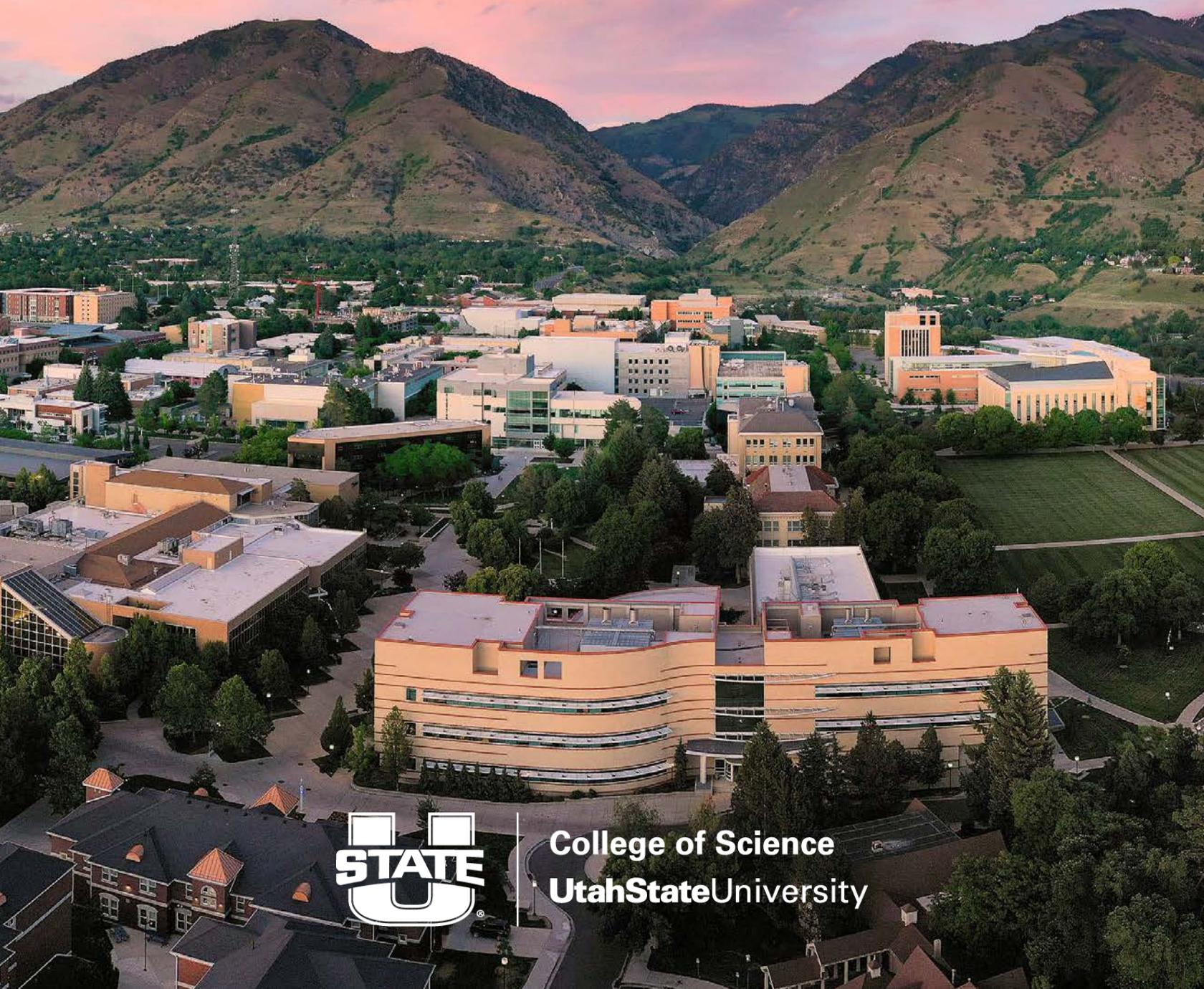


2022 - 2023 Chemistry & Biochemistry Newsletter

KINETIC



College of Science
UtahStateUniversity



Letter from the Department Head



Dear Alumni and Friends,

It is my pleasure to welcome you to the Department of Chemistry and Biochemistry Annual Newsletter. This year has been eventful in the life of our department. Research in the department continued to grow this past year, with total expenditures exceeding \$3 million, publications in top journals across the fields of chemistry and biochemistry, and presentations at events around the world. Our undergraduate and graduate students continue to excel in research, with authorship on papers and invitations to present at top meetings. The strength of their training is evident in their continued success at landing top positions. Some of the research successes of the past year are highlighted in this newsletter. We are proud of the high quality of teaching provided to students in majors across USU. In our range of chemistry and biochemistry classes, we served over 8,000 students

for a total of 23,207 student credit hours this last year. Also featured here are highlights of new faces in the department, promotions and retirements, and our Alumni Achievement Award recipients for the year.

We hope you enjoy this newsletter - catching up on the exciting events of the past year. Please stay in touch and plan on stopping by if you are in the area.

All the best,

A handwritten signature in black ink that reads "Lance Seefeldt". The signature is fluid and cursive, with a large initial "L" and a long, sweeping tail.

Lance Seefeldt

Department Head, Chemistry and Biochemistry

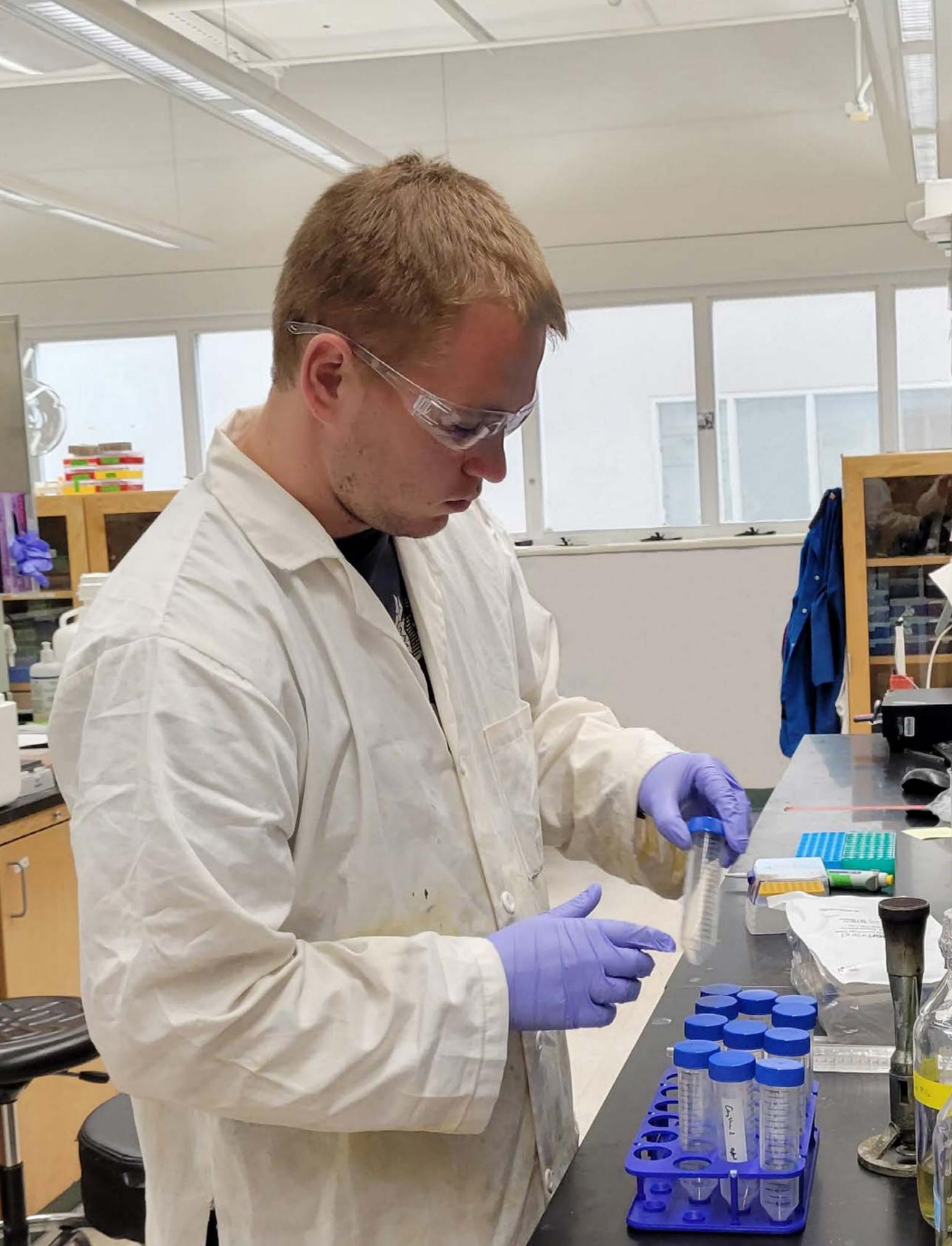
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Designed by Tia Lawrence

Photos by Cindy Weatbrook, unless otherwise denoted.

