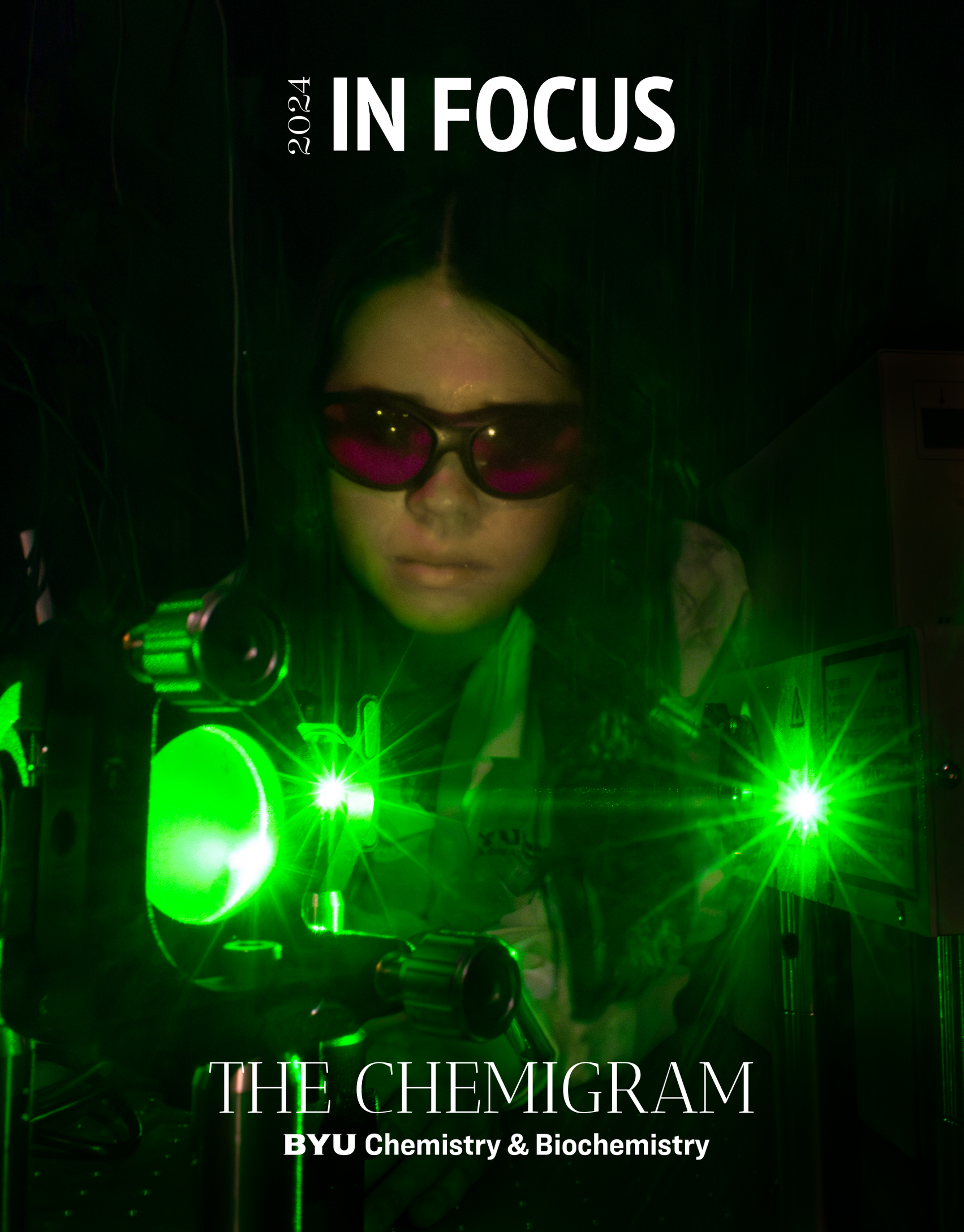
2024

IN FOCUS



THE CHEMIGRAM

BYU Chemistry & Biochemistry

Letter from the Chair



As we reflect on the past year, we are proud to highlight several significant achievements and milestones that underscore our commitment to excellence and innovation:

- Construction of the "Flask": We created a dedicated space for undergraduate and graduate students to socialize, work on homework, and collaborate on projects.

- Research Mentorship: As a department, we mentored 326 undergraduates in our research labs, providing funds for a total of 128,601 student work hours. This initiative fulfills the university's directive that every student should have at least one experiential learning experience.

- Groundbreaking for the Eyring Science Center Addition: This expansion includes a dedicated lab space for a Cryo-EM instrument. The innovative aspects of Cryo-EM–particularly its ability to handle a wide range of sample types and conditions, its non-reliance on crystallization, and its capacity to provide insights into dynamic processes–make it a complementary and sometimes superior technique to X-ray crystallography for structural biology. This capability places us at the forefront of structural biology research.

- 50th Anniversary of the College of Physical and Mathematical Sciences: The year-long celebration culminated in a gala where we announced the new name of the college: the College of Computational, Mathematical, and Physical Sciences.

- Fundraising Competition: Leading up to the gala, the college hosted a Giving Week initiative to encourage alumni donations for continued research and lab mentorships. Thanks to seed money from generous donors, the initiative surpassed its goal of 500 independent donors, achieving a total of 966 sponsors. The Department of Chemistry and Biochemistry placed second in the competition, earning $15,000. This amount was contributed to our Student Aid account, which provides scholarships, fellowships, and paid research positions for our students.

Additionally, we welcomed Dr. Kenny Lee and Dr. Brandon Gassaway to our faculty. Both Dr. Lee and Dr. Gassaway earned their bachelor's degrees from our department, followed by PhDs from Purdue University and Yale, respectively. Before joining BYU, Dr. Lee was a postdoctoral scholar and staff scientist at the University of Wisconsin-Madison, and Dr. Gassaway was a postdoctoral scholar at Harvard.

In addition to welcoming new faculty, I am pleased to report that Ken Christensen, David Michaelis, JC Price, James Patterson, and Stacey Smith were all promoted to the rank of Full Professor. James Moody obtained Continuing Faculty Status (CFS) and was promoted to Associate Professor.

These accomplishments collectively mark another productive year for our department and highlight our commitment to providing a transformative education to our students. Our success today would not be possible without the contributions of our emeritus faculty, staff, and students. We truly stand on the shoulders of giants and are committed to continuing the upward trajectory established by those who came before us.

-Jaron Hansen

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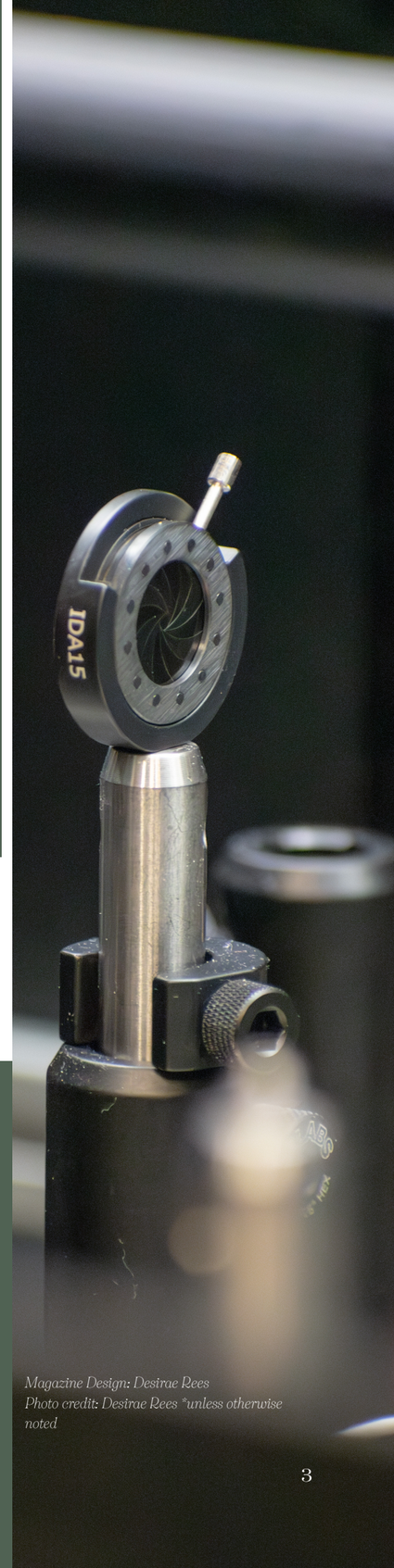

Magazine Design: Desirae Rees
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Measuring Impact

Scan this QR code for our website to find more information about making an impact.
https://www.chem.byu.edu/donate/

