WESTERN WASHINGTON UNIVERSITY

DEPARTMENT OF CHEMISTRY

SPRING 2021 NEWSLETTER

MESSAGE FROM THE CHAIR

Carry the Fire

Last year was like no other in our collective memories. From my perspective, the best-case scenario is that I will only write a letter of this sort once, which is to acknowledge the great stresses, dangers, and difficult times we have faced. Like countless other institutions dealing with the COVID-19 pandemic, Western quickly pivoted to remote instruction for all our courses and largely closed campus to in-person activities. As I started as Chair of the Chemistry Department in mid-June of last year, we needed to quickly figure out how to safely open our doors for in-person research activities, hire essential personnel to maintain critical building operations, and grapple with looming budget fears for the next academic year. Despite all the mounting stresses and threats, we made it through the past year with some light at the end of the tunnel.

The demands placed on our entire community of students, staff, and faculty have been great, and it is now clear we can emerge from the pandemic more creative and resilient than before we embarked on this journey. We should all take great pride in our accomplishments in the face of adversity, of which there are many. In our newsletter this year, you'll learn about how members of our General Chemistry Coordinating Team (Amy Cully, Prof. Spencer Berger, and Prof. Betsy Raymond) quickly devised an engaging and informative lab curriculum for remote instruction. You'll also see that we had an unprecedented number of students graduating (86!), many of whom have gone off to graduate school, professional healthcare schools, or directly into the workforce. The last year has also seen our department publish 27 scholarly manuscripts, the vast majority of which have undergraduate and/or graduate student co-authors. You'll also read about how our faculty have been awarded a windfall of external grant funds, bringing in over $3.5 million from grants through the National Science Foundation, National Institutes of Health, Research Corporation, and the American Chemical Society Petroleum Research Fund. Of particular note are our pre-tenured faculty, where seven Assistant Professors received a record six NSF grants within the past year. All these grants will yield transformative experiences for our students engaged in research activities. You'll also read about the awards our more established faculty have received for teaching, mentoring, and research; Prof. Greg O'Neil won the WWU Paul J. Olscamp Research Award, Prof. Mark Busssell won the Arlan Norman Award for Excellence in Student Mentoring, and Prof. David Rider was named a Henry Dreyfus Teacher-Scholar. Lastly, you'll also read about the bravery and initiative many of our students embodied when they answered the call

to work at Northwest Labs to support rapid COVID testing for communities across the country. I'm humbled by their impact on our society, as their critical work assisted in saving thousands of lives in real time.

As with most years, our Chemistry community has been in flux. We say thanks and farewell to Sam Danforth, one of our instrument technicians, and Gary Carlton, our stockroom manager and safety coordinator, as they've both accepted new challenges outside of our department. Prof. David Patrick has also accepted a permanent role as the Dean of the Graduate School and Vice Provost for Research. His leadership will be missed, but we are excited about what influence he will have over the broader campus community. We are excited to welcome Amanda Weis (WWU Chemistry alum, BS 2015, MS 2017) as our new stockroom manager and safety coordinator. We also have two new tenure-track faculty members joining us, Profs. Karin Lemkau and Norda Stephenson. Prof. Lemkau is jointly appointed with the new Marine and Coastal Sciences Program (MACS) and Prof. Stephenson is jointly appointed with our Science Math and Technology Education Program (SMATE). We're excited about the new ideas and energy that they all bring to our growing department.

We are truly proud of our students and their accomplishments, both here and post-WWU. In our newsletter this year, you'll also read about Dr. Zach Thammavongsy (WWU alum, BS 2011, MS 2013) and his important work in our Alumni Spotlight. Many of you, as members of our community, have enabled our students to realize their goals and accomplishments through your generous gifts to our department, and for those gifts we are grateful. This past year has threatened the financial well-being and security of many students at WWU. If you are considering a contribution to WWU this year, please consider these two funds: the WWU Student Emergency Fund and the Supporting Black Students in STEM Scholarship Fund. Additionally, May 27th of this year is WWU Give Day. If you would like to maximize your impact on the Chemistry Department, please consider donating to either the Morse Chemistry Undergraduate Research Challenge Fund (with matching funds up to $20K) or the Sal and Judy Russo Biochemistry Research Challenge Fund (with matching funds up to $5K). Both of these funds are specifically focused on summer research stipends for undergraduates in Chemistry and Biochemistry. Through summer research experiences, students learn the true intricacies of being a scientist day-to-day and these opportunities are often transformative for their professional growth.

I'd like to conclude this year's message with personal reflection. No matter what emotions we all felt over the past year, they were surely strong. I recall those first two silent and frightening weeks of being in lockdown with children at home. Megan and I would look forward to a brief respite of listening to Ben Gibbard (Death Cab for Cutie front man and 1998 WWU alum) play live daily sets on YouTube from his home in Seattle; simply knowing that we're all sharing in a similar experience of isolation meant a

lot to us. I remember the euphoria our eight-year-old son felt when we adopted our 'quarantine kittens' last summer. I also remember how it made me feel to watch him raise his hand in front of a Zoom window for the first time, just trying to connect with his peers through the digital divide after six months of no school activities. Most recently, I recall the comic joy of preventing my newest research students from trying to hug and kiss the lab bench when they were able to get into the lab to try their hands at research for the first time. We all have indelible memories and experiences from the past year, and it is important to acknowledge the innumerable traumas we've faced due to a global virus outbreak, a societal protest following the police killing of Black Americans, and a tumultuous political climate that worked actively to divide us.