Cover photos by Levi Sims, USU Marketing



Written by Mary-Ann Muffoletto, Photo Credit: Jordan Truex/USU

In a rare feat, Utah State University biochemists Thomson Hallmark and Ryan Jackson, along with collaborators, published not one, but two seminal papers in a top-tier, peer-reviewed journal this year. **Their findings describe the structure and function of a newly discovered CRISPR immune system** that — unlike better-known CRISPR systems that deactivate foreign genes to protect cells — shuts down infected cells to thwart infection.

“With this new system, known as Cas12a2, we’re seeing a structure and function unlike anything that’s been observed in CRISPR systems to date,” says Jackson, assistant professor in Utah State’s Department of Chemistry and Biochemistry.

In tandem papers, the USU researchers, along with colleagues from Germany’s Helmholtz Institute for RNA-based Infection Research, U.S.-based biotechnology company Benson Hill and the University of Texas at Austin, report findings in “Cas12a2 Elicits Abortive Infection via RNA-triggered Destruction of dsDNA,” and “RNA Targeting Unleashes Indiscriminate Nuclease Activity of CRISPR-Cas12a2” in the Jan. 4 issue of *Nature*.

The research is supported by the U.S. Department of Health & Human Services National Institutes of Health.

CRISPR, a manageable acronym for the mouthful “Clustered Regularly Interspaced Short Palindromic Repeats,” has captured the imaginations of scientists and lay people alike with its gene-editing potential. Study of CRISPR DNA sequences and CRISPR-associated (Cas) proteins, which are actually bacterial immune systems, is still a young field, although it’s receiving widespread attention for its gene-editing applications and the recent Nobel Prize awarded to Jennifer Doudna and Emmanuelle Charpentier. Jackson and Hallmark are among researchers around the globe deciphering the basic structure of these systems and what makes them tick.

“The findings reported in our two *Nature* papers were nearly six years in the making,” Jackson says.

Identified as a distinct immune sys-

tem within the last five years, the Class 2, type V Cas12a2 is somewhat similar to the better-known CRISPR-Cas9, which binds to target DNA and cuts it — like molecular scissors — effectively shutting off a targeted gene. But CRISPR-Cas12a2 binds a different target than Cas9, and that binding has a very different effect.

“The Cas12a2 protein undergoes major conformational changes upon binding to RNA that opens an indiscriminate active site for DNA destruction,” Jackson says. “Cas12a2 destroys the DNA and RNA in target cells, causing them to go senescent.”

Using cryo-electron microscopy or “cryo-EM,” the USU team demonstrated this unique aspect of CRISPR-Cas12a2, including its RNA-triggered degradation of single-stranded RNA, single-stranded DNA and dou-

Year In Numbers

ble-stranded DNA, resulting in a naturally occurring defensive strategy called abortive infection.

“Abortive infection is a natural phage resistance strategy used by bacteria and archaea to limit the spread of viruses and other pathogens,” says Hallmark, a third-year doctoral student. “For example, abortive infection prevents viral components that have infected a cell from replicating.”

Jackson says the team captured the structure of Cas12a2 in the act of cutting double-stranded DNA.

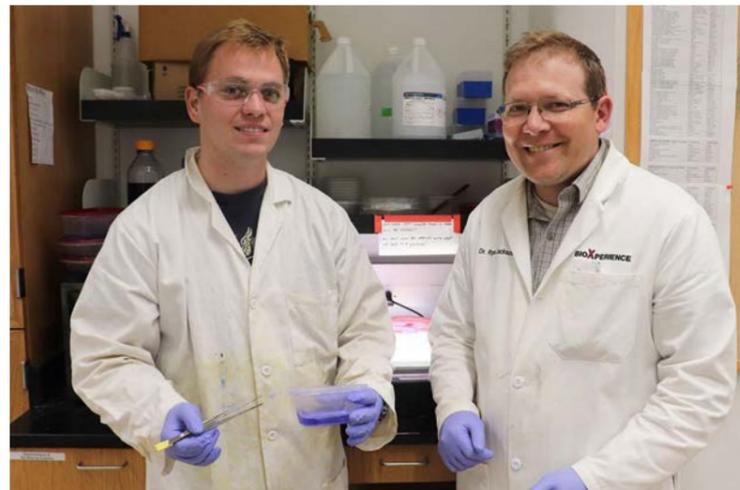
“Incredibly, Cas12a2 nucleases bend the usually straight piece of double-helical DNA 90 degrees, to force the backbone of the helix into the enzymatic active site, where it is cut,” he says. “It’s a change in structure that’s extraordinary to observe — a phenomenon that elicits audible gasps from fellow scientists.”

Jackson says the difference between a healthy cell and a malignant cell or infected cell is genetic.

“If Cas12a2 could be harnessed to identify, target and destroy cells at the genetic level, the potential therapeutic applications are significant,” he says.

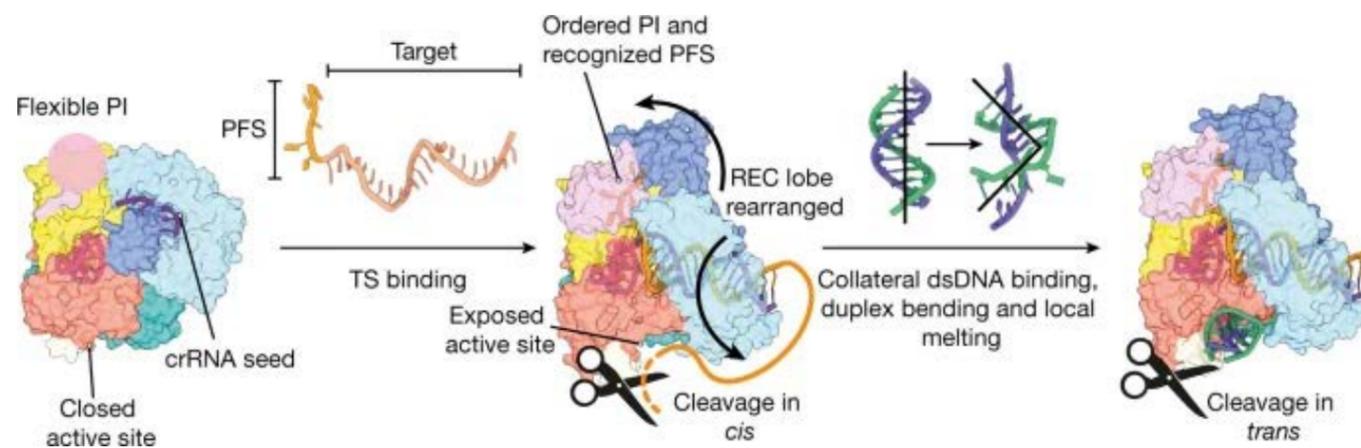
In addition, Cas12a2’s RNA diagnostic capabilities, described in the set of papers, could advance efforts to stem the effects of a number of genetic diseases.