Donor Gifts

$1.99 million in undergraduate research awards

$138,064 in undergraduate scholarships

$348,813 in graduate fellowships

$15,000 in gifts for student travel

Department Efforts

15,379 students served

71,060 student credit hours taught

$5.3 million in grant funding

41 Fellowships

88 Degrees Awarded

PhD = 24
MS = 4
BS/BS = 60

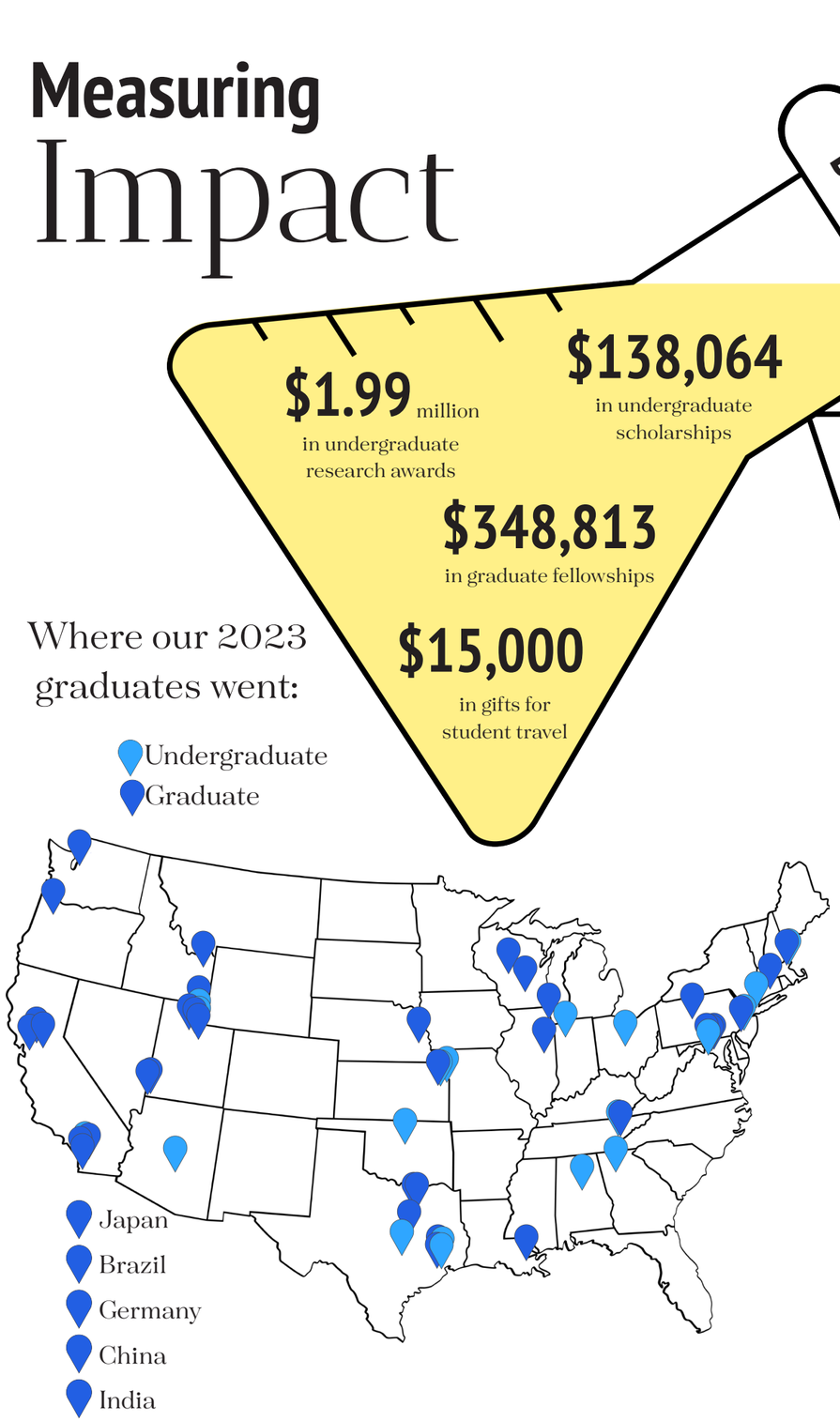
67 Scholarships

143 Total Publications with **302** student authors

70 Student Conference Presentations

128,601 Total Undergraduate Research Hours with **326** students involved

Where our 2023 graduates went:



On behalf of students in the Department of Chemistry and Biochemistry, we extend our heartfelt gratitude to our donors. Your unwavering support has a profound impact on them and their pursuit of knowledge. Regardless of the size of your gift, your generosity reverberates in the hearts of our students. In their own words:

"I am beyond grateful for this fellowship experience that will add value to my career and my professional goals. I will pay it forward through hard work, dedication and looking always to serve others."

"This scholarship is a great weight off my shoulder and a huge blessing. I not only get to learn about our Savior in my religion classes but also in my science classes. BYU is a place like no other."

"Thank you for your generous donation that made it possible for me to attend the American Chemical Society meeting. I did not just present my research, but I was also able to attend several seminars, learn from more experienced researchers, and create meaningful networks. You are a gift to me, and many others, and I am grateful."

When considering giving opportunities, thank you for keeping us in mind. Every dollar counts, including small regular contributions to our Student Aide Gift Fund.

Learning In Focus

In both chemistry and biochemistry laboratories, “focus” is the essential element that bridges meticulous experimentation with profound scientific discovery. It’s the unwavering attention to detail, whether it’s measuring reactants to the precise milliliter in a chemistry lab or observing the subtle changes in protein folding in a biochemistry setting.

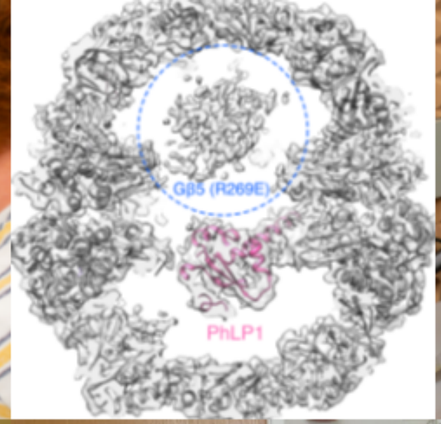
In a chemistry or biochemistry lab, focus means:
-Precise calibration of instruments like spectrophotometers and pipettes.
-Analyzing results with a critical eye to deduce chemical behaviors and properties.
-Exploring the molecular basis of life processes in health and disease.
-Applying findings to develop new drugs, therapies, and diagnostic tools.

When combined, the definition of focus in these labs encapsulates the convergence of chemical principles with biological insights. It’s about harnessing the power of both disciplines to explore the building blocks of life and the reactions that sustain it. Focus in this context is the disciplined pursuit of knowledge that leads to innovations in science and beyond.

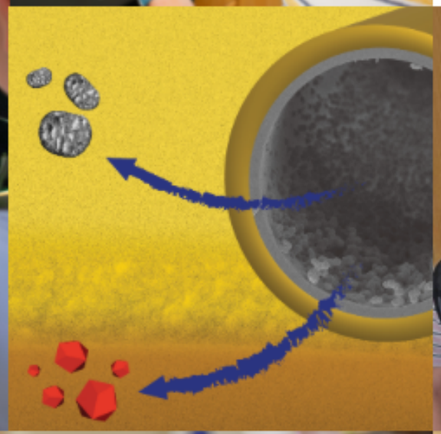
This search for focus is one of the many worthy pursuits we strive to develop in our students. To illustrate that point, here are some photographs–fleeting moments of captured time–taken by our faculty and students. They display the labors and fruits of their focus on collaboration, innovation, teamwork, connection, and discovery–and show, through their eyes, what is worthy of their focus here at BYU.