As the pandemic carried on, I dealt with the daily frustrations by walking two miles each day throughout our neighborhood with a close friend. We were able to share each other's struggles and successes, which provided some salve for our lives. In the wake of summer when we were faced with yet another challenge of oppressive smoke due to wildfires across the American West, we had to halt our walks. In lieu of that, I decided to reread a novel that greatly affected me the first time I read it, "The Road" by Cormac McCarthy. This book paints a desolate post-apocalyptic landscape of fear and isolation, but at its heart, it is a story about love and survival between a parent and child. Together, they grapple with who are the good guys and who are bad, what is the meaning of each day, and acknowledging that no matter how little one has, there are others who have less. What gets them through their journey is a mantra they tell themselves, that they "carry the fire" and they're looking for others who do the same. The author leaves its meaning up for interpretation by the reader. For me, to carry the fire represents hope and the goodwill of humanity. From the moment I read this novel a decade prior, I've always viewed our students as the ones who carry the fire, and only now do I realize that we all do. By shouldering the burden of figuring out how we teach our students effectively in a completely foreign modality, our staff and faculty carry the fire. By struggling through isolation, financial and domestic insecurities, and the difficulties of online learning to persevere and succeed, our students carry the fire. By wearing our facemasks to protect ourselves, to protect those around us, and to show solidary with our fellow humans, we all carry the fire.

P. Clint Spiegel, Jr.
Professor and Chair, Chemistry Department

DEPARTMENT GRADUATES

Congratulations to all **86** of our graduates from Spring 2020 to Winter 2021!

BS Biochemistry

Anna Allen
Patricia Barry
Noah Barti
Kristina Boyko
Graham Bradley
Kaitlyn Chow
Logan Day
Herman Dhaliwal
Kimberly Dowdle
Natasha Flitz
Shaye Fowler
Amanda Gale
Connor Garrels
Max Grossman
Dedeepya Gudipati
Kian Hausken
Ashlee Hoffman
Khleo Isaguirre
Katherine Johnston
Leah Kjormoe
Kayla Koch
Sifora Lebeneh
Cassandra Leonard
Iain Mackley
Derek McCaffery
Eric McKenzie
Nicholas McLaughlin
Christopher Mitchell
Maya Noesen
Wyatt Parks
Bryce Petit Estell
Riley Roberts
Connor Shay
Garrett Strawn
Savanna Takasaki
Macallan Thorndike
Johanna Urbach
Celena Wilson
Derek Young

BS Chemistry

Kristopher Aguayo
Alexandria Anderson
Emily Bottemiller
Erick Carrothers
Tara Chin
Dario Cirlincione
Sullivan Cohen-Pope
Joseph Eli Doebler
Evan Fitzpatrick
Connor Gallagher
Rachael Gitnes
Kyle Juetten
Eric Kowaleski
Aidan Kuhne
Clay Maitem
Collin Mallinak
Gabriel Morris
Brittany Mureno
Lilah Nay
McKenzie Riley
Tierra Smith
Jeremy Talusig
Dylan Turner

BA Chemistry

Lauren Baker
Sara Coleman
Jordan Green
Matthew Knowlton
Nicole Larson
Silvana Saad
Cory Sergeant
Arcadia Tullis
Bodi Van Roy

BAE Chemistry/Education

Emma Enga
Kasey Hebert
Lacey Johnson

MS Chemistry

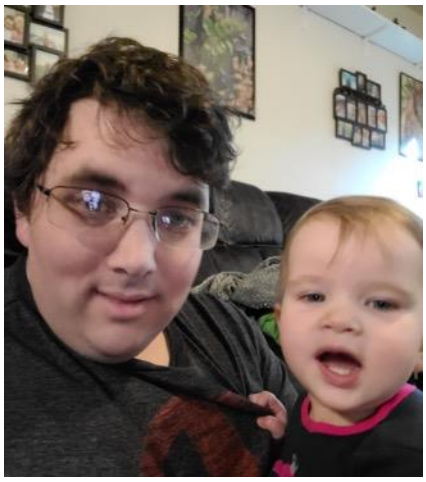
Douglas Baumgardner
Cassidy Crickmore
Megan Deshaye
Haley Doran
Justin Doyle
Michael Leitch
Alberto Melchor Bañales
John Springer
Evangeline Starchman
Sarah Struyvenberg
Reuben Szabo
Maggie Wang

OUTSTANDING GRADUATES OF 2020

MAYA NOESEN (OUTSTANDING UNDERGRADUATE)

Maya Noesen was selected as the 2020 Chemistry Department Outstanding Undergraduate Student. Previously a graduate of Olympia High School, Maya graduated from WWU in June 2020 with University Honors and a BS degree in both Biochemistry and Environmental Science. She worked for three years as a research assistant in Prof. David Patrick's lab on nanoparticle synthesis. She was also active in the Chem Club, working to make each event more inclusive. At Huxley College of the Environment, Maya served as an Associated Students senator; she helped establish the Student Senate during its formative years and created and chaired the senate's Discrimination Complaint Procedure Review Committee. Maya received the Pacific Northwest Clean Water Association Environmental Stewardship Scholarship, the Alumni Association Leader Scholarship, and the President's Scholarship. In the summer of 2018, Maya studied abroad in Belize to learn more about fieldwork and the nation's ecosystems and culture. Next, she will enroll at Stanford University for a Master of Science degree in environmental engineering with a focus on human health and the environment.

