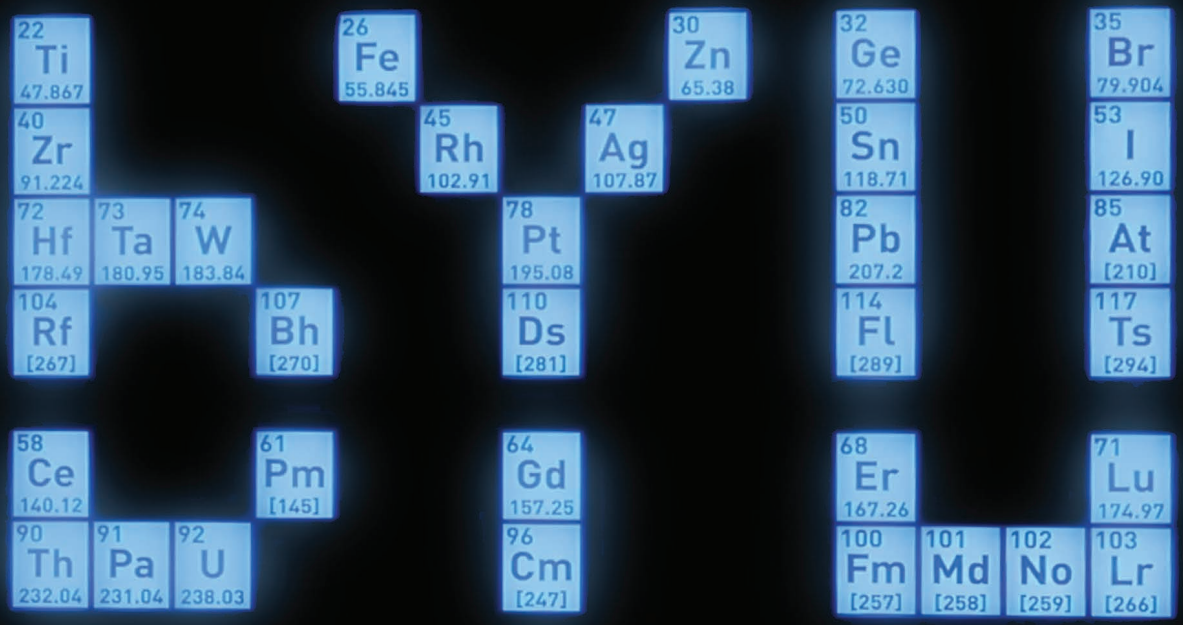
CHEMIGRAM

2019



Department of Chemistry and Biochemistry

BRIGHAM YOUNG UNIVERSITY

CONTENT

This year the world remembered the 50th anniversary of the first manned Moon landing. I confess that it is the 50th time I personally have celebrated that July 20 anniversary, and it was fun to see everyone else going along this time! The Moon landing stoked my young love of science, and is one of the most important reasons I am a chemist now.

In the coming year we will get to celebrate another event that was crucial to my becoming a chemist: 2020 is the 100-year anniversary of the establishment of the BYU Department of Chemistry and Biochemistry. The pioneering work of many has built the department over the years into the vibrant place it is today. Please join us for the kick-off celebration of our centennial anniversary at the annual homecoming banquet on Friday, September 18, 2019. See the back cover of the CHEMIGRAM for more details and how to RSVP for this free event.

In the pages that follow you will see more abundant evidence of the vibrancy of our department than I can cover in this brief space. For example, I am happy to report that a number of our colleagues have advanced in rank, including promotions to Associate Professor with continuing faculty status for Stacey Smith, JC Price, David Michaelis, and Josh Andersen, and promotion to Professor for Scott Burt. We thank them for the excellent teaching and scholarship that has led to these well-deserved promotions. We are delighted to welcome James Harper, who built a very successful research/teaching program at the University of Central Florida as an expert in molecular structure determination using solid-state nuclear magnetic resonance, as the most recent addition to our faculty. Kim Christensen, who has long set a positive tone of "can do" service to the department and the university as Business Office Manager, retired (and moved directly into another job in the Payson Temple presidency), with Steven Johnson stepping right in to fill Kim's big shoes; we wish Kim the best and are grateful for the talents of Steven. Bringing a wealth of experience from the Department of Statistics, Amy Cetz joined us as Graduate Program Administrator, replacing Kari Van Sickle. We look forward to the strength Amy adds to our graduate program.

This year also saw internal and external reviews of the department, which gave us a sense that we are in generally good shape with some areas where we can continue to improve as we strive to broaden our reach and strengthen the more than 11,000 students we directly work with each year. We saw establishment of a new Women in Chemistry club to better serve our students, and thanks to generous donations we celebrated the International Year of the Periodic Table with the addition of fully up-to-date, electronically-controlled periodic tables in each of our large lecture halls. Besides including all the newly-discovered elements, we think they look "really cool!" Read on to learn more about some of these things and other evidence of a vibrant department.

Of course the department would not be what it is today without the contributions of emeritus faculty and staff, friends of the department, and our wonderful students and alumni. Thanks for the past 100 years, and we look forward to a bright future built on this foundation.

David V. Dearden

2018 AT-A-GLANCE

CHEMISTRY AND BIOCHEMISTRY

FULFILLING THE MISSION OF BYU

DEPARTMENT GOALS/ INITIATIVES

- Identify, recruit, and retain the best faculty who will fulfill the mission of the university and achieve the high standards of discipline.
- Prepare our students by providing engaging, rigorous classroom instruction.
- Provide our students with opportunities to participate in meaningful research projects.
- Create a sustainable structure for maintaining and replacing research and teaching instrumentation.

EFFECTIVE TEACHING

Students

11,651 Enrollments
406 Majors (39% female, 61% male)
57 BA or BS graduates
111 Graduate students
6 PhD Graduates
8 MS Graduates

Student Destinations

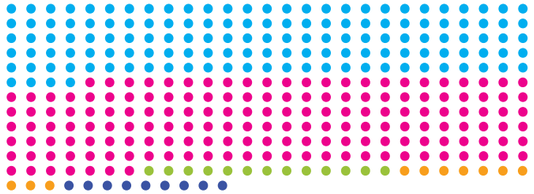
29% Grad School
35% Professional School
22% Jobs as Chemist/Biochemist
4% Teaching Chemistry
10% Other

EXPERIENTIAL LEARNING

Mentored Research

315 total undergraduates

- 139 Majors
- 144 Non-majors
- 13 Talmage Fellows
- 10 REU Students (Research Experience for Undergraduates)
- 9 High School Students



PRODUCTIVE SCHOLARSHIP

Scholarship

136 peer reviewed publications
98 with student coauthors
$3.6 million in external funding in 2018

NEW PERIODIC TABLES INSTALLED IN THE BENSON SCIENCE BUILDING

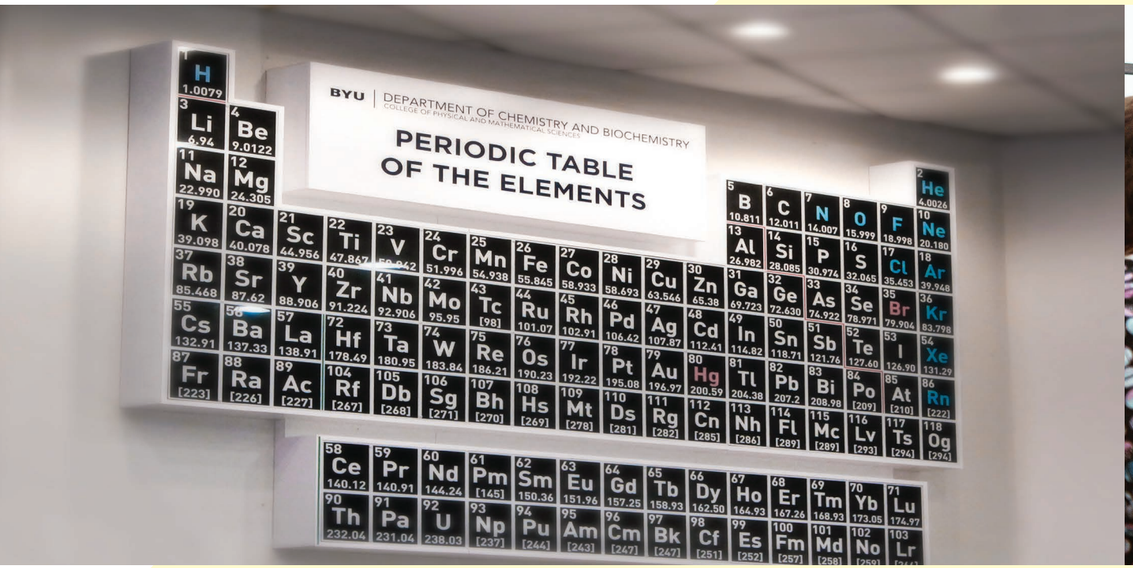
On February 17, 2019, the periodic table of elements celebrated its 150th birthday. In honor of this occasion, UNESCO and the American Chemical Society (ACS) have declared 2019 the International Year of the Periodic Table.

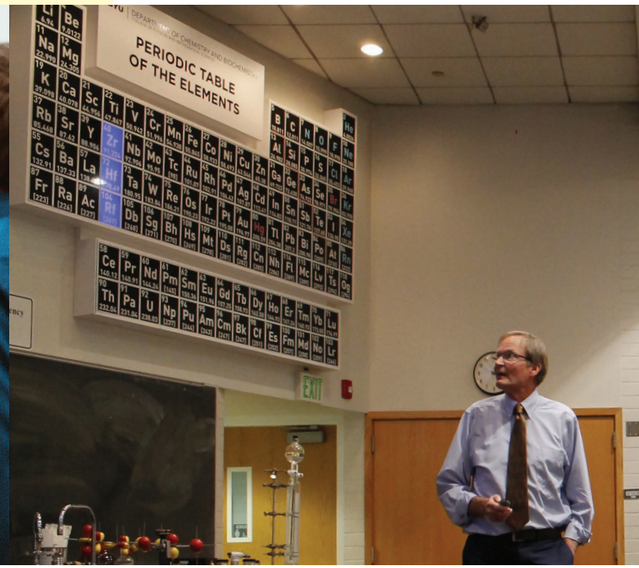
BYU's Chemistry Department celebrated this occasion with the unveiling of new interactive periodic tables in the three lecture halls in the Ezra Taft Benson Building. These unique interactive tables were designed and built by Unrivaled, an Ogden-based company that worked closely with the Department of Chemistry and Biochemistry faculty and staff in the creation process. The periodic tables were showcased on February 14, accompanied by a lecture on the history of the periodic table by chemistry faculty member Steven G. Wood.

