsen

In the bright, echoing atrium of the Eccles Health Science Education Building, elementary-age children and their parents gather around a table. A presenter hands out test tubes with a green liquid inside—a mix of pureed peas, dish soap, and meat tenderizer.

“Do you know what DNA is?” the presenter asks. Heads nod.

“But have you ever seen DNA?” Heads slowly shake.

The presenter hands around squirt bottles of rubbing alcohol—the final ingredient to make the DNA in the peas, dissolved in the murky liquid, clump together. Each child adds the alcohol and brings the test tube up to their eye to see the clear layer of alcohol atop the green soup.

“See that white stringy stuff between the layers?” the presenter says. “That is DNA!”

Small eyes widen and mouths drop open as parents suddenly lean in closer to see, matching their kids’ enthralled energy. “Wait, what?”

Summer Science Day, on July 12, was full of similar moments, as University of Utah Health researchers shared the wonders of the scientific world with an eager, all-ages audience. The event, which organizers hope will become an annual tradition, demonstrated an appetite for science engagement in the community, as well as the buffet of activities and offerings from across the university.

“We hope to give families an opportunity to meet scientists in person, tour different lab spaces, and learn about the research that we’re doing at the U,” said Janet Iwasa, PhD, director of the Genetic Science Learning Center (GSLC) in the Spencer Fox Eccles School of Medicine at the University of Utah. “We would love to inspire Utah kids to see themselves as future scientists and science educators.”

Exploring mitochondrial biology. Photo credit: Janet Iwasa

Inspired by science festivals

Around 1,000 people attended Summer Science Day, which included science demonstrations, workshops and classes, and tours of working labs. Researchers from many departments participated and presented. The Departments of Nutrition & Integrative Physiology, Biochemistry, and Human Genetics co-sponsored the event, along with the U’s Core Research Facilities and BioHive, a Utah non-profit.

[Look back at the full schedule of the 2025 Summer Science Day.]

The GSLC organized Summer Science Day. For more than 30 years, the GSLC has produced videos, lessons, activities, games, animations, and other ways to teach genetics and health in a clear, engaging way.

Iwasa, who became director of the GSLC in 2024, was inspired by an annual science festival she attended in Boston before moving to the U more than a decade ago.

“After I became the director of the Genetic Science Learning Center,” she said, “I was excited to find myself surrounded by a team that is engaged in science outreach and education and has the experience

Learning about viral symmetry. Photo credit: Paul Gabrielsen

and enthusiasm to organize a public-centered event that featured fun science activities for all ages. Summer Science Day was born.”

Enjoyed by participants and presenters

Participants old and young packed into the HSEB Alumni Hall to touch pig lungs, explore the mathematics of folding virus proteins, and rapidly freeze food with liquid nitrogen. Across the hall, workshops gave participants a chance to mix colors of light, peer through microscopes, and explore the paths that lead people into biomedical science.

"It was awesome,” said participant Pannyun Yiu. “A great opportunity to get kids exposed to different areas of science. I especially appreciate the activities of interest for older kids and teens, which can be hard to find.”

"Great event with so many opportunities to connect with scientists,” added participant Will Freund.

Grace Gabrielsen, 18, found the activities eye-opening. "I finally understand how scientists do research,” she said.

"The turnout was amazing,” said presenter Rebekah Nicholson, a PhD candidate in the Department of Nutrition & Integrative Physiology. “It was such a cool experience to interact with so many kids/community members. I'm so glad I got to participate.”

"Definitely a fun and slightly chaotic day,” said presenter Rachel Torrez, a postdoctoral research fellow in the Department of Biochemistry.

Organizers are thrilled with the success of the first Summer Science Day and hope to host another next year. The enthusiasm for science from attendees matches perfectly with the bountiful scientific expertise of the University of Utah.

“We have both a lot of people interested in science,” Iwasa said, “and scientists interested in sharing their research.”

[Learn more about the Genetic Science Learning Center.]

Purifying DNA from peas. Photo credit: Paul Gabrielsen

CLASS OF 1995 REUNION

Bil Clemons

Standing: Michael Bialecki, Cheryl Baird, Bil Clemons, Laura Hays, Daren Heaton, John Aron, Owen Pornillos. Kneeling: Mona Mallampalli, Tracey Fleischer, Michael Mathews, Angie Hinz (was Kolhoff). Not pictured is Dan Morath who left before the pic was taken.

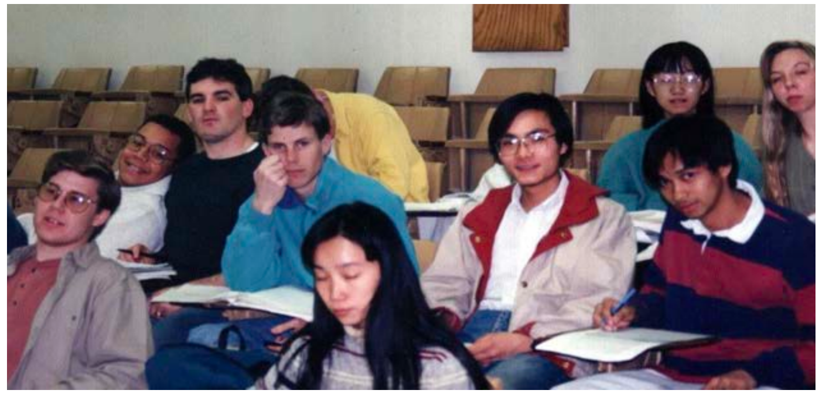


Photo taken in the fall of 1995. Missing from the photo is Monica (Mona) Malampalli, who likely took this photo, and John Aron, who is hiding in the back.

In 1995, the Bioscience Graduate programs matriculated 44 students. The Biological Chemistry program was relatively new and seven students from the programs joined the Biochemistry Department. Recently, in celebration of the 30th anniversary of their start in grad school, the 95ers gathered in Salt Lake City to revisit the place where they became scientists. It was a joyous event and an inspiration for various members of the department. The 95ers are successful in academia, industry, and law.

Bil Clemons is a Professor of Biochemistry at CalTech.

REMEMBERING CURTIS ATKINS

Dana Carroll

Curtis Atkin was a Research Assistant Professor of Internal Medicine (Hematology, Nephrology) and of Biochemistry for many years. He was a scientist's scientist, always curious, always eager to learn how the world works.

Curt was born in Salt Lake City in 1942. As a boy, in approximately 1950, he visited our School of Medicine as a patient and was seen by Dr. Frank Tyler. He had early symptoms of Alport Syndrome, a genetic disease that ultimately leads to kidney failure, loss of hearing, and a variety of other complaints. Curt thus became a subject in one of the earliest genetic disease studies at the U.