DOUGLAS BAUMGARDNER (OUTSTANDING MS STUDENT)



Doug Baumgardner (shown with his daughter Lynnlee), the Outstanding Chemistry Master's Student, graduated in the spring of 2020. Doug first came to WWU as an undergraduate – a veteran of the armed services – and earned his BS degree in Chemistry in 2018. As an undergraduate, Doug worked on a variety of projects as a researcher in Prof. John Gilbertson's group. As a master's student, his main focus was on investigating the reduction of nitrogen oxides utilizing coordination compounds. Doug wrote an invited paper that was published in 2020 as a perspective in *Dalton Transactions*. While working on a different aspect of his project, he discovered some novel reactivity of samarium towards N-oxides that was also published in *Chemical Communications* in 2020. As a teaching assistant, Doug was consistently dependable and patient. He helped develop numerous new lab preparations in the upper-division inorganic/physical chemistry laboratory series. He was also

heavily involved as a teaching assistant in the instrumental chemistry lab course. Doug did all of this while starting a new family and commuting to work from Skagit every day. He is currently enrolled in the PhD program at the University of Washington.

Christopher Swanson (Outstanding MS Student)

Christopher Swanson, the Outstanding Biochemistry Master's Student, graduated in December of 2019. Chris started his college career as an undergraduate at WWU, working with Prof. Steven Emory and receiving his BS degree in Chemistry in June of 2017. As a graduate student, Chris switched his focus to biochemistry and joined Prof. Clint Spiegel's group to study ribosome structure and function. The project Chris worked on concerned understanding the molecular mechanism of a cyclic peptide antibiotic, argyrin B, which potently inhibits prokaryotic ribosome function. Through Chris's careful work, he was able to show that argyrin B targets a late ribosome recycling step as its mode of inhibition. Chris is also known throughout the department as an inclusive community member, often participating in various social activities and making it a priority to welcome new students to the department while training several undergraduate researchers as they joined various biochemistry research groups. Since graduation, Chris has been working at Northwest Laboratory in Bellingham at the front lines of COVID-19 testing for the nation.

NEW FACULTY AND STAFF

Karin Lemkau, Assistant Professor

Karin Lemkau joined Western in the fall of 2020 as an Assistant Professor in the Chemistry Department and the Marine & Coastal Science Program. Originally from Yellow Springs, Ohio, Dr. Lemkau followed in the footsteps of her grandfather, a theoretical chemist, earning her BA in Chemistry from Wesleyan University. While at Wesleyan, she was introduced to the field of oceanography and she has been living at the interface between chemistry and the oceans ever since. She obtained her PhD in Chemical Oceanography and Environmental Chemistry from MIT and the Woods

Hole Oceanographic Institution (WHOI). Her graduate research with Dr. Christopher Reddy examined petroleum weathering in the environment and involved work on the M/V *Cosco Busan* and *Deepwater Horizon* oil spills.

After graduate school, Dr. Lemkau traveled west to join the lab of Dr. David Valentine as a postdoctoral scholar at the University of California, Santa Barbara. During her postdoctoral research, she applied her laboratory, machine shop, and scuba diving skills to design and test sampling equipment for collecting gas and oil samples from natural hydrocarbon seeps. Dr. Lemkau has participated in numerous research cruises focused on studying petroleum in the coastal oceans, and has ventured to the ocean depths three times in the deep-ocean research submersible *Alvin*. Prior to her arrival at Western, she was an Assistant Professor of Marine Science at the Maine Maritime Academy. Her research focuses on organic anthropogenic contaminants. She employs a variety of analytical techniques, including mass spectrometry, to track the fate and transport of pollutants in the environment. She is thrilled to have found a home at Western that allows her to continue to combine her love of chemistry with her love of the oceans.

Outside the lab, Dr. Lemkau enjoys traveling, hiking with her husband and dog, doing jigsaw puzzles, and tinkering in the garage.

Norda Stephenson, Assistant Professor

Norda Stephenson joined Western as an Assistant Professor of Chemistry and Science Education in the fall of 2020. Dr. Stephenson pursued her undergraduate and graduate education at the University of the West Indies, Mona Campus, Jamaica. She holds a BS in Chemistry and Management, an MS in Science Education, and a PhD in Chemistry. Dr. Stephenson's dissertation, under the guidance of Dr. Novelette Sadler-McKnight, focused on the implementation and evaluation of the biphasic Science Writing and Workshop Technique (SWWT), which combines the elements of inquiry, collaboration, writing, and reflection in the laboratory with critical thinking workshop sessions, and its impact on the critical thinking skills of general chemistry students, using a mixed method approach. Dr. Stephenson's most recent appointment prior to arriving at Western was as postdoctoral research associate in chemical education at Florida International University, where she worked with Dr. Justin Carmel. Her postdoctoral research focused on the development and analysis of tasks to assess the proficiency of general chemistry students in selected scientific practices, using evidence-centered design principles.

Dr. Stephenson's current research interests are in the area of chemical education, and center around undergraduate science students' understanding of science and engineering practices, pre-service science teachers' conceptual understanding, and persistence, participation, and retention patterns of students from underrepresented groups in STEM. Along with her colleagues Drs. Erin Duffy, Lina Dahlberg, and Dimitri Dounas-Frazer, Dr. Stephenson was recently awarded an NSF grant to support their work titled "An Interdisciplinary Exploration of Student Engagement in Scientific Practices in Undergraduate Biology, Chemistry, and Physics Laboratory Courses" (see pages 23-24).