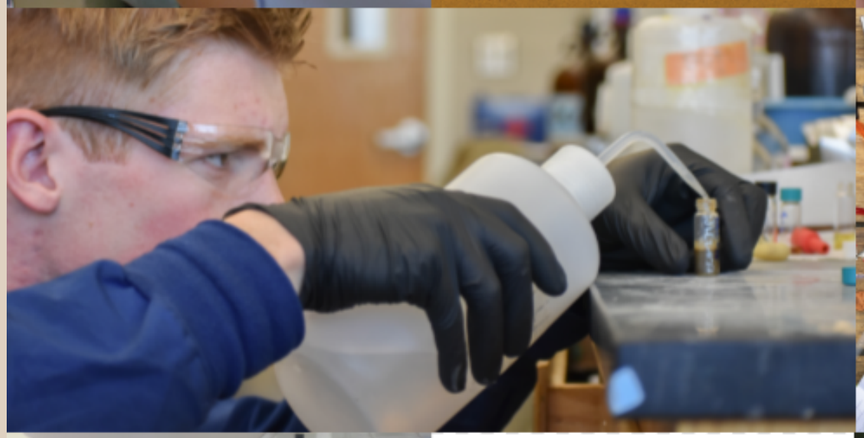




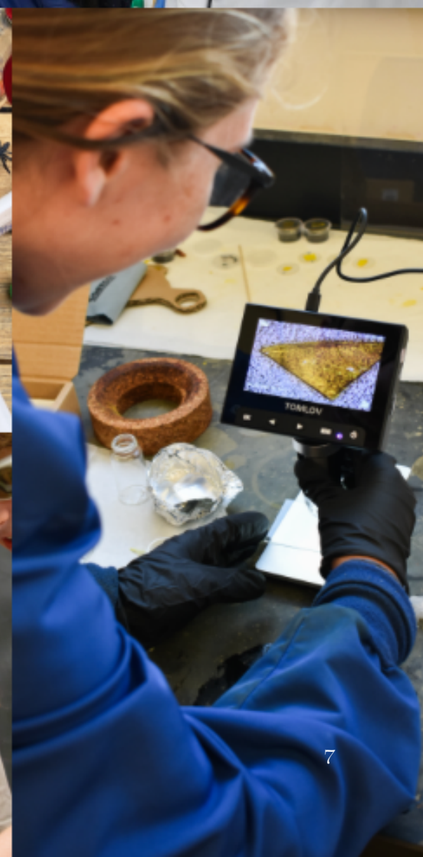




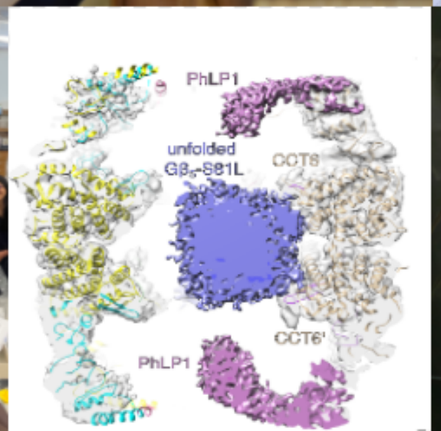














Michaelis Lab:

A Focus on Invention

In the middle of June, when the rest of the BYU campus is relatively empty, the fourth floor of the Benson Building is a notable exception. That's because it's home to the Michaelis Lab, a hotspot of organic compound generation that's teeming with collaboration, innovation, and entrepreneurship.



Collaboration

Dr. David J. Michaelis, founder and leader of the Michaelis Lab, has BYU roots that run deep. A BYU alum himself, Michaelis graduated from the Department of Chemistry and Biochemistry in 2005 as an undergraduate member of the Paul B. Savage Lab. "I was the first person in his lab to put an antibacterial compound on a polymer, and then we coated a titanium slide and we showed that it didn't grow biofilms on it," Michaelis says. "Now, he has that molecule on polymers on [tracheal] tubes and catheters."

Today, Michaelis works alongside his previous mentor and was recently granted full professorship status. By the beginning of the 2024 Fall Semester, two of Michaelis's own children will be students here at BYU, carrying on their father's legacy of academic excellence.

Like light reflected and fragmented off of glass, the Michaelis Lab works within the confines of compound synthesis to approach a scattered variety of applications. "If we can make stuff," he says, "then we can interface with inorganic chemistry, and organic, biochemistry, medicinal chemistry, and materials chemistry. And, we're really good at making stuff."

That "stuff" is a wide variety of molecular compounds, materials, and crystals. Current research in the Michaelis Lab includes the synthesis of cancer drugs for other BYU labs to screen, pharmaceutical catalysis, and ligand design.

A key part of what makes the Michaelis Lab special is the interconnected nature of his team members. "My lab is humming in the summer with undergraduates," he says. With 15 undergraduate students, several graduate mentors, a high school student, and a Talmage Fellow recipient, his lab is a unique blend of student involvement and cooperation. "I've been at a whole bunch of universities everywhere, and nobody ever has undergraduates in their lab really doing real science and publishing awesome papers. By the end of the year, we'll have published nine papers with 30 undergraduate co-authors on it. It's freaking awesome."

Innovation

Brimming with constant developments and discoveries, there is never a dull moment for Michaelis or his students. One research group of several students, led by an undergraduate on track for Scripps Research Institute this fall, recently discovered new platinum complexes that could have a massive ripple effect on the field of catalysis.

"All of these different complexes have unique reactivity, and she's discovering new reactions that happen really well with these catalysts, how they're unique compared to other plain catalysts; that's my favorite thing that I'm thinking about these days."





Terahertz frequency-producing materials, in particular, have become another exciting focal point in the laboratory.

"Have you been to the Marriott Center recently?" Michaelis asks. "And you walk through a scanner? You know what that scanner is? It's a terahertz frequency scanner." These scanners, also used in airport security lines, use light waves that are not absorbed by clothing; instead, they are absorbed by water, a major component of the human body. These imaging techniques can pierce through thin materials to detect metal and ceramics that may be concealed under a person's clothes or in a suitcase, backpack, or purse.

"This frequency of light is awesome for lots of medical applications: food quality, and national security, but we don't have very bright light bulbs," Michaelis explains. "So, we're like Thomas Edison. We're creating new light bulbs for terahertz frequency light. Our intense materials are making this field better and people are doing new things that they couldn't do before because of our materials."

These generative crystals are compounded on-site in the Michaelis Lab, materializing in vibrant hues of red, green, yellow, and blue. These crystalline structures are the key to creating a new generation of stronger, more effective terahertz light bulbs. They are used under focused laser light in collaboration with the Johnson Lab at BYU.

Entrepreneurship

While catalysis, materials, and medicinal chemistry are the three main focuses of his current research, Michaelis is ever-innovating and has exciting new ideas on the horizon for expanding his laboratory's demographic.

"I'd really like to get into organic photovoltaics," Michaelis muses. "We already make these molecules that do terahertz generation, and we'd like to do light-capture instead. They're very similar molecules.

Between the demands of parenthood, soccer coaching, supporting his children's extracurricular activities, and running his own chemical research lab, Michaelis is also in the process of creating his own start-up, Terahertz Innovations. While the full-scale of his master plan is still in the early stages, his company is already selling crystal compounds and works in collaboration with CP Chem and with Tech Transfer grant money from the National Science Foundation. His goal is to create a production facility that focuses on real sustainability in emissions and organization, creating a foundation built on ethics and designed to last for generations.

Written by Emily Smith

Johnson Lab:

A Focus on Light

Written by Emily Smith

Jeremy Johnson is many things: a husband, father, travel enthusiast, PhD recipient. Recently, however, his professorship and research into groundbreaking terahertz studies at BYU have earned him another title: trailblazer.

A BYU alumni, Johnson worked in the Eric T. Sevy Lab and graduated with an undergraduate degree in chemistry in April 2006. He completed graduate school and received a PhD from MIT (2011), going on to fulfill a postdoctoral fellowship with the Paul Scherrer Institute in Villigen, Switzerland. After participating in a short research opportunity at the Yokohama National University in Japan, Johnson settled back at BYU in 2015 as an assistant professor and was granted associate status in 2021.

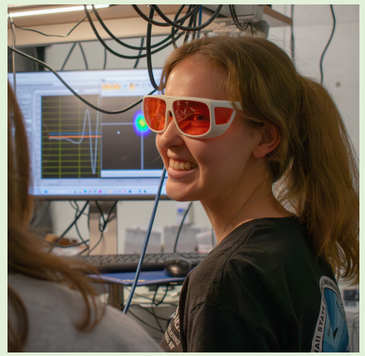
These days, Johnson's laboratory specializes in cutting-edge technology surrounding the generation and use of terahertz light. Terahertz light falls between infrared and microwaves on the electromagnetic spectrum and is extremely useful in studying and controlling solid and liquid materials on trillionth-of-a-second time scales.

"In my physical chemistry lab, we try to understand the properties of different kinds of materials, and then use that to design new materials," he said. "Half of our research involves developing new materials that we use to generate the terahertz light, and we do that with a big collaboration with David Michaelis in our department."

To create terahertz light, one needs a material with good properties and proper conditions to create ideal generators. Because of the field's newness, the Johnson Lab is discovering what best generates terahertz light while working in conjunction with the BYU Michaelis Lab to make these visions a reality.

"It's been a phenomenal collaboration," Johnson says. "We do computational design and discovery of the materials, trying to predict what materials would make really good terahertz generators, and then [the Michaelis Lab] will synthesize molecules and grow the crystals. Then we'll determine the structure and test them out to see how well they work in comparison to our predictions, so that's pretty fun."

In classic BYU fashion, these crystalline materials are so effective that they have been adopted into "over 100 different labs around the world." To learn more about the Michaelis Lab and its involvement in this field, please see "A Focus on Invention - The Michaelis Lab" in this publication.



After fine-tuning their terahertz generation ideas, the Johnson Lab puts their creations to work. It turns out that terahertz light has a host of fascinating applications, many of which could change the face of medical diagnostics, security, and production assembly. Not only is the Johnson lab creating light, they're creating new ways to use it.

"The nice thing about terahertz light," Johnson said, "is that it passes through and interacts with a lot of materials. The Johnson Spectroscopy Lab sees endless opportunities with this kind of terahertz technology. One of their growing projects involves using terahertz light to improve medical tissue imaging.

"Right now, for a number of diseases, you take a tissue biopsy and then stain it with this multistep process that, sometimes, isn't very reproducible," Johnson said. This tissue is placed under an optical microscope, where a pathologist must manually determine whether the tissue contains the suspected disease.