“We’re just scratching the surface, but we believe Cas12a2 could lead to improved and additional CRISPR technologies that will greatly benefit society”



USU doctoral student Thomson Hallmark, left, and Ryan Jackson, assistant professor in USU’s Department of Chemistry and Biochemistry publish new findings about CRISPR-associated nuclease Cas12a2 in two papers in Nature. (Photo Credit: M. Muffoletto/USU)

Mechanism of RNA target-activated collateral nuclease activity in Cas12a2.



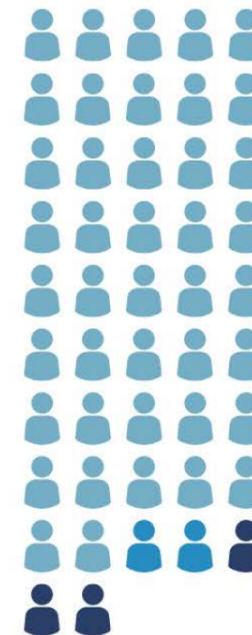
8,491

students served
for a total of

23,207

student credit
hours taught

47 degrees
awarded



- Bachelor's of Science
- Master's of Science
- Ph.D.

across
29
journals

\$3.4



million+
in research
expenditures

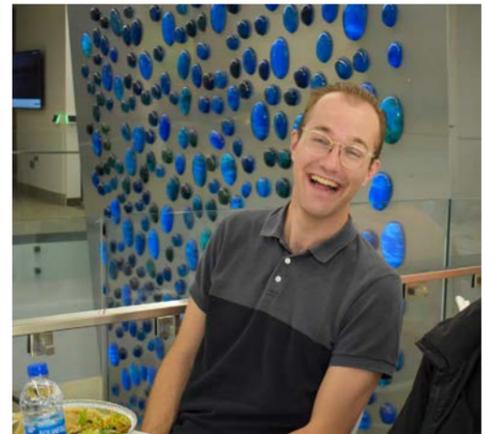
Funding supported by

- Department of Energy
- Los Alamos National Laboratory
- National Institutes of Health
- National Park Service
- National Renewable Energy Laboratory
- National Science Foundation
- Seek Laboratories

57
publications

including

24 with
student
coauthors



HANSEN LIFE SCIENCES RETREAT 2022

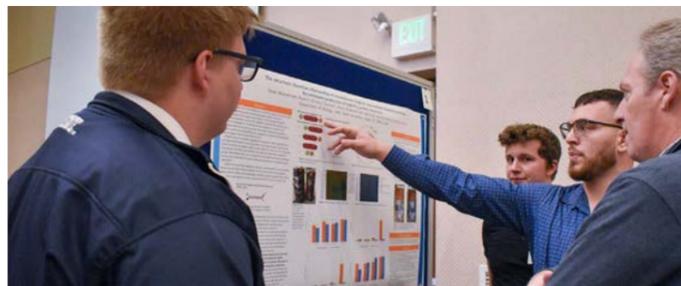


Written by Mary-Ann Muffoletto, Photos by Cindy Weatbrook and Mary-Ann Muffoletto

Utah State University's Department of Chemistry and Biochemistry hosted the 12th annual Hansen Life Sciences Retreat Oct. 21-22 in Logan, Utah. Attendees and organizers of the university-wide event say getting researchers from different disciplines together to discuss their research fosters broader understanding of challenging questions, along with beneficial collaborations.

"When researchers work together across disciplines, they can make more informed decisions," said retreat participant Dillion Weatherston, a USU biological engineering graduate student, who completed undergraduate studies at USU last spring. "I learned a lot, in particular, from the biochemists who are involved in CRISPR research."

"We can broaden our knowledge in this retreat setting and get different ideas from multiple directions," said doctoral student Sobita Kunwar.



Weatherston and Kunwar were among some 60 scholars from five colleges participating in the retreat, which featured oral lab overview presentations, as well as research poster sessions preceded by poster presenter lightning pitches.

“We were delighted to honor the late R. Gaurth Hansen with another outstanding retreat,” said Lance Seefeldt, professor and head of the Department of Chemistry and Biochemistry. “The quality of the posters and talks was excellent this year. We offer a sincere ‘thank you’ to all of the participants, the organizers and our supporters, Drs. Lars Hansen and Grace Tsiang.”

“This is a gathering to encourage collaborative efforts and celebrate each individual’s contributions in the larger research community.”

Gaurth’s son, USU alum and Nobel Laureate Lars Hansen ’74, welcomed retreat attendees via video from London, England. The University of Chicago economics professor told participants his Aggie roots run deep, and encouraged them to make the most of opportunities to reach across departments and share ideas. “My wife, Grace, son Peter, and I are proud to support the R. Gaurth Hansen Life Sciences Retreat,” he said.

The two-day gathering included a keynote address by visiting scholar Sheena D’Arcy, associate professor in the Department of Chemistry and Biochemistry at the University of Texas at Dallas. USU alumni Yalemi Morales (BS’10, Ph.D.’15, Biochemistry), a USU postdoctoral fellow from 2015 to 2019 and currently Lead Quality Control Scien-



2022 Hansen Life Sciences Retreat poster presentation award recipients were, from left, Tessa Siler, Dillon Weatherston, Emilee Rickabaugh, Joshua Denson and Samuel Baker.



Biochemistry undergraduate student Sarah Nielson, left, discusses her research poster with fellow 2022 Hansen Life Sciences Retreat participants. The annual gathering drew student researchers from five USU colleges. (Photo Credit: M. Muffoletto/USU)

tist at therapeutics manufacturer Cytiva, and Tyler Archibald (BS’20, Biochemistry), research associate at biotechnology research company Seek Labs, led a panel discussion, offering career advice to retreat participants.

Student researchers recognized with poster presentation awards, which included a \$100 gift card, were:

- Samuel Baker, Chemistry and Biochemistry, “Structure Function Analysis of the Shigella T3SS Protein IpaD Implicate a Rare Pi-helix Secondary Structure in DOC-enhanced Virulence,” Faculty Research Mentor: Nick Dickenson
- Joshua Denson, Chemistry and Biochemistry, “An Exploration of TRAMP Complex Assembly using Hydrogen-Deuterium Exchange, Surface Plasmon Resonance, and Biochemical Analysis,” Faculty Research Mentor: Sean Johnson
- Emilee Rickabaugh, Biological Engineering, “Modeling Bruch’s Membrane using Recombinant Hagfish Slime Proteins,” Faculty Research Mentors: Justin Jones, Elizabeth Vargis
- Tessa Siler, Chemistry and Biochemistry, “Electrochemical DNA-based Biosensor for the Detection of DNase I Activity,” Faculty Research Mentor: Artavazd Badalyan
- Dillon Weatherston, Biological Engineering, “Modeling Bruch’s Membrane using Recombinant Hagfish Slime Proteins,” Faculty Research Mentors: Justin Jones, Elizabeth Vargis



USU’s annual Hansen Life Sciences Retreat honors the memory of R. Gaurth Hansen, right, a renowned biochemist, professor and administrator who spent much of his career at USU. (Photo Credit: USU Special Collections.)

Student researchers Bella Lonardo and Zaharah Rossi (Chemistry and Biochemistry) received special recognition for their lightning pitch highlighting their research, “Modification of Ribonucleoprotein Substrates for the Investigation of PRMT1 Substrate Recognition,” with faculty research mentor Joanie Hevel. The team received a light-up lightning lamp traveling trophy to display in the Hevel Lab until next year’s retreat.

The Hansen Life Sciences Retreat honors the memory of renowned biochemist R. Gaurth Hansen (1920-2002), a gifted scientist, teacher and administrator, who spent much of his career enriching Utah State. A Cache Valley, Utah native, Hansen joined USU’s faculty as an academic vice president in 1968, and was soon promoted to provost. His efforts contributed to a twenty-fold increase in the university’s research budget. He was named USU Distinguished Professor Emeritus in 1985 and retired from Utah State in 1994.



Interested in participating in the 2023 Hansen Life Science Retreat? Scan the QR code or visit our website

Remembering Anna Lou Hansen

Beloved friend of the University, Anna Lou Rees Hansen passed away at the age of 102 on August 3, 2022.

