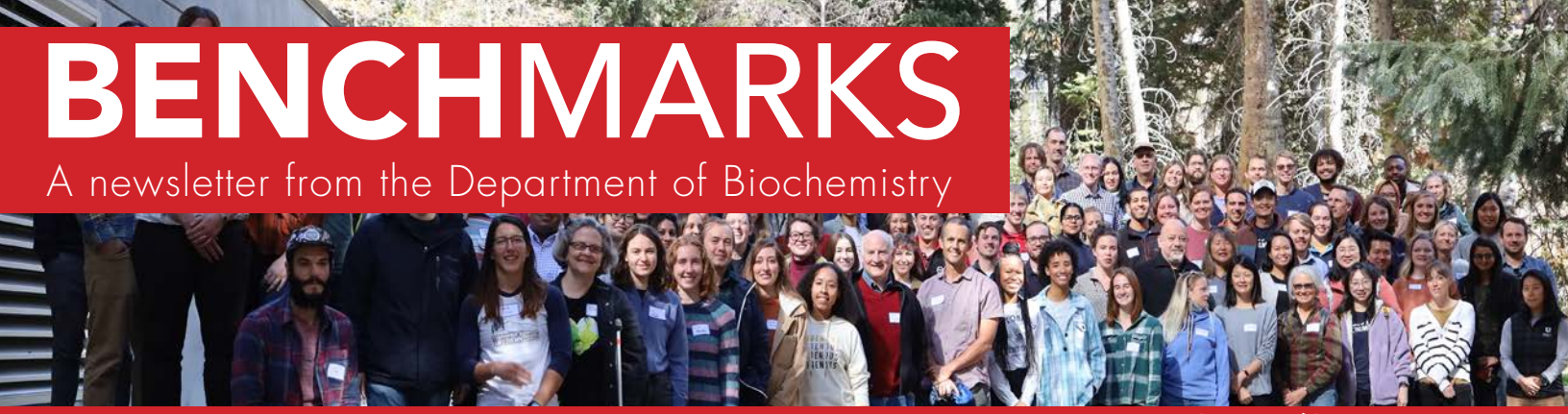
BENCHMARKS

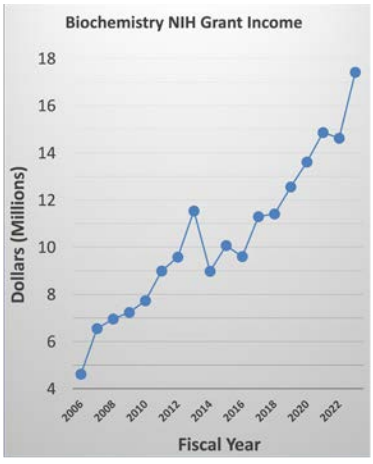
A newsletter from the Department of Biochemistry



Spring/Summer 2023

GROWING UP Chair's Message from Wes Sundquist

The complexities of growth are nicely captured by contrasting quotes from Irish poet William Butler Yeats: "Happiness is neither virtue nor pleasure nor this thing nor that but simply growth. We are happy when we are growing." Compare that to Indian entrepreneur N.R. Narayana Murthy: "Growth is painful. Change is painful. But, nothing is as painful as staying stuck where you do not belong." For the past several decades, our Department has been privileged to grow, and it has mostly been a happy trail, albeit with occasional winces of pain. In the mid 1980's, when Dana Carroll and Marty Rechsteiner began the Biochemistry Department renaissance, we held irregular faculty meetings around a single table at a local Thai restaurant. We now hold bi-weekly faculty meetings in a conference room filled with more than 20 tenure-line faculty members. Losing Pad Thai clearly falls on the "pain" side of the ledger, but growth has been good to us in many other ways, particularly in allowing us to recruit gifted new staff, trainees, and faculty members whose fresh ideas and perspectives have greatly enhanced our educational and research capabilities. As we continue to grow, it's worth considering how we can best maximize our collective happiness (and impact!), and minimize any pain.



As the Department has grown to over 200 members, we've had to formalize administrative structures, adapt our mechanisms for communication, and pay attention to how we maintain community and connectivity. Three years ago, we added eight departmental "Directors" to oversee each of our major departmental missions: Administration (Jared Kirby), Community Engagement (Janet Iwasa), EDI (Paul Sigala), Faculty Affairs (Tim Formosa), Graduate Education (Adam Hughes), Medical Education (Janet Lindsley), Postdoctoral Affairs (where Tyler Starr has just replaced Minna Roh-Johnson), and Research (Jared Rutter). This change was only partly a desperate response to the realization that my administrative burden was about to increase substantially with Chris Hill's promotion from Co-chair to Vice Dean for Research at the School of Medicine - it was also motivated by the sense that we needed more focused attention on each mission to make steady, value-driven progress. The Directors model has worked even better than I had imagined because we now have an accomplished cadre of leaders who generate and discuss new ideas, set clear annual goals, and help us achieve those goals. We can now point to tangible annual progress across our missions, and it feels to me as though we are moving forward more thoughtfully and deliberately. We've similarly grown and formalized our administrative support structure under Jared Kirby's able leadership. For the first time we're about to create multi-person groups to support post-award grants management and coordinate our different departmental programs. Our rising NIH funding levels reflect departmental success, but also provide a sense of how much our administrative workload has grown over the years (see graph). Every new grant requires additional hiring, ordering, budget management, regulatory and compliance tracking, scientific reporting, etc. Still, it's a nice problem to have and Jared and his team have done a great job supporting our growing needs.