The Johnson Lab believes they can improve this process. Developing what they call "automated hyperspectral analysis," the lab is creating a system of mirrors and light that can scan human tissue samples with terahertz light. These scans would be recorded and analyzed by a computer, coded to recognize and flag disease markers. The process would be repeatable, causing no damage to the tissue, and avoid human error and lengthy dye procedures.

Johnson's laboratory is also discovering exciting implications about how terahertz light interacts with crystalline structures. They've discovered that they can push atoms far from their equilibrium structures with light, altering their properties and how they behave as materials.

"We have this core structure-function relationship that's central to chemistry," Johnson said, "[But] one of the things that terahertz light is really good at, especially for solid materials, is–if you send strong terahertz pulses into the material–you can excite atomic motion." These pulses can cause atomic vibrations, allowing chemists to manipulate atomic motions and rearrange crystal structure–and, by extension, material properties.

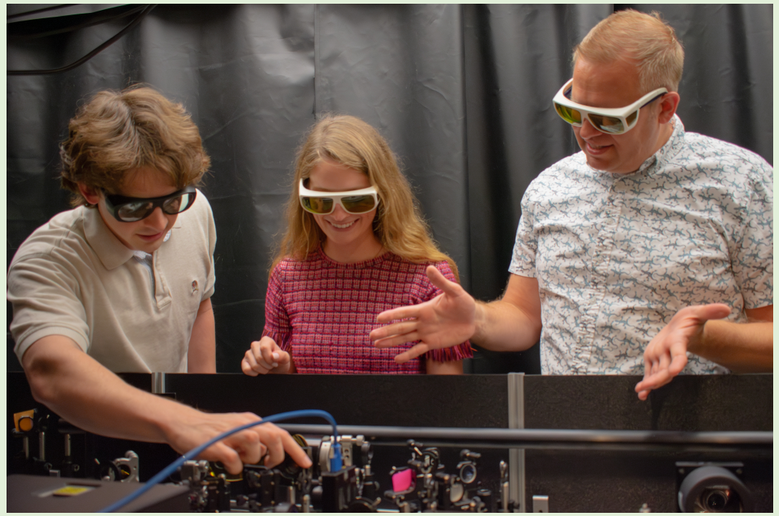
"There's one set of experiments we're working on right now where we use the terahertz light to excite circular motion of the atoms in a crystal," Johnson said. "You can take a material that's not magnetic and that circular motion, induced with light, makes it magnetic."

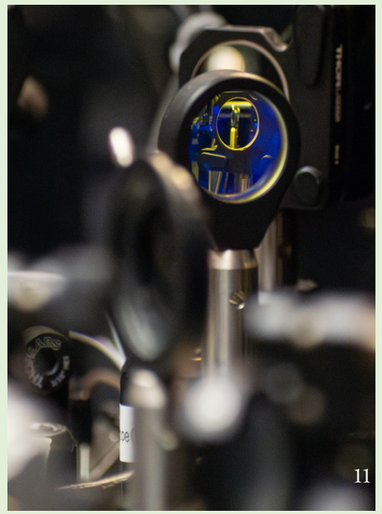
This discovery has possible major implications for technological advancements. "This can potentially serve as the basis for [what we call an] ultrafast switch," Johnson said. "[It] would be the basis for extremely high-speed computer processors, or new flash drive memory, that would be millions of times faster than what we currently have."

While all of these discoveries offer thrilling possibilities, Johnson says that his students are the true drive behind his work. Johnson says that getting to work with students in his lab throughout their time at BYU allows for greater friendships and mentorships to develop.

"It's just fun working with the students, and we've got great undergraduate and PhD students here," he said. "It's fun seeing them learn and develop new skills, present at really cool conferences, and do cutting-edge research [not only] in our lab but also with collaborators."

Johnson is helping to pioneer research that will not only expand the boundaries of academia; he's also changing the world in which we live, one beam of terahertz light at a time.





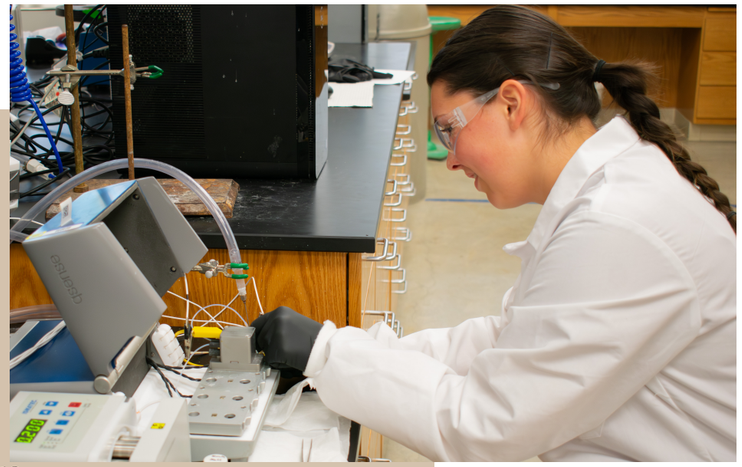
Paxton Lab:

Focus on the Process

Wally Paxton at Brigham Young University (BYU) is a leading figure in the realm of stimuli-responsive chemistry. His work is advancing our understanding of chemical processes, both on Earth and in extraterrestrial environments, reflecting a profound commitment to innovation and exploration in the field.

Paxton's journey began when he joined BYU in 2018 and was swiftly promoted to associate professor in 2019. He established the Paxton Lab in the Benson Building, creating a research environment dedicated to exploring the frontiers of chemistry. Paxton's foundational work was influenced by his time at Penn State University, where he focused on catalysis and developed an interest in confining chemical reactions to specific surfaces. This exploration led to his groundbreaking development of "nanobots"–tiny particles that swim like bacteria and can be controlled using magnetized nickel segments. This innovation opened a new field of research and has been cited over 2,200 times, culminating in recognition at the first Nanobots International Conference in Catalonia, Spain.

Inspired by his success, Paxton began investigating how atomic processes could be manipulated more effectively. His research shifted from merely explaining or predicting chemical reactions to actively controlling them. This approach has driven several high-impact projects that have garnered national attention, numerous publications, and substantial funding.



Membranous Bubbles

One of the Paxton Lab's notable recent projects involves creating bubble-like structures that respond to varying pH levels. These structures, which resemble soap bubbles, are formed from aggregated molecules that change their properties under acidic or basic conditions. The lab has developed materials based on these structures that can form tiny vesicles in low pH environments, expanding into larger structures resembling cell membranes under different conditions. This research, recently accepted for publication in the Langmuir journal, holds significant promise for applications in fields such as drug delivery and environmental monitoring. Paxton describes these structures as "pH-responsive," emphasizing their ability to mimic biological membranes and potentially revolutionize how we approach chemical environments in various applications.

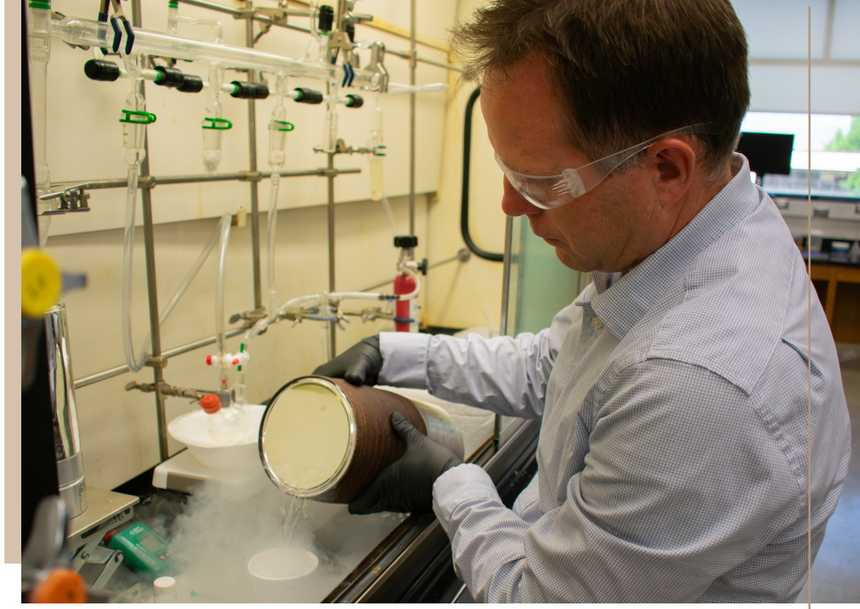
Polymers in Space

The Paxton Lab is also tackling challenges related to space technology. During satellite launches, optical technology can become covered with debris, impacting its functionality.

Alex Stapley, an undergraduate student from the BYU Physics Department, proposed a polymer that adheres to dust and evaporates in the vacuum of space. The Paxton Lab's experiments with this polymer, funded by the Utah Space Grant Consortium, have demonstrated its effectiveness in removing dust by evaporating the coating. This solution could significantly improve the maintenance of optical technology in space by addressing debris accumulation. The ongoing research aims to refine this polymer's properties to enhance its effectiveness in various space conditions.