Anna Lou met her husband Gaurth Hansen as a child in Smithfield, Utah, where her father, Dr. George Rees was a family physician who served much of Cache valley for decades. She graduated from Utah State University in 1942 with a degree in clothing and textiles. She taught home economics and physical education to high school students prior to getting married and starting a family. In 1943, she and Gaurth Hansen were married in the Logan Utah temple.

Anna Lou was an accomplished homemaker, using skills she learned from her Utah State University degree not only in her home life, but also in support of a variety of charitable activities. She had the primary responsibility for raising their three sons, Roger, Ted, and Lars, while her husband developed his academic career as a biochemist at the University of Utah, University of Illinois, and Michigan State University prior to arriving at Utah State University. Anna Lou Hansen used her considerable talents in the home and the community through countless volunteer hours helping children develop their reading skills. She is survived by her three sons, seven grandchildren, and twelve great-grandchildren.

Anna Lou has been a long-standing supporter of Utah State University, especially during the extended time period when her husband was Provost. Two of her sons, Roger and Lars, along with one granddaughter have also received degrees from Utah State University.



Gaurth and Anna Lou Hansen are shown to the left. Anna Lou was a dedicated homemaker and supporter of the university. (Photo Credit: Chemistry Photo Archives/USU.)

Doctoral Student Nikolay Tkachenko Recognized by Utah's American Chemical Society Chapter



Doctoral student Nikolay Tkachenko, right, with USU Chemistry and Biochemistry Department Head Lance Seefeldt, was named "Outstanding Graduate Student of the Year" by the Utah Chapter of the American Chemical Society. (Photo Credit: Lauren Anderson/USU)

Written by Mary-Ann Muffoletto

Utah State University doctoral student Nikolay Tkachenko was named "Outstanding Graduate Student of the Year" by the Utah chapter of the American Chemical Society. He was among eight chemistry professionals, educators and students honored in a Nov. 3 ceremony held at Thanksgiving Point in Lehi, Utah.

The recognition comes as no surprise to Tkachenko's faculty mentor, Professor Alexander Boldyrev.

"In addition to his brilliant research and hard work, Nikolay is the most organized scholar I've ever met," says Boldyrev, R. Gaurth Hansen Professor in USU's Department of Chemistry and Biochemistry. "This quality is one of the reasons he has published, to date, 41 peer-reviewed papers in major journals during his undergraduate and graduate student career."

This is high praise coming from Boldyrev, who has mentored top USU graduate students, including five scholars named USU Robins Award Graduate Student Researchers of the Year, as well as recent recipients of prestigious postdoctoral fellowships at Los Alamos National Laboratory.

Tkachenko, who began his graduate studies at Utah State in August 2018, has earned a number of accolades at the university, college, and departmental levels. He was recently honored at the USU College of Science's 2022 Fall Convocation as the recipient of the Claude E. ZoBell Scholarship. In recent years, he's received the Stephen Bialkowski Award in Environmental Chemistry (2020), the Early Research Progress in Chemistry Award (2020), and the Marjorie H. Gardner Teaching Award (2019) for outstanding work as a teaching assistant.

Beyond USU, Tkachenko received the British Petroleum Scholarship Award in 2017 and in 2016. In 2016, he was awarded the First Degree Diploma of the VII International Natural Sciences Tournament for individual competition and

the First Degree Diploma of the International Forum of Young Scientists "Science Game" for team competition.

Tkachenko was selected for a summer internship at Los Alamos National Lab in 2020, during which he established an ongoing research collaboration in quantum chemistry on quantum computers with lab personnel.

"Starting with my LANL internship, I was developing new techniques for reducing complexity of quantum chemistry calculations on quantum computers," he says.

Boldyrev says Tkachenko's collaboration with LANL has led, so far, to six published papers, with the USU doctoral scholar as lead author on articles in ArXiv (under review in PRX Quantum) and ACS Catalysis, and as second author on papers published in Journal of Chemical Information and Modeling, The Journal of Physical Chemistry A and Organometallics. "These are extraordinary accomplishments for a doctoral student," Boldyrev says.

Tkachenko's current pursuits include the use of machine learning and artificial intelligence for development of atomistic potentials in varied molecules, clusters, and materials.

A native of Novosibirsk, Russia, Tkachenko completed undergraduate studies in fundamental and applied chemistry at Novosibirsk State University, Boldyrev's alma mater, in 2018. He and his wife, Anastasiia, a USU doctoral student in computer science, enjoy board games, gardening and cooking, as well as biking and hiking.

USU Chemist Awarded Prestigious Postdoctoral Post at Los Alamos National Lab

Written by Mary-Ann Muffoletto

In the spring of 2020, Utah State University doctoral scholar Maksim Kulichenko looked forward to accepting a prestigious internship at New Mexico's storied Los Alamos National Laboratory. He was one of an unprecedented three USU scholars, all students of Professor Alex Boldyrev selected for the highly competitive opportunity.

Just as Kulichenko and his fellow Aggies were making housing plans and travel arrangements, the COVID-19 pandemic progressed, and the internships were moved to remote status. The scholars dove into their internships — remotely — from Logan.

"Yes, it was disappointing news, as we all looked forward to being at the historic lab and exploring the surrounding landscapes," Kulichenko says. "But, on the plus side, we saved on rent and travel."

For Kulichenko, the partnership led to a sought-after post following his May 2022 graduation. Kulichenko has been named a Director's Postdoctoral Fellow, one of a limited number of posts offered by the lab to a select pool of the nation's top scholars. "I'm very excited to join the lab in person," says Kulichenko, who has been working, since his internship, with the lab's team members. "This is an opportunity to continue our work in developing models to advance quantum mechanical calculations, allowing for increasingly faster, large-scale simulations."

During his LANL collaboration, the quantum chemist has delved into machine learning and neural networks, aimed at addressing computationally demanding chemistry calculations. "This is usually done by pre-trained artificial neural networks," Kulichenko says. "However, neural networks require a proper dataset to be trained on. I've worked toward developing a technique of constructing a dataset which would cover as much chemical space as possible while keeping a manageable dataset size."

Kulichenko, who was named Chemistry and Biochemistry's 2022 Outstanding Graduate Student, has high praise for Utah State and, especially, for his faculty adviser Boldyrev. "Dr. Boldyrev is the best mentor I have ever met," he says. "He provides his students with the freedom to pursue ideas while teaching valuable research and time management skills, offering encouragement and instilling skills and knowledge for success." Kulichenko says he's also grateful for USU faculty, for lecture programs that gave him opportunities to meet experts pursuing breakthrough science, and to staff who enabled him to present at national meetings and to participate in the LANL internship. "There's a tremendous amount of paperwork and preparation required to participate in research at a high-security facility, especially as an international student," he says. "USU really cares about its students and their success. USU staff members went above and beyond to help me succeed."



Professor Alexander Boldyrev (center) stands with graduate students (from left) Maksim Kulichenko, Pavel Rublev, Nikolay Tkachenko and Nikita Fedik. Boldyrev was named USU's "Outstanding Graduate Mentor of the Year" in 2017. (Photo Credit: M. Muffoletto/USU)

Four Chemistry Faculty Members Promoted



From left, Dr. Ryan Jackson, Dr. Kim Hageman and Dr. Lisa Berreau, Dr. Yi Rao, and Dr. Seth Lyman

We are thrilled to share exciting news that Dr. Yi Rao and Dr. Ryan Jackson have recently been promoted to associate professors, which is a remarkable achievement and a testament to their hard work, dedication, and scholarly contributions to the field. We congratulate them on this well-deserved recognition and wish them continued success in their research and teaching endeavors. We would also like to congratulate Dr. Kim Hageman on her promotion in 2022 to the position of full professor. We are incredibly lucky to have such a passionate, dedicated, and capable

researcher and mentor in our department. Additionally, we would also like to extend our congratulations to Dr. Seth Lyman on his promotion to research professor. Dr. Lyman's significant contributions to the Bingham Research Center have been instrumental in its success, and this promotion is a reflection of his outstanding work. We are honored to have such talented individuals as part of our community and look forward to seeing their continued impact on the field of chemistry and biochemistry.