After 3 years at BYU, Curt obtained his bachelor's degree in chemistry at Caltech in 1964, and a Ph.D. in Biochemistry at the University of California, Berkeley in 1970. A prestigious Helen Hay Whitney Postdoctoral Fellowship supported 3 years of research at the Karolinska Institute in Stockholm, Sweden, where he also met his wife, Elisabet Thor. He returned to Utah in 1973 on the research track faculty. His training was in the area of metalloproteins and metal trafficking, and he continued to do research in this field. But he also maintained a scientific interest in the disease that was increasingly affecting him, and he obtained grants for the effort to further define its genetic basis.

With the advent of human molecular genetics on our campus, the tools to discover the gene responsible for Alport Syndrome were close at hand. Curt began a collaboration with David Barker, who had come to Utah initially as a postdoctoral fellow with Ray White, but who later established an Alport project in his own lab in the Department of Physiology. This collaboration resulted in identification of the gene for a specific collagen subtype – Collagen IV A5 – as the culprit. Different mutations were present in different families, but all affected the same gene. This discovery was published in Science in 1990.

At about this time, we asked Curt to give a seminar on Alport in the

Left: Curt Atkin as a young man. Right: Curt in southern Utah, probably in the 1990s.

Biochemistry Department. He described the hunt for the gene and showed a slide with the various mutations that had been identified to that date. He pointed at one and said, "This is the sucker that's killing me." I think it was a source of great satisfaction to Curt that he had participated in both the beginning and the end of the genetic study of Alport Syndrome. In doing so, he linked the early days of genetic research at Utah with the modern era of gene discovery.

Curt suffered from hearing loss and kidney failure, had two kidney transplants, and was on dialysis for 18 years. He succumbed to his very personal disease in January 2000. I remember him as a very unassuming but very dedicated scientist and a gentle human being.

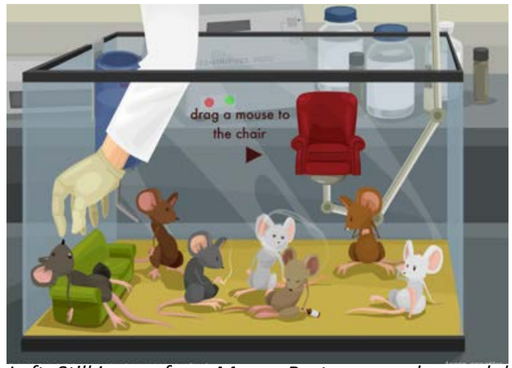
WILLIAM J. RUTTER 1927-2025

Bill Rutter was an alumnus of the Department of Biochemistry at the University of Utah, receiving an M.S. degree in 1950. He went on to an illustrious career as an academic scientist, as a builder and leader of institutions and as a biotech pioneer. Read more about Bill on the Biochemistry Notable Contributors page.

A NEW CHAPTER FOR THE GENETIC SCIENCE LEARNING CENTER

Janet Iwasa

For more than a quarter of a century, the Genetic Science Learning Center (GSLC) at the University of Utah has been a global leader in science education and communication. Through innovative multimedia resources, curriculum development, and strong partnerships with teachers, scientists, and communities, the center has helped millions of learners, from middle school students to healthcare professionals, understand the rapidly advancing fields of genetics, biology, and health sciences.



Left: Still image from Mouse Party, a popular module on Learn.Genetics. Right: still image from a video from Genetic Tech Investigations.

The GSLC is best known for its two award-winning online platforms, Learn.Genetics and Teach.Genetics, which together have reached millions of classrooms and households around the world. These resources combine interactive activities, animations, games, and explanatory texts to make science both approachable and engaging. Each year, hundreds of thousands of teachers across the US incorporate GSLC content into their classrooms (including the classrooms of both of my SLC school district-educated kids!)

From the GSLC's inception in the early 2000s until last year, Dr. Louisa Stark served as director of the GSLC, guiding its growth into one of the world's most recognized science education resources. A Professor of Human Genetics and the H.A. and Edna Benning Presidential Endowed Chair, Louisa established co-design approaches to curriculum design, where content producers, like the GSLC, partner closely with teachers to design new educational materials. She also emphasized the importance of rigorous evaluation and research in education. These influences are seen and felt throughout the GSLC's many projects.

In the summer of 2024, as Louisa entered into a well-deserved phased retirement, I stepped into the role of Director of GSLC. As a specialist in molecular and cellular visualization, I have long been interested in science education and communication, and was excited to work with the highly interdisciplinary team of professionals at the GSLC. The 15-person GSLC team includes science educators and curriculum specialists who ensure that our content is aligned with educational standards and accessible to learners of all backgrounds, a research and evaluation team that rigorously tests how materials perform in real classrooms, artists, videographers and multimedia developers who develop engaging and interactive illustrations, videos, and animations that make our educational materials distinctive and memorable, and web developers who build the flexible digital platforms that host our content.

Since taking on directorship of the GSLC, the team has released a new curriculum module for middle and high school students called "Genetic Tech Investigations" which merges engineering design principles with life sciences, and started developing a module called "Seeds of Change" which looks at how different genetic engineering techniques have been used to improve crops. We've also teamed up with researchers across the U to develop medical interventions and informational videos for patients, assess educational and outreach programs, and develop data-rich websites. We're also interested in reaching out to our local communities in the Wasatch front. We hosted a first-ever Summer Science Day in July which welcomed over 1000 people to learn about research on upper campus (see article by GSLC science writer Paul Gabrielsen earlier in this newsletter) and plan on making this an annual event.

We'll also soon be making some additional changes to our center: to honor Louisa's legacy and in recognition of the support she is providing to us, the GSLC will soon be re-named the Stark Science Learning Center (SSLC) and will be holding a gala on May 23, 2026 at the Libby Gardner Hall Concert Hall to celebrate. We'll be making announcements on our social media pages, and I hope you will be able to join us!

CELEBRATING THE INSPIRING CAREER OF TIM FORMOSA

Janet Lindsley

"It's been a pretty good place" is how Tim Formosa recently summarized his time so far in the U's Biochemistry Department. Tim was one of the first faculty hired into the re-vamped department by co-chairs Dana Carroll and Marty Rechsteiner as an Assistant Professor in 1989 and recently retired as an Emeritus Professor. Like many of us, he spent some time passing through the valley of struggle/challenge/despair and emerged a staunch supporter of students, faculty, and the primacy of the scientific method. He exudes a joy that comes from generously helping others obtain their goals, and possibly also from retirement 🙂.