Another hallmark of a great scientific community is that everyone actively engages in everyone else's science. Most fundamentally, this requires scientific breadth and curiosity. It also requires good mechanisms for communicating and learning about the problems others are tackling. We all suffer from information overload, and I'm struck by the ever-increasing importance of: 1) clear scientific presentations, and 2) dedication to learning in the face of an information fire hose. As a Department, we have an obligation to provide great training in scientific communication, and to help reduce the information stream to a manageable flow. Once again, this has required formalizing how we communicate and learn across many different levels – from general biochemistry to specialized topics like membrane protein structure and function. We have too many different flavors of meetings to list them all, but several that I personally find useful include our well attended weekly departmental research in progress meetings, which expose us to the research of nearly every departmental member; annual graduate student thesis committee meetings, which provide unvarnished insights into the struggles and successes of our talented graduate students; and informal core faculty "Think Tank" meetings, where we present and discuss new research directions and grant proposal plans. We also have a very informative departmental webpage, and Janet Iwasa directs an active social media presence, despite her Chair's continued Twitter incompetence. Finally, one of our most important core missions is to generate biochemical insights

Biochemistry Department members at the annual picnic in May. Photo credit: Justin English.

that transform our understanding of biology and can ultimately advance the practice of medicine. We continue to share and celebrate such advances by selecting and summarizing the most important advances made in our department each year. The seven selected advances from 2022, as well as the entire collection since 2016, can be viewed on our website.

All great communities also enhance collaboration, inclusivity, friendship, and support. Our growth is helping us to diversify our community, which is great, but growth also poses challenges for ensuring that everyone remains well connected and supported. In that regard, one of the very nice developments from the past year was our successful endowment of a Biochemistry Trainee Support Fund. Thanks to your generosity this past UGiving Day, we were able to endow an emergency support fund that will help our trainees to cover unexpected expenses. This resource can make the difference between trainees being able to complete graduate studies vs. having to pause their career progression. The endowment appears nearly sufficient to last in perpetuity, although we are still happy to accept additional donations to place it on even firmer footing. We're also always striving for better ways to strengthen friendships and have fun together. Thanks to the hard work of our new Events Supervisor, Megan Hendrickson, and the Retreat Planning Committee (currently Justin English, Keren Hilgendorf, and Matt Miller), our annual Department Retreat is now terrific (see photo), and we rewarded their success by asking them to organize the Departmental Picnic as well, which was more fun than ever this year. On a more serious note, our expansion is also creating the critical mass necessary to create impactful new partnerships, including larger, collaborative programmatic grants, greater scientific outreach, enhanced connections with industry, and additional opportunities for philanthropy. These are all areas where we still need to grow, and I'm grateful that your many contributions are helping us move along those paths.

MARJORIE RICHES GUNN 1928 - 2023

Wes Sundquist

We are saddened to note the passing of Marjorie Riches Gunn, a dear friend and wonderful supporter of our Department, this past May. Marge was born in 1928 in Smithfield, UT (Cache County). She got a business degree in Salt Lake City, and then joined the US Foreign Service, with postings in London and in Stockholm. As a result, she was a wonderfully interesting person with a life-long love of travel, many international friends, and a love of opera, ballet, art, and theater. Her friend, Pippa Bush, described her perfectly as "Intrepid, curious, pan-world visionary, a people person, and a minimalist".

When her foreign service ended, she moved back to Salt Lake City, where she worked as secretary to our first Department Chair, Leo Samuels (1944-64), and then as Executive Assistant to George Cartwright, Chair of Internal Medicine. During this period, she married Francis Gunn, who was the founding chair of Chair of Pathology (1945-53). Marge was an integral member of our biomedical research and education communities, and she helped to create our culture of positivity, support, and scientific excellence.

Marge was also a remarkably generous person. She cared deeply about young people, which led her to endow our Gunn Prize for Graduate Student Excellence, and to give other benevolent gifts that enhance our missions. She helped to make us who we are, and she is greatly missed.

Marjorie Riches Gunn at the 2017 Biochemistry Annual Picnic.

THANK YOU FOR A SUCCESSFUL GIVING DAY!

Thank you for all of the generous donations to the University of Utah Department of Biochemistry Trainee Emergency Support Fund. Our very talented trainees can sometimes face challenges as they work towards completing their studies, including the financial pressures of living on student/trainee stipends. Unfortunately, some of our trainees have occasionally had even to leave our program primarily due to financial hardship. Your donations will be used to help our trainees through such emergency financial hardships and continue with their graduate and postdoctoral programs.

We're excited to announce that we received gifts totaling $15k, which greatly exceeded our goal of $10k. This high level of funding has made it possible for the Biochemistry Department to match the $15k, which will allow us to establish an endowment that will provide emergency support assistance to our trainees for years to come, although we still need a bit more funding to create an entirely sustainable fund.

For U Giving Day 2024, we plan to include support for the University of Utah chapter of SACNAS, a national STEM organization that fosters the professional development and success of scientists from underrepresented backgrounds. The Utah SACNAS chapter is led by graduate students and postdoctoral scientists and has played a major role in shaping the diversity and inclusive excellence of our Health Sciences community. For these efforts, our SACNAS chapter was recognized in 2021 with national Chapter-of-the-Year distinction, in recognition of the importance of the work and transformative impact of the chapter. Members of the Dept. of Biochemistry play major roles in SACNAS, including the current president, multiple additional officers, faculty co-advisors, and front-office staff who provide administrative support. We will provide more information as we approach U Giving Day in 2024, but you are welcome to make a donation to support the ongoing work of SACNAS at the current U Giving page. We thank you in advance for your generous support for SACNAS and our Trainee Emergency Fund.