Farewell to Dr. David Farrelly

After 32 years, Dr. David Farrelly, theoretical and computational chemist, has retired. David arrived at USU in 1991, studying classical and quantum mechanical techniques to explain the properties of matter under extreme conditions. David published more than 80 peer reviewed articles while at USU, including 13 Physical Review Letters and a letter to *Nature*. The department is very thankful to David for his many years of service and wishes him a happy retirement.

From left, Dr. Nick Dickenson, Dr. David Farrelly, Dr. Lance Seefeldt, Dr. Tianbiao Liu, and Dr. Tuan Trinh (Photo Credit: J. Truex.)

USU Inaugural Professor Pursues 'Off-Road' Approach on Professional Journey

Written by Mary-Ann Muffoletto

Utah State University professor Kimberly Hageman takes one of renowned naturalist John Muir's quotes to heart: "Of all the paths you take in life, make sure a few of them are dirt."

"It's an approach I recommend for career decisions, as well as pathways through life," said the environmental chemist as she opened her Nov. 29 presentation during the university's 2022 Inaugural Professor Lecture Series. Hosted at USU's Nora Eccles Harrison Museum of Art, Hageman's lecture was the final presentation of a succession of fall gatherings coordinated by the Provost's Office to highlight the accomplishments and academic journeys of faculty, who have been promoted to full professor in the past year.

Hageman says her parents took her on her first camping trip when she was just three weeks old. "So they're responsible for my love of the outdoors," says the Montana-born professor in USU's Department of Chemistry and Biochemistry. "You can take the girl out of the mountains, but you can't take the mountains out of the girl!"

As a child, Hageman loved spending time in her chemist father's lab, keeping an eye on the mechanical chart recorder, chugging along and mapping peaks from the gas chromatogram.

"Chromatography is a research technique I love to this day."

During undergraduate studies at Ohio's Kenyon College, Hageman discovered the field of environmental chemistry, which combined two of her passions. "I knew from that day what I wanted to do," she says.

The intrepid scholar sought advice but judiciously carved her own path. She was advised not to take a break between earning her bachelor's degree and pursuing graduate studies. Instead, Hageman marched up to University of North Dakota professor Steven Hawthorne at a conference and asked for a research assistant job. (She got it.)

"What I learned from that experience and



At USU's Science Unwrapped outreach program on Oct. 21, 2022, Professor Kim Hageman demonstrates environmental monitoring equipment she used at arctic Alaska's Toolik Research Station to inquisitive guests. (Photo Credit: USU/M. Muffoletto)

what I share with my students is: If you want something, be bold and don't be afraid to ask for it," she says. "You might get it."

Hawthorne guided her in super-critical fluid extraction research, an opening into the green chemistry movement, as well as to further opportunities. Hageman conducted research at Alaska's arctic Toolik Field Research Station ("one of the coolest experiences of my life") and also pursued chromatography research at South Africa's University of Potchefstroom. Hawthorne also introduced her to Oregon State professor Jennifer Field, who became Hageman's doctoral adviser.

For her doctoral research, Hageman commuted to an abandoned chemical plant near San Francisco, where she honed her skills in measuring contaminants in groundwater. At the same time, she met her research colleague, soulmate and future husband, Rob Alumbaugh, current lecturer and teaching lab coordinator in USU's Department of Chemistry and Biochemistry.

After completing her doctoral degree, Hageman ignored another conventional piece of academic advice — never pursue a post-doc position where you earned your Ph.D. — and instead enthusiastically accepted an opportunity to conduct research on the atmospheric transports of contaminants to

national parks.

Her first faculty appointment led her to New Zealand's University of Otago, where she taught and pursued research for 11 years as she enjoyed the geological wonders of the island nation. In 2018, deciding to move closer to family, she and Rob, now New Zealand citizens, returned to the U.S. and Hageman joined USU's faculty.

At Utah State, Hageman and her students explore the behavior and fate of organic contaminants in the environment, including investigating the spread of pollutants through Earth's atmosphere to remote ecosystems like arctic Alaska or Utah's drying Great Salt Lake. She also collaborates with colleagues in agriculture and entomology, and she is excited about a newly developed website called the Pesticide Toolkit, which allows users to predict pesticide behavior in agricultural environments.

"I'm so grateful, first of all, to my students, as well as my colleagues and friends, who enable me to pursue projects I'm passionate about," Hageman says.

Quoting Dr. Seuss's popular book *The Lorax*, she encourages all to fight for their "Truffula tree": "Plant a new Truffulla. Treat it with care. Give it clean water. And feed it fresh air."

Recognizing Achievement in the University



Dr. Yi Rao, assistant professor of Chemistry & Biochemistry, left, and doctoral student Nikolay Tkachenko, to the right, were both honored at this year's College of Science Awards ceremony (Photo Credit: L. Anderson/USU.)

The Department is happy to recognize the achievements of three individuals who were honored by the College of Science and University this year.

Undergraduate student Sarah Nielson has been recognized as this year's *Undergraduate Teaching Fellow of the Year* by the College of Science. Sarah Nielson was the 2022 recipient of the Harris O. and Eleanor Y. Van Orden Award in Biochemistry, given to the top undergraduate in USU's biochemistry lecture series. That honor gave her a key edge in becoming an Undergraduate Teaching Fellow for the series, along with her infectious enthusiasm for the subject. Along with her teaching excellence, Sarah is an avid researcher. As a biochemistry major with a minor in biology, she studies protein arginine methyltransferases – enzymes important to cardiovascular health – with faculty mentor Joanie Hevel. To fund her research, Sarah was awarded two USU URCO grants and was selected as a Peak Fellow. She presented her research at USU's 2022 Hansen Life Sciences Retreat. Following graduation from Utah State, Sarah, who has lived in Utah, Missouri, and Indiana, will pursue a doctoral degree in biochemistry at the University of Texas at Austin where she'll continue research in enzymology.

Nikolay Tkachenko has been selected as the *Doctoral Student Researcher of the Year* by both the College of Science and the University, as the recipient of this year's Robins Award. A doctoral student in the lab of R. Gaurth Hansen Professor Alex Boldyrev, Nikolay Tkachenko has garnered numerous impressive accolades during his USU career. Named the 2022 Outstanding Graduate Student of the Year by the Utah Chapter of the American Chemical Society, Nikolay is a recipient of USU's Claude E. ZoBell Scholarship, the Stephen Bialkowski Award in Environmental Chemistry, the Early Research Progress in Chemistry Award and the Marjorie H. Gardner Teaching Award. In addition, he was selected for a prestigious summer internship with Los Alamos National Laboratory, which led to an ongoing research collaboration focused on developing new techniques for reducing complexity of quantum chemistry calculations on quantum computers. Nikolay has published more than 40 peer-reviewed papers in major scientific journals during this academic career. A native of the "cold and snowy" Siberian city of Novosibirsk, Russia, Nikolay says his grandmother, his mathematician mother, and his nuclear physicist father instilled his love of science at an early age. He and his wife, Anastasiia Tkachenko, a USU doctoral student in computer

science, enjoy board games, gardening, cooking, cycling and hiking.

Finally, Dr. Yi Rao, assistant professor, has been chosen as this year's *Faculty Researcher of the Year*. Dr. Yi Rao is an assistant professor of analytical and physical chemistry. His research is focused on interfacial physical chemistry for environmental issues, solar energy conversion, and catalysis. A 2021 recipient of a National Science Foundation Faculty Early Career Development (CAREER) Award, Dr. Rao has pioneered several state-of-the-art interface-specific, nonlinear optical spectroscopies for structures and dynamics at different interfaces. Among his projects is developing laser techniques to advance photoelectrical chemical reduction of carbon dioxide for energy production. Dr. Rao earned a doctoral degree in 2003, under the supervision of Dr. Hong-fei Wang, from the Institute of Chemistry, Chinese Academy of Science. In 2004, he pursued a postdoctoral fellowship in experimental nonlinear interfacial spectroscopy with Dr. Kenneth Eisenthal's group at Columbia University, and continued as a research associate in collaboration with Eisenthal and Dr. Nicholas Turro at Columbia. Prior to joining USU in 2017, Dr. Rao was a research associate professor at Temple University.