Tim received his PhD in Biochemistry & Biophysics from UCSF working on bacteriophage T4 DNA recombination and replication in the lab of Bruce Alberts; in fact, one of Tim's SDS-PAGE gels is Figure 8-14 in the Molecular Biology of the Cell (7th edition) textbook, the book that we continue to use with incoming graduate students! Tim was one of the first people to use affinity chromatography for protein purification and identification. In 1983, together with colleagues in the Alberts lab, Tim published a protocol for coupling a purified protein to agarose beads, creating a column using these beads, and isolating proteins from a cell lysate that specifically interact with the purified protein. What now sounds like an obvious way to identify interacting proteins was a breakthrough technology at the time, one I still remember learning about as a graduate student.

A young scientist in training: Tim's first day of school. Photo courtesy of Tim Formosa

For his postdoc Tim decided to learn yeast genetics and moved to Lee Hartwell's lab at the University of Washington in 1985. Hartwell had hypothesized that the cell cycle must be tightly regulated and therefore governed by gene products, and he and his lab went on to identify hundreds of genes that control cell division, earning him a share of the 2001 Nobel Prize for Physiology or Medicine. While Tim was looking to learn genetics, Lee was looking for a biochemist and Tim's project once again involved using affinity purification, initially to identify yeast proteins that bind to DNA, and eventually switching to studies of proteins that bind to DNA polymerase α. Tim found several interesting proteins, including what we now know as the histone chaperone, FACT.

Tim in the lab, circa 2004. Photo courtesy of Tim Formosa

Once Tim established his own lab in Utah, he combined these biochemical approaches with unbiased genetic methods to identify mutations in the genes encoding FACT and related proteins, and analyzed these in biochemical and structural studies done in collaboration with Chris Hill's lab. These studies sought to determine how a factor could be essential for both DNA replication and transcription, which had generally been considered to be distinct processes, ultimately converging on the model that both require interrupting and establishing the integrity of chromatin structure. Tim became known as a very careful scientist who doggedly and joyfully pursued the facts of FACT, sometimes putting him at odds with what other researchers claimed. Others proposed that FACT's primary role was to disassemble nucleosomes, allowing RNA polymerase to traverse chromatin, but the Formosa team's studies revealed a more global role in maintaining chromatin in an appropriate state. In their "chromatin repair" model, FACT constantly monitors the integrity of chromatin globally by disassembling and reassembling individual nucleosomes. Other processes such as histone modification, transcription, and DNA replication are dependent on FACT's ability to "reorganize" nucleosomes, giving access to these various protein machines while FACT disrupts, modifies, restores, and replaces existing chromatin states. This model explains the broader effects of FACT on processes like differentiation of cell fates and epigenetic inheritance of chromatin states, and has been broadly adopted within the chromatin field.

Tim's lab was always small and he continued to do lab work himself up until he closed the lab in 2023. One benefit for the department of his small lab was getting to hear Tim himself give Research in Progress (RIP) talks each year. He'd volunteered to give the first RIP of the year, and it was always a treat! He is tremendously skilled at building a research story, while simultaneously keeping us laughing with puns and jokes. Tim annually reminded us how incredibly lucky we are to be doing science, and how much fun it is to propose new ideas and make novel discoveries. His talks set a high bar for the level of scientific discussion and effective communication of research questions and techniques. We left his talks feeling good about being able to understand complex ideas and proud to be part of a fun-loving and thoughtful community.

Tim claims to have been surprised by how much he enjoys teaching. Back in the early days of our department, one of our roles was teaching a 70+ hour, lecture-based medical biochemistry course. These lectures were divided up among our small faculty. The emphasis at the time was to fill the allotted slots with lectures on Biochemistry without much attention paid to whether the topics were relevant to future physicians. Tim's contributions stood out for respecting and effectively engaging students, leading the medical school administration to choose him for organizing all of the basic science courses during the winter block of the first year and serving on the curriculum committee. In 2007, he was selected to help lead the medical school curriculum transformation process that broke down departmental silos and integrated basic and medical science courses for first- and second-year students. In 2012, Tim became the co-director for the first-year, Molecules, Cells and Cancer course. He remained in this role, working first with Matt Topham, MD, and then Karen Moser, MD, as course co-directors, for the remainder of that course's existence (until 2023). He was the medical school's domain expert for Cell and Molecular Biology, which meant that in addition to teaching this content within his own course, he worked with other course and clerkship directors to teach molecular diagnostic methods throughout the curriculum. Tim also served for many years on the school of medicine's Promotions Committee, a group charged with determining what to do when medical students struggle in courses. He learned that students struggle for numerous different reasons, and yet can go on to become excellent physicians. This led him to become an advocate for early identification of why individual students struggle and providing the appropriate support for each, as well as co-authorship on medical education articles about assessment for learning and promotion of a mastery orientation to learning. In the past few years, Tim helped design the current MD Program, particularly the student assessment processes, as well as serving as a beloved problem-based learning facilitator.

In addition to all of his leadership and teaching of medical students, Tim was also a driver of our current first year graduate student curriculum. Beginning in 2017, he led the development and implementation of the first-year guided proposal preparation and capstone exam. He set clear and challenging expectations for students, and created a system to support them in achieving these expectations. He argued that knowing the answers was less important than asking the right questions, and often paraphrased Voltaire, saying that ambiguity is uncomfortable, but certainty is absurd. The students lovingly called his method of pushing them to do more than what they thought they were capable of as the Formosa Grill (who remembers the homonymous restaurant that used to be on 2100 South?). In 2022 Tim helped design the Foundations of Molecular Biology course, a team-based learning course for incoming students to practice thinking like scientists and preparing for their end-of-year capstone exam.

Tim's contributions to medical and graduate student education have been so significant partly because he was able to take what he learned from one area and apply that to the other. He taught medical students that a differential diagnosis is a list of hypotheses that might explain a patient's symptoms and clinical findings, and that a key role of the physician is to determine how best to test these hypotheses. He took ideas about assessment and timely feedback from medical education to develop our current graduate student capstone preparation and exam format. He firmly believed that faculty should be sitting on the same side of the table as the students, and that our job is to help them on their journeys. These efforts, together with challenging, supporting, and inspiring countless students, earned Tim two impressive teaching awards: the 2012 Leonard W. Jarcho, MD, Distinguished Teaching Award from the school of medicine, and the 2022 University of Utah Distinguished Teaching Award.

Many of the faculty are personally grateful to Tim for serving as the departmental Director of Faculty Affairs and the chair and member of the School of Medicine Faculty Appointment, Review, and Advancement (FARA) committee. He set up fair and effective processes to ensure transparency in faculty promotion and provided clear feedback to help faculty (and sometimes department chairs) develop files that accurately reflect their contributions. His perspective is that everyone is trying to do a good job, and we all need feedback to let us know where we might need to put in a bit more effort. He believes both that it's essential we hold the line on quality and, after working with so many faculty and reading their files, that we have wonderful colleagues here!