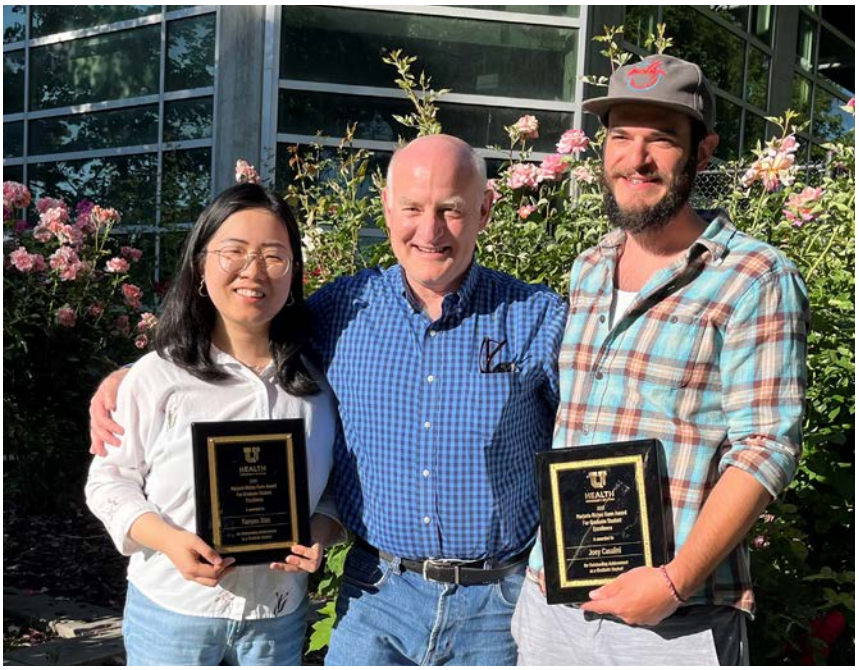
THE 2023 MARJORIE RICHES GUNN AWARD FOR GRADUATE STUDENT EXCELLENCE

Minna Roh-Johnson and Adam Hughes

Each year the Department of Biochemistry selects an outstanding PhD student to receive the Marjorie Riches Gunn Award for Graduate Student Excellence in Biochemistry. This year, the award went to two students, Joey Casalini (Roh-Johnson lab), and Tianyao Xiao (Hughes lab).

Joey Casalini joined the Roh-Johnson lab in 2018, and his main thesis work dissected an unconventional method for how macrophages communicate with cancer cells. Macrophages are a part of the immune system, and typically function to protect the host, but macrophages can be two-faced. In many cancers, especially solid tumors, macrophages take on a very different function and develop mechanisms to promote tumor growth and metastasis. Together with a postdoc in the lab, Dr. Chelsea Kidwell, Joey discovered that one of the ways that macrophages perform these deceitful actions is by transferring their mitochondria, an organelle that is known to provide energy for the cell. Surprisingly, Joey discovered that the transferred macrophage mitochondria aren't "normal". Rather than performing energy-producing functions, the transferred macrophage mitochondria are dysfunctional, accumulate reactive oxygen species, and activate proliferation pathways. Thus, macrophages transfer mitochondria to cancer cells, those transferred mitochondria act as a signal in the recipient cancer cell, and promote cancer cell proliferation. This work was published earlier this year in eLife, and uncovers a new mechanism that could potentially be exploited with therapeutics. For his impactful work, Joey has been recognized with a number of awards including the NIH F31 predoctoral fellowship, the Rising Star in Cancer award from the Huntsman Cancer Institute, and now, this Marjorie Riches Gunn Award. Outside of his research, Joey is well known for his love of music, performing his original music to this lab video (and also starring in the video!); his humor and creativity as one of the Trivia Masters (along with fellow student, Julio Fierro) at our departmental retreats; and his commitment to equity and outreach by teaching to incarcerated individuals through the University of Utah Prison Education Program. We are very proud of Joey and all of his accomplishments, and we are excited to see what he does next!

Tianyao Xiao, who is originally from China, moved to the US for graduate school. Tianyao completed her PhD work in the Hughes lab. Tianyao's thesis work focused on understanding how mitochondria maintain quality control during times of stress. Her work led to two first author papers, one in Life Science Alliance and another in the Journal of Cell Biology (final reviews pending). In her studies, she uncovered an ER-based quality control mechanism that enables cells to cope with toxic, unimported mitochondrial proteins during times of mitochondrial import failure. In her most recent paper, she conducted a genome-wide screen in yeast to identify new players involved in formation of mitochondrial derived compartments. She found a surprising new role for phospholipids in regulated MDC formation, which has opened new doors for understanding the function of this mysterious pathway in cells. During her tenure, Tianyao received the University of Utah Graduate Research Fellowship, and was selected to present her work in an oral talk at the annual ASCB meeting in 2022. Over the past five years, Tianyao has been a pillar and role model of the Biochemistry community. She is known as an excellent mentor and friend to her student and postdoc colleagues, and a wonderful community citizen, demonstrating consistent leadership in Biochemistry community events and serving as a role model for her peers. Tianyao recently moved to UC Berkeley, where she is doing a postdoctoral fellowship in the lab of Elcin Unal.



2023 Marjorie Riches Gunn awardees Tianyao Xiao (left) and Joey Casalini (right) with Wes Sundquist (center). Photo credit: Minna Roh-Johnson.

JAMES CHEN PRESENTS THE 2023 PACE LECTURE

A celebratory dinner at Log Haven after the Pace Lecture. From left to right: Wes Sundquist, James Chen, Brenda Bass, Tyler Starr, Jared Rutter, Janet Iwasa, and Yang Liu.

On June 5, the 2023 Pace Lecture was given by Dr. James Chen, HHMI Investigator and MacGregor Distinguished Chair in Biomedical Science at UT Southwestern. James described his seminal studies defining how cells sense invaders and trigger innate immune responses, including discovering the key nucleic acid sensors, MAVS and cGAS, defining and characterizing the cGAS-cGAMP-STING signaling axis, and uncovering a key role for covalent attachment of prokaryotic cGAS analogs to other proteins – ubiquitin style – within CBASS anti-phage defense systems. One highlight of his wonderful lecture was a detailed description of how his laboratory combined classical biochemistry with a series of clever deductions to identify the cyclic dinucleotide, cGAMP, as the critical second messenger in innate immune signaling, and then to identify cGAS as the enzyme that makes cGAMP.

GRADUATE STUDENT RISING STARS SYMPOSIUM

Minna Roh-Johnson

2023 Graduate Student Rising Stars with Minna Roh-Johnson (right) and Will Holland (second from right). Photo credit: Michael Kay.

The Graduate Student Rising Stars symposium builds from an over 10-year long symposium series called "Rising Stars". For Rising Stars, the Department of Biochemistry, often in collaboration with other departments at the U, invites talented postdoctoral fellows from around the country to come visit Utah and share their exciting work with the community. These events have led to positive and long-lasting relationships, particularly as many of the faculty at Utah are former Rising Stars who have been invited over the years.