Dr. Stephenson enjoys reading, playing board games, and landscape photography. She expects the picturesque views and breathtaking scenery of the Pacific Northwest to revive her love affair with photography and the outdoors.

Amanda Weis, Stockroom Manager and Safety Coordinator

Amanda Weis returned to the Chemistry Department as the Safety Coordinator and Stockroom Manager in July 2020 after working as an Inorganic Chemistry Analyst at Edge Analytical in Burlington, WA. Ms. Weis is a native Washingtonian, having grown up in the small town of Waitsburg before attending college at WWU, getting a BS (2015) and MS (2017) in Chemistry. She had also previously worked in the department office as a student, and completed her thesis research project in Prof. Spiegel's research group. Ms. Weis is excited to be back at WWU, where she can leverage her experience in industry to continue propagating a culture of safety in our chemistry community. An avid outdoors person, she is finding new and interesting ways to commute to campus and cause herself bodily harm while riding bikes, either on the road or the mountain.

ALUMNI SPOTLIGHT

We always love to hear what our alumni have been up to since graduating from Western! Here, we catch up with Dr. **Zach Thammavongsy**, who earned his BS (2011) and MS (2013) degrees in our department. Since Zach is modest about his accomplishments, we'll preface this by mentioning that Zach was recently named a CAS Future Leader by the American Chemical Society, and has received some great shout-outs in Chemical & Engineering News for his science education game company, d-Orbital Games. Here, Zach describes his time at Western and his experiences since then.

I started at Western in the fall of 2006, and declared my major in chemistry in 2008. I still remember the day when I talked to Denice Hougen to declare my major. At the time, my science course GPA wasn't ideal, and I had some reservations about pursuing a physical science degree. Denise was so warm and welcoming and displayed so much excitement for me to join the Chemistry Department that I began to think I may have found a departmental home at WWU.

My involvement within the Chemistry Department helped build my sense of belonging in college. I started in the general chemistry laboratory as a lab prepper, working for Scott Wilkinson. I then became an undergraduate teaching assistant when Brandon Dietrich took over as the laboratory coordinator. These two work-study jobs helped build my self-confidence, due to the fact that I was relied upon and trusted by professionals to maintain the daily activities of a university teaching laboratory course.

By far the most life-changing experience I had at WWU was when I joined Dr. John Gilbertson's research team in 2010. Under his guidance, I developed an iron complex with a non-innocent ligand system to convert CO_2 to CO. More importantly, I was able to learn from my failures in the laboratory, and I had several challenges. Dr. Gilbertson was a very patient mentor who allowed me to grow as a chemist, and more generally as a student. I was fortunate to stay on Dr. Gilbertson's research team as a master's student, and received my MS in the spring of 2013.

After leaving WWU, I attended the University of California, Irvine (UCI) to pursue my PhD in Chemistry. From day one of my PhD program, I felt extremely comfortable with my new surroundings. This is partially because there were so many fellow WWU Vikings in the PhD program at UCI, but mainly

because of the strong research training I received in Dr. Gilbertson's lab. I joined a new research lab at UCI, working with Dr. Jenny Y. Yang in developing transition metal complexes of modified azaphosphatranes. I was fortunate to publish six papers (five as first author and one as corresponding author) and mentor five undergraduate researchers (all went on to graduate programs) while at UCI.

I enjoyed my chemistry graduate school experience, which is surprisingly rare to hear most graduates say. I took advantage of the opportunities I was given at UCI to improve my writing, reading, teaching, and research skills. I was named a UCI Pedagogical Fellow, where I took a year-long course in pedagogy and won the university and department's top graduate teaching award. I took writing and presentation workshops at UCI to improve my science communication skills. I traveled to four ACS conferences and numerous small teaching events to present my research. I was also able to participate in outreach programs to bring science experiments to underserved and underrepresented youths in Santa Ana, California, and to coordinate lab tours at UCI. My overall experience at UCI compelled me to pursue a non-traditional postdoc, where I am able to continue to build and improve all aspects of my academics.

I am currently a teaching/research postdoctoral fellow at a small, private liberal arts college named Chapman University in Orange, California. I teach a foundational course for freshman and sophomores where we discuss science literature, write scientific articles, and conduct STEM research. My postdoctoral experience has challenged me to think outside of chemistry, and has opened the door for experiential learning beyond a traditional lecture course. I am still able to conduct my independent research and mentor undergraduate researchers in the chemistry lab, and at the same time teach the next generation of scientists to incorporate all aspects of science and art into their research. I even included an educational component in my independent research where I combine my love for board games and chemistry. You can check out my recent publication in the *Journal of Chemical Education* on my website (www.thammavongsy.com).

When I am not teaching, researching, or mentoring, I run a science education game company called d-Orbital Games. We craft chemistry card and board games for the college chemistry classroom. You can download a free version of all our games to print and play on our website, www.dorbitalgames.org. We are currently collaborating with an inorganic chemistry professor at San Jose State University to craft a

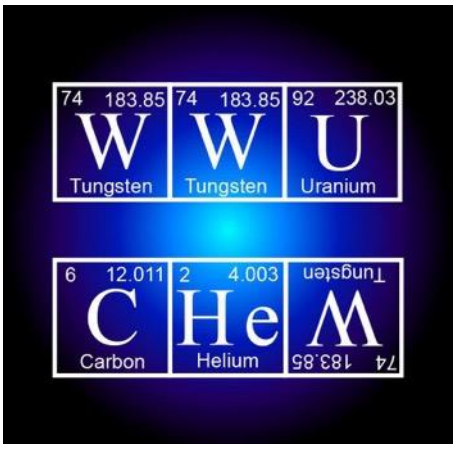
Symmetry Adapted Linear Combination (SALC) board game, and would be happy to collaborate with professors and students from WWU. Furthermore, we design chemistry badges and pins. I use the badges to distribute to my students in the classroom as prizes and as rewards for undergraduate researchers who master a laboratory technique. Due to the pandemic, I have been incorporating virtual chemistry badges into my learning management system. You can access these free virtual chemistry badges on d-Orbital Games' website.