Thank you Tim for all that you've done for us. You've made lasting contributions to the fields of DNA replication and role of chromatin structure in many nuclear processes, to the education of thousands of medical and graduate students, and to the development of numerous faculty. I think we'd all agree that you followed Dana Carroll's ubiquitous advice to new faculty well: Don't mess up (a slight misquote to suit the nature of this publication)! Congratulations on a job very well done.

A banner of Tim hangs in front of the Pie Pizzeria in 2022. Photo courtesy of Tim Formosa.

A HISTORY OF THE BIOCHEMISTRY DEPARTMENT: PART 5
MEDICAL AND GRADUATE EDUCATION

Dana Carroll

In this installment of the history of the department, I want to focus on educational efforts. At the time Marty Rechsteiner and I assumed the co-chairmanship, each basic science department was responsible for a year-long course in the medical curriculum. Ours was for first-year students and was comprised entirely of lectures.

Since neither of us had been in Biochemistry before, we each took over a section of the medical course, both to get to know the curriculum and to see what might need to be changed. One problem was that very little clinically relevant information was presented. We tried to emphasize medical connections when the occasions arose. For example, in a lecture on DNA replication and repair, I acknowledged that essentially all cancer treatments in use at the time were carcinogenic – both ionizing radiation and chemotherapy with DNA synthesis inhibitors.

Tim Formosa (center) and his CBL group on "Dress as Dr. Formosa" day in 2017. Photo courtesy of Tim Formosa.

Another innovation we made during that period was to supplement the lectures with small group sessions that we called “problem-based learning.” This was an approach I had learned about from chairs at other schools*. We assigned Floyd Sweat to lead this effort. He constructed plausible clinical cases that illustrated biochemical processes or got ones that were developed at other schools. The students liked them, but the cases were pretty simple and covered only a small range of our course topics.

There have been several overhauls of the curriculum for the first and second years since that time, each one intended to integrate the science they were learning with disease symptoms, diagnosis and treatment. Departmental courses disappeared and content was moved into courses with broader assignments. Examples in the curriculum prior to the current one were Molecules, Cells and Cancer; Metabolism and Reproduction; and Host and Defense. What had been departmental content was incorporated into these courses as appropriate. Small group clinical-based sessions were an important feature of each new course, and many Biochemistry faculty members participated as facilitators. I found these sessions very enjoyable because the students liked them, we could see them educating themselves, and I learned just enough about medical practice to be dangerous.

Janet Lindsley (left) being honored with the Lifetime Achievement Award by the Association of Biochemistry Educators in 2025.

Tim Formosa and Janet Lindsley served leading roles in the design and execution of each of the curriculum reforms and represented Biochemistry very effectively. Tim was a popular teacher and content expert in cell and molecular biology. Janet had a huge impact by integrating metabolism and nutrition into the curriculum. Both received top teaching awards for their efforts. Tim has retired this year, although he continues to help with small group instruction. (See Janet’s appreciation of Tim elsewhere in this issue.) Janet is partially retired but still engaged.

As many of you know, Janet became a professional educator, served for many years as part-time Assistant Dean for Medical Education and published in education journals, while coordinating Biochemistry’s teaching efforts and working directly with students. When the AMGDB (mentioned in the footnote below) decided to sponsor an organization of biochemistry course directors, Janet was elected as its first chair. Earlier this year that group established a prize in Janet’s name and chose her as its first recipient. Cheers, Janet!

I must say I have been disappointed in one aspect of our evolving medical student educational efforts. As more explicitly clinical instruction was moved into the first two years (a good thing), a correlate was to be inclusion of more basic science in the third and fourth years. That “return to basic science” has taken a long time to develop and, until very recently, was not really embraced by the clinical departments. Biochemistry was consistent in advocating for this and in offering elective courses, but students did not flock to those offerings. My own Genetic Therapies course, designed for fourth year medical students, became more of a graduate student course. I am reliably informed that this situation has changed in our newest curriculum. All students must now take 2 intensive Advanced Integrated Science Courses from a menu of options. Two of these courses (so far) come from Biochemistry: Morgan Nelson’s Beyond BMI (metabolism-focused) and Tyler Starr’s Outbreak (emerging viruses).

*For a number of years, I attended meetings of the Association of Medical and Graduate Departments of Biochemistry (AMGDB). This was an annual gathering of department chairs that took place on the Martin Luther King weekend in a tropical location. Some people called this a boondoggle (no real argument from me), but I met people and learned things that were valuable back at home. I served as chair of the Education Committee of this organization for a couple of years. I only avoided becoming president of the AMGDB by stepping down as chair in Utah just before I was asked.

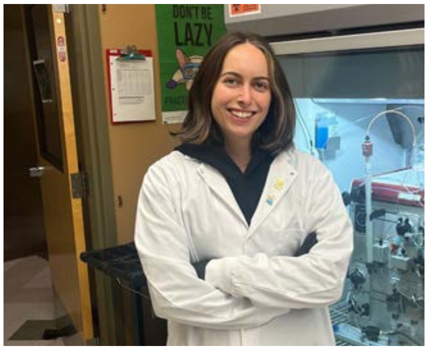
Dana Carroll is Distinguished Professor Emeritus of Biochemistry and is one year older than the Department.

INFECTIOUS DISEASE RESEARCH IS ESSENTIAL FOR NATIONAL SECURITY

Annika Schmid

The current Trump administration has made it clear through its Make America Healthy Again Strategy that it wishes to focus U.S. federal funding for biomedical research on chronic and childhood diseases, such as obesity, prediabetes, and autism, while decreasing federal funding for research on infectious diseases and related successes, such as mRNA vaccines. This strategy, which minimizes U.S. infectious disease research at the national level, poses a risk to our national security. Federal investment in basic science research focused on the root causes of infectious diseases and our immune responses to these microorganisms is a necessary component of America's strategy to secure our nation’s public health, as well as our social and economic security.

The most recent example of a pathogen-driven pandemic that caused massive U.S. security concerns was the COVID-19 pandemic. The pandemic has taken 1.2 million U.S. lives, but it also brought crippling economic insecurity, threatened the strength of our military, and



Annika in the lab. Photo credit: Annika Schmidt.

dissolved civility within our society. And the COVID-19 pandemic might not be a once-in-a-generation event. Research shows that frequency, health toll, and economic consequences of viral zoonotic outbreaks are on the rise. A key strategy to prepare better for future pandemics caused by infectious pathogens is to invest in basic science research. There is a whole host of research focused on assessing emerging and re-emerging infectious diseases and their ability to cause disease in humans on a mass scale.