Sarah Nielson, undergraduate researcher in the Hevel lab, was awarded the *Undergraduate Teaching Fellow of the Year* award. She graduated *Summa Cum Laude* this May, and will be pursuing a graduate degree at the University of Texas - Austin (Photo Credit: L. Anderson/USU)

New Faces in the Department



Ida Walters

Ida joined the department in May 2022 as a staff assistant. In her current role, she supports the department head as well as various department committees. She handles class scheduling, duties related to faculty promotion and tenure, and is the general office manager. Ida is originally from the northern Mexican state of Chihuahua and landed in Logan after stints in Los Angeles, California; Provo, Utah; and Champaign Illinois. She holds a B.A. in Spanish and B.A. in Latin American Studies from BYU and a M.A. in Spanish Literature from BYU. She is married to Dr. Matthew Walters, a mechanical engineer in fracture control at Northrup Grumman, and they are the parents of five children. When she is not busy working, Ida enjoys spending time with her family and friends, cooking, reading, and traveling.



John Russell

John and Linnea (his wife) moved to Logan from Bozeman, Montana during the summer of 2022. John finished his Ph.D. in chemistry from Montana State University in the summer of 2022, with a research focus of Ni-catalyzed cross-coupling of C—O electrophiles. Last academic year, John enjoyed teaching and interacting with the students of CHEM 2310, CHEM 2320, and the corresponding labs as a temporary assistant professor. Linnea finished her DPT from Baylor University in December and is working as a physical therapist at Mountain West Physical Therapy. They enjoy exploring the mountains around Logan, the national parks of Utah, and the amazing geology of the state. Outside of work, they can be found hiking, mountain biking, skiing, and interacting with the community.



Lindsey Sills

Lindsey moved to Logan in 2017 and has worked at the University since 2020. He currently works as a business assistant in the department, where he reviews p-card transactions, travel expenses, and does year-end review. He has a Newfoundland named Dovie who is a giant, furry goof. In his free time, Lindsey enjoys reading, camping, road trips, and learning about various topics such as wildlife, ecology, and history. Currently, he is teaching himself to sew and looking forward to summer adventures.



Tia Lawrence

Tia has been working as a staff assistant in the department since December 2022. When she isn't running around Widstoe and Maeser, she enjoys being outside, running, hiking, and gardening or staying in to read and play games. Her favorite part about working in the Chemistry Department is being able to interact with faculty, students, and staff across the university... and the fact that you can get Aggie Ice Cream right across the street. She is currently studying community-based Ag Education at USU, with the hopes of working with Extension services after graduation.



Tuan Trinh

Dr. Trinh is an assistant professor in the Department of Chemistry and Biochemistry. He received his Ph.D. in chemical engineering from Delft University of Technology in 2010. Prior to joining the Department of Chemistry and Biochemistry (2022) at USU, he was a research assistant professor at the University of South Florida (Tampa), a research scientist at the University of Michigan (Ann Arbor) and Columbia University (New York), a postdoctoral researcher at the University of Texas at Austin and the University of Amsterdam (the Netherlands). Dr. Trinh's research interests are a broad range of nanomaterials and spectroscopy, with applications in highly efficient opto-electronic devices. Currently, he serves as an associate editor for the *Journal of Science: Advanced Materials and Devices* (Elsevier BV.).

New Graduate Student Spotlight



Clockwise, starting from top left:

1. My name is Chad Callister and I was born and raised in Kaysville, Utah. I got my undergraduate degree here at USU, and I like to do activities. My hobbies change every couple of years, so I am barely passable at quite a few things but have the gear for all of it. The last little while I've been really into baking, so I may have a treat on hand at any given time.

2. I am Loknath Dhar, an environmental chemistry enthusiast. I joined the Department of Chemistry at Utah State University in the fall of 2022. I completed my B.S. and M.S. in Chemistry from Jahangirnagar University, Bangladesh, where my primary field of research was Environmental Chemistry. Driven by a passion for environmental sustainability, I have decided to work in the field of air quality management.

3. Olive is a Master's student in the Jackson Lab. In her spare time, she likes to cook, home brew, work on electronics projects, and rockhound.

4. I'm Hannah Feinsilber, a first-year Biochemistry Ph.D. student in Dr. Seefeldt's lab. I love rock climbing, running, biking, hiking, and paddle boarding.

5. Thi Thu Trinh Phan is a Ph.D. student in Physical Chemistry. She is studying novel photophysical properties and devices in the Trinh Lab.

6. My name is Andrew Hammer. I am from Iowa and have been in Logan for too long. I enjoy research and for my weekend activities, I enjoy research. I am specifically interested in pathogens and the mechanisms of virulence systems.

Cindy Weatbrook honored as University-wide Employee of the Month



Cindy Weatbrook, Graduate Program Coordinator for the Chemistry and Biochemistry Department, was named as the January 2023 Employee of the Month in recognition of her "exceptional performance in all areas of her work!"

She was commended for "always meet[ing] deadlines, even when faced with a heavy workload." But it goes beyond simple job responsibilities for Cindy. She genuinely cares for the graduate students in her care. For example, she created a "starving student" cupboard in the department breakroom to ensure graduate students working in labs late at night or on the weekends are able to find nourishment after hours.

She goes above and beyond her department duties by serving as a member of the USU Equity Hearing Council, advocating for graduate student compensation, representation and rights, and consistently going the "extra mile."

Her positive attitude, ability to get along with all those she works with, and her willingness to always lend a helping hand, make Cindy a pleasure to work with and an asset to her department and the university.

Thanks Cindy for a job well done and congratulations on an honor well-deserved!

2023 Department Awards

Each year, the Department of Chemistry & Biochemistry recognizes the achievements and hard work of our talented students and faculty. This year, twenty-four undergraduate students, seven graduate students, and two alumni received awards, totaling more than \$12,500 dollars in funding for education and research. We are extremely excited to celebrate these individuals over the next few pages.



Alumni Achievement Award

David Bienvenue



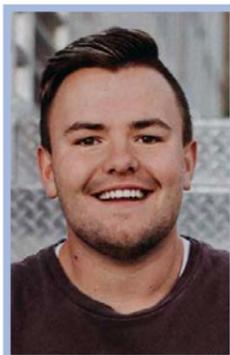
Dr. David Bienvenue received his Ph.D. in Biochemistry from Utah State University in 2001. He currently serves as the Senior Director of Protein Science at Bonum Therapeutics in Seattle, Washington. He has previously served as the Vice President of Protein Sciences, Analytical, and Process Development at Aptevo Therapeutics. He led the Aptevo Early Product Development Team to develop novel proteins for immuno-oncology and is an inventor on multiple Aptevo patents.

Joseph Gardner



Dr. Joseph Gardner received his Master of Science in the department in 1980 and his Ph.D. from the University of Wisconsin - Madison. He spent most of his career at Proctor & Gamble, where he held many different leadership positions, most notably as Director of the Chemistry & Discovery Division. More recently, he was President and CEO of Akebia Therapeutics and Aerpio Pharmaceuticals. He is also an Adjunct Associate Professor of Biochemistry in our department and this past year taught a highly successful graduate class.