Last year, Biochemistry made the decision to extend this series to graduate students, and the department held the first Graduate Student Rising Stars Symposium. Last year's 2022 symposium was a great success, and we hope that the event will kick off another great annual symposium series in which we feature talented graduate students from around the country, particularly students from historically excluded groups. We received another great pool of applications this year. Many of this year's 2023 applicants had learned about this event from their colleagues, which was exciting news as it meant that last year's students had great experiences at Utah and shared this information with their communities. Together with the Department of Nutrition and Integrative Physiology, we were fortunate to invite another 10 remarkable students this May 2023 to share their work and time with our community. These students all gave spectacular talks in the fields of metabolism, cell biology, cancer, and biochemistry, and engagement was so high that we consistently had to cut off question periods to stay on schedule. It was particularly gratifying to see our community of trainees and faculty come together, be fully engaged and asking questions during the symposium, and participating and helping plan the social activities. We would like to especially acknowledge Biochemistry postdocs, Luis Cedeño-Rosario and Aldo García Guerrero, who took the lead in organizing several of the events over the 3 days. In addition to the symposium, the invited students participated in career development workshops, including how to pitch their science, as well as a figure design workshop led by Dr. Janet Iwasa, PI of the Animation Lab in the Department of Biochemistry. We hope that the Graduate Student Rising Stars will continue to be a successful program, and a tradition that we continue every year. The event ended with an overwhelming feeling of enrichment, both personally and professionally, and we are eager to begin planning the next one in 2024.

UTAH'S MD-PHD PROGRAM RECEIVES A PRESTIGIOUS NIH MEDICAL SCIENTIST TRAINING PROGRAM (MSTP) AWARD

Michael Kay

Utah's MD-PhD Program is celebrating two major milestones this summer – its 30th anniversary and the receipt of an NIH Medical Scientist Training Program (MSTP) grant. The program, founded in 1993, is dedicated to training the next generation of physician-scientists via a dual-degree program that provides trainees with rigorous research and clinical training in ~8 years. Biochemistry labs are a popular destination for these students, and Michael Kay has served as program director since 2020.

The MSTP is a highly competitive training grant sponsored by the NIH to support leading MD-PhD programs across the country. This new $1.7 million 5-year award will provide support for individual trainees as well as the development of innovative training approaches. Our MD-PhD program has grown rapidly in recent years, more than doubling in the past five years (with >50 students currently in training). A comprehensive program review in 2018 (led by Chris Hill) identified program strengths and opportunities for improvement, with a focus on issues that had stymied previous MSTP applications. Guided by these recommendations, the program has flourished with robust institutional support, tighter integration of clinical and research training (including smoother transitions between them), expanded recruiting efforts (leading to a 3-fold increase in applications), improved diversity recruiting, and increased trainee success in obtaining NIH individual fellowship awards.

MD-PhD students greatly enrich our community by helping to con-

nect basic and translational research to clinical practice as students train to become future physician-scientist leaders. Program alumni have gone on to a variety of high-impact positions in academic and clinical medicine as well as biotech (e.g. Charles Langelier, who received his MD-PhD in Biochemistry in 2011 from Wes Sundquist's lab and is now a leading translational researcher in infectious disease at UCSF).

MD-PhD group photo, with Michael Kay (front row, right).

A HISTORY OF THE BIOCHEMISTRY DEPARTMENT: PART I

Dana Carroll

Our Department of Biochemistry was born in 1944. Its founding was part of the transition from a two-year to a four-year medical school that started in 1943. Although there were lectures in biochemistry during the previous phase, the hiring of Dr. Leo Tolstoy Samuels as department chair signaled a commitment to an academic discipline with a strong research focus. During this same period, the Medical School made other significant recruitments, including Maxwell Wintrobe as Chair of Medicine, and Louis Goodman as Chair of Pharmacology.

Leo came from the University of Minnesota where he was an Associate Professor of Physiological Chemistry. His research interests lay in steroid hormones – their metabolism, how to measure their concentrations, and their physiological roles and effects. His Ph.D. from the University of Chicago, which he obtained in two years, was on the effect of nutrition on the male hormone system.

As chair, Leo began hiring faculty, recruiting graduate students and postdocs, and collaborating with the other departments in the medical school. He was part of the group led by Max Wintrobe and Frank Tyler that applied for and received the first extramural NIH grant (#00002) for studies of hereditary and metabolic diseases. Emil Smith, who later moved to UCLA and became a prominent protein chemist, was hired on the Biochemistry faculty to lead the Metabolic Laboratory. Another early recruit was Guarth Hansen, who mentored Bill Rutter for his Master's degree in 1950 and took Bill with him to the University of Illinois later that year.

Emil Smith was said to be an excellent lecturer for medical and graduate students. He taught fundamental science in the context of what he called "disturbances of the human being" – i.e., diseases. According to his wife, Leo was not a good lecturer. He believed that teaching well was important but that too much emphasis on teaching drew faculty away from the primary source of their reputations, which was their impact on medical knowledge.

The Department's first home was the attic of the Life Science Building that still stands (undergoing renovation) on the main campus.* In the 1950's, funds were obtained from the Eleanor Roosevelt Cancer Research Fund to erect a Cancer Research Building that had one floor each for the Departments of Biochemistry, Physiology, and Anatomy. This small building became a link between the large School of Medicine and Hospital Building (Building 521, dedicated in 1965) and the Wintrobe Building (1980), and we continued to have space there until our move to the EEJMRB in 2005. It was torn down as part of the ongoing preparation for removal of Building 521 and the coming construction of the new Medical School Building.

Leo Samuels in 1956.

Leo's research on steroid hormones led to the publication of over 200 research papers and a number of awards. He served as President of the Endocrine Society, won the Koch Award from that society, was a member of the organizing committee for the First International Congress of Biochemistry (Moscow, 1961), served on a WHO Expert Advisory Panel, won the Utah Award of the American Chemical Society, and was awarded an honorary D.Sc. degree by the U. of U. He stepped down as chair in 1964, but continued research until his death in 1978. I knew Leo slightly and can confirm that he was a kind, gentle, and dedicated man.

*It was in Kent Golic's lab in that attic that the very first genome edited organisms were produced, using zinc-finger nucleases developed in my lab.