The executive branch of the federal government has significant influence over how federal research dollars are allocated. It can set priorities and curtail types of research through executive orders. If the current Trump administration wants to strengthen U.S. national security, it would invest more heavily in infectious disease research by setting research priorities relevant to stopping the threat posed by these diseases. They would also prioritize funding programs for disease surveillance through the National Institutes of Health, Department of Homeland Security, the Centers for Disease Control and Prevention, and the Department of Defense. Additionally, the executive branch would strategically align our country with international public health agencies, such as the World Health Organization (WHO), and the Global Health Security Agenda, that strive to protect the global population from biological threats. Instead, this administration has done the opposite and left our country and our citizens open to the threat of infectious disease. For example, the U.S. used to rely on annual WHO surveillance of circulating influenza strains to design the annual flu shot. Now the shot is being designed with far fewer data points, leaving us more vulnerable to seasonal flu.

The research I am pursuing here at the University of Utah is precisely the type of research that I believe is necessary to enhance our nation's capacity to respond to global health threats, such as COVID-19. I am researching the evolutionary and biochemical mechanisms that drove viruses like SARS-CoV-2 to be able to infect humans. Understanding these mechanisms will make it easier to assess the risk novel viruses have of infecting humans and causing pandemics. My research focuses specifically on the family of viruses that includes SARS-CoV-2, the causative agent of the COVID-19 pandemic. SARS-like coronaviruses are an ideal viral family to study because of the number of viral genomes that the scientific community has sequenced from this family, which makes it possible to track their evolution and host tropism. In the future, I can see the impacts of this research reaching beyond this family of viruses and being relevant to other emerging viral groups. Sadly, this type of research is not seen as a priority by the current leadership in the White House and the Department of Health and Human Services (see the priorities set by HHS here). I believe this lack of foresight will have negative consequences for American health and security.

It is essential to advocate for the funding of infectious disease research. For me, I see the drawdown of funding as a significant threat to U.S. national security, but there are a number of other important reasons to fund scientific research. I encourage everyone to make their voices heard and to continue participating in important conversations like these.

Annika Schmid is a graduate student in the Starr Lab and the views expressed are her own.

UNLOCKING THE SECRETS OF INSULIN RECEPTOR SIGNALING

Aaron Boakye

Every time we eat, our bodies perform a remarkable balancing act. Insulin, a hormone released by the pancreas, helps shuttle glucose from our bloodstream into cells, where it is used for energy. This process relies on a molecular gatekeeper called the insulin receptor, a protein embedded in the surface of our cells that acts like a lock waiting for insulin to turn the key.

Aaron Boakye

But what happens when this lock jams? For millions of people living with type II diabetes, the insulin receptor doesn't respond properly, leading to dangerously high blood sugar levels. Despite decades of research, we still don't fully understand how this receptor works, or how it malfunctions. That is where my research comes in.

As a PhD candidate, I am fascinated by the molecular mechanism that governs insulin signaling. My thesis focuses on visualizing the full-length insulin receptor (FL-IR), especially when it's bound to proteins that inhibit its function. One of these proteins, Grb14, acts like a molecular brake, preventing the receptor from doing its job. Another, H-Ras, helps Grb14 latch onto the receptor more tightly. Together, they form a complex that shuts down insulin signaling, but we have never seen exactly how this trio assembles.

Why haven't we solved this puzzle yet? The insulin receptor is notoriously difficult to study. It's large, flexible, and embedded in the cell membrane, making it challenging to capture with traditional imaging techniques. Most structural studies focus on receptor fragments or use conditions that don't accurately reflect their native environment. That is like trying to understand a car engine by looking at a single spark plug.

To overcome these challenges, our lab is using cryo-electron microscopy (cryoEM), a cutting-edge technique that allows us to freeze proteins in action and visualize them at near-atomic resolution. We have developed methods to purify the full-length receptor and reconstitute it in lipid bilayers, tiny synthetic membranes that mimic the cell's surface. By combining this approach with binding partners such as Grb14 and H-Ras, I aim to gain a detailed understanding of the entire inhibitory complex.

This work isn't just about pretty pictures. Understanding how the insulin receptor is regulated at the molecular level could open new doors for treating diabetes and related metabolic disorders. If we can pinpoint how Grb14 and H-Ras shut down the receptor, we might be able to design drugs that block this interaction and restore insulin sensitivity. One part of my research draws inspiration from virology, leveraging viral mechanisms to stabilize and visualize the full-length insulin receptor (FL-IR) in a more native state.

Dr. Wesley Sundquist's pioneering work on the ESCRT system, originally discovered through HIV research, has revealed how cells and viruses remodel membranes with precision. By tagging FL-IR with ESCRT-recruiting motifs, we are using this viral-inspired machinery to drive the self-assembly of exosome-like particles enriched in insulin receptor, mimicking its natural membrane context.

By combining these strategies, membrane reconstitution via nanodiscs and exosomes, the goal is to determine the full structure of FL-IR and FL-IR bound to its inhibitory partners Grb14 and H-Ras. This approach reflects the receptor's native signaling environment, offering new insights into diabetes and metabolic regulation.

But beyond the therapeutic potential, this project speaks to a deeper curiosity: how do proteins communicate across the membrane to control life's essential processes? The insulin receptor is a model system for studying signal transduction, a universal language used by cells to respond to their environment. By decoding this language, we gain insight into everything from growth and metabolism to cancer and aging.

Aaron Boakye is a PhD Candidate in the Department of Biochemistry working on insulin receptor signaling in the Hill lab

BUILDING BRIDGES IN SCIENCE

Alisa Poppen, Myla Van Duyn, and Yang Liu

Over the past two years, the Liu Lab has hosted three exceptional PathMaker Bridge Fellows, Jessica Quijano (2023–2024), Cecellia (Myla) Van Duyn (2024–2025), and Alisa Poppen (2025), through the Huntsman Cancer Institute's PathMaker Bridge Program. This fellowship brings middle and high school educators from Utah and across the country into research laboratories, with the goal of helping them translate their experiences back into the classroom through curriculum materials connected to biomedical science.

The Liu Lab with the Granger High TSA team after an inspiring campus visit in September 2025. Photo credit: Isaac Maestas.

Jessica, a science teacher at North Brunswick Township Middle School in New Jersey, was the lab's first Bridge Fellow. Working closely with graduate student Courtney Dawes, Jessica helped develop methods for visualizing extrachromosomal DNA (ecDNA), a circular DNA element that plays a key role in cancer evolution. She brought contagious enthusiasm to the young lab. "Jessica's curiosity and energy helped shape our lab's culture," Courtney recalled.

Myla, a biology teacher at Granger High School in West Valley City, Utah, has been an especially active connector between the Liu Lab and her school community. In addition to learning the lab's research, Myla has shared her excitement for science with her own students. During both years of her fellowship, she brought groups of Granger High students to the Liu Lab to learn about CRISPR technology and fluorescence imaging. Students toured the facilities, observed experiments, and even attended a lab meeting to see how scientists design studies, a memorable first encounter with biomedical research.