Dr. Wood is the faculty member who initiated the idea for creating updated, accurate periodic tables for the lecture halls. In his lecture "The Periodic Table: 150 Years Serving up the Elements in an Orderly Fashion - with Style," he dissected the history not only of the periodic table, but the discovery of the essential characteristics of the elements: their names, atomic masses, and corresponding atomic numbers.

From Antoine Lavoisier to Stanislao Cannizzaro to Dmitri Mendeleev, Dr. Wood walked the audience through the important names and discoveries that led to the periodic table as we understand and study it today.

The Benson Building's installment of the interactive periodic tables will provide a new, more efficient and correct method of showcasing the elements, and the department thanks our generous donors for their contributions.





Donors reception: Jennifer Poole, Jennifer Nielson, Brent Hall, Andrea Hall, Joel Hall, Kyle Johnson (from left to right).

CELEBRATING 150 YEARS OF THE PERIODIC TABLE

Our sincere thanks to the following donors of the electronic periodic tables:
- Roger and Francell Bottomfield
- Dennis V. and Shirley J. Knudson family
- "High Impact Teaching" grant, College of Physical and Mathematical Sciences
- "Matching Funds to Support General Education" grant, BYU General Education

Written by Emma Parnell, edited by Taelin Wilford / Photos by Yao Kuang Lee and BYU Photo

Research Offers Hope for Simpler Cancer Diagnosis and Treatment

Monitoring cancer can often be an intrusive and exhausting process for patients. But with BYU chemistry professor Ryan Kelly's new research, there is hope for a simpler way: No more biopsies. No more spinal taps. Instead, patients may be able to take a simple blood test to diagnose, monitor and tailor appropriate therapies for various cancers.

Creating therapies for cancer patients is greatly enhanced when doctors know about the biochemical makeup of tumors, including what proteins are present and at what levels. For this project, recently published in top-ranked journal *Analytical Chemistry,* Kelly collaborated with researchers from the Pacific Northwest National Laboratory and Oregon Health & Science University to isolate circulating tumor cells (CTCs) from blood and determine which proteins were present.

Their technique uses a new technology, called nanopots, to capture more protein information from a single cell than ever before.

CTCs are extremely rare cells that have shed from a tumor and are carried around the body, acting as seeds for the growth of additional tumors in distant organs. Traditionally, learning about the protein makeup of a blood or tissue sample has required thousands or millions of cells. Because CTCs are so rare, their proteins could not be studied.

"It used to be that the only thing you could do with CTCs is count them, which would usually correlate with cancer," said Kelly. "But it's not always effective. We want to get beyond that."

By measuring the proteins in CTCs, physicians will be better equipped to know what is working with a therapy regimen and continue or modify treatment accordingly.

"Targeted approaches for studying proteins from single cells have been around for a while, but the problem is you have to know exactly what you're looking for," Kelly said.

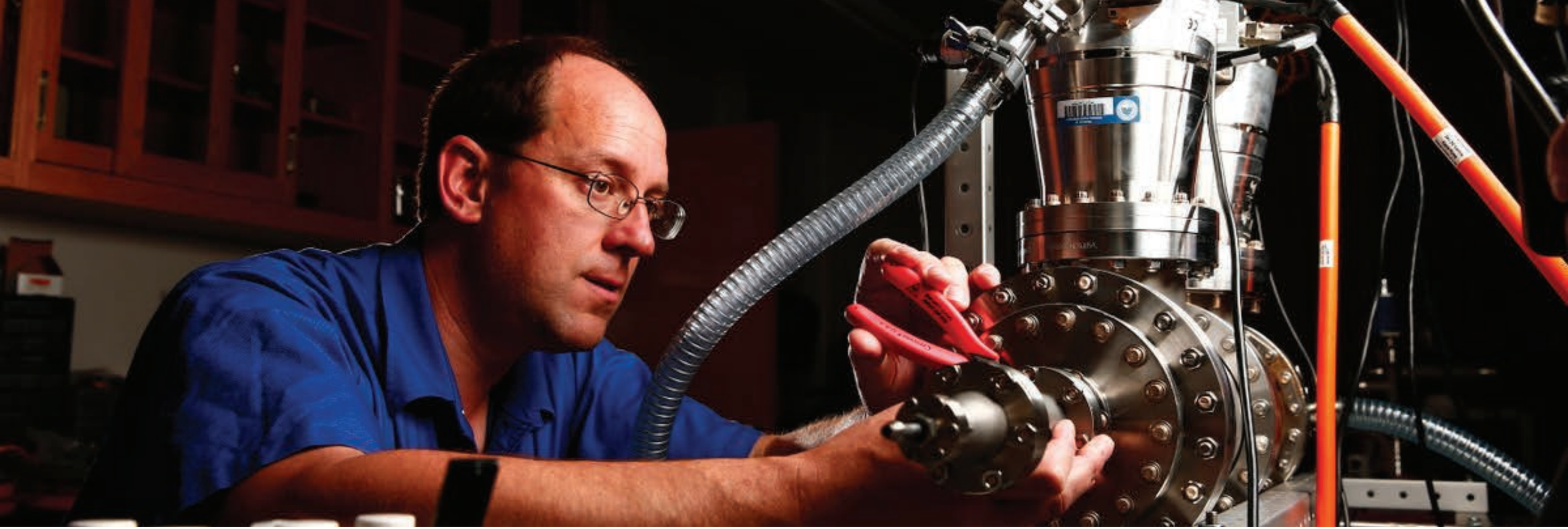
"What we are doing is cataloging as many proteins as possible from single cells, without having to pick what we're looking for beforehand. Nobody's done that before with small numbers of CTCs."

The research team hopes CTCs can eventually serve as a "liquid biopsy" by providing information about the tumors from a simple blood test.

"We would like to know how a therapy is impacting a cancer without having to do an invasive biopsy every time," Kelly said. "We're excited about the implications this could have in the long run for cancer diagnosis, treatment, and the development of new therapeutic approaches."

Written by Whitney Steele / Photo by Jaren Wilkey

Brigham Young University associate professor Ryan Kelly works on identifying proteins within cancer cells at his laboratory in Provo on Friday Oct. 26, 2018.



Daniel Austin Makes Strides in MASS Spectrometry and Receives Curt Brunnée Award

The International Mass Spectrometry Society recently presented Dr. Daniel Austin with the Curt Brunnée Award, recognizing outstanding contributions to the development of instrumentation for mass spectrometry by a scientist under age 45. Dr. Austin was invited to Florence, Italy to receive the award and present a lecture at the 22nd International Mass Spectrometry Conference, August 2018. This is only the third time the prestigious award has been given to a scientist in North America.

Dr. Austin's research group has pioneered efforts to miniaturize ion traps for portable chemical analyzers, and they have also developed devices for studying nanoparticles and microparticles by measuring their electrical charge and mass. A novel approach used by the group is to create electric fields using printed circuit boards or lithographically patterned substrates rather than relying on conventional machined metal electrode structures.

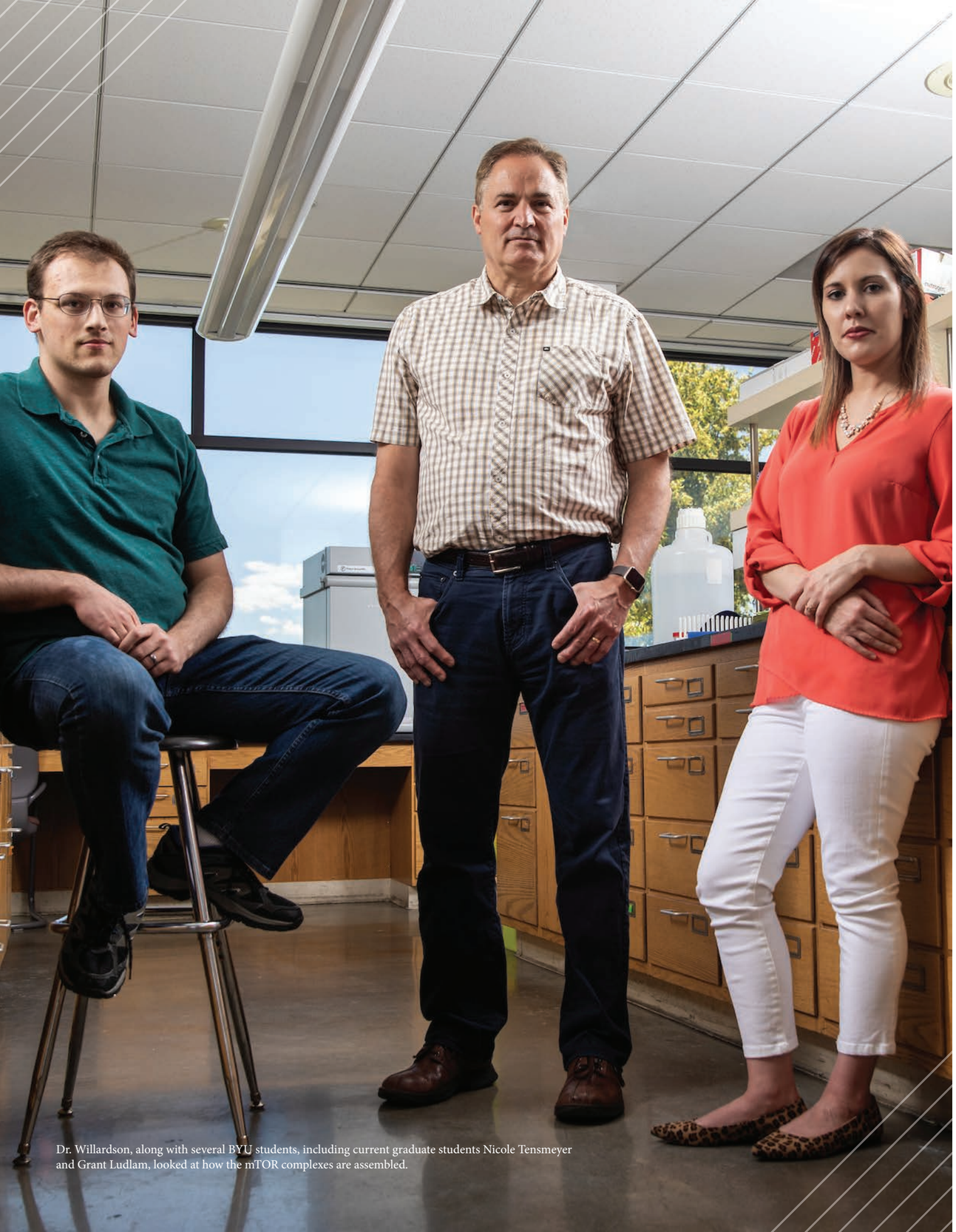
They have also designed various instruments and techniques for making mass spectrometric measurements from spacecrafts. For instance, they are developing an inlet that reduces the fragmentation of molecules brought into a mass spectrometer from an orbiting spacecraft, and they hope to have this device included on future missions within our solar system. This device will allow confident identification of molecules that might indicate habitable environments or possible life elsewhere in the solar system.