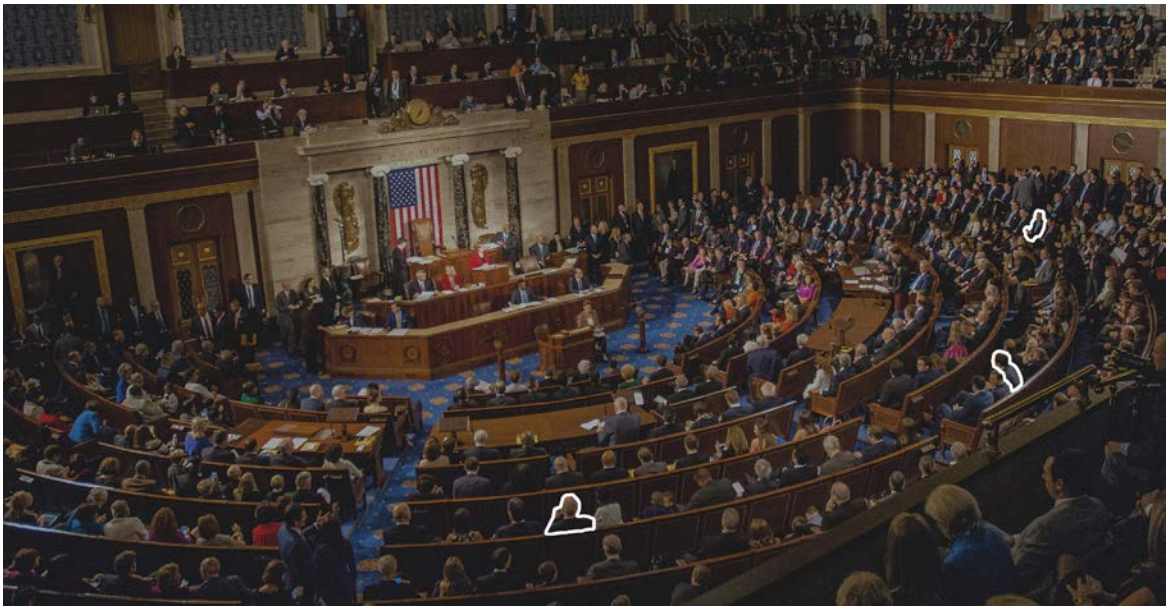
Dana Carroll is Distinguished Professor Emeritus of Biochemistry and is one year older than the Department.

OPINION: BRIDGING THE GAP

Adedeji Aderounmu

After seeing the recently released Oppenheimer biopic, a friend asked me why modern scientists don't have the same cachet with the public that used to exist in the mid to late 1900s. Physicists like Oppenheimer, Einstein and Stephen Hawking penetrated the zeitgeist of their times in a way that seems unattainable today. Of course, I pushed back with a staunch defense of the modern scientist arguing that scientific progress produces more specialization accompanied by a vast amount of knowledge that makes modern science too niche to connect with the public in the same way. I brought up CRISPR and how genetic therapy will have a similar effect given enough time. But even I didn't believe my own arguments. There is a version of the world where the people who cracked the mRNA vaccine code are already household names, a world where every African child knows the name of the chemist that discovered artemisinin. But we don't have that world because there is a gap between the modern scientist and the public, a gap that must be bridged.

Modern medical science has changed the world in a multitude of ways, most of them positive. Vaccines prevent debilitating illness from a variety of infectious diseases and genetic therapies are being deployed to treat monogenic genetic disorders like spinal muscular atrophy and sickle cell disease. All of this means that people are living longer, healthier lives. But there is a growing chasm between the scientists who do the basic science that led to these amazing discoveries and the public who funds and benefits from this research. On the face of it, this is an understandable problem. As knowledge expands, increased specialization is required to study new areas and adquately harness this knowledge for translation into real world benefits. Just as we would never ask a neurosurgeon to draw up building plans for the new school of medicine, we should not expect all researchers to be able to convey the nuances of their research to the general public. Unfortunately, this necessary specialization alienates the public from the workings of science and leaves too much to the goodwill of the middlemen who connect scientific discovery to public good.



Out of the 435 current members of the U.S. House of Representatives, only three have PhDs in the natural or physical sciences.

Earlier this year, a study in Nature Climate Change entitled "Communicating future sea-level rise uncertainty and ambiguity to assessment users" claimed that over the last 30 years, scientists have not done a great job communicating the complexities and practical implications of processes that lead to sea-level changes. The authors focused on the language used to describe the uncertainty in projecting sea-level changes, and how this may have impacted the reaction of policymakers and the public. This paper is not the first of its kind; different groups have suggested that climate change communication to the public has failed to make the threat real and present, resulting in the political polarization of an issue with near-universal scientific consensus. But this does not tell the complete story. Communication is not the only problem, and other factors cause these scientific facts to be lost in translation on the way to becoming public policy. One solution is for scientists to become more involved in shaping public policy, either as politicians or by forming interest groups to leverage political power. If we accept that the problem is not simply a failure of communication between scientists and non-scientist policymakers, but also sometimes a purposeful decision to ignore scientific consensus, scientists becoming directly involved in the transmission of these ideas into real life outcomes would make a significant difference.

A quick glance at the history of scientists in politics at the federal level reveals that science Ph.D. holders rarely run for the United States Congress. A 2019 Science article by Sir Ian Boyd argued that the same is true in the United Kingdom, as only one of 650 members of the lower legislative chamber of the UK's Parliament held a science PhD. In historical terms, Angela Merkel is the only research scientist to have attained the highest office in the land, and Germany's policies in her time as Chancellor often reflected the scientific consensus. Instead, politics is typically dominated by lawyers, economists and businesspeople, even though economic and legal considerations are not inherently more important than scientific input. In practice, scientific considerations are often siloed when public policy is being debated, with scientists seen as advisors for fact-finding committees and expert panels, while real decision-making remains in the hands of elected officials or judges who often prioritize other concerns. A popular argument for why scientists don't pursue public office is the difference in personality types required for the different roles. Scientists are cast as custodians of knowledge who have no interest in the rhetorical games political candidates have to play to win elections. But this stereotype ignores the fact that scientists develop advanced analytical skills that would prove useful for shaping complex public agendas.