Alisa, a science teacher at The Waterford School in Sandy, Utah, joined the lab in 2025 and brought a dual perspective as both educator and researcher. Her experience deepened her technical skills and strengthened her approach to teaching and mentorship in the classroom.

"I supported the work of a graduate student (Zach Berkheimer), performing PCR, clean-up, in vitro transcription, and cleavage reactions, lots of centrifuging and even more pipetting," Alisa said. "I was reminded that it can feel uncomfortable to try new things, but the graduate students and PI always trusted me. I want my students to feel that same confidence when they learn new techniques."

Reflecting on the program, Dr. Liu noted, "The fellows bring fresh perspectives, creativity, and a strong sense of purpose. Their presence reminds us that mentorship is not just about teaching skills but about opening doors to scientific discovery for the broader community."

That same spirit now extends beyond the PathMaker program. Through Myla, several Liu Lab members—Jared Thompson, Grant Schlauderaff, and Ian Pantziris—Rachel Vawdrey began supporting Granger High's Technology Student Association (TSA) teams in 2024, offering project consultations that helped both biotechnology and engineering teams advance to the Utah semifinals. Encouraged by that success, the Liu Lab returned in September 2025 for a panel discussion with more Granger students on science and college life. In a newsletter by student journalist Sarinna Goleman, Hamda Aden (11) shared, "Listening to the panel helped me see the different paths you can take in university before medical school. I was especially inspired by the cancer cell imaging research and by the work of Courtney Dawes."

Through programs like PathMaker Bridge and partnerships with Granger High, the Liu Lab continues to build a lasting bridge between research and education, fostering curiosity and discovery across generations.

STAFF HIGHLIGHT: MEET JUDY MONTANO

Growing up in Milwaukee, Wisconsin, Judy Montano was the youngest of three children and the only girl in the family. With two older brothers and a neighborhood full of boys, she spent her childhood outdoors playing football, basketball, and kickball. She played basketball through high school, graduating in 1978, and later worked in fast food and as a secretary at Allen Bradley, an electronics manufacturer. Restless and eager to see more of the world, she joined the U.S. Navy in 1984.

Her first experience away from home was boot camp in Orlando, Florida, where she found the training both physically demanding and surprisingly regimented. After completing eight weeks of training, she received orders to Moffett Field, an air station near San Jose, California. There she joined a P-3 squadron, directing and signaling planes on the ground—a position that introduced her to people from around the world and broadened her perspective. It was also at Moffett Field that she met her husband, Sergio, who served in the same squadron.

Judy and Mojo. Photo credit: Judy Montano.

During her 20 years of Navy service, she pursued multiple medical roles. After training as a hospital corpsman, she became a pharmacy technician at naval hospitals in San Diego, Oakland, and Great Lakes, as well as overseas in Guam. Seeking further challenges, she completed a year-long Independent Duty Corpsman program, which prepared her to take on responsibilities comparable to a physician's assistant. Assigned to a ship based in San Diego, she became the senior "doc" responsible for the health and welfare of 300 personnel. Deployments took her across the Pacific, to Hawaii, Australia, and the Persian Gulf, where she worked under challenging and, at times, dangerous conditions. She later served at the Marine Corps Recruit Depot in San Diego before retiring in 2005.

Retirement didn't mean slowing down. While raising her three children—Alex, Mario, and Alexis—she began a second career as a civilian with the Department of Defense in San Diego, working in medical administration. Later, she joined the Department of Veterans Affairs as a healthcare inspector, leading teams across the country to evaluate VA hospitals. In 2018, she was promoted to open a new inspector's office in Salt Lake City. She and Sergio moved to Utah, settling on three acres in Stockton, Tooele County.

There, she realized a lifelong dream: owning horses. Today, Dakota and Mojo take up much of her free time. Mojo, in particular, helped her rebuild her confidence in the saddle after a scare with Dakota. "Owning horses is a lot of work, but I love a challenge. It keeps me busy and grounded."

After retiring from the VA in early 2024, she quickly found herself restless. Wanting to stay active and connected, she applied to several university positions. When she interviewed with Biochemistry, she immediately felt at home.

In the Biochemistry Department, Judy manages travel arrangements and reimbursements for faculty, staff, and students; scheduling conference rooms; ordering supplies; and overseeing emergency preparedness. She finds the work engaging and especially enjoys coordinating faculty and student travel, which allows her to interact with a wide range of people.

Outside of work, Judy enjoys spending time with her family. Her oldest son, Alex, lives in Dallas and works as an air traffic controller for Southwest Airlines; he has a son, Alex Jr., who is seven. Her second son, Mario, is an aerospace engineer in San Diego with two daughters, Makayla and Mariela. Her daughter, Alexis, also lives in California, working in medical supply chain inspection. She enjoys hiking on local trails during lunchtimes and has hiked the Grand Canyon to the bottom and back twice, and of course riding and caring for her horses Dakota and Mojo.

FACULTY HIGHLIGHT: MEET NILADRI SINHA

Niladri and Meenakshi visiting Mt. Hood. Photo credit: Niladri Sinha.

Niladri Sinha grew up in the bustling city of Calcutta and attended a private school known for its academic rigor, where he remembers balancing his schoolwork with time spent on the cricket pitches with friends. Excelling at chemistry and math, he felt pressure to pursue medicine or engineering. Medicine was quickly ruled out when he realized he fainted at the sight of blood, but biology and chemistry began to spark his curiosity. By the end of high school, his interest in organic chemistry had led him to become increasingly drawn to molecular biology.

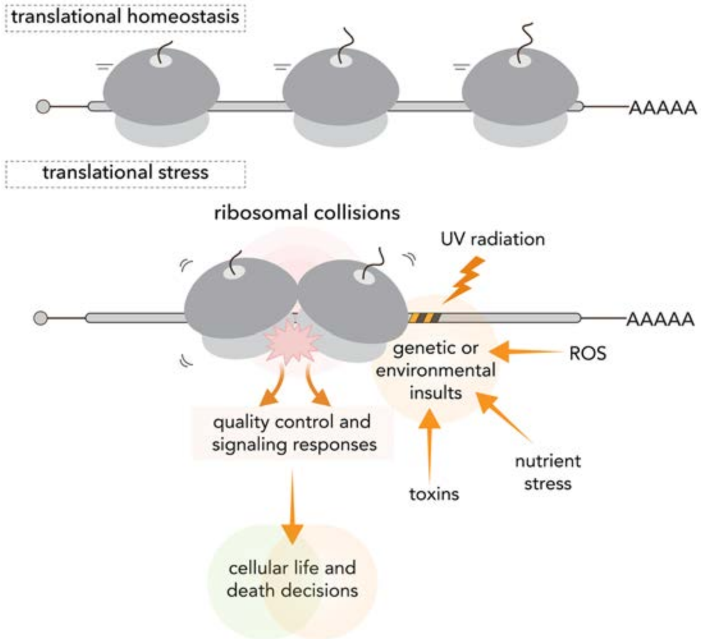
At St. Xavier's College in Calcutta, Niladri majored in microbiology and minored in chemistry and computer science. A turning point came during his first undergraduate biochemistry class, when his professor introduced Christian Anfinsen's Nobel Prize–winning experiment showing that protein folding is encoded entirely by its amino acid sequence. The elegance of the idea captured his imagination and inspired him to pursue biochemistry.