For many years Dr. Austin's research group has developed technology to take mass spectrometry out of the lab and into the field. Portable and handheld chemical analyzers have a significant advantage for many applications, including emergency response, environmental monitoring, chemical weapons detection, and national security. His group has developed the world's smallest linear ion trap, the central element of a portable system. PerkinElmer is now commercializing this technology for their next generation of portable gas chromatograph mass spectrometers.

Dr. Austin's research group has developed an image charge detector comprised of patterned electrodes and are currently working with NASA to develop this into an instrument to measure the charge and size of atmospheric dust on Mars. These dust grains are a potential respiratory hazard to astronauts and may interfere with oxygen production and solar panels. This analyzer will allow the first measurements of the properties of these grains and hopefully lead to solutions as NASA prepares to send a manned mission to Mars.

Dr. Austin and his students have also contributed to research instrumentation within the BYU Department of Chemistry and Biochemistry. For instance, he and an undergraduate student designed and built a TGA-MS (Thermogravimetric Analyzer – Mass Spectrometer) using a commercial TGA, a commercial quadrupole mass filter, an off-the-shelf vacuum system, and easily obtained components. They also developed the sample line and interface between the two instruments and wrote software to control both from a single platform. This effort provided a low-cost alternative to commercial TGA-MS instruments while matching the performance of a dedicated system with publicly available software and diagrams. The instrument is currently being used by several research groups.

Written by Taelin Wilford / Photo courtesy of Daniel Austin



Dr. Willardson, along with several BYU students, including current graduate students Nicole Tensmeyer and Grant Ludlam, looked at how the mTOR complexes are assembled.

BYU Team Breaks Down Major Players In Cell to Score Future Cancer Therapy Wins

Learning more about a specific protein complex and how it works is a stepping stone for others who might look for cancer therapies or ways to help treat diabetes and other diseases.

In the world of biology, each individual cell also has many moving parts and pieces, each with specific roles and places to be. If one of those pieces isn't working correctly, it can affect the entire cell, much like a soccer team doesn't perform as well if every player is not doing his or her job.

For the past five years, researchers at BYU have studied protein complexes that have the job of regulating cell growth and survival, processes that are essential for cells to grow healthily. Consequently, these protein complexes are also a target for cancer and other diseases. The team is working to better understand the role and functionality of the complex, named the mechanistic target of rapamycin - or mTOR for short.

Learning more about mTOR and how it works is a stepping stone for others who might look for cancer therapies or ways to help treat diabetes and other diseases. "We are not developing cancer therapies directly, but we are contributing to the fundamental understanding of cellular function that underlies those types of treatments," said BYU professor and lead author Barry Willardson.

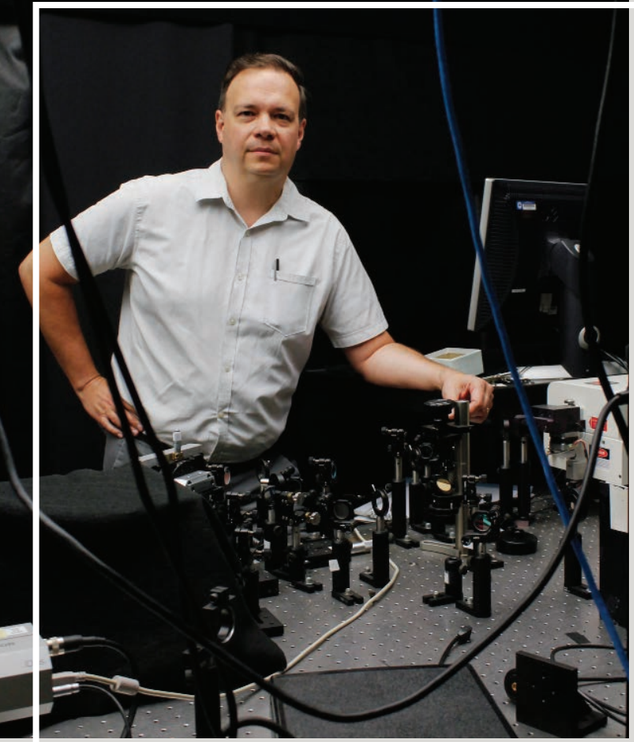
In a study published in *Nature Communications*, Willardson, along with several BYU students, including current graduate students Nicole Tensmeyer and Grant Ludlam, looked at how the mTOR complexes are assembled. In a cell, proteins seldom work on their own, they work in complexes with other proteins, much like a soccer team relies on each other to defend and score. In this instance, mTOR has subunits called mLST8 and Raptor, two proteins that help to stabilize mTOR."Proteins are made as a linear string of amino acids, but eventually they have to come together into a three-dimensional shape," Tensmeyer said. "How they fold into this shape affects the way they can function. Additionally, they have to be in a very specific shape to work properly. Sometimes that can happen without assistance but sometimes it needs help getting into that shape, and that's where a chaperonin comes into play."

Much like an adult chaperone would watch over a group of children, a chaperonin is a cellular machine that supervises proteins and helps them get folded into the aforementioned specific shapes or get into position to operate correctly. It's also similar to the way the captain of a soccer team helps guide his teammates to the correct position on the field. In the case of the mTOR complex, a chaperonin called CCT is needed to fold both mLST8 and Raptor and help them assemble with mTOR. "The folding done by CCT is normally a good thing," Ludlam said. "But in diseases like diabetes or cancer, mTOR can get out of control. We think if we can stop CCT from folding mLST8 then we can stop the cancer progression."

The group at BYU worked closely with scientists in Spain who were able to view the complex with a cryo-electron microscope, a cutting-edge instrument that uses electrons to give researchers an almost atomic-level look at the complexes and allows them to understand what is going on at the molecular level.

The study was funded by a grant from the National Institutes of Health and by the BYU Simmons Center for Cancer Research.

Written by BYU News / Photo by BYU Photo



James Patterson Receives Naval Research Grant

Congratulations to Dr. James Patterson for being awarded a government grant from the Naval Surface Warfare Center (NSWC), Indian Head Division. This division is part of the Naval Engineering Education Consortium. One of the purposes of this grant program is to establish connections between universities and Navy research facilities. This program is also designed to facilitate the progress of students going to work in U.S. Navy research laboratories.

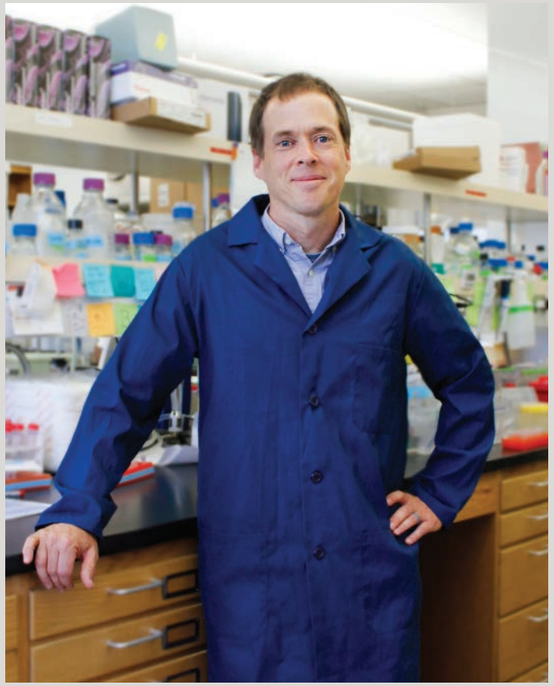
Dr. Patterson will use this grant to fund projects related to understanding the molecular effects of aging, mechanical deformation, thermal stress, and other factors on the materials used in plastic bonded explosives (PBX) and propellants. Patterson's desired research outcome is the creation and validation of models for how these materials behave and respond to stresses in order to better prepare and use them for their intended purposes.

Written by Taelin Wilford / Photo by Yao Kuang Lee

Sabbatical Down Under

Professor Joshua Andersen recently returned from sabbatical in Melbourne, Australia. Dr. Andersen spent his time working at the Walter and Eliza Hall Institute (WEHI) alongside Dr. David Huang and Dr. David Komander. WEHI is a world famous center for research on apoptosis with many of the most exciting discoveries in the field happening there. "As a graduate student working in the apoptosis field, it had always been a dream of mine to spend time doing research at the WEHI," said Andersen. While working in Dr. David Huang's group, Dr. Andersen focused on learning CRISPR genome screening and mouse cancer models, both of which are areas of expertise in the Huang group and at the WEHI in general. "These are techniques that I'll bring back to BYU and will significantly increase the impact of our research," said Andersen.