Eliminating Waste through Sugar Fuel Cells

Another significant focus of Paxton's research is renewable energy, particularly through the utilization of carbohydrate food waste. Whey permeate, a byproduct of cheese and yogurt production, presents disposal challenges due to its biohazardous nature. Paxton's lab has adapted existing electrocatalysts to these permeate surfaces, developing electric fuel cells that generate water and carbon dioxide. The process converts waste into energy while producing carbonate ions (CO_3^{2-}), which can be trapped in water and disposed of as carbonate salts. This approach offers a sustainable solution to waste disposal and energy production, potentially benefiting both power companies and dairy manufacturers. Although current technology limits the efficiency of these cells, Paxton's team is actively working on optimizing the process to improve yields and overall effectiveness.



Seeing the Big Picture

Throughout his career, Paxton has emphasized the importance of balancing detailed scientific work with a broader perspective. He believes that while focusing intently on a single project can be beneficial, it is essential to remain open to new opportunities and broader goals. "There are other opportunities that can come along," Paxton notes. "If you're hyper-focused on one thing, you might miss out on other kinds of opportunities." This approach reflects his belief in the value of understanding core principles while exploring new and innovative applications.

Paxton's core values guide his approach to both his research and his life. He is committed to understanding the fundamental principles of chemistry and applying that knowledge to make a positive impact on the world. Additionally, Paxton is dedicated to teaching and mentoring his students, encouraging them to embrace both detailed and broader perspectives in their research. "What am I really focused on?" Paxton reflects. "I'm focused on understanding chemistry principles, using them to improve the world, and teaching my students to do the same." This holistic approach drives his work and motivates his students to explore and innovate.

In summary, Wally Paxton's work at the Paxton Lab is a testament to the integration of innovative thinking and practical application. His research spans various fields, from space technology to renewable energy, addressing pressing global challenges while advancing scientific knowledge. By exploring stimuli-responsive chemistry and its diverse applications, Paxton and his team are making significant strides that contribute to both scientific discovery and societal impact. Their work exemplifies a commitment to pushing the boundaries of what is possible in chemistry, offering solutions that have the potential to transform industries and improve lives.

Written by Emily Smith

Mentored Undergraduate Research

OTT RESEARCH AWARD RECIPIENT

Benjamin Karlinsey

My research employs DNA as a structural template for nanoscale electronic junctions via DNA origami. This technique folds single-stranded DNA into diverse geometries using complementary staple strands. I utilize a DNA origami rectangle with extended staples to attach metal and semiconductor nanorods functionalized with DNA. Aligning nanorods along the origami axis via complementary staple ends, I've developed nanoscale Schottky junctions using cadmium sulfide and gold nanorods. Currently, I aim to create a semiconductor-semiconductor p-n junction with cadmium sulfide and cadmium telluride nanorods, advancing DNA templated self-assembly of transistors.

As a research assistant, I've gained invaluable experience in chemistry. Applying classroom knowledge, I've made unique contributions, gained independence in experimental design, and honed troubleshooting skills. This role has equipped me with specialized knowledge vital for my future research. Contributing to a recently published paper has provided insight into the publication process and enhanced my writing skills, crucial for my career ahead.



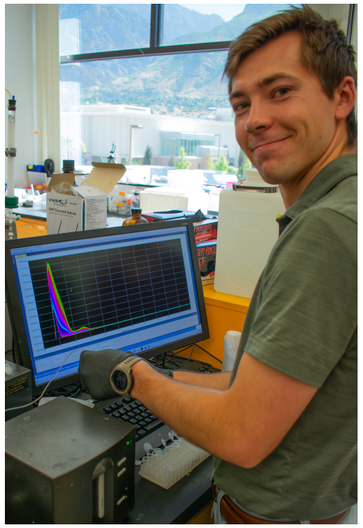


OTT RESEARCH AWARD RECIPIENT

Spencer Jones

In the Castle lab I have worked on multiple projects involving thermally promoted radicals for cyclizations and C–H activations. From a ketone we can form a radical precursor that will form an imine radical. This radical, depending on the functional groups and presence of a radical trap, can form a pyrroline, tetralone, or be functionalized at the g position.

Being in the Castle lab has helped me apply my education to our projects. While learning about my reactions, I have also refined my communication, critical thinking, and use of the scientific method. I attribute my growth to my brilliant mentors and coworkers through our passion for our work.



KEARNES RESEARCH AWARD RECIPIENT

Jordan Gardner

Our lab studies iron metabolism to discover novel treatments for iron-related diseases such as anemia. In particular, I study how different molecules impact the iron-binding behavior of the transport protein transferrin. Thus far, we have demonstrated that pyrophosphate ensures that iron binds exclusively in transferrin's N-lobe. Since recent research has demonstrated that N-lobe transferrin acts as a signaling molecule to increase an organism's sensitivity to EPO, we are currently working on identifying an analog of pyrophosphate that will similarly produce N-lobe transferrin, which drug could potentially support increased production of red blood cells and hemoglobin in anemic patients.

My URA at BYU has deeply enriched my academic journey, offering hands-on research experience from planning to interpretation. It has sharpened my analytical skills, allowing me to explore new questions independently and draw meaningful conclusions, inspiring me to continue exploring our world's mysteries.



OTT RESEARCH AWARD RECIPIENT

Natalie Parkinson

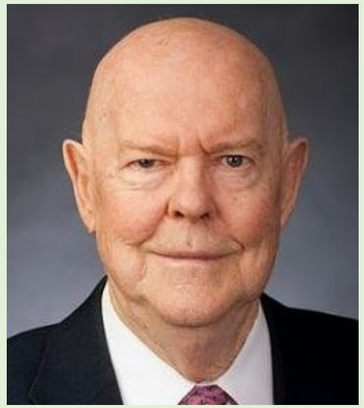
Our research involves measuring the heat capacities of solids at low temperatures. These measurements are necessary to compute thermodynamic functions at room temperature and understand electronic, magnetic, and other cool and potentially useful characteristics of a solid. I have worked on projects involving cardiovascular medications, materials with applications for lithium extraction, electrolytes for lithium batteries, and more.

Research is awesome and not easy. The transition from the classroom to the laboratory can be rocky. Research requires me to think independently, take the initiative, and become comfortable trying new things. I'm grateful for the opportunity to learn and fail in a low-stakes environment, and for the funding that makes this feasible. The URA program is empowering me to contribute effectively to the scientific community.

In Memoriam

Reed Izatt





Photos courtesy of the Izatt Family

With the new year often comes changes; a series of firsts. For the Brigham Young University Department of Chemistry and Biochemistry, this marks the dawn of the first year and first semester since Dr. Reed M. Izatt's passing.

Born October 10, 1926, Izatt passed away in his home and in the presence of his family on October 29, 2023. He had just turned 97 years old. His funeral was held on November 4, 2023 in Provo, UT; he was buried in his hometown of Logan, UT that same day.

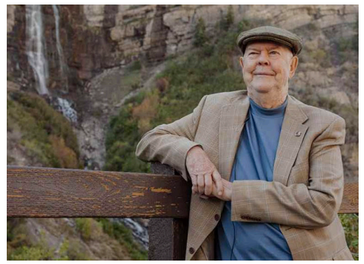
Izatt's relationship with BYU began when he became a faculty member in 1956 for the Chemistry Department. A brilliant pioneer of chemical science, he would go on to collaborate with other bright chemists, creating his own research lab that housed undergraduate, graduate, and PhD students. Author or co-author of over 540 publications, his work has been cited over 30,000 times and is still relevant today. He is also attributed as the founder of the International Izatt-Christensen Award in Macrocyclic and Supramolecular Chemistry and other globally prestigious awards, endowments, and symposiums, including the International Symposium on Macrocyclic and Supramolecular Chemistry (ISMSC). He was also the recipient of many prestigious titles and awards, including Fellow of the American Association for the Advancement of Science, the American Chemical Society's 1996 Separations Science Award, the 1990 Medal for Science and Technology from the governor of Utah, the 1983 Calorimetry Conference Huffmin Award, and was listed in the chemistry's sector's Ranking of Best Scientists list from Research.com. A committed scholar and researcher, his influence continues to permeate universities, conferences, and individual lives worldwide.

In addition to his glowing academic accomplishments, Izatt worked with colleagues Dr. Jerald S. Bradshaw and Dr. James J. Christensen to create IBC Advanced Technologies in 1988. The company functions as a provider for a variety of chemical technology supplies and focuses on advancing chemistry in sustainable, ecologically-responsible ways.

A devoted chemist, faithful disciple of Jesus Christ, compassionate soul, and adoring father and husband, Dr. Reed M. Izatt's life and legacy stand witness to his upstanding character and gifted mind. The BYU Department of Chemistry and Biochemistry expresses condolences to his family and immense gratitude to a life so well-lived and so dearly loved.

To learn more about Dr. Reed M. Izatt's life, please read his obituary at https://www.bergmortuary.com/obituaries/Reed-Izatt/#!/Obituary.