I am in the process of applying to tenure-track positions in chemistry. I hope to one day provide as good an experience to my future students as the Chemistry Department at WWU provided for me. I am grateful for all the opportunities, advice, and kindness the chemistry professors and staff showed me during my time at WWU. The Chemistry Department at WWU holds a special place in my heart, and I hope to visit there soon.

DEPARTMENT EVENTS

Our department recently hosted (remotely) the American Chemical Society Northwest Regional Meeting (**ACS NORM**) May 9-11, 2021. Check out next year's newsletter for highlights.

NORM2021
PEAK CHALLENGES, OCEANS OF OPPORTUNITY



WWU Chemistry Department Newsletter #21 was edited by Rob Berger, with contributions from staff and faculty, Zach Thammavongsy, and Western Today.

Find us on Facebook (www.facebook.com/wwuchem) and Twitter (@WWUChem)!

2019-20 STUDENT AWARDS

CRC Press Chemistry Achievement Award
E. Wiechmann

Outstanding Honors Chemistry Student
Hanna Kodama

Outstanding Organic Chemistry Student
William Magedanz

Outstanding Analytical Chemistry Student
Romane Frevol

Outstanding Inorganic Chemistry Student
Rachael Gitnes

Outstanding Physical Chemistry Student
Kyle Juetten

Hypercube Scholar
Dario Cirlincione

ACS Senior Organic Chemistry Student Award
Kian Hausken

Sea Bong Chang Memorial Biochemistry Award
Erin Rosenkranz

Advancing Chemistry Through Service (ACTS)
Kristopher Aguayo
Rachael Gitnes
Maya Noesen

Chair's Award for Outstanding Student Initiative
Kristopher Aguayo
Rachael Gitnes

ACS SCI Scholars Internship Program Award
Reilly Lynch

ACS Organic Chemistry Research Fellowship
Jessica Gallawa

Barry Goldwater Scholarship
Melody Gao

Outstanding Graduate Teaching Assistant
Cassidy Crickmore

Outstanding MS Graduates
Douglas Baumgardner
Christopher Swanson

Outstanding Department Graduate
Maya Noesen

2020-21 STUDENT FELLOWSHIPS AND SCHOLARSHIPS

WWU Chemistry Scholarships
Hanna Kodama
Julie Schexnayder

Larry Heimark Chemistry Scholarship
Reilly Lynch

Hach Land Grant Scholarships
Kaliya Moen
Eden Ojala

Verna Alexander Price Chemistry Scholarship
Meredith Boxx

Jerry Price - Nancy Scherer Scholarship
Nathan Avery

Knapman Chemistry Scholarships
Melody Gao
Alison Keller

Ruth Watts Female Scientist Scholarship
Izzi Piper

Barbara French Duzan Scholarships
Alexandra Hoff
Hanalei Lewine
Ali Pierce
Estelle Ronayne

Women in Science Scholarship
Kaitlyn Flynn

Joyce B. Lavender Merriman Scholarship
Kelly Fick

Jarvis Memorial Summer Research Award
Hanalei Lewine
Izzi Piper

Karen & Joseph Morse Research Fellowships
Alex Johnson
Samantha Patrick

OTHER STUDENT AND ALUMNI RECOGNITION

- Department alum **Ian Smith** (MS 2018) received an Editor's Award from the *Journal of Thrombosis and Haemostatis*. This award recognizes the first author of a paper (in Ian's case, a 2020 paper written with members of the Spiegel group) that stands out as a significant conbution to the field.
- Recent alums **Kristina Boyko** (currently at UC Berkeley), **Eoghan Gormley** (currently at the University of Oregon), and **Paul Spaltenstein** (currently at the University of Utah) received Honorable Mention in the 2021 NSF Graduate Research Fellowships Program.