UNDERGRADUATE



Jacob Allen

Thomas M. Farley Chemistry Award



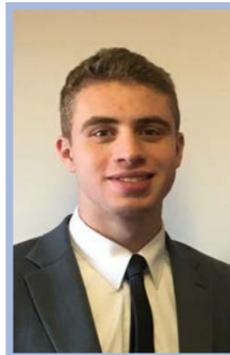
Sofia Hakh

Thomas M. Farley Chemistry Award



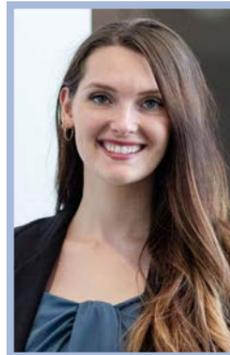
Brooklyn Palmer

Thomas M. Farley Chemistry Award



Joseph Wiberg

Thomas M. Farley Chemistry Award



Mallory Liebes

Stephen Bialkowski Award in Environmental Chemistry



Tyler Barry

Garth & Lila Lee Scholarship



Joe Halling

Garth & Lila Lee Scholarship



Bella Leonardo

R. Gaurth Hansen Scholarship



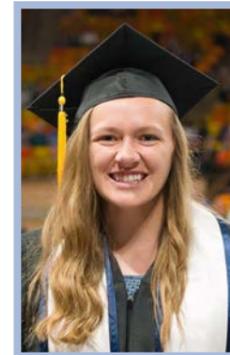
Aimee Schaelling

ACS-HACH Land Grant Scholarship



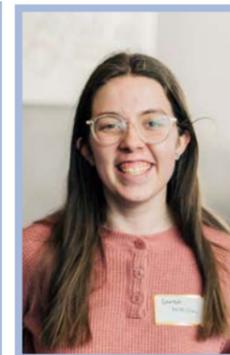
Jackson Morely

George H. & Billie Bush Emert Scholarship



Ayzia Ford

AIC Foundation Award
Maeser-Bauer Outstanding
Graduating Senior in Chemistry
Undergraduate Research Award



Sarah Nielson

Maeser-Bauer Outstanding
Graduating Senior
in Biochemistry
Undergraduate Research Award



Evah Peard

Maeser-Bauer Outstanding
Graduating Senior in Chemistry
Undergraduate Research Award



Sydney Schmidt

Harris O. & Eleanor Y.
Van Orden Award
in Analytical Chemistry
Harris O. & Eleanor Y. Van
Orden Award in Physical
Chemistry
ACS Division of Analytical
Chemistry Undergraduate
Award



Noah Schade

Irving Condie Frost Award in
Biochemistry



Marcus Hayden

Harris O. & Eleanor Y. Van
Orden Award in Biochemistry



Andrew Williams

Undergraduate Research
Award

Not Pictured:

Allison Hall

Garth & Lila Lee
Scholarship

Braxton Floyd

Thomas M. Farley Chemistry
Award

Tali Hendrickson

Thomas M. Farley Chemistry
Award

Noah Mandleco

Thomas M. Farley Chemistry
Award

Brian Riding

ACS Division of Inorganic
Chemistry Undergraduate
Award

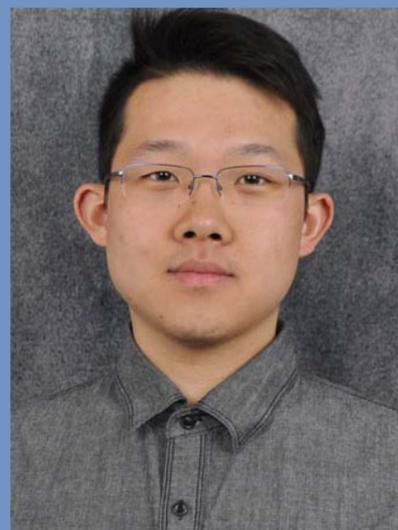
Haley Fisher

ACS Division of Physical
Chemistry Undergraduate
Award

Sophia Leavitt

Irving Condie Frost Award
in Biochemistry
Harris O. & Eleanor Y. Van
Orden Award in Inorganic
Chemistry

GRADUATE



Wenda Wu

Teng Outstanding Graduate Student
in Chemistry



Nikolay Tkachenko

Teng Outstanding Graduate Student
in Chemistry
Dr. William Moore Award



Mark Gold

Marjorie H. Gardner Teaching
Award



Jesse Brown

Stephen Bialkowski Award in
Environmental Chemistry



Keyang Wu

Early Research Progress in Chemistry
& Biochemistry Award



Pavel Rublev

Early Research Progress in Chemistry
& Biochemistry Award

Undergraduate Student Association

Right, undergraduate students Bella Lonardo, Lorenzo Papworth and Brian Riding volunteering at USU's Science Unwrapped. The Undergraduate Student Association regularly participates in the monthly event to bring science to members of the community. (Photo Credit: Madelyn Peel/USU.)



Written by Madelyn Peel

After a few years hiatus, the Chemistry and Biochemistry Undergraduate Student Association (CABUSA), previously referred to as Chem Club, was reorganized this past fall. CABUSA's mission is to enhance the overall campus experience by uniting students with interests in the fields of chemistry and biochemistry through activities, meetings, service, and participation in national chemistry (American Chemical Society) and biochemistry (American Society for Biochemistry and Molecular Biology) organizations. The academic year was kicked off with an opening social and an information meeting regarding student leadership positions, as well as elections for the year's student leaders.

Once elected leadership was in place, we held monthly club meetings to prepare for upcoming events, discussed ideas for expanding the club, and played games to socialize with our fellow chemistry and biochemistry students. The department library was also reserved for weekly study groups, where students could get together and help one another with challenging coursework.

Throughout the academic year, we presented a table at Science Unwrapped each month, sharing chemistry-based experiments with families and individuals of all ages and backgrounds. Some of these experiments included Elephant Toothpaste, Lemon Volcanoes, Slime, and Cabbage Chemistry, all of which were a blast to demonstrate and excite our young friends about science.

Additionally, at the end of the fall semester we were able to visit an elementary school's after-school program and teach some principles of what it takes to be a scientist, after which we made slime with the students.

In the spring, CABUSA held a fundraiser in conjunction with the Graduate Student Council selling t-shirts and jackets to the department and the community. We also received a grant from the American Chemical Society for our student chapter (contained as a part of CABUSA). We express our gratitude to those who supported the fundraiser and who put forth the needed efforts to submit our ACS grant application. Our plans for these funds include supporting monthly meetings for the coming year, as well as funding supplies for our Science Unwrapped experiments and more community classroom presentations.

As the year came to a close, we held elections for the 2023-2024 school year, filling all available positions. Gratefully, we acknowledge the efforts of many faculty and staff throughout the Chemistry and Biochemistry Department who made the reorganization of CABUSA possible, whether through time or money spent, and allowed for this community to become a reality once again for our students. We also recognize the hard work student members put into inviting and participating, while carrying class loads and a multitude of other responsibilities. We look forward to a productive year enhancing our students' undergraduate experience through service, networking, socialization, and community engagement.

Graduate Student Council



Written by Calvin Luu

The Chemistry and Biochemistry Graduate Student Council's mission is to represent the graduate student's interests in the Department of Chemistry and Biochemistry. The Council provides a platform for the graduate students to discuss and address personal and department-wide issues, to support graduate student's mental and physical well-being through clear communication with the faculty, and to assist in increasing the quality of the student's academic, professional, and social pursuits. Over our first full year as a Council, we have started conversations surrounding student-faculty expectations by surveying graduate students concerns and issues with their time at USU. In addition, the department began drafting a Memorandum of Understanding (MOU) that outlines graduate student-faculty mentor expectations. The Council played an instrumental role in representing graduate students' interests and expectations and implemented them into the MOU. The goal of the MOU is to ensure equal expectations are met between each graduate student and their faculty mentor.

In addition, the Council held several events, including a fall welcome party for new graduate students in the department and Friendsgiving, bringing together graduate students for a dinner amongst friends, family, and colleagues. The Council also held a successful "Pie-a-TA" fundraiser that was

popular among the undergraduate student population. The goal of the Council's fundraisers are to hold more graduate student events, including monthly departmental lunches for graduate students, and to lay the groundwork for a council-sponsored graduate student scholarship.

Over the summer, the Council, in conjunction with the Assistant Director of the Science Writing Center, will be holding a weekly writing workshop for graduate students to work on manuscripts, oral exam proposals, thesis and dissertations, and conference abstracts.

Lastly, the Council established a new position, the Sustainability Advocate, and selected Hannah Feinsilber (Seefeldt Lab) to lead the advancement of waste reduction, recycling of materials, and initiatives for greener chemistry practices in the department.

GSC Leadership:

Taylor Dederich (President), Josh Denson (Vice President), Steve Anderson (Mental Health and Inclusion Advocate), Calvin Luu (Secretary), Taylor Dittmar (Social Media Specialist), Andrew Egan (Campus Outreach), Hannah Feinsilber (Sustainability Advocate), and Cindy Weatbrook (Advisor).