Written by Emily Smith



Morris Robins

The BYU Department of Chemistry and Biochemistry has lost another beloved emeritus professor, Dr. Morris Joseph Robins. Born on September 28th, 1939 in Nephi, Utah, Robins passed away on December 16th, 2023. He is survived by eight children, 28 grandchildren, and 22 great-grandchildren.

Robins enjoyed a successful international career and became a globally-renowned chemist. A graduate of the University of Utah class of 1961, Robins went on to intern with Eastman Kodak and held a postdoctoral position at the Roswell Park Memorial Cancer Research Institute. He received his PhD from Arizona State University and held positions at the University of Utah, the University of Alberta, and eventually was recruited by Brigham Young University as a professor of organic and medicinal research chemistry.

During his career, Robins also successfully created and owned several drug patents. He was a prestigious, sought-after mentor and served as chairman of the Gordon Research Center for many years.

On his tribute wall on the Walker Anderson Funeral Home website, family, friends, and associates remembered Robins as humble, kind, pure-hearted, and compassionate. Their testaments bear witness that his gentle character and faith were just as integral to his life as the innovative chemistry and profession he loved.

In lieu of flowers, the Robins family requested that family and friends donate to the Church of Jesus Christ of Latter-day Saints' Light the World campaign, which provides basic necessities for impoverished families around the world in a vending-machine transactional form during the month of December. "In lieu of flowers," his obituary says, "please consider donating to one of Morris's favorite charity campaigns, the Light the World Giving Machines. Goats were his favorite donation item." Friends and associates can donate to this cause when the Giving Machines open again in December of each year.

The BYU Department of Chemistry and Biochemistry expresses its utmost gratitude for Dr. Robins and his personal and professional contributions to both BYU and the chemical community at large. The department also expresses its sincerest condolences to the Robins family and wishes them peace and healing during this time.

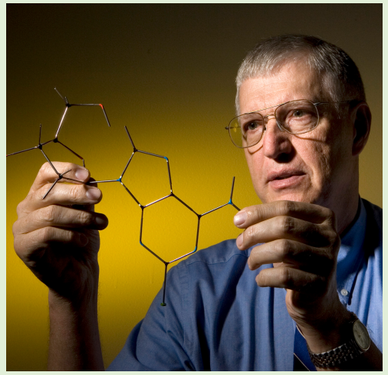
To read Robins' complete obituary, please visit https://www.walkersanderson.com/obituaries/Morris-Joseph-Robins?obId=30130714.

Written by Emily Smith

Photos courtesy of the Robins Family







New Faces

Written by Emily Smith



Mary Fisher joined the BYU Department of Chemistry and Biochemistry staff as the Chem Stores Administrative Assistant in June of 2023. She received her bachelor's degree from BYU in Clinical Laboratory Science and has 10 years of hospital laboratory experience in various states, including Utah, Illinois, and Maryland.

Mary has three sons attending school and one daughter, a missionary for the Church of Jesus Christ of Latter-day Saints in Hamburg, Germany. Together, they like to play games, watch movies, hike, and play with their yellow labrador, Ozzy.

In her spare time, Mary enjoys being outside. Her favorite activities include hiking, biking, gardening, and watching her sons play sports. She is also passionate about music, enjoying listening to her three sons play the piano and listening to her daughter practice the violin.



Brandon Gassaway is an Assistant Professor in the Department of Chemistry & Biochemistry at Brigham Young University, whose research focuses on functionalizing protein post-translational modifications using thermal stability proteomics and phospho-amino acid orthogonal translation systems. Gassaway graduated Magna Cum Laude with university honors from Brigham Young University, where he worked in the laboratory of Dr. Emily Bates.

Gassaway went on to do his graduate studies with Dr. Jesse Rinehart at Yale University. He then began a post-doctoral fellowship in the laboratory of Dr. Steven Gygi.

Gassaway and his wife Katelyn (also a BYU Biochemistry alumna) are the parents of three children. He enjoys coaching his children's soccer teams, spending time outdoors (especially hiking, camping, and white-water rafting), and all things sci-fi/fantasy.



Alena Allred recently celebrated her 32nd wedding anniversary with her husband Brian, a Clinical Director at Telos. Together, they have four wonderful children.

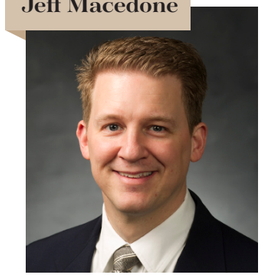
Professionally, Allred recently served as the Department Secretary for the Center for Improvement of Teacher Education and Schooling (CITES) in the McKay School. Prior to her career with BYU, she worked in the Utah County Attorney's Office Bureau of Investigations and has had various administrative roles throughout her life.

Allred received her Bachelor of Arts from BYU and is still passionate about learning, striving to take a class every semester. She particularly enjoys studying the scriptures, having taken "The Writings of Isaiah" three times. She loves the outdoors, reading crime novels, keeping up with crafting trends, and spending time with her family.

Photos courtesy of the Faculty and Staff

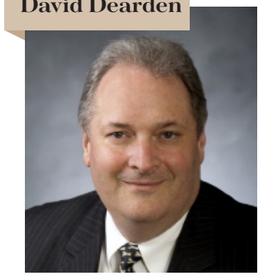
Faculty / Staff Awards

Jeff Macedone



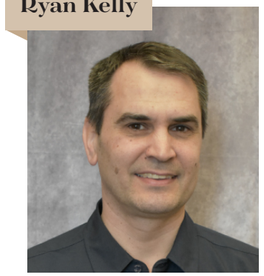
Mentoring
College Award

David Dearden



Faculty Distinguished Citizenship
College Award

Ryan Kelly



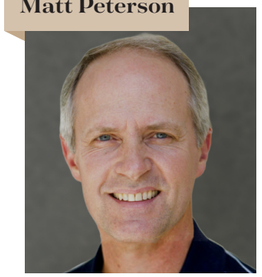
Early Career Scholarship
College Award

Jeremy Johnson



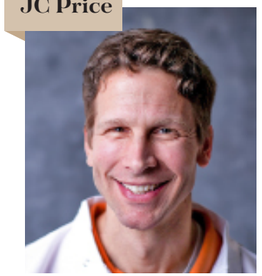
Early Career Scholarship
College Award

Matt Peterson



Majors' Teaching and Mentoring
Department Award

JC Price



Grad Student Teaching and Mentoring
Department Award

Kara Stowers



Citizenship
Department Award

Wally Paxton



Service Teaching
Department Award

AND

Recognition for Pioneering Work in Nanobots at the first annual Nanobots International Conference
External Award

Kristian Peterson



Citizenship
Department Award

David Michaelis



University Experiential Learning
BYU Careers Award

Grant Jensen



Elected a Fellow of the American Academy of Microbiology
External Award

Photos courtesy of the BYU Faculty and Staff

Alumni Impact

Written by Emily Smith

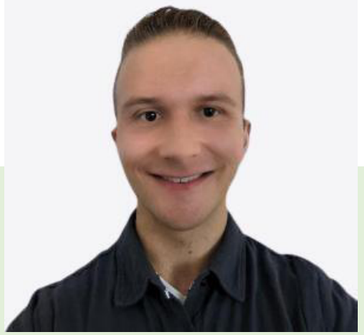


Leena Patil graduated with a PhD in Nucleoside Chemistry and served as a postdoctoral fellow in the BYU Milton Lee Lab until 2023. Since then, she has been granted the position of senior scientist at Vanderbilt University and spoke at the 2024 US Human Proteome Organization (USHUPO) Conference in Portland, Oregon.

Patil shared her experience at USHUPO on social media, saying, "It was amazing to witness global and local community of proteomic and lipidomic researchers who passionately inspire innovation. As an ECR committee member, I was able to speak and inspire high school students as the next generation of scientists." The entire JC Price Lab at BYU, where Patil worked, also came in full force to show their support.

Nathan Brown graduated in 2019 with a BS in Biochemistry. Also a member of the Joshua Price Lab, Brown was selected for the National Science Foundation Graduate Research Fellowship Program.





Zach Jones, B.S. 2022 and former URA recipient and member of the Joshua Price Lab, was selected as a Graduate Research Fellow for the National Science Foundation.



Mary Vallecillo, a BYU PhD graduate, was listed by Forbes as one of the top 100 most influential women in Central America. She now works as a fellow at the Brigham and Women's Hospital in Boston, MA, studying immunology and pathology.

Throughout her education and career, Vallecillo has dedicated herself to championing opportunities for women. She is also an advocate for mental health wellness and increased awareness about the health of women and children. She is also interested in studying rare diseases such as Alzheimer's, lupus, and muscular dystrophy.