Outside of the WEHI institute, Dr. Andersen gave research seminars around Australia. While presenting at the University of South Australia in Adelaide he was able to meet with several groups who were working on a protein called 14-3-3, which is a research focus of his lab. "It was a thrill being able to interact with these groups face to face [and] share ideas," said Andersen.



Written by Taelin Wilford / Photo by Yao Kuang Lee

Milton Lee Earns THREE Acclaimed Chemistry Awards

2019 recipient Milton L. Lee (center) is presented his award by sponsor representative, Michelle V. Buchanan (right), and Bonnie A. Charpentier, ACS President (left).

Congratulations to Emeritus Professor of Chemistry Dr. Milton Lee for being awarded the 2019 Giorgio Nota Award, the 2019 Award for Analytical Chemistry from the American Chemical Society, as well as the 2018 historic Csaba Horvath Memorial Award.

The Giorgio Nota Award is presented to a scientist who has made a significant contribution to capillary liquid chromatography. Part of Dr. Lee's research focuses on the development of new instrumentation and supporting technology in capillary chromatography and in chromatography coupled to mass spectrometry. His keynote lecture at the May 2018 International Symposium on Capillary Chromatography highlighted the current mobile chromatography instrument trend. After successfully developing a hand-held gas chromatograph-mass spectrometer system, Professor Lee and his colleagues are currently developing a portable liquid chromatograph that is small enough to carry comfortably. This instrument can be used for point detection of a variety of compounds including chemical warfare agents, environmental pollutants, chemicals in contaminated food, drugs of abuse, pharmaceuticals, and explosives, to name a few. The device is designed to be battery operated, which allows for an operator to detect and measure chemicals of interest on the spot.

Lee was presented the 2019 Award for Analytical Chemistry from the American Chemical Society (ACS) for his developments in column technologies, instrumentation, applications, and commercial implementation of microseparations and combined microseparations/mass spectrometry. This award was presented on April 2, 2019 at the American Chemical Society's National Meeting in Orlando, Florida. The purpose of this award is to recognize and encourage outstanding contributions to the science of analytical chemistry.

Milton Lee was also presented with the historic Csaba Horvath Memorial Award. This award is given to the top separation science chemist in the world. The medal recognizes a scientist who has shown dedicated contributions to the field of separation science. Dr. Lee certainly has been a pivotal contributor to this field.

Dr. Lee began his career at BYU in 1976 and spent nearly 40 years as a chemistry professor, 25 years of which he was the H. Tracy Hall Professor of Chemistry. Although he is retired from full-time faculty assignments, Dr. Lee continues to maintain an active research lab. Along with being the author of close to 600 publications, presenting his research on over 700 different occasions, and co-founding several companies—including Axcend, Sensar Corporation, Torion Technologies, and Lee Scientific—Lee has recieved significant peer recognitions during his career. The ACS Award for Analytical Chemistry in particular is the most prestigious in the nation for analytical chemistry and a major honor for the recipient. Dr. Lee's lifelong contribution to the field is an inspiration to many.

Written by Taelin Wilford / Photo by Mark Philbrick

KARL G. MAESER EXCELLENCE IN TEACHING AWARD

Jaron C. Hansen received the Karl G. Maeser Excellence in Teaching Award, honoring faculty members for outstanding teaching accomplishments and is made possible by the generosity of the Karl G. Maeser Scholarship Society. Professor Hansen was the recipient of this award at the 2018 University Conference.

"The enthusiasm Jaron C. Hansen exhibits both inside and outside of the classroom demonstrates why it is important for a teacher to be anxiously engaged in research. A world expert in atmospheric chemistry and renewable energy, he keeps his classes exciting so that the material sticks—even in the much-feared Chemistry 105. Jaron is especially effective at mentoring struggling students," said the University Conference Committee.

IZATT-CHRISTENSEN FACULTY EXCELLENCE IN RESEARCH AWARD

The Izatt-Christensen Faculty Excellence in Research Award is presented every other year to a faculty member of the Chemistry and Biochemistry department who has made impressive strides in their research. Dr. Brian F. Woodfield is this year's recipient. Dr. Woodfield's lecture entitled "Act First, Worry Later" discussed the importance of failure in order to learn. He described his work with low-temperature specific heat and solid-state physics, aluminas, the Fisher-Tropsch process, and the conversion of waste to liquid fuels. Dr. Woodfield's other research includes chemical thermodynamics, solid-state physics, high-temperature superconductors, novel synthetic techniques, catalyst supports, and catalysts.

He began teaching at BYU in 1997 after having received his PhD in physical chemistry at the University of California, Berkeley. During his time at BYU, Dr. Woodfield developed the Y Science virtual lab project, a set of sophisticated and realistic simulations for middle school, high school, and college-level science students which simulates the situations and decisions they would have to make in a real laboratory setting. These labs include Virtual ChemLab, Virtual Physics, Virtual Physical Science, and now Virtual Biology. These labs reach roughly 1,000,000 students every year, and are currently being updated in anticipation of their use on a global scale. This award is made possible through the donations of family members, scientific associates, and former students of Dr. Reed Izatt and Dr. James Christensen.

NICHOLES-BUTLER CITIZENSHIP AWARD

Dr. Steven Wood was awarded the Nicholes-Butler University Citizenship Award at the department session of the University Conference held August 29, 2018. The two-fold purpose of this endowment fund is to recognize in a permanent way Joseph K. Nicholes' dedication to the highest purposes of Brigham Young University, and to honor a faculty member who has displayed exceptional and superior citizenship in the University. This award is presented every five years to a faculty member who exhibits balance between academic achievement, religious commitment, and education in the broadest sense – the all-around faculty citizen. "Dr. Wood exhibits the characteristics that make him an exemplary recipient of this award through his excellence in teaching and serving our students, willingness to try and prove new approaches, love of the story of science along with the science, and dedicated and unselfish service to the department and to fellow faculty members." "Thanks for being part of us and for showing us how a university citizen should perform!" said Department Chair, Dr. David Dearden. "It is always humbling and meaningful to be recognized by your colleagues, especially knowing the contributions they regularly make to the department and the university," said Dr. Wood. "This award provides the opportunity to do something that I would not otherwise have had the resources to do. I would like to travel and visit some of the sites that played key roles in the development of chemistry. I like history and have found that telling the stories and explaining the historical context of chemistry brings a human dimension to the science and helps students better learn and appreciate the material."

BYU FACULTY WOMEN'S ASSOCIATION CITIZENSHIP AWARD

Dr. Jennifer Nielson received the Citizenship Award presented by the BYU Faculty Women's Association. The association was founded to improve the quality of professional life for faculty women, to increase awareness of and sensitivity to gender issues, and to promote solidarity and a sense of community among the members of Brigham Young University.

Dr. Nielson is an excellent teacher, serves as a faculty member, and is an associate dean of the College of Physical and Mathematical Sciences. She uses her talents in local, national, and international settings; she is the co-creator of Chem Camp and travels to Uganda each summer to work with secondary and university science teachers.

GEORGES GUIOCHON FACULTY FELLOWSHIP

Dr. Ryan Kelly was awarded the 2019 Georges Guiochon Faculty Fellowship. This fellowship is awarded annually to one member of a U.S. academic or government institution whose research has shown excellence in fields aligned with liquid phase separation science. Dr. Kelly's research is focused on the development of nanoPOTS (Nanodroplet Processing in One pot for Trace Samples) and its coupling with ultrasensitive nanoLC-MS, enabling identification of more than 3000 protein groups from as few as 10 mammalian cells—a greater depth of coverage than had been previously achieved for 5000 mammalian cells. As part of this Fellowship, Dr. Kelly presented his research at the 2019 HPLC symposium in Milan, Italy (June 16-20).

HUGH M. HUFFMAN MEMORIAL AWARD

BYU's emeritus faculty member Dr. Lee Hansen was awarded the Hugh M. Huffman Memorial Award at the 2019 U.S. Calorimetry Conference in Santa Fe, New Mexico. This lifelong research award is given to honor those who have emulated in their careers the same care and passion for which Dr. Huffman was well known, and who have made long-term contributions to thermodynamics involving calorimetry and/or thermochemistry. Dr. Hansen was a professor of chemistry at BYU from 1972-2004 and focused his research largely on calorimetry and thermodynamics. His other research includes air pollution, pharmaceuticals, batteries for heart pacemakers and Mars rovers, and ecophysiology of plants and insects. Since reaching emeritus status, he has continued with his research in these fields with great success, publishing over 60 papers and earning several awards. Dr. Hansen's career has not only furthered the field of calorimetry, but his research and teaching also included analytical chemistry, inorganic chemistry, and technical writing with occasional courses in biochemistry and special topics. His lifetime commitment to continuing research and furthering the field of calorimetry is inspiring, and the department congratulates Dr. Hansen on this lifetime achievement award.

Halle Veysey

Advisor - Daniel Austin

Working under the mentorship of Dr. Daniel Austin, Halle Veysey researched charge detection mass spectrometry. Charge detection mass spectrometry (CDMS) can be used to determine the charge and mass-to-charge ratio (m/z) of particles. In a CDMS linear detector array a charged particle passes through a series of alternating grounding and sensing linear electrodes, with the first and last electrodes being grounded. The image charge of the particle is amplified and recorded as the particle enters and exits the sensing electrode, and a differentiating amplifier separates the data into two peaks. Published works have shown several ways to determine the m/z of a particle using a charge detector. Veysey's research uses a modified version of these approaches that is simpler to implement and allows for a wider range of particle sizes to be examined. The research group is applying CDMS to analyze dust particles within the Mars atmosphere. Veysey states, "Major gaps exist in our understanding of the dust particles in the Martian atmosphere. The size of dust grains has previously been measured only indirectly and as an average, while the electrical charge of Mars dust has never been measured. It is presently unknown whether the peak height, peak area, or some other parameter within the data corresponds to the charge of the dust particle. Measurement of these parameters is not only critical to our understanding of the Martian surface, atmosphere, and climate, but also to estimating risk to future Mars missions."