STUDENTS ON THE FRONT LINES

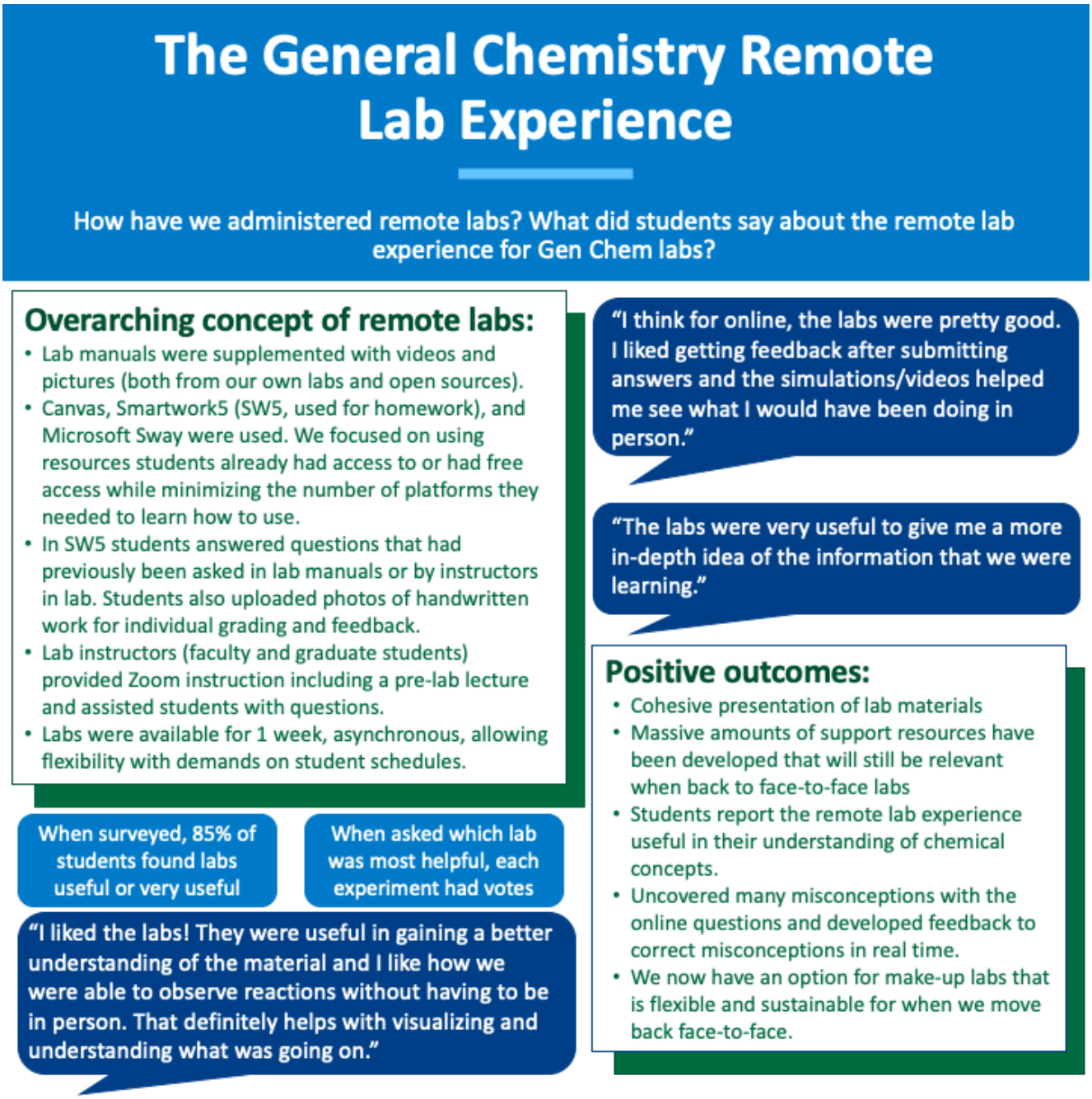
During the pandemic, we have been amazed and inspired by the extent to which our students have answered the call to help. In particular, many chemistry and biochemistry students worked (and in some cases continue to work) on various aspects of COVID-19 testing at Northwest Laboratory in Bellingham. The picture at right shows members of the Spiegel research group (*l-to-r*: Shaun Peters, Dr. Kenneth Childers, Connor Garrels, Riley Roberts, Estelle Ronayne, and Sarah Haines), among the 20+ students in our department who contributed to the testing efforts.

Chris Swanson, a recent MS graduate in our department (see page 7) who works as a PCR Technician at Northwest Laboratory, nicely sums up how students have contributed. “Many of our students have been extraction technicians. They are in charge of preparing reagents and materials for RNA extraction. They also ensure patient samples are handled and extracted accurately and correctly. They don’t get to perform the actual extraction, as we have a robot do it. We have robots do lots of things and it’s very awesome, since pipetting 384 samples by hand is just no fun. Some Western Chem students perform the PCR reaction, which involves transferring the purified RNA to an enzyme primer mixture which is then run through a thermocycler. We have also had a few Western Chem accessioners, who are the people that enter patient data into a medical network application and process the samples when they arrive.”

We are so proud of the way our students have used their education to make these important contributions in a time of need. “I joined NW Lab because in searching for jobs after my graduation, I figured out that I needed purpose in my employment,” Chris says. “For me this has been a humbling experience to realize that each 200 microliters of sample represents a human life, whether it’s a test to allow a life-saving surgery to proceed, or simply allow a child to visit their grandparents. Not to mention that the people who I work with are downright fantastic.”

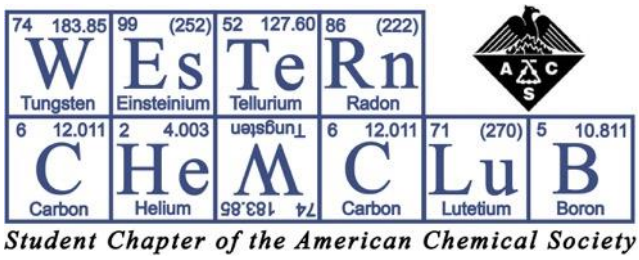
REVAMPING LABS FOR REMOTE INSTRUCTION

In the past year, our department has quickly adjusted to teaching our courses online. Among the biggest challenges has involved revamping the general and organic chemistry labs, which in typical times are inherently hands-on experiences for hundreds of students each year. The hard work to adapt the general chemistry labs was done by **Amy Cully**, **Spencer Berger**, and **Betsy Raymond**, and implemented by our many outstanding lab instructors. The outcomes are summarized in the infographic below.