Photos courtesy of the alumni

Philip Low at Anniversary Gala

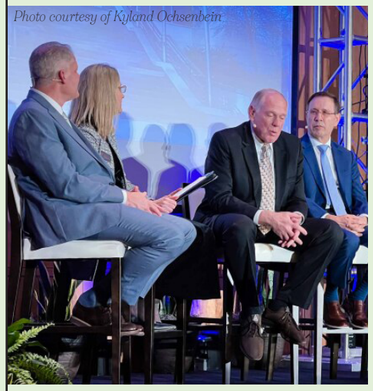


Photo courtesy of Kyland Ochsenbein

On February 23rd of this year, BYU alumni and current member of the Chemistry and Biochemistry Department advisory board Philip Low participated in the College of Physical and Mathematical Sciences' 50th Anniversary Gala as a keynote panelist and seminar speaker.

The college, renamed the College of Computation, Mathematical, and Physical Sciences at the gala's proceedings, hosted faculty, students, and notable alumni for a grand name-reveal, lecture, and live Q&A panel. Also among the panelists were BYU President C. Shane Reese and computer science program success story Carlos Martins, who spoke about the future of the college and their vision for its continued success.

Low has contributed over 50 years to chemical discovery. He started his chemical education with BYU and received his undergraduate degree in 1971, going on to receive a PhD from the University of California in San Diego. He is now a professor and researcher at Purdue University, where he holds the title of Presidential Scholar for Drug Discovery and the Ralph C. Corley Distinguished Professor of Chemistry award.

With an emphasis in targeted imaging design and therapeutic development to fight human disease, Low has over 360 patents, is directly involved in the discovery of eight therapeutic drugs currently under clinical trial, is the founder of seven companies, and has been cited in scholarly publications over 74,000 times. He has won dozens of awards for his contributions to drug discovery and administration techniques and has particular interest in cancer, sickle cell, and malaria research.

On behalf of our students and faculty, the BYU Department of Chemistry and Biochemistry wishes to thank Low for his continued support for and collaboration with the BYU community. His vested interest and efforts to the global chemistry community and our corner of campus continue to make a difference.

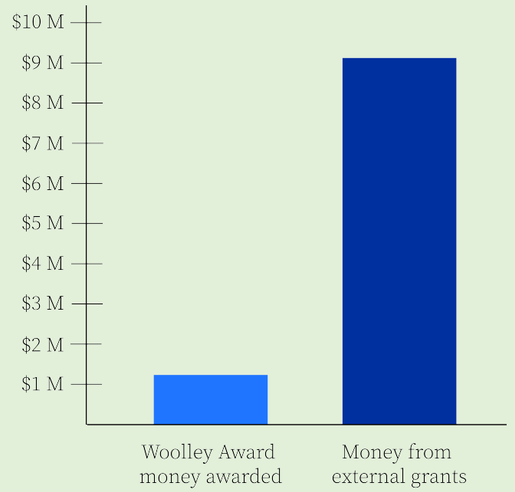
The BYU Department of Chemistry and Biochemistry welcomes participation from alumni on the new advisory board. If you are interested in getting involved, please contact department chair Dr. Jaron Hansen via email at jaron.hansen@byu.edu.

Written by Emily Smith

Woolley Awards

As of this year, the department has awarded $1.25 M as Earl M Woolley Research Innovation Awards since 2017. These awards seed new ideas and provide bridge funding for faculty between grants. The return on investment from this program is over 700%. This seed/bridge money has resulted in almost $9M in external awards and fostered collaboration between faculty. This award was set up from funds the department received from the Dan Simmon's Pfizer settlement.

Written by Ken Christensen



Annual Lectureships

Written by Emily Smith

Izatt-Christensen

Speaking to BYU students on March 12th and 13th, Dr. Frances S. Ligler of Texas A&M University presented her research and successes with optical biosensor development. Such miniscule technology, developed with increasing sensitivity and accuracy, can be used to deeply analyze large swaths of molecular data in real-time. These sensors can be used to capture measurements and interactions between living cells, allowing analytical observation without interrupting cellular processes.



Photo courtesy of Dr. Ligler

Ligler also partnered with Dr. Nicholas A. Peppas for an evening lecture titled "Small Inventions to Benefit a Big World," where they discussed the benefits of generating and patenting chemically-based inventions while weathering the challenges of entrepreneurship. Together, they discussed how chemical inventions have positive ramifications for health care and can impact remote communities around the globe.

In addition to joining Ligler on March 13th, Dr. Nicholas A. Peppas also spoke on March 14th about his lab's research in a lecture titled "Nanobiotechnology and Intelligent Biomaterials to Address and Treat Autoimmune Diseases." Peppas explored creating effective microparticles for the medical industry, focusing on meeting medical needs while avoiding additional harm.

We're grateful for the Izatt-Christensen Lectureship Endowment that makes this annual lectureship possible.

Rossiter

On March 26th and 27th, the BYU Department of Chemistry and Biochemistry welcomed Dr. Tehshik Yoon from the University of Wisconsin-Madison as this year's Bryant E. Rossiter lecturer. A distinguished alumnus of Harvard, Berkeley, and Caltech, Yoon also completed an NIH postdoctoral fellowship with the Eric Jacobsen laboratory and has been at UW-Madison since 2005. Yoon is a highly decorated chemist, recognized with numerous awards, fellowships, and grants from prestigious organizations such as Eli Lilly, Pfizer, the American Chemical Society, and the NSF. His research focuses on organic synthesis, catalysis, and transition metal photocatalysis.

During his two-day lecture series, Yoon discussed "Photoredox Couplings Using Base Materials" and "Stereocontrol in Photochemical Synthesis." He detailed his lab's work on optimizing reactions with affordable, commercially available materials for ketonizing carboxylic acids and developing complex catalytic compounds. Yoon's lecture took a fresh, honest look at his own research, describing the laboratory's use of oxidative photochemistry, the disappointment that accompanies poor results, and the gritty persistence it takes to actualize one's theories as a chemist.

Many thanks to the Bryant E. Rossiter Memorial Endowment for funding these annual lectureships.



Photo by Emily Smith

Cougars Abroad

Written by Emily Smith

Europe - Spring 2024 Study Abroad

In June, Dr. Daniel E. Austin and Dr. Matthew R. Linford returned from leading a six-week study abroad in Europe. They were accompanied by 19 students and toured the historical, cultural, and scientific sites of England, the Netherlands, France, Switzerland, Italy, and Slovenia.



Photo courtesy of Daniel Austin

Students visited various sites of chemical importance, learning about the laboratory history of the Eiffel tower, Italian glassmaking, and the chemical aspects of Slovenia's Postojna Cave system. They also toured a synchrotron, walked through a sewer museum, and visited an exhibit that highlights the technology of the past few hundred years. Furthermore, they enjoyed a private tour of the British Museum, conducted by a BYU professor of archaeology and classical studies.

Uganda - Chemical Education Training and Humanitarian Aid

This spring, Dr. Jennifer B. Nielsen created a team and visited Makerere University's campus in Kampala, Uganda, to host workshops for chemistry education students. This is the 12th of Nielsen's annual visits to Uganda, where she has previously met with high school chemistry teachers and their students. The program is part of a partnership between Makerere University and BYU in an effort to improve scientific teaching methods throughout the country.

This year, Nielsen and her colleagues implemented new training

Photo courtesy of Matthew Allen



developed here at BYU, designed to inspire greater hands-on learning. Prospective teachers participated in a three-day conference where they were trained, participated in real teaching scenarios, and received constructive feedback.

Nielsen's group also participated in humanitarian efforts at the Sanyu Babies' Home, an organization in Kampala, Uganda that cares for abandoned children from infancy through the age of four. Students and leaders interacted with the children, cleaned equipment, and served meals during their volunteer service.

Photo courtesy of Dr Savage



American Samoa - Rheumatic Heart Relief

On May 2nd, Dr. Paul B. Savage led a group of 13 BYU students and healthcare volunteers to the Pacific Islands on an annual humanitarian trip arranged by the Rheumatic Relief Organization. Originally started by Barb and Lori Allen at UVU, the program transferred to BYU and now helps screen thousands of children in American Samoa for rheumatic heart disease.

In addition to providing health screenings and sending recommended care reports to the Department of Healthcare in American Samoa, volunteers also learned songs and puppet shows in Samoan to educate children about wound care and how to seek medical relief. They participated in cultural dances, spoke with children from around the country, and appreciated the natural beauty of the Pacific while helping save and improve the lives of thousands of children between the ages of five and 18.

This program is entirely donation-dependent. To contribute, volunteer, or learn more, visit rheumaticrelief.byu.edu.