Peter Rosen has been working under Dr. Brian Woodfield to help develop a novel method for measuring the heat capacities of materials under pressure. Rosen then characterized this method and used it to measure the heat capacities of metal organic frameworks under pressure. The materials they measure exhibit a property called gate opening, which allows a large amount of adsorbed gas to adhere to the surface of the material. They hypothesized that the adsorbed gas causes a change in the lattice of the material, and they investigated this phenomenon by looking for transitions in the heat capacity measurement. Their experiments showed that adsorbed gas did cause a heat capacity transition. Their results are important because they provide basic understanding of the gate opening mechanism, and this understanding can be used to optimize metal organic frameworks for gas adsorption.

When asked how this mentored experience impacted his education, Rosen states: "Mentored research has been a very important part of my BYU education, and it would not have been possible without your donations. It has helped me understand how to approach difficult problems, [has] deepened my understanding of the scientific process, [has] helped me feel that I am a part of the scientific community, and has given me the tools to understand the scientific research for others. I am truly grateful for the generous donors that have supported me because the research opportunity their donations supported have been a defining part of my BYU experience."

Peter Rosen

Advisor - Brian Woodfield

Misael Lazaro

Advisor - Josh Andersen

Misael Lazaro worked in the Andersen lab on autophagy: a self degrading pathway that requires the growth of autophagosomes in order to recycle broken down organelles or proteins. The dysfunction of this process is the key to understanding the pathophysiology of human diseases such as chemo-resistant cancers. While data shows that ATG9A and Unc-51-like Kinase-1 (ULK1) localize at the isolation membrane, where the autophagosome is made, the exact mechanism of how these two proteins interact is not well understood. In addition, the data shows a lack of interaction between these two proteins when ATG13, a protein in the ULK1 complex, is knocked out of Hek 293 cells. Lazaro did assays in various conditions, such as treating the cells with Baf (a drug that inhibits the lysosome) or EBBS (medium that stimulates hypoxic conditions), to see how autophagy was affected with ATG13 KO cells. Lazaro and the Andersen group are also in the process of making viral vector addbacks and will do assays to validate the results they get in the KO cell lines. Finishing these experiments would help verify the co-localization results and find binding sites that would impact the development of drugs that could treat chemo-resistant cancers. Lazaro states, "I am very thankful for the generous donors that provide these kinds of opportunities for students like me, who cannot afford such valuable experiences. I am also very grateful for the people that have given so much for others who are in more need. I intend to provide the same favor for the rising generation of scientists."

David Kastner has been working under the mentorship of Dr. Steven Castle on extending the functionality of bulky dehydroamino acids to the creation of stable alpha-helical peptides. These peptides should exhibit a higher resistance to proteolysis while maximizing control over the structural process. "We completed the synthesis of the alpha-helical peptides and have begun working on setting up the appropriate procedures for performing structural calculations, which will allow us to predict the exact conformation of our peptides," said Kastner. "Some of the methods we are working on applying to this system are deuterium exchange calculations, which will tell us which atoms are hydrogen bonding which is an important parameter for future calculations."

Kastner continued, "the mentored learning experiences that I have participated in have been the most important and rewarding of my undergraduate education. My mentor, Dr. Castle, has played a pivotal role in helping me develop not only as a scientist but as a person. I am so grateful to everyone involved in undergraduate research at BYU. It has made an immeasurable difference in my education and helped me develop the qualities necessary to succeed in graduate school. . . . Not only did I have the opportunity to learn a host of new skills, but I was also able to contribute to the research project and by the end of my senior year was very comfortable with the techniques and theories and was able to pass on my knowledge to others. Lastly, I am very grateful for the generous contributions of all the donors."

David Kastner

Advisor - Steven Castle

Kim Christensen

After over 12 years of exceptional service, Kim Christensen retired on September 28, 2018. Christensen received his bachelor's degree in accounting from Brigham Young University and then went on to receive his MBA from the University of Phoenix.

Christensen began working at BYU in September 2006 as Business Manager for the Department of Chemistry and Biochemistry. In 2011 Christensen received the CPMS Outstanding Administrative Employee award. When his colleagues were asked to describe him in a few short words, Kim was described as "a kind and brilliant man, service oriented and humble." He was admired by all for his dedicated and hardworking nature not only in relation to his work, but also in relation to his work within The Church of Jesus Christ of Latter-day Saints and with his family.

While doing his undergraduate degree at BYU he met his wife Wynette, to whom he has been married for the last forty-two years. Together they have six children and nine grandchildren. One son, Bryce Kim, passed away in 2009, shortly after returning from a church mission in Cape Town, South Africa. His memory will always be preserved by his family.

Kim Christensen's personal interests include beekeeping, hiking, cross country skiing, and running. Over the years he has run the Rex Lee Run for Cancer Research, the Moab Half Marathon, the Top of Utah Marathon, and the Fillmore Sprint Triathlon. Christensen is also avidly involved in the Scouting program. He is currently the chair of the Boy Scots of America and LDS Church Relationships committee, is Philmont and Wood Badge trained, and has received the Silver Beaver award.

Christensen's retirement includes serving as first counselor in the Payson Temple presidency and enjoying time with his family while continuing to be involved in his outdoor endeavors.

We wish Kim all the best in his retirement and thank him for his years of dedication and service.

Written by Taelin Wilford / Photo courtesy of Kim Christensen

James Harper, PhD

Dr. James Harper joined the department faculty on August 1, 2019. Dr. Harper earned his Bachelor of Science in Chemistry and his Master of Science in Physical Chemistry from Brigham Young University. Dr. Harper then earned his PhD in NMR spectroscopy from the University of Utah, working under Dr. David Grant. Dr. Harper completed post-doctoral work at Montana State University under the advisement of Dr. Gary Strobel, and went on to work at the University of Utah's NMR center as a research scientist for the next decade. In 2011 he accepted a faculty position in the Department of Chemistry at the University of Central Florida, advancing to associate professor in 2017.

In 2013 Dr. Harper made a discovery that allowed scientists to obtain complete crystal structures for molecules using only NMR data and computational methods. Harper states, "I believe that this is the first demonstration of crystallography without x-rays or other similar diffraction methods. We have subsequently demonstrated that the structures obtained this way are unusually accurate and have developed methods for assessing accuracy at each atomic position. This new approach is now being called "NMR crystallography" and has become a focus for numerous groups worldwide."

Dr. Harper met his wife during his studies at the University of Utah. She is currently a faculty member at Utah Valley University and has a PhD in optical spectroscopy. Together they have three children—one son and two daughters aged 5 months, 5 years, and 6 years old respectively. Outside of the lab, Harper is an avid mountain biker and often rides with his wife, who participates in triathlons. He also enjoys doing trail rides with his kids. While in Florida their family trip favorite was to travel to the Dry Tortugas National Park in the Florida Keys, but with a love of the mountains, the family is glad to be back in Utah.

Written by Taelin Wilford / Photo courtesy of James Harper

Steven Johnson

We are pleased to welcome Steven Johnson as our departments new Business Manager, replacing Kim Christensen. Johnson joined the department on September 10, 2018. After earning his master's degree in Accounting (MACC) from Brigham Young University, he earned his CPA license and was the managing partner in his tax accounting firm for over 20 years in Utah County. Outside of work, Johnson spends his time outdoor cooking, gardening, volunteering with the Boy Scouts, and spending time with his family. Two of his six children are currently serving missions in Mexico and Texas, and they will return to their studies at Brigham Young University in Fall 2020. The words of Theodore Roosevelt inspire his efforts: "Far better it is to dare mighty things, to win glorious triumphs, even though checkered by failure . . . than to rank with those poor spirits who neither enjoy nor suffer much, because they live in a gray twilight that knows not victory nor defeat."

Written by Taelin Wilford / Photo by Yao Kuang Lee

Amy Cetz

Amy Cetz joined the department on August 5, 2019 as the Graduate Program Administrator. Cetz previously worked in the BYU Department of Statistics for the last 8 years as both the Department and Graduate Secretary. "I really enjoy working with students and seeing their successes. One of my goals is to be able to offer a positive experience for the students so they know they are valued and that we want to help them achieve their educational goals," said Cetz. In her spare time, Cetz likes to create in different forms, which stems from her educational background. She has a Masters of Fine Arts in Printmaking. She also enjoys traveling with her husband and learning about new cultures. One particular experience involved her playing with baby cougars: "They were playful, but when they tried to get my attention, I was given a good slap across the face with their paw. Needless to say, playtime was over." We welcome Amy to the department and wish her well in this new adventure.

Written by Taelin Wilford / Photo courtesy of Amy Cetz

Merrill Chritensen (Left) Dave Rose (Middle) Daniel Simmons (Right)

Student Fellowships:

News from the Simmons Center for Cancer Research

Dr. Dan Simmons, emeritus biochemistry faculty, established the Christine Bireley Oliver Fellowship in Cancer Research. The year-round fellowship is awarded to the highest quality PhD student who demonstrates exceptional research productivity and commitment to a career in cancer research, who is anticipated to become a principal investigator and make groundbreaking contributions to the field of cancer research. This year's recipient is Nicole Tensmeyer. Her work alongside Dr. Barry Willardson on mTOR complexes was recently published in *Nature Communications*. Congratulations to Nicole for this excellent achievement.

In September 2018 the new David and Cheryl Rose Family Student Cancer Research Endowment was established. This endowment is composed of the ESPN Infinity Coaches Charity Challenge winnings, a personal contribution by Dan Simmons, and a donation by the Simmons Center for Cancer Research which will be made in Fall 2019. The intent of this endowment is to fund one spring and summer term student fellowship in perpetuity for full-time cancer research.