Niladri went on to pursue a master's degree in biophysics and bioinformatics at the University of Calcutta. During the 2009 swine flu pandemic, he worked on sequence analysis of H1N1 influenza strains, tracing mutations and viral lineages, and that experience sparked a career-long interest in host–pathogen interactions. At this point, pursuing graduate school in the U.S. seemed like the next obvious step, and Niladri started applying for Ph.D. programs, deliberately choosing schools that were not located in big metropolitan cities like Calcutta. Salt Lake City and the U's Biological Chemistry program offered the mix of science and lifestyle he was looking for.

In the Bass lab, Niladri studied Dicer, a key RNA-processing enzyme in invertebrate antiviral defense. His graduate work revealed an unexpected function for Dicer's helicase domain in recognizing double-stranded RNA, a unique mechanism for detecting genetic material that resembled viral replication intermediates. In parallel with his biochemical studies of Dicer, Niladri worked with the Shen lab to use cryo-electron microscopy to study Dicer's structure. Beyond the lab, he found a strong network of friends and opportunities to keep playing cricket on a pitch located in the Avenues.

For his postdoctoral training, Niladri chose to shift into ribosome biology. He joined Rachel Green's lab at Johns Hopkins, where he was free to "ask any question you wanted, as long as it connected to translation." Deciding to explore proteomics, Niladri took intensive Cold Spring Harbor courses, and started new collaborations. His research explored how cells respond to translational stress. His work showed that ribosome collisions, caused when stalled ribosomes are rear-ended by other ribosomes, activate quality-control pathways that influence cellular life and death decisions. He also uncovered how RNA damage, caused by stresses such as UV radiation, can trigger cell death more immediately than DNA damage, reframing how cells sense and respond to stress.

After six years in Baltimore, Niladri was happy to return to Salt Lake City. While considering other offers, he realized he was drawn back by the warmth of the community, the rigorous scientific environment, and the quality of life. Now, just months into setting up his



Elongation distress is a key trigger for translational regulation.

lab, he is building a team to investigate how cells manage ribotoxic and proteotoxic stress. “What I’m most excited about is training students,” he says. “Those early years of mentorship were so important for me. Now I want to create that environment for others.” His research has direct relevance for cancer, where rapid protein synthesis collides with nutrient limitations, and he is eager to collaborate with colleagues in metabolism and structural biology.

Now living in the Avenues with his wife Meenakshi, he spends weekends hiking in the Cottonwood Canyons or exploring southern Utah. He is also an avid reader of nonfiction, with favorites ranging from Siddhartha Mukherjee’s *The Song of the Cell* to Ed Yong’s *I Contain Multitudes*. And although he admits to being a bit rusty after a number of cricket-less years in Baltimore, he is looking forward to returning to the cricket pitch as a batsman and wicketkeeper.

ALUMNUS HIGHLIGHT: MEET HEATHER HUNDLEY

Heather and her family on vacation this past summer.

Heather Hundley grew up in Springfield, Illinois, a small city in the center of the state that serves as the capital. From an early age, she recalls gravitating toward quantitative subjects. A memorable science fair project on fertilizers which she carried out with her father, a landscaper, and a growing interest in mathematics and chemistry during high school steered her toward science.

Heather began her undergraduate studies at a community college before transferring to Eastern Illinois University. There, she majored in chemistry in a small department that offered close mentoring and individual attention. Though she started with an interest in chemical engineering, she soon discovered biochemistry after working on a cloning project with a newly recruited faculty member. This project led to her to attend her first national conference (ASBMB) in San Francisco. “I thought it was amazing,” she said. “It felt like such a luxury to be able to think about interesting questions and do experiments.”

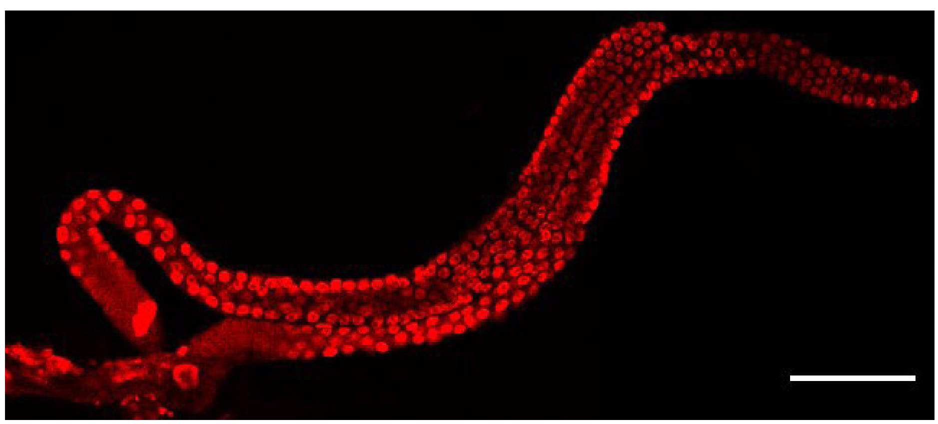
After completing her Ph.D. in Biomolecular Chemistry at the University of Wisconsin, a growing interest in RNA regulation and translation led her to join Brenda Bass' lab, where Heather started studying RNA editing in C. elegans, specifically exploring how editing in the 3’ untranslated regions of mRNAs influenced RNA localization and ribosome association. She enjoyed the scientific independence she had in the Bass lab as well as being part of an active and exciting lab. At the same time, she balanced life milestones: she got married, and welcomed a son.

When her husband, Pete Hollenhorst, received a faculty offer at Indiana University in Bloomington, she made the move as well - first in a non-tenure track position in the medical sciences program, where she started her own lab and welcomed her second son. Within a few years, she transitioned to a tenure-track role and later moved to the Department of Biology on the undergraduate side of campus. Meanwhile, she built an independent research program investigating how RNA regulation shapes organismal physiology, from neuronal responses to hypoxia to immune defenses in C. elegans. One project investigates how the RNA-editing enzyme ADAR3, expressed in the brain, contributes to both normal physiology and glioblastoma. Another branch of her lab studies how worms respond to bacterial infection, teasing apart the genetic pathways that govern host-pathogen interactions.