WWU CHEM CLUB

Despite the strange year, the Chem Club has continued to meet and host activities over Zoom and has also added Prof. Jen Griffith as a faculty advisor. Weekly meetings provide a much-needed social outlet; very often the tangent conversations (and pet guest appearances) take up more meeting time than business items. These weekly meetings have also been used to get to know different faculty members through "Chat with a Prof" events, or as game nights, with the most popular being online Pictionary. The 9th Annual Trivia Night was well attended and a lot of fun, with beaker mugs going to the winners as usual. Prof. Gilbertson was pleased to be on the winning team this year!



New this year have been two "Cook with a Chemist" events led by Prof. Griffith, where we all cooked the same recipe together in our own homes – roasted tomato pesto pasta at the first event, and wacky cake at the second – while learning about the cooking chemistry involved. Professional development events like the "Who, What, When, Why, How of Graduate School", "Undergraduate Research Opportunities", and "College-to-Career" alumni panel [Dr. Amanda (Norell Bader) Grennell and Jennifer Dell] have worked very well online, with the chat function encouraging more students to ask questions than ever before. The Chem Club students also invited Dr. Karin Öberg, an astrochemist from Harvard, to chat with students and present one of the winter quarter's seminars. The ability to have speakers (and alumni) not in the local area is something we hope to continue even once we are all in-person again. **If you would like to share your career experiences with current students, please let us know. We are always looking to re-connect with alumni.**

One set of events that have been sorely missed this year are the demo shows at local schools and science workshops with students on campus. We are really looking forward to the return of these, making LN2 ice cream (store-bought vanilla ice cream is just not as good!), and of course, the annual picnic! There's no date set yet for the next picnic, but watch the Facebook page for announcements (www.facebook.com/wwuchem), as alumni and friends of the department are always welcome.

FACULTY AND STAFF PROMOTIONS

JOHN GILBERTSON PROMOTED TO FULL PROFESSOR

John Gilbertson was promoted to Full Professor in the fall of 2020. Since joining the faculty at WWU in 2008, Dr. Gilbertson has worked to challenge students to engage in the subject matter and to fully understand it at its highest level – in the classroom, laboratory, and his group's research. He sees research as the most impactful form of teaching, and prioritizes maintaining a vibrant research program that addresses scientific problems with societal impact. Dr. Gilbertson has a successful track record of obtaining external funding as either a PI or co-PI ($3,580,352 total) that has provided students not only in the Chemistry Department, but in the Physics and Mathematics Departments as well, with multiple research opportunities over a wide range of different projects. Two of those grants have been for major instrumentation for research and upper-division coursework (a single-crystal X-ray diffractometer and a 500 MHz NMR upgrade). In his time at WWU, Dr. Gilbertson's research has involved >45 undergraduates and 7 MS students. Together, they have built an internationally recognized research program in inorganic chemistry, studying the reduction of pervasive environmental pollutants such as N-oxides and carbon dioxide. They have published 14 manuscripts, all with undergraduate co-authors, all in high-impact, peer-reviewed journals. Dr. Gilbertson has received numerous awards, including an NSF CAREER Award, Cottrell Scholar Award, Henry Dreyfus Teacher-Scholar Award, and (with undergraduate student Audrey Cheung) ACS Division of Inorganic Chemistry Award for Undergraduate Research.

DAVID PATRICK NAMED DEAN OF THE GRADUATE SCHOOL AND VICE PROVOST FOR RESEARCH

David Patrick has been named Dean of the WWU Graduate School and Vice Provost for Research, after serving as interim Dean during the 2019-20 academic year. Dr. Patrick has been on the faculty of the WWU Chemistry Department since 1996, and has at times held positions as director of Scientific Technical Services, director of the Advanced Materials Science & Engineering Center, and affiliate faculty member in

the Institute for Energy Studies. Through his group's research on solar energy concentration and conversion and organic semiconductors, Dr. Patrick has been a strong proponent of involving students at all levels in research, including high school, undergraduate, and graduate students. For his research and student mentorship, Dr. Patrick has received a variety of awards over the years, including WWU's Olscamp Research Award and Arlan Norman Excellence in Student Mentoring Award. In his positions leading WWU's Graduate School and Office of Research and Sponsored Programs, Dr. Patrick will bring his expertise and vision to support students and faculty and expand the scope and impact of research at WWU.

FACULTY AWARDS

Mark Bussell was honored with the 2021 Arlan Norman Award for Excellence in Student Mentoring. This award recognizes a faculty member in the WWU College of Science & Engineering for excellence shown in the mentorship of graduate and undergraduate student researchers. In the first seven years this award has existed, Dr. Bussell is the fourth faculty member in the Chemistry Department to receive it. Since joining the WWU faculty in 1990, Dr. Bussell has published over 40 peer-reviewed papers describing work done at WWU, and has received numerous award for his scholarship and teaching, including the Paul J. Olscamp Research Award, Cottrell Scholar Award, and Henry Dreyfus Teacher-Scholar Award.