The goal here is not to grab power and impose the scientist's will on the people in some dictatorial technocracy. Instead, the idea is to normalize science as a cultural and political centerpiece. We have seen interest groups like the Federalist Society and Christian Evangelicals take a more active interest in politics over the last few decades. What stops the scientific community from getting involved in politics at this level? Taxes are debated in every election cycle, but funding for the scientific enterprise is rarely brought into the public sphere. A unionized scientific community could leverage its political influence into campaigns for better pay for academics of all levels and better financial support for research improving on the current system where individual scientists are pit against one another, competing for limited grants and funding. A scientific community that is more engaged in the public sphere would connect better with the public to discuss actual scientific controversies and dispel misinformation. Consequently, a public with a better understanding of the workings of the scientific process, from grant funding to hypothesis testing, is likely to be more receptive to the complexities of vaccines and clinical trials and climate change. Issues like access to abortion, a medical issue that has been miscast as a cultural issue because of the involvement of religious groups in the political process, could actually be decided by a scientific board of medical doctors who have real life experience and expertise, not

lawyers and judges making decisions based on legal technicalities or religious beliefs.

Currently, scientists exist in the ivory tower and the public feels our impact either through public policy decided by non-scientists or partnerships with private companies who have business interests. We recommend a course of action but don't possess the political power to ensure that they are put into action. We have tried decades of advocacy and regular scientific communication but the planet continues to die partly because we don't have the power to do what needs to be done. It is time to take a more active role in connecting the lab bench to public good.

Dr. Adedeji Aderounmu is a recent graduate from Brenda Bass' lab. He received his Ph.D. in May 2023 for his work on Dicer helicase evolution and engineering.

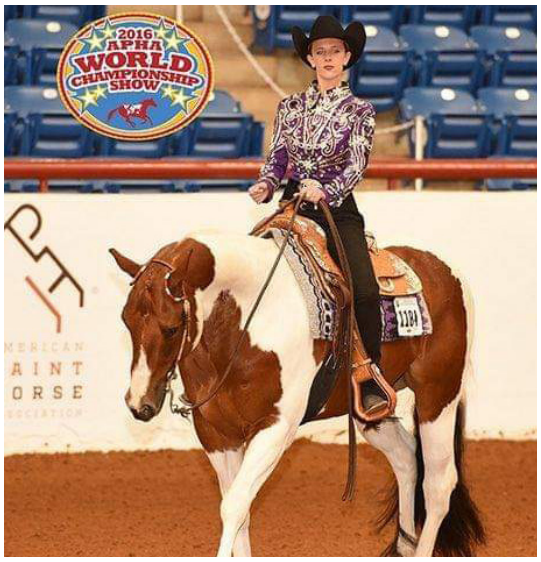
STAFF HIGHLIGHT: MEET MEGAN HENDRICKSON

Megan Hendrickson, the event supervisor for the Department of Biochemistry, was born and raised in Utah. She grew up in West Jordan on an 80-acre family farm, where her family grew alfalfa, raised beef, and kept horses. Megan participated in 4-H events as a youth, and often rode and showed horses in local competitions.

An avid reader, Megan decided to major in English and took a job as an editor after she graduated college. She soon realized that this position wasn't what she wanted to do, and took on other positions. Until recently, Megan worked at Utah State University's 4-H extension program, where she worked to implement youth development programs, including competitions and leadership conferences. During this time, she discovered a love of coordinating events.

As our event supervisor, Megan provides support to ensure that all departmental events run smoothly, including the annual picnic and retreat, as well as visits by guest speakers. She says that she has enjoyed tackling something new in this position, which she just started earlier this year.

In her spare time, Megan spends time with her family, including a daughter, Charlotte, who just turned 1. She also continues to enjoy horse riding (and occasionally still competes) and reading (she is currently enjoying the Finlay Donovan series).



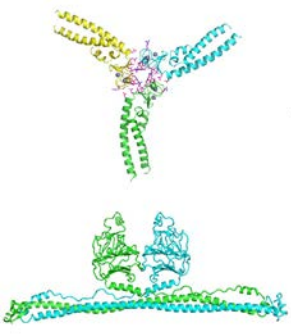
Left: Megan Hendrickson with her husband Kyler and daughter, Charlotte. Right: Megan showing her horse, Nora, during a competition.

FACULTY HIGHLIGHT: MEET BARBIE PORNILLOS

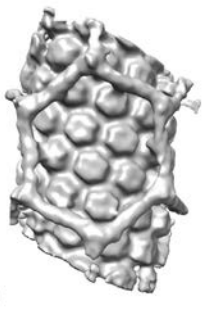
Barbie Pornillos with daughters Lauren and Kay-C.

Barbie Pornillos, who was recently recruited as the Director of the Cryo-EM facility at the U, spent a lot of her Missoula, MT childhood in the outdoors, where she enjoyed hiking and fishing. Her interest in science, she says, grew from her love of being outside. At Montana Tech of the University of Montana (formerly known as Montana State School of Mines) in Butte, Barbie initially intended to major in Environmental Engineering. After watching a lecture in her freshman chemistry class about the fungal synthesis of taxol, a cancer drug that was originally only acquired from the bark of the Pacific yew tree, Barbie decided to work in the lab of Andrea Stierle, a faculty member who was leading a natural products chemistry lab. Barbie recalls trips into the woods, where lab members would look for tree-dwelling bacteria and fungi. Later, in the lab, they would look for activity and try to isolate compounds with interesting activity using chemical purification methods. This experience piqued Barbie's interest in research, and she began thinking about her next steps.

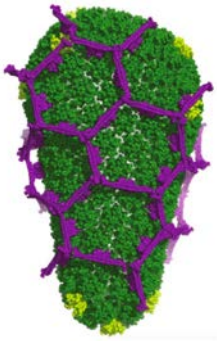
During high school, Barbie participated in local science fairs and had, on multiple occasions, traveled to the U to attend an annual Science Symposium. Having enjoyed these visits, Barbie applied to the U and was accepted to the U of U Chemistry program. After switching to the Biological Chemistry (BC) program, Barbie joined Wes Sundquist's lab and began working on the structure of the HIV capsid. She continued work on capsid structure as a postdoctoral fellow in Mark Yeager's lab at the Scripps Institute, where she was able to isolate and solve the structure of hexameric CA lattices at high resolution. After moving to



Structures of TRIM5 trimer and dimer building blocks



Subtomogram averaged structure of TRIM5 bound to the HIV-1 CA hexagonal lattice



Model of an HIV-1 core caged by TRIM5 (courtesy Janet Iwasa)

the University of Virginia, Barbie continued working on capsid structure as well as investigating how TRIM proteins bind the CA lattice.