"We would like to acknowledge the work that every single graduate student has contributed to their research, to teaching, to the department, and to the motivation and success of their fellow peers."



Calvin Luu, secretary of the Graduate Student Council, participated in the "Pie-a-TA" Fundraiser to help raise funds for graduate student events.

CONGRATULATIONS CLASS OF 2023

The Department of Chemistry and Biochemistry is proud to celebrate our graduating class of 2022 - 2023. The College of Science awarded 47 degrees to students majoring in chemistry or biochemistry this year. Of this number, 42 B.S degrees, two M.S. degrees, and three Ph.D.s were awarded. This graduating class represents an exceptionally bright group of students, who excelled not only academically but also in undergraduate research, community service, and extracurricular activity.

Our department would also like to acknowledge this year's valedictorian, Dylan Julander. High academic achievement in the major of chemistry teaching helped distinguish Dylan from his peers, and we applaud his dedication. This marks the second year in a row that a student from the Chemistry and Biochemistry Department has been chosen for the honor. Last year, Porter Ellis, undergraduate researcher and student of Dr. Nick Dickenson, was chosen.

We congratulate these individuals as well as all of our graduates of the year, and wish them well in their future endeavors.

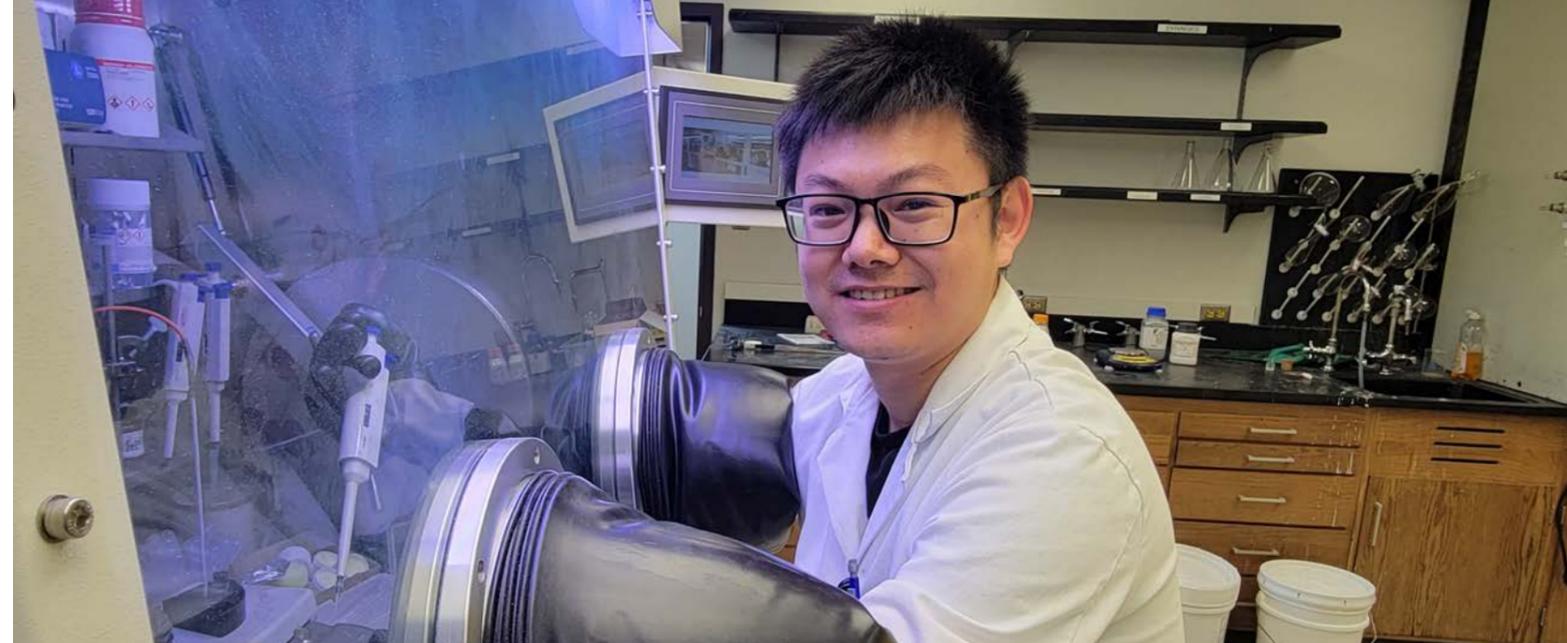
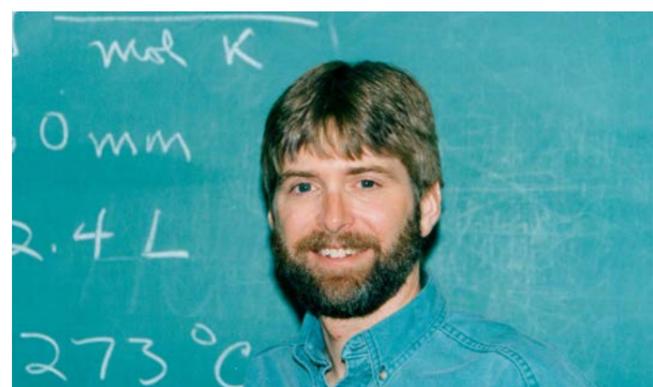
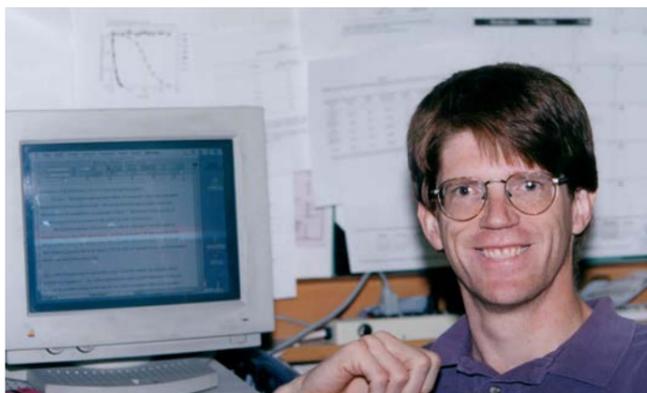
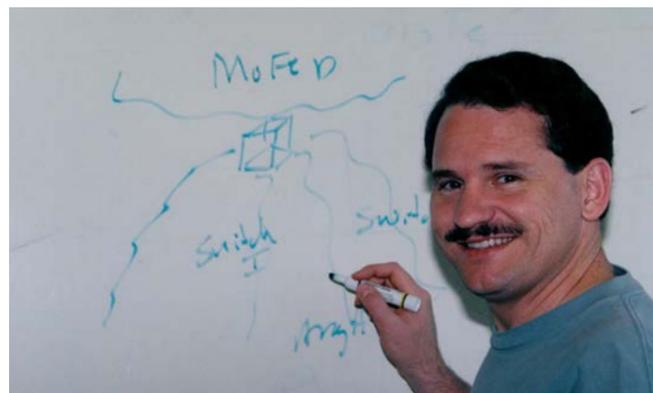




Blast From the Past

Our department is extremely grateful for our dedicated faculty members, several of whom have served our department for many years. We would like to thank all of our faculty for their tireless efforts.

Counter-clockwise starting from top left: Steve Scheiner, Lance Seefeldt, Brad Davidson, Lisa Berreau, and Scott Ensign (Photo Credit: Chemistry Photo Archives)



Thank You for Your Support

The Department of Chemistry and Biochemistry continues its ambitious efforts to provide the best educational experience, research opportunities, and service to our students and our community. As an alumnus, faculty member, staff member, parent of a student, or friend to our department, your contributions help us provide an impactful education to current and future students. With gifts from you, we work to enhance research initiatives that prepare our students for the future. Every dollar makes an impact for our Aggie Scientists.



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(Photo Credit: J. Truex/USU)

Mark Your Calendars

SEPT
9

Old Main Hill
Challenge

Graduate Student Council Fundraiser

OCT
27

Hansen Life
Sciences Retreat

APR
16

2024 Department
Awards Ceremony

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