Cristy Welsh has been serving as the new Program Coordinator for the Simmons Center for Cancer Research since September 2018. "Working for the Simmons Center has been a dramatic, but fulfilling change in my career. I've truly enjoyed using my abilities to further the mission of the center, and help it navigate into a new season offering students not only on-campus experiences, but off-campus cancer research opportunities as well. I am proud to say we have funded the most students in the history of the Center this spring/summer, as well as having sent half of these students to five prestigious institutions to conduct research. These include the Dana-Farber Cancer Institute at Harvard University, the Stanford Cancer Institute, the James Cancer Hospital at Ohio State University, the University of Colorado Cancer Center, and Tolero Pharmaceuticals. I'm looking forward to expanding our relationships and opportunities for students to research in the future," says Welsh.

Simmons Center
For Cancer Research
BRIGHAM YOUNG UNIVERSITY

Written by Taelin Wilford / Photo courtesy of Simmons Center for Cancer Research

Brittany Knighton (Left) and Naomi Flindt (Right)

3 Minute Thesis College Competition Winners

BYU graduate students in chemistry Brittany Knighton and Naomi Flindt, placed first and third at the Three-Minute Thesis (3MT) College Level Competition of the College of Physical and Mathematical Sciences (CPMS) at BYU. Since Brittany took home the first place prize, she will have the opportunity to go on to represent the CPMS at the University Level Competition.

Her research, entitled "Coherent Control," dealing with high-field terahertz spectroscopy, landed her the opportunity to progress in the competition. Naomi Flindt also took home a prize with her research entitled "How Not to Die From Disease," or, in more scientific terms, "Quantification of Fe in Biological Samples Using XRF to Understand the Role of Iron in Inflammation and Disease." The Chemistry Department was well-represented at the 3MT event this year, with 11 graduate students participating in the department competition and over half moving on to the college-level competition. The College office stated that the quality of presentations this year was the best they have ever seen.

Three Minute Thesis is a competition that originated at the University of Queensland in Australia, but now includes more than 600 academic institutions worldwide. BYU has participated in the program for three years now.

Written by Emma Parnell / Photo by Yao Kuang Lee

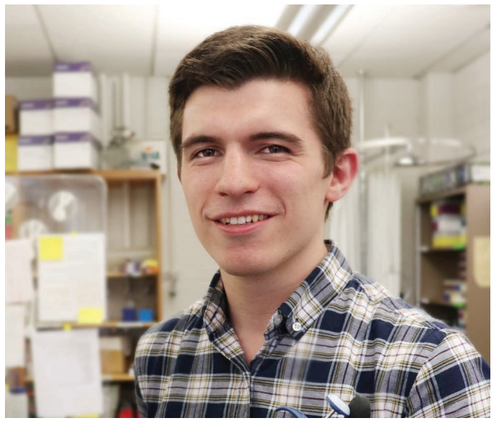
From CHEM 391 Paper to SLAS Publication

"Selection of Functional Intracellular Nanobodies"

James Woods is a fourth-year undergraduate student in biochemistry at Brigham Young University in Provo, Utah. Originally from Corvallis, Oregon, Woods has been studying in Provo since 2014, with the exception of a two-year break from 2015-2017 when he lived in Bulgaria as a church service missionary with The Church of Jesus Christ of Latter-day Saints.

Woods began doing research in Dr. Pam Van Ry's lab at Brigham Young University, which focused on the etiology of pulmonary fibrosis. Currently, he is working at the Fritz B. Burns laboratory headed by Joshua L. Andersen, PhD, associate professor of biochemistry, Brigham Young University. This lab focuses on understanding cancer cell signaling and chemotherapy resistance. Woods' recent publication in Society for Laboratory Automation and Screening (SLAS) Discovery began as a class assignment but developed into a full-length review paper thanks to the encouragement of Dr. Andersen, "James is an outstanding, intellectually curious undergraduate researcher and an unusually good writer. For this project, he immersed himself in the literature and put together a review that truly will benefit the scientific community. It's a remarkable accomplishment for a student his age. He has an incredibly bright future."

Woods plans to apply for medical scientist training programs (MSTPs) and hopes to expand on his interest in high-throughput screening and large molecule drug development.



Article courtesy of James Woods; written by SLAS.org at https://slas.org/eln/discovery-cover-spotlight/. / Photo by Yao Kuang Lee

Uniting WOMEN in Chemistry

In 2016 Dr. Kara Stowers—then a new member of the Chemistry and Biochemistry Department—met with a handful of women in the department to discuss a potential program for female chemistry students. The meeting also addressed the challenges that female BYU students face within the Chemistry and Biochemistry majors. This meeting was the genesis of the Women in Chemistry Club.

In Winter 2018, Naomi Flindt (then a first year-graduate) approached Halle Murray (a chemistry student going into her senior year) and together they united their common passion to help women in the major stay involved. Their common goal was to start a club that empowers women to navigate the major. Flindt and Murray then approached biochemistry senior Lara Grether. "The diversity of the team was important as we wanted a representative from each undergraduate major in the department to help spread the word to their peers. These majors (biochemistry and chemistry) are very small in comparison to other STEM majors, making it important to have a club specifically for chemistry and biochemistry.

Women is Chemistry club with guest speaker Dr. Richmond

Flindt continues, "We felt there was a need for women specially to have a community where they can turn to when they have questions about their major, classes, and career prep. We thought that this club could be a great place to start building the foundation for such a community," said Flindt. By the end of the summer the club was established and now consists of a leadership of 11 and over 80 total graduate and undergraduate women. The club was also approved as an official American Chemical Society (ACS) affiliated club.

"The Brigham Young University Women in Chemistry Club is a student initiative group of women looking to build a community within the department of chemistry to inspire, support, and address issues concerning quality of life for women in chemistry," says Naomi. "These aims are being achieved through informal monthly socials, an annual panel discussion luncheon, and an annual lecture symposium. We hope that this will also aid in enriching students' scientific network inside as well as outside of BYU. We hope that this club will not only help with the retention of undergraduates in the major, but will help them find a trajectory to successful careers in chemistry and biochemistry."

The club hosted five activities last year. These informal activities were designed to foster peer mentoring, support, and to help undergraduates navigate career and research opportunities. This past year the club hosted a Q&A snack and chat with Dr. Pam Van Ry and Professor Rebecca Sansom. The highlight activity of the year was a luncheon with Geraldine Richmond, PhD. Dr. Richmond is a prestigious analytical chemist from the University of Oregon who serves on the National Science Board. She was awarded the Priestley Medal in 2018 and runs an outreach program for early stage female scientists to succeed called COACh.

Flindt states, "We are extremely grateful to Dr. Stowers and her commitment to empower women in the department. We have been supported immensely by all members of the faculty in the Department of Chemistry and Biochemistry. We have also received great support from the College of Physical and Mathematical Sciences and BYUSA."

Membership is free and all interested undergraduate and graduate students can sign up by emailing womeninchem@byu.edu or by going to clubs.byu.edu and requesting to join.

Written by Taelin Wilford / Photo courtesy of Women in Chemistry

Keeping up with KEETON

MS, Biochemistry
December 2015

William Keeton is an alumnus of BYU's chemistry program who completed his bachelor's and master's degrees at BYU before going on to complete dental school at the University of the Pacific Arthur A. Dugoni School of Dentistry in San Francisco. While there, he served on the curriculum committee and as the vice chair of the Council of Students, Residents, and Fellows for the American Dental Education Association (ADEA). Keeton also served one year as a national representative for all dental students nationwide and frequently traveled around the country, advocating and instructing deans and dental schools on innovative classroom instruction techniques and new teaching modalities (pedagogy).

Keeton at the ADEA Gies Award

Keeton graduated with his dental degree in 2018 with high honors and was matched to Yale School of Medicine's Pediatric program, where he began his pediatric training in July of that year. When asked about what prompted Keeton to choose pediatric dentistry, he said, "Kids bring out the best in people. For me in particular, they inspire me to be the best I can be. Even on my saddest of days, kids have a way of lifting me up and leaving me re-inspired and re-motivated to be and do better." Keaton also added, "Kids are innocent, and sometimes mistreated. I went to Barrow, Alaska, for an externship the summer before my senior year of dental school. There, I saw children with teeth destroyed by cavities. It was after that trip that I decided I was going to specialize in pediatrics, and swore to be an advocate for children."

Keeton credits much of his success to knowledge gained during his years at BYU, dubbing his master's degree in chemistry as "invaluable" in his career. "Dentistry is simply chemistry and biochemistry," he said, explaining how every element of dental work, from the materials used for fillings to x-rays to anesthetics, all involve the chemistry he studied in his undergraduate and graduate programs.

"Along the way, the BYU Chemistry Department brought out talents in me I never knew I had, gave me confidence I lacked, and provided me with countless mentors that helped shape me into who I am . . . I bleed 450 nm, through and through."

Written by Emma Parnell, Edited by Taelin Wilford / Photo courtesy of William Keeton

LAURA NIELSEN

BS, Biochemistry
April 2008

HONORED

With Chemical Technician Award

Laura Nielsen, a technician at Phillips 66, is the recipient of the 2019 National Chemical Technician Award. The award, administered by the American Chemical Society Committee on Technician Affairs, honors excellence and professionalism among technicians, operators, analysts, and other applied chemical technology professionals. Among her accomplishments at Phillips 66, Nielsen has led the development of new synthetic pathways for the organic photovoltaic group. She developed an easily scalable procedure for making a new monomer, which led to a patent with her as lead inventor. She also contributed to the invention of two polymers for organic photovoltaic applications and provides coaching to all the technicians in the group in safe chemical handling, waste management, and appropriate use of lab equipment.