Now back at the U, Barbie plans to balance her work as Director of the Cryo EM facility with continued HIV-related research in collaboration with Owen Pornillos. From her grad school years, Barbie remembers that one of the major perks of being at the U was being able to get out onto the Bonneville Shoreline Trail while a gel was running. She looks forward to hiking and running in the Utah mountains, and teaching her daughters to fly fish.

FACULTY HIGHLIGHT: MEET OWEN PORNILLOS

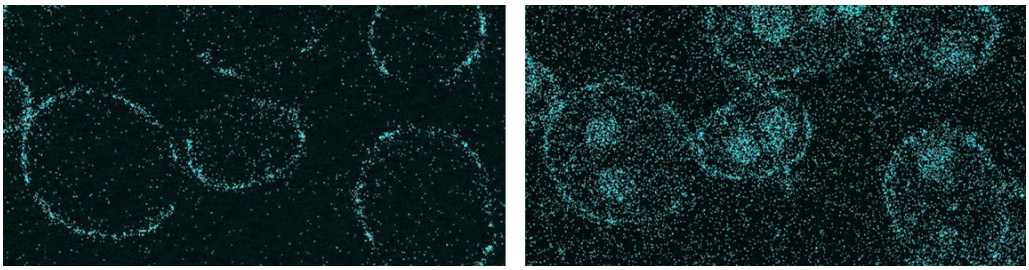
Owen building a capsid at the Math Museum in NYC.

Owen Pornillos grew up in a small fishing and farming village in Philippines called Nabua, located south of Luzon island and within a 20 mile radius of three volcanoes. He left for Manila after qualifying for attendance at a public boarding school, called the Philippine Science High School. Along with 200 classmates from around the Philippines, Owen was immersed in an advanced science-oriented curriculum, including college-level courses. From this formative experience, Owen says, his career in science was "inevitable." Owen remained in Manila to attend the University of the Philippines, where he initially began as a chemical engineering major, but switched to molecular biology while still in his freshman year. For his undergraduate thesis, Owen independently designed a project focused on isolating a fungal protein with a specific enzymatic activity. As graduation neared, Owen's advisor, Flerida Cariño, suggested that Owen apply to graduate schools. Luly Cruz, a faculty member working jointly at the University of Philippines and with Toto Olivera (U of U Biology), suggested that Owen look into the Biological Chemistry (BC) program at the U.

After rotations with Toto, Venki Ramakrishnan, and Wes Sundquist, Owen joined the Sundquist lab and started work on the biology of HIV, including projects focusing on Vpr and TSG101, and also met Barbie Ganser, a fellow graduate student in Wes' lab. For his postdoc, Owen moved to San Diego where he worked at The Scripps Research Institute and later worked at the biotech company Celgene, where he focused on solving structures of kinases. After a couple of years, Owen was recruited as a research faculty member of Mark Yeager's lab, initially starting at Scripps before moving to the University of Virginia. At UVA, Owen transitioned to a tenure-track position in 2011 and, together with Barbie, started a research group which has focused on understanding different aspects of the HIV life cycle, and in particular on the structure and function of the HIV capsid and of restriction factors known as TRIM proteins.

Owen and Barbie were recently recruited back to the University of Utah, and Owen is currently in the process of setting up his lab in Biochemistry. He has a lot of active projects in his lab, and he is particularly excited about projects focused on reconstituting various aspects of HIV replication in vitro starting from purified components (in collaboration with the Sundquist lab and others). He is inspired by the wide-ranging interests in the department, and looks forward to collaborations with other department members in new areas.

When he was a graduate student, Owen enjoyed hiking, camping, and mountain biking, particularly in southern Utah, and he looks forward to returning to these activities again with his family, including daughters Kay-C (17) and Lauren (15).



Purified GFP-labeled HIV-1 cores (pseudo-colored in cyan) bind at the periphery of purified cell nuclei but do not enter the nucleoplasm. Right panel: Nuclear entry of the GFP-labeled cores can be triggered by a peptide that contains a phenylalanine-glycine motif found in many nuclear pore complex proteins. The Pornillos lab is using this biochemical reconstitution system to understand how HIV-1 enters the nucleus of a host cell.

ALUMNUS HIGHLIGHT: MEET SCOTT KNIGHT

We're kicking off a new "Alumnus highlight" series with Scott Knight, a former postdoctoral fellow in Brenda Bass' lab. Thanks to Scott for participating, and please feel free to reach out to us (jiwasa@biochem.utah.edu) if you're interested in being featured or would like to nominate a former Biochemistry Dept trainee.

Scott Knight grew up in a rural farming community in Oregon and attended Linfield College (now LInfield University) in McMinnville, OR. After a brief stint waiting tables, Scott got a job at a Portland company that was developing HIV diagnostic kits, where he discovered that he enjoyed working in a lab and doing science. After less than a year, he was heading to graduate school at the University of Montana, where he studied protein-nucleic acid interactions. Seeking to improve his biochemistry skills, Scott applied to Brenda Bass' lab as a postdoctoral fellow.

Upon joining the Bass lab in 1999, Scott focused on understanding the basic mechanisms of RNA interference (RNAi), a process that had just been recently described by Andrew Fire and Craig Mello in 1998. Brenda encouraged lab members to go after interesting scientific questions regardless of approach or discipline, resulting in a vibrant group that brought together structural biology, genetics, animal behavior, with classical biochemistry and molecular biology. Scott recalls the weekly Research in Progress (RIP) talks (a tradition that continues to this day), where he interacted with other trainees and faculty in a lecture hall that was often crowded to the point of being standing-room only.

After leaving the U, Scott took a faculty position at the University of Richmond. After several years, he became interested in positions in industry, and joined Sigma Aldrich (now Millipore Sigma) in St. Louis to lead a program focused on RNAi tool development. Scott found that he really appreciated the short development cycles in industry, allowing teams to release new usable tools and platforms to labs in a matter of months. Scott later was recruited to Monsanto (also in St.