Student Focus

Photos courtesy of the students

Awards



ENOCH HO
Etter Student Lecturer



WISDOM ABIODUN
Etter Student Lecturer



JACOB HENINGER
2023 ACS Utah Poster Award



NAOMI ELMER
2023 ACS Utah Award - Undergraduate Student



MICHAEL DAVENPORT
2023 ACS Utah Award - Graduate Student



JESUS BOTELLO
2024 ACS Summer Undergraduate Research Fellowship

News



Callum Flowerday:
Speaker at the European Geosciences Union (EGU) General Assembly Conference
April 2024
Vienna, Austria



Sachini N. Moratuwage:
Poster Presenter
72nd ASMS Conference on Mass Spectrometry and Allied Topics *(ASMS 2024) Anaheim, California*

Sudam Mane:
Featured in BYU YMagazine
"A Hindu scholar in the heart of Utah: How Sudam Mane combines faith and science at BYU" by Grace Pope *January 2024*



Photo courtesy of Jaren Wilkey

Aimee Schill:
Honorable Mention National Science Foundation Graduate Research Fellowship Program Application
Michaelis Lab



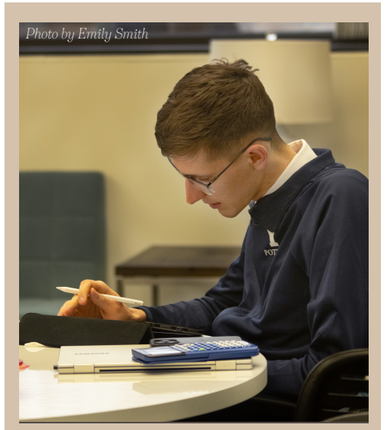


Photo by Emily Smith

The Flask Lounge

Focus on Belonging



In the tiled, utilitarian hallways of the Benson Building, it isn't difficult to wish for a cozy space to relax, study, and unwind. To address these needs and continue fostering a greater sense of community among our students, the BYU Department of Chemistry and Biochemistry designed and created The Flask: a new student lounge that opened its doors at the beginning of this year.

"The University has prioritized increasing the sense of belonging among students, staff, and faculty at BYU," says Jaron Hansen, department chair. "After consulting with the Department's Executive Committee, we believed that one way to foster this among our undergraduate and graduate students was to create a space for them to study and socialize together."

The lounge, designed by HR Specialist Teresa Harper in conjunction with the BYU Facilities Planning team, is located at C158 BNSN. Originally called the "Belonging Lounge," it was christened as "The Flask Lounge" through a popular vote at its grand opening. To add a bit of chemical flair to the proceedings, a ribbon of nitrocellulose–a substance used as the main ingredient in gun cotton and modern gunpowder–was lit and served as the official "ribbon cutting" of the ceremony.

"The new student lounge has had a tremendous impact on our students," Hansen says. "'The Flask' has quickly become the most popular space in our department. From the moment the building opens to its closing time, there is always a group of students utilizing this space." Whiteboard-top tables and whiteboard walls, sofas, colorful artwork, and splashes of plant life make for a welcoming atmosphere where students host study groups, laugh, eat lunch, and find refuge amidst rigorous academic requirements and the pressures of the outside world.

Another key component of The Flask Lounge is its iconic alumni wall where graduating students and alumni are invited to sign their names. "It has been wonderful," Hansen says, "to witness the reactions of our current students as they study the wall, recognizing names of mentors, faculty, and friends who have graduated from our program. This connection helps them feel validated in their decision to pursue a challenging major, knowing that a degree from our department opens up many opportunities in life."

All alumni, recent and longstanding, are invited to visit BYU campus to add their names to this signature wall. For questions or keycode access, please visit the main office at C100 BNSN.

Written by Emily Smith

Scholarships and Fellowships

Graduate Fellowships and Awards

ROLAND K. ROBINS
Heitor Fusco Nagliati
Timothy Skaggs
Alexis Christine Gibson
Aaron Wilson
Hillary Otieno Owuor
Dallin Tyger
Dongdong Yang
Sudam Shivaji Mane
Noah James Mismash
Kevin Bretzing
Humphrey Andanyi Lidweye
Matthew Lutz
Maria Jose Pedroza Romo
Wisdom Oshireku Abiodun
Prasadika Samarawickrama
Shane Michael Drake
Alexander Barrett Elliott
Nathan McMurray
Samantha Hatfield
John Asafo Adjei
Adele Teressa Chalmers
Conner Joseph Nelson
Latifat Oluwatobi Ganiyu
Kriti Shrestha
Samira Jafari
Alvaro Lizarbe
Aaron Lucas Zaugg
Junhan Chen
Adeyemi Obafemi
Steven Christiansen
Shelby Thomas Harris

MILTON L. LEE ANALYTICAL CHEMISTRY
Siqi Huang
Sara "Madi" Johnston
Rebekah Snow Stanley

JENNIE R. SWENSEN
Cecilia Sanders

CHARLES E. and MARGARET P. MAW
Mariur Rodriguez Moreno
Megan Faux Nielson
Liahona Angelie

J. REX and MARCIA A. GOATES
Melissa Nguyen Lumogdang

LOREN and MAURINE F. BRYNER
Sin Hang (Enoch) Ho

BRADSHAW ORGANIC CHEMISTRY
Michael Thomas Davenport
Stephanie Garcia Morin

TELFORD and FRANK WOOLLEY MEMORIAL
Rashini Madushika Perera

FRITZ B. BURNS CANCER RESEARCH
Cameron Leigh Simmonds
Yen Jou (Zoe) Chang
John Carl Johanson
Stefannia Esparza Pulido
Jhon Alfonso Sia
Nicholas Bair

GARTH LEE OUTSTANDING GRADUATE STUDENT
Stephanie Garcia Morin

Undergraduate Research Awards

TURNER UNDERGRADUATE RESEARCH FELLOWS
Jacob Limburg
Simon Hovanski
Miles Bradford

KEARNES UNDERGRADUATE RESEARCH FELLOWS
Jordan Gardner
Jacob McGuire

OTT UNDERGRADUATE RESEARCH FELLOWS
Jacob Truman
Kirt Noble
Benjamin Karlinsey
Chad Hyer
Natalie Parkinson
Spencer Jones

Undergraduate Scholarships

H. TRACY HALL
Stephen Crawford
Mason Haws
Evan Tsubaki
Lina Sabin
Joshua Brown
Rebecca Cole
Tyler Mitton
Christian Garrard
Miles Bradford
Benjamin Karlinsey
Sophie Nelson

KENNETH W. BRIGHTON
Matthew Stetcher
Jackson Mattingley
Logan Dodds
Hayley Garrett
Conner Morris

BYRON J. WILSON
Elijah Pehrson
Carson Hoopes
Christopher Calder
Shane Koslow

RICHARD L. SNOW FAMILY
Ethan Hardy

BOYD A. WAITE
Madeleine Unguren
Logan Wallace
Jungil Bae
Nathan Rudd

HIRAM and PERMELIA DAYTON
Mitchell Poulson
Anna Nelson
Eliza Crowley
Ryan Walker
Tyler Allen
Riley Leonard Pherson
Lauren Cook

STUDENT AIDE GIFT FUND
Riley Nickles
Joseph Clayson
Jacob Orchard
Emma Richardson
Rachel Thompson
Genesis Orozco

DENNIS V. and SHIRLEY J. KNUDSON
Jenna Fitzsimmons
Ruth Patterson
Makenzie Hampson
Dylan Knabb
Takumi Ford
Laura McPhie
Nicholas Tapia

PARLEY NELS and PARLEY LEROI NELSON
Caleb Potter

EDWARD G. PAUL
Spencer Ricks

LAWRENCE MARK LEE MEMORIAL
Kyle Nielson
Jacob McGuire

IDA TANNER HAMBLIN
Abigail Banks
Ella Norton

Undergraduate Awards

KEITH P. ANDERSON AWARDS FOR OUTSTANDING PERFORMANCE
Outstanding Freshman Chem non-major — Stephen Hales
Outstanding Freshman Chem major — Eleanor Woolley
ACS Outstanding Analytical Sophomore — Troy Hess
Outstanding Organic Chem non-major — Jason Carlson
ACS Outstanding Organic Chem major — Camryn Young
Chemistry Literature Award — Conner Murray
Outstanding Biochemistry Student non-major — Zach Fiore
Outstanding Biochemistry major — Ethan Hardy
ACS Outstanding Physical Chemist — Michael Haggard
ACS Outstanding Inorganic Chemist — Jacob Limburg
Outstanding Advanced Analytical Chemist — Dallin Weaver
Outstanding Advanced Biochemistry Lab major — Luke Westhoff
Outstanding Advanced Biochemistry major (Senior) — Keegan Lloyd
Outstanding Graduating Senior -- CHEM BS — Simon Blackhurst
Outstanding Graduating Senior -- Biochem BS — James Holladay

ELIOT BUTLER SERVICE AWARD
Emma Richardson

IDA TANNER HAMBLIN OUTSTANDING 3rd-YEAR MAJOR
Hailey Hepworth

Many thanks to our Donors whose funds make this possible!

DEPARTMENT OF CHEMISTRY
AND BIOCHEMISTRY
BRIGHAM YOUNG UNIVERSITY
C-100 BNSN
PROVO, UT 84602-1030

HOMECOMING CELEBRATION 2024

Thur, Oct 10, 6:30pm
Benson Building W170

RSVP HERE

The BYU Department of Chemistry & Biochemistry welcomes you back to campus. Rather than dinner, please join us for hors d'oeuvres and gracious company, followed by faculty speaker Jeremy Johnson.

RSVP by Tuesday, Sept 24th