Alumni, we love hearing from you and keeping up with your post graduation paths. If you have any news you would like to share, please contact Sue Mortensen at suemort@chem.byu.edu

Written by Taelin Wilford / Photo by Bud Ghosh

National Science Foundation Research Experiences for Undergraduates Site Established at BYU

Professors Daniel Ess, Rebecca Sansom, and Kara Stowers were recently awarded a National Science Foundation (NSF) grant to host visiting students during spring and summer terms. The purpose of the Research Experiences for Undergraduates (REU) NSF grant is to provide students from two- and four-year colleges with limited research experience the opportunity to perform high-impact research under the direction of a BYU chemistry or biochemistry faculty member.

REU participants at Brigham Young University receive funding to attend a national or regional chemical conference, have the opportunity to visit chemical and biochemical companies, deliver scientific presentations, act as counselors for the BYU Chem Camp, and participate in other activities such as hiking, rafting, and camping at some of Utah's famed national parks.

One recent summer student, Vanessa Bustamante, worked with an anaerobic digester to produce methane gas as a renewable energy source under the direction of Dr. Jaron Hansen. Mason Laikupu worked under the direction of Dr. Daniel Austin on continuing the development of paper spray mass spectrometry by investigating holder designs generated with 3D Printing. Andrew Ralph tells of his experience working under Dr. Matthew Linford: "The Linford lab focuses on material science, and my summer research focused on the surface analysis of glass using time-of-flight secondary ion mass spectrometry (ToF-SIMS). The ToF-SIMS technique is important because we are able to analyze the outer 1-2 nanometers of the glass surface, which is where all the chemistry occurs. We specifically examined $SiOH^+/Si^+$ to quantify how much surface hydroxylation took place after we chemically treated the glass surface."

"The REU program helped me open my perspective on what's out there for science majors that does not include teaching. It gave me the experience to research on a project and understand how hard it can be to get results. It helped me understand that research takes time and there will be failures along the way, but we need to stand back up again every time. The program gave me great respect for researchers who have dedicated their lives to research because I understand the difficulties of research," said Gracie Damstedt.

When asked what she felt the most important part of the REU program was, Gracie said, "I think the most important part of the REU experience is preparation for the future. REU helped us know what's out there and getting us prepared for what the future holds by having tours to companies, life in graduate school, and relationships. The best part of the REU experience was the atmosphere of a family that the REU program presented. We did all the activities with other members of the internship and faculty, it brings the people together . . .. The lab that I was in was like another family, everyone was close to each other, helping each other out with research and materials, and joking around; it felt like family."

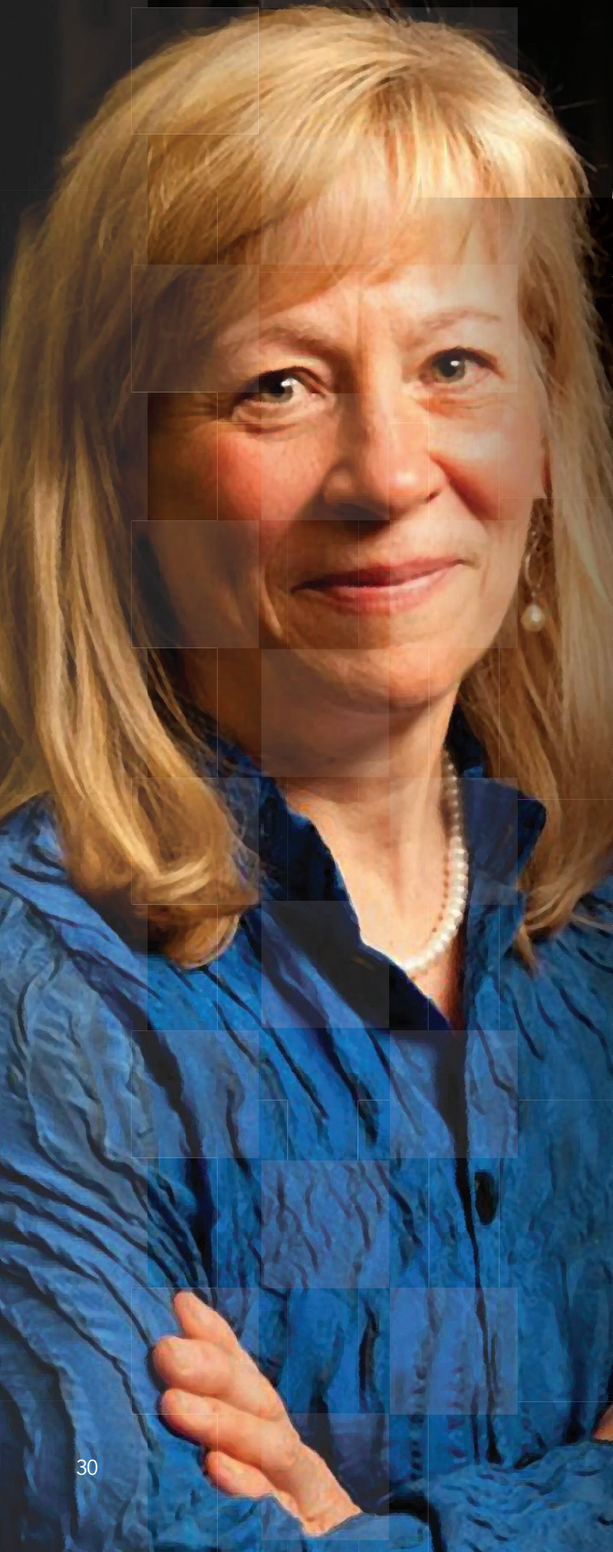
The August 2018 REU group reunited at the American Chemical Society (ACS) National Meeting and Exposition in San Diego to present their research findings. The 2019 cohort of students arrived in May from universities across the United States ranging from Northern Arizona University to Leeward Community College in Hawaii.

"This program is special because it uniquely brings together many faculty members and graduate students to serve as mentors to share great science within our special BYU atmosphere," said Dr. Ess.

Written by Taelin Wilford / Photo's courtesy of Daniel Ess

REU AND TALMAGE INTERNS

ARCHES NATIONAL PARK CAMPING TRIP



Izatt-Christensen Lecture

The eleventh annual Izatt-Christensen Lecture was held on February 26-27, 2019, and presented by Dr. Geraldine Richmond of the University of Oregon. Dr. Richmond is widely known as a pioneer in surface science, particularly in the relationship between water and hydrophobic substances. Dr. Richmond also currently serves on the National Science Board as the U.S. Envoy to the Lower Mekong River Countries, and is the founding director of COACh, an organization that has helped over 20,000 women scientists and engineers in career advancement within the U.S. and developing countries in Asia, Africa, and Latin America. Dr. Richmond presented a series of two lectures during her time at BYU.

The first, a general interest lecture entitled "Global Scientific Engagement," focused on the importance of international collaborations, gathering scientists and citizens alike across the world to research and actively fight climate change and its detrimental outcomes. Dr. Richmond told students of the six necessary ingredients to successful international collaborations, including building trust, listening to learn, education, the realization that talent is everywhere, getting the whole picture, and being open to partnerships. The troubles and needs Dr. Richmond discussed in her lecture (including outdated scientific equipment, lack of funding for education, and even child malnourishment and stunting in developing countries) exist across the world, and need the aid of international collaborations to come together and solve them.

Dr. Richmond's technical lecture was entitled "Mulling Over Emulsions: Molecular Assembly at Complex Liquid Surfaces." This lecture focused on the oil-water interface, and the relationship between water and hydrophobic liquids. Dr. Richmond's research found that, despite the term "hydrophobic," these liquids do indeed have a reaction with water. This reaction had several surprising results, including the decoupling of the motions of the OH particles in the solution, and the correlated effect between the transition of pH with the reaction, as it only occurred in a solution where the pH was less than 4.5. Dr. Richmond also discovered that chemical potential formed at the interface, and drew ions into the oil interface, which was unexpected. Dr. Reed Izatt, one of the benefactors of the lecture series, attended Dr. Richmond's lectures and presented her with a plaque commemorating her as the speaker of the 2019 Izatt-Christensen lecture series.

Written by Emma Parnell / Photo courtesy of University of Oregon

Broadbent Lecture Series

This year's Broadbent Lecture Series, which took place on February 4-5. 2019, was presented by Dr. Samuel Gellman, a research professor from the University of Wisconsin-Madison who studies chemical biology. His research has earned him nearly twenty awards, including the Phi Beta Kappa Teaching Award and the Ronald Breslow Award for Achievement in Biomimetic Chemistry. Dr. Gellman presented two lectures on his research into peptidic foldamers to interested chemistry students and faculty. The first was a general interest lecture entitled, "Peptidic Foldamers: Extrapolating from Proteins," and the second technical lecture was entitled, "Impact of Backbone Modifications on Informational Properties of Polypeptides."

Foldamers, he explained, are unnatural oligomers that can adopt regular shapes that are reminiscent of those formed by biomacromolecules like proteins and nucleic acids. Prof. Gellman's lab focuses on foldamers composed of β-amino acids, which differ from natural α-amino acids in that they have an additional backbone carbon atom. They have been particularly successful in mimicking the structural and functional complexity of natural peptides using heterooligomers composed of mixtures of α- and β-amino acids (called α/β-peptides).

In his technical lecture, Dr. Gellman introduced his studies and experiments in extrapolating from proteins using α/β-peptide foldamers to inhibit viral infection, specifically by the hPIC3 and RSV viruses, which have similar infection machinery. He and his team developed a strategy for converting an existing α-peptide inhibitor of viral infection into an α/β-peptide inhibitor, with retained function and much greater resistance to proteolytic degradation.

Despite these important successes, Dr. Gellman assured students that many problems in foldamer research still await creative solutions and that much remains to be done.

Written by Emma Parnell / Photo courtesy of American Peptide Society

M.G. Finn

In Celebration of Collaboration: A Multidisciplinary Approach to Biologically Functional Nanoparticles

Dr.Finn's seminar was funded by the university's Visiting Scholar Program

On April 11, 2019, the Chemistry and Biochemistry Department Chair at the Georgia Institute of Technology, Dr. M.G. Finn, presented a lecture on "Chemistry, Biology, Immunology, and Evolution with Viruses." Dr. Finn received his PhD from Massachusetts Institute of Technology, and is the recipient of the ACS Cope Scholar Award (2017), Children's Research Scholar, Children's Healthcare of Atlanta Award (2015), Alexander von Humboldt Foundation Research Award (2012), The Scripps Research Institute Outstanding Mentor Award (2011), and the Packard Foundation Interdisciplinary Science Award (2002-2006).