Alongside research, teaching and mentoring have become central to her career. After years of teaching first-year medical students, she designed an advanced undergraduate molecular biology lab course at IU. Students spend three-hour sessions applying concepts hands-on—expressing proteins in bacteria, using CRISPR in yeast, or silencing genes in worms. “I didn’t want to just lecture. I wanted students to experience what it feels like to actually do science.”

Graduate mentorship is equally important to her. She remembers entering grad school herself with little background knowledge, and she carries that empathy into her advising. “I assume my students might feel just as overwhelmed as I once did. My goal is to support them fully, push them, and help them find their path.” Seeing her students grow into independent scientists, often surpassing her own knowledge, remains one of her greatest joys. Her advice for Biochemistry trainees is to "make sure to have fun. You need to work hard, but you also need to enjoy life. That balance is important, and in Utah, the environment makes it easy to get outside and recharge.”

Outside of science, she and Pete are raising two teenage sons, Evan and Bryce (named after one of Heather’s favorite National Parks), and enjoy exploring nearby state forests.



Immunostaining of the ADAR enzyme in the C. elegans germline, taken by Hundley Lab graduate student Emily Erdmann.

HONORS, GRADUATIONS, AND TRANSITIONS

MAJOR FACULTY AWARDS & RECOGNITIONS

Julia Brasch received the 2025 University of Utah EHS Partner in Safety Award.

Janet Iwasa received tenure and was promoted to Associate Professor!

Janet Iwasa received the Bruce Alberts Award for Excellence in Science Education from the American Society of Cell Biology.

Janet Lindsley received the inaugural Lifetime Achievement Award from the Association of Biochemistry Educators, and the award will be named after her going forward.

Jared Rutter received the 2025 UU Distinguished Research Award.

Helena Safavi-Hemami received tenure!

Peter Shen received the 2025 Spencer Fox Eccles School of Medicine Warren and Jessica Cannon Research Excellence/Impact Award.

Peter Shen received the Award in Collaboration as part of the 2025 Huntsman Cancer Institute Annual Awards.

Paul Sigala received the 2025 Spencer Fox Eccles School of Medicine Warren and Jessica Cannon Research Excellence/Impact Award!

Tyler Starr was selected to speak at the School of Medicine Research Advisory Council "New Faces Symposium"

Wes Sundquist was named to the TIME100 list of 100 most influential people for 2025 (Time Magazine).

Wes Sundquist received the 2025 Mani L. Bhaumik Breakthrough of the Year Award, together with Moupali Das and Yvette Raphael (American Association for the Advancement of Science/Science Magazine).

Wes Sundquist received the Warren Alpert Foundation Prize for Scientific Achievement, together with Tomas Cihlar and John Link (Harvard University).

Wes Sundquist received the World Laureate Association Prize (WLA) Prize for Life Science or Medicine, together with Scott Emr.

Helena Safavi (left) and Janet Iwasa (right) at their tenure celebration in September. Photo credit: Michael Kay.

MAJOR GRADUATE STUDENT & POSTDOC AWARDS

Erica Hastings (Sigala lab) was selected as a speaker for the Utah Center for Iron and Heme Disorders Rising Stars Symposium and the American Physics Society Conference in Anaheim.

Amber Vogel (Hill lab) won best talk award at the West Coast Structural Biology Workshop

Sam Scherer (Kay lab) received an American Peptide Society Symposium Travel Award

Parker Nichols (Bass lab) received a Damon Runyon Postdoctoral Fellowship

Lainie Boyle (Bass lab) won a poster prize at the 2025 RNA Society meeting.

Caroline Craig (Starr lab) was awarded a F31 graduate fellowship from NIAID for viral receptor-binding specificities research

Corey Cunningham and **Nate Krah** (Rutter lab) won the Susan Cooper Jones Endowed Fellowship in Cancer Research from HCI

Erin Kober (Hilgendorf lab) was awarded a spot on the Developmental Biology T32 training grant

Abby Jackson (Hilgendorf lab) was selected as a speaker at the CSHL meeting on the Biology of Cancer: Microenvironment & Metastasis

Rachel Torrez (Iwasa lab) was awarded a F32 postdoctoral fellowship from NIGMS.

GRADUATIONS & TRANSITIONS

Julio Fierro (Roh-Johnson lab) started a postdoctoral position at Stanford University

Ji Eon Kim (Ducker lab) started a faculty position at Sejong University in South Korea

Briana Miles (Barrios lab) was accepted to graduate school at the University of Calgary

Paul Spaltenstein (Kay lab) started a Scientist position at Aliri Bioanalysis in Salt Lake City

Kylie Jacobs (Hughes lab) moved to a new position at the Utah State Public Health Laboratory.

Sara Wong (Hughes lab) moved on to a new position as an SRI Independent Research Fellow at the U

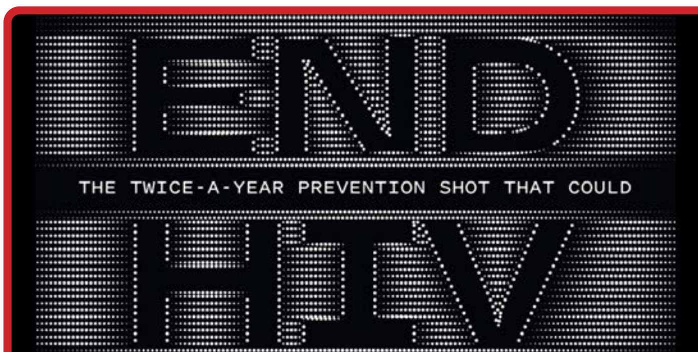
The following students completed their PhD degrees since the last publication of the newsletter in Spring 2025: Julio Fierro (Roh-Johson lab), Supraja Ranganathan (Bass lab), Marcy Mitchell (Kay lab), Erica Hastings (Sigala lab), and Genevieve Couldwell (Sundquist lab).

KUDOS AND THANKS

Thanks to Tyler Starr and colleagues! He organized a very successful Graduate Student Rising Stars event in May, 2025.

Thanks to Toto Olivera! He gave a fascinating Pace Lecture as a keynote talk for the Graduate Student Rising Stars event.

Thanks to Janet Iwasa (and those of all of the participating labs and support teams) for putting together a successful Science Day. They had 1000 visitors!!!



Read "The Twice-a-Year Prevention Shot That Could End HIV," a piece in the fall 2025 U Magazine featuring Wes Sundquist and the work that led to the development of Lenacapavir.

Photo credit: Dave Titensor.

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Photos from the 2025 Biochemistry Picnic. Credit: Tim Formosa

Photos from Tim Formosa's retirement celebration. Credit: Michael Kay.