Louis) to lead the RNAi and gene editing efforts there. After this group was acquired by Bayer, Scott now leads the precision genomics group at Bayer. Focusing exclusively on crop sciences, Scott's team carries out genotyping on huge scales in order to build models that can predict how different crops will perform in the field.

For trainees looking to enter industry, Scott has generously offered some words of advice. (1) Look into internships. Scott's team at Bayer regularly hires interns who are in the process of completing their Ph.D., and this is a great opportunity to learn about industry positions and gain practical experience. (2) Interpersonal skills are important. Scott notes that, in industry, success can often be predicted not just by what skills you have, but by how you interact with others. (3) A lot of groups, like Scott's, are collecting huge amounts of data. Having a skillset that allows you to take advantage of big data to solve problems will likely serve you well in the future.

Scott in Bayer's Precision Genomics lab in St. Louis standing in front of one of the sample-handling automation systems.

HONORS, GRADUATIONS, AND TRANSITIONS

MAJOR FACULTY AWARDS & RECOGNITIONS

Owen Pornillos and **Barbie Ganser-Pornillos** joined as new faculty members in the Department. They come to us from the University of Virginia where they have done groundbreaking research on HIV-1 replication and innate immunity.

Michael Kay is PI on a prestigious NIH Medical Scientist Training Program (MSTP), which will provide funding for the University of Utah MD/PhD program. This is the first time that Utah has had MSTP funding.

Dana Carroll, Distinguished Professor of Biochemistry, received the Rosenblatt Prize from the U in May. This is the highest award given to faculty members. Dana has also recently moved into emeritus status. We spent a wonderful day in May celebrating his many contributions to science, our department, and our university. Dana played a leading role in defining who we are today, and we are grateful for his wonderful accomplishments and service.

Keren Hilgendorf received a Pew Scholars Award, which is the highest recognition given to young faculty members in biomedical research (together with the Searle Scholars Award). Keren is the 10th faculty member from our department to receive a Searle/Pew Award.

Janet Iwasa was featured in a very nice piece in Current Biology.

MAJOR GRADUATE STUDENT & POSTDOC AWARDS

Megan Okada, a graduate student from the Sigala Lab, received the prestigious International Weintraub Award, which recognizes outstanding achievement in Graduate Studies. The award was given to just 12 students from a pool of international candidates. Read more here.

Kylie Jacobs, a postdoc in the Hughes lab, was awarded a F32 from NIGMS as well as a position on the T32 in metabolism training grant.

Onyeka Obidi, graduate student in the Brasch lab, won the ASBMB Graduate Student Diversity, Equity and Inclusion Award to attend the DiscoverBMB conference.

Talia Cahoon, a graduate student in the Miller lab, was awarded a T32 on the Genetics Training Grant.

Kevin Chui, a graduate student in the Hughes lab, was awarded an F31 from NIA (National Institute on Aging).

Michael Stewart, a graduate student in the Miller lab, received an F31 from NCI to "Investigate the regulation and mechanism of tension-sensors Stu2 & Ndc80c at budding yeast kinetochores."

Radek Omelianczyk, a joint postdoc in the Sigala and Leffler labs, was awarded a 1-year pilot grant from the Cooperative Centers for Excellence in Hematology to study metabolic changes in red blood cells due to sickle cell disease, hypoxia, and malaria infection.

Shuxin Wang, a graduate student from the Shen lab, won the Ken Jacobs Memorial PhD thesis award, which is given to the most outstanding UU computational doctoral dissertations in genomics. Her thesis defense was really a nice celebration of great science and accomplishment.

Luis Cedeño-Rosario, a postdoc in the Rutter lab, received a Postdoctoral Diversity Enrichment Program grant from the Burroughs Wellcome Fund.

James Carrington and **Rachel Skabelund** (graduate students in the Rutter lab) received NIDDK T32 pre-doctoral fellowships in metabolism.

Kristina Seller, a postdoc in the Rutter lab, was awarded a 24-month postdoc mobility fellowship from the Swiss National Science Foundation.

Erica Hasting and **Shai-anne Nalder**, graduate students in the Sigala lab, were awarded the 2023 John Weis Memorial Graduate Student Award in recognition of their research achievements.

Julio Fierro Morales and **Shai-anne Nalder**, graduate students in the Roh-Johnson and Sigala labs, respectively, were awarded the 2023 Sherman R. and Deborah Ann Dickman Graduate Student Travel Fellowship in recognition of research excellence.

Joey Casalini and **Tianyao Xiao**, graduate students in the Roh-Johnson and Hughes labs, respectively, were awarded the 2023 Marjorie Riches Gunn Award for graduate student research excellence in biochemistry.

Taylor Stevens, a postbaccalaureate student in the Roh-Johnson lab, and **Shai-Anne Nalder**, a graduate student in the Sigala lab, are recipients of the SACNAS National COLOR (Chapter Officer Leadership October Retreat) awards. These awards will fund their attendance to the SACNAS National meeting in Portland, Oregon, as well as a 1-day retreat to connect and strengthen leadership skills.

GRADUATIONS & TRANSITIONS

The following students completed their degrees since the last publication of the newsletter in Winter 2022/2023: Shuxin Wang (Shen lab, PhD 2023), Tianyao Xiao (Hughes lab, PhD 2023), Qian Xue (Roh-Johnson lab, PhD 2023), Joey Casalini (Roh-Johnson lab, PhD 2023), Henry Wienkers (Hill lab, PhD 2023), Alan Blakely (Hill lab, PhD 2023), Adedeji Aderounmu (Bass lab, PhD 2023), Ian Cooney (Shen lab, PhD 2023), Yi Wolf Zhang (Chou lab, PhD 2023), Sreeja Govindarajan (Cao Lab, Masters 2023).

SAVE THE DATE! Please join us at 7pm on Tuesday, September 26 at the Natural History Museum for the University of Utah Frontiers of Science Lecture from Nobel Laureate Venki Ramakrishnan (a member of our Department from 1995-2000), and a celebration of the opening of their new exhibit on the ribosome (featuring Janet Iwasa's animations!). It should be a wonderful evening!

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Photos from Dana Carroll's Retirement Celebration, held in May 2023.