His presentation focused on how the sizes and properties of virus particles place them at the interface between the worlds of chemistry and biology. "We use techniques from both fields to tailor these particles for applications to cell targeting, diagnostics, vaccine development, catalysis, and materials self-assembly," said Dr. Finn. This work involves combinations of small-molecule and polymer synthesis, bioconjugation, molecular biology, protein design, protein evolution, bioanalytical chemistry, enzymology, physiology, and immunology. Finn concluded that this research "is an exciting training ground for modern molecular scientists and engineers."

PhD student Brady James had the opportunity to work with Finn on his vaccine project. This project involved making the sugars which are conjugated to the virus-like particle (VLP). "It was great to meet such a charismatic leader in medical research. Meeting him and discussing the research made me want to get my work done much quicker so I could see what the results were," said James. "I really liked that he was so willing to help students succeed in the pursuit of their careers. He is a great guy, and attending his seminar was one of the best I felt we've had during my time in the graduate program at BYU."

Edited by Taelin Wilford / Photo courtesy of Georgia Tech Science

Judith Frydman

Proteostasis Function and Disfunction: The Folding Machines That Maintain Proteome Health

Dr. Frydman's visit was funded by BYU's Visiting Scholar Program

On October 25, 2018, Stanford professor Dr. Judith Frydman presented her visiting scholar lecture on "Proteostasis Function and Disfunction: The Folding Machines that Maintain Proteome Health." Frydman is a distinguished biochemist who has made seminal contributions to understanding the role of molecular chaperones in maintaining the protein complement of the cell (the proteome) and identifying what breaks down in diseases of the proteome such as Alzheimer's, Parkinson's, and Huntington's diseases.

Dr. Frydman began her lecture by addressing how correct protein folding and quality control are essential for normal cellular function. She explained that the accumulation of misfolded proteins is emerging as central to a wide range of disease states, including many neurodegenerative disorders such as Huntington's Disease and Prion Disease. "A complex network of molecular chaperones facilitate protein folding and assembly and monitor all aspects of protein homeostasis. Chaperones assist the folding of newly translated and stress-denatured proteins, as well as affect protein quality control," said Frydman.

"Our research investigates the mechanisms and pathways by which chaperones carry out these diverse functions. Systems approaches identified a chaperone network linked to the protein synthesis apparatus assists protein biogenesis. The emergence of this translation-linked chaperone network likely underlies the elaborate co-translational folding process necessary for the evolution of larger multidomain proteins characteristic of eukaryotic cells. A stress-inducible chaperone network protects cells from environmental stress and assists quality control. These chaperones also communicate with the ubiquitin-proteasome pathway to clear misfolded proteins from the cell. Protein quality control in the eukaryotic cytosol relies on the sequestration of misfolded cytosolic proteins in specific quality control compartments. Our studies of chaperone function provide a framework to understand the link between protein misfolding and human disease," said Frydman.

Edited by Taelin Wilford / Photo courtesy of Stanford University

Benson Family Commemorates Shared Heritage with Tree Decorating Party

Traditions cherished by a past president of The Church of Jesus Christ of Latter-day Saints were resurrected December 3 when the family of Ezra Taft Benson partnered with the Benson Building staff to host a Christmas tree decorating party on the BYU campus.

Chemistry students and Benson family members mingled together, discussing the former prophet's legacy while decorating a Christmas tree. The tree was adorned with musical instruments and pages from Handel's "Messiah," a testament to both President Benson's love of music and his spirituality. President Benson passed away in May 1994.

"It's great to connect people that are in the building that is his namesake with his family," said Jacob Shaner, a junior studying chemistry. Shaner said he helped drive attendance to the event by publicizing it through Y-Chem, BYU's chemistry club.

"One thing I like about the Benson Building is there's a whole case dedicated to President Benson and his heritage," said Shaner. "It has actual things he owned. You can get a sense of who he was. It's fitting this event is here."

Written by Matthew Bennett / Photo by Hannah Miner

Graduate Awards

Charles E. and Margaret P. Maw Fellowship
Brittany Knighton

Roland K. Robins Research Fellowship
Nicole Tensmeyer
Basu Aryal
Abraham De la Cruz
Seth Taylor
Dhruv Shah
J.D. Singleton
Concordia Lo
Mary Vallecillo
Hans Anderson

Bradshaw Organic Fellowship
Isaac Smith

J. Rex and Marcia A. Goates Research Fellowship
Andrew Arslanian

Loren & Maurine F. Bryner Fellowship
Kyle Clark

Telford and Frank Woolley Memorial Fellowship
Supeshala Sarath Nawarathnage

Telford and Frank Woolley Memorial Award
Teresa Smith
Daniel Joaquin
Tianyao Meng

Jennie R. Swensen Fellowship
Chloe Chan

Jennie R. Swensen Award
Tahereh Gholian Avval
Dulashani Ranasinghe

Outstanding PhD Graduate
Cody Cushman

Garth L. Lee Award
Elaura Gustafson

Undergraduate Awards

Funded by the Keith P. Anderson Endowment

Outstanding BA/BS Graduate
Megan Asplund

Eliot A. Butler Service Award
Erika Weir Jackson
Blake Nordblad

Freshman Chemistry Major Award
Margaret Granger

Freshman Chemistry Non-Major Award
Hunter Lindsay

Ida Tanner Hamblin Female in Chemistry Award
Kristen Read
Isabella James

Analytical Chemistry Undergraduate Award
Timothy Swingle

Organic Chemistry Major Award
Daniel Hart

Organic Chemistry Non-Major Award
Chandler Eyre

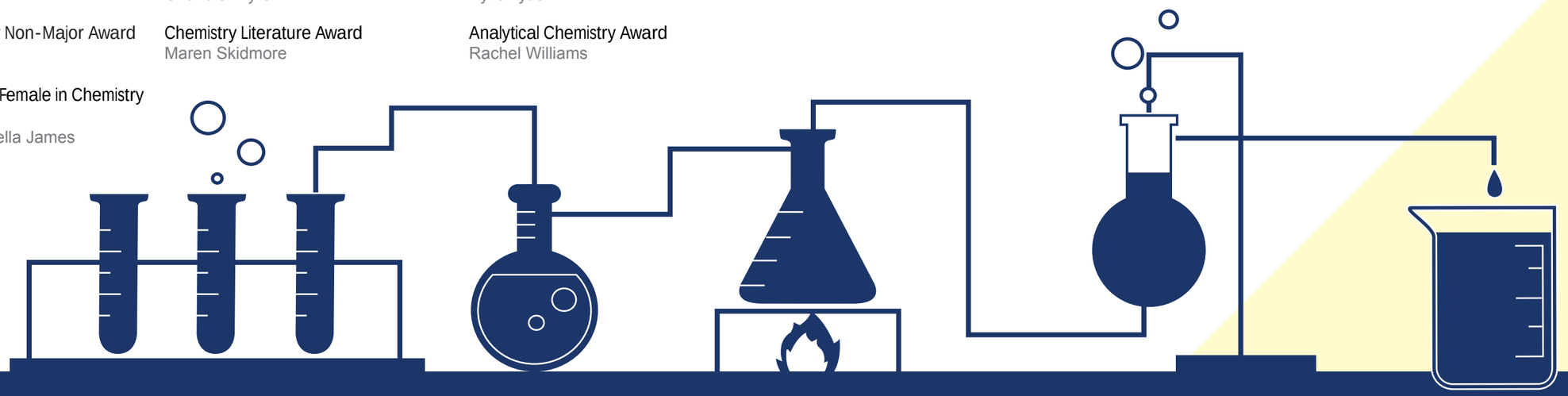
Chemistry Literature Award
Maren Skidmore

Physical Chemistry Award
Seth Fankhauser

Biochemistry Major Award
R. Tanner Hardy

Inorganic Chemistry Award
Kylie Lytle

Analytical Chemistry Award
Rachel Williams



Undergraduate Scholarships

Ida Tanner Hamblin Scholarship

Sariah Dorian
Anna Schouten

Kenneth W. Brighton Scholarship

Cole Gardner
Joshua Porter
Shi Liang

Byron J. Wilson Scholarship

Katelyn Nichols
Tanner Roylance
Bridger Woods
Mariah Pay
Courtney Vavricka

Hyrum & Permelia Dayton Scholarship

Megan Anderson
Tyler Bishop
Rebecca Clark
Carley Johnson-Martinez

Boyd A. Waite Scholarship

Ekow Amakye
Connor Holman

H. Tracy Hall Scholarship

Austin Ellis
Sam Clift
Hyrum Haack
Joseph Wilson
Robert Hadfield
Isaac Tangen
Jacob Vance
Emanuel Vance Willis

Dennis V. & Shirley J. Knudson Scholarship

Haley Hunsaker
Abigale Lord
Alma Longhurst

Thank you to our donors whose endowed funds have allowed us to present these scholarships and fellowships.

1920-2020

100 YEARS OF CHEMISTRY BIOCHEMISTRY

You're Invited to the Kickoff Celebration!

Watch for these and other commemorative events and activities in the coming year:

Symposium: The impact of chemistry in our world and BYU's contributions to the field.

Historical items featured: on our web site and in the Benson Science Building.

Recognition of current and emeritus faculty.

A Homecoming 2020 culminating celebration.

Enjoy a complementary Homecoming Dinner

Friday, October 18th

6:00 pm

RSVP BY OCTOBER 1ST

Come join us!
Centennial celebrations begin!

Please RSVP for this fall's homecoming dinner through one of the following methods :

* RSVP Link : https.//forms.gle/mRdEZM8v-JSucaZM38
* Call (801) 422-2792
* Email coffice@chem.byu.edu

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