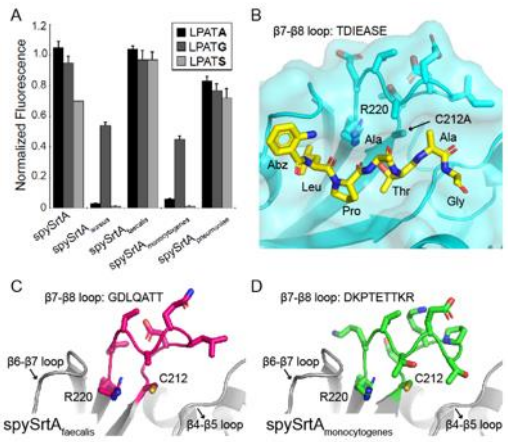
Greg O'Neil received the 2020 Paul J. Olscamp Research Award. This award recognizes a faculty member in the College of Science & Engineering for their impressive record of scholarship and research. Since joining the WWU faculty in 2008, Dr. O'Neil has published over 30 peer-reviewed papers describing work done at WWU, and has received grants from the National Science Foundation, National Institutes of Health, Henry Dreyfus Foundation, Research Corporation for Science Advancement, American Chemical Society Petroleum Research Fund, and Washington Research Foundation to support his research focused on natural products chemistry. In all, his funding since arriving at WWU is approximately $2 million.

David Rider (shown with his research group) received a 2020 Henry Dreyfus Teacher-Scholar Award, recognizing his scholarly research accomplishments and devotion to inclusive and engaging teaching both in the classroom and in the lab. Dr. Rider considers the award a recognition of the commitment and dedication to research goals from the nearly 50 undergraduate researchers and master's students that he has had the honor to mentor since 2010. The countless hours spent on research by these students, including many from the Chemistry and Engineering & Design Departments and others from AMSEC's Materials Science program, have allowed the Rider group to make important contributions to various fields ranging from fuel cell catalysts to aerospace composites. Further, this group has only been allowed to have these successes thanks to the unwavering intellectual and technical support from faculty, staff, and students in these three programs (Rider: "THANK YOU ALL!!"). In Dr. Rider's view, the shared vision and culture for supporting undergraduate STEM research across disciplinary boundaries in these WWU programs has been key to his research and educational goals, and he stresses that this Henry Dreyfus Teacher-Scholar Award recognizes their efforts as well. This award provides the Rider group with summer stipends for nearly half a dozen students over the next 5 years, which will allow the team to ask and investigate important research questions in the fields of solar energy devices and alternative resin systems for aerospace materials.

FACULTY GRANT FUNDING

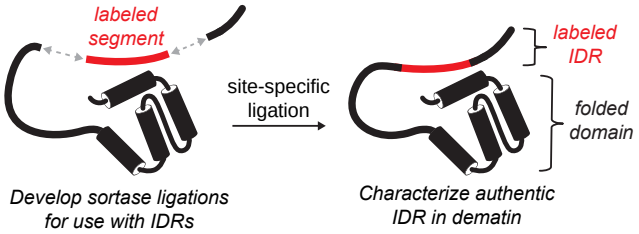
Jeanine Amacher received a Cottrell Scholar Award from the Research Corporation for Science Advancement for her project titled "Investigating Sortase Enzyme Activity and Specificity Using Natural Sequence Variation and Ancestral Sequence Reconstruction" ($100,000 over 3 years). This proposal builds off of a collaborative project between the Amacher and Antos labs, which characterized the contributions of the beta7-beta8 loop of Class A sortases to their enzymatic function and target recognition. In this award, the Amacher lab will investigate other classes of sortases (e.g., B-F) to see if these selectivity determinants are shared. For the educational component of this award, Dr. Amacher aims to create an elective course introducing first- and second-year students (including transfer students) in the department to research opportunities.

Dr. Amacher also received a Faculty Early Career Development (CAREER) Award ($660,000 over 5 years) from the National Science Foundation, Division of Chemistry. In this award, "The Stereochemical Basis for Target Selectivity Encoded by Specificity-Determining Loops in Peptide-Binding Domains", the Amacher lab will broadly investigate how structurally conserved loops near the binding and/or active sites of peptide-binding domains (e.g., sortases and SH2/SH3 domains) affect target recognition and enzymatic activity. For sortases, we will look at Class A sortases using structural biology, specifically X-ray crystallography. They will look at SrtA enzymes from several *Streptococcus* species, including *S. pyogenes* (see figure at right), *S. agalactiae,* and *S. mutans.* For the educational component of this grant, Dr. Amacher will organize the Life Sciences Symposium an additional three times over the next five years, as well as incorporate computational projects into her lab, with a dedicated yearly summer student stipend for computational research, and create an upper-division elective course to introduce students to science communication and science in society.

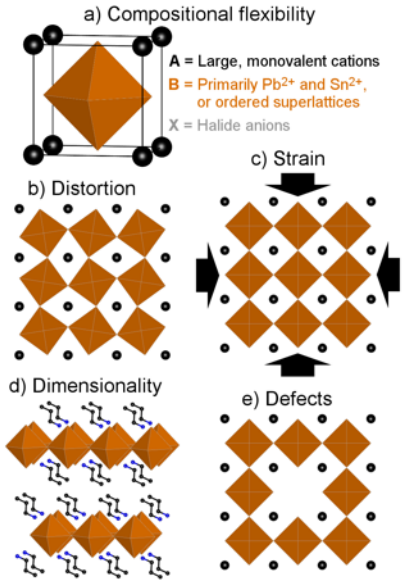


Activity and structure of spySrtA. (A) Enzyme assays of spySrtA loop-swapped variants reveal a similar range of activities and selectivites as seen previously with S. pneumoniae SrtA (activities are normalized to S. aureus SrtA and the peptide LPATG. (B-D) Preliminary experimental structures of peptide (LPATAG)-bound C212A spySrtA (B) and the loop-swapped variants, spySrtA$_{faecalis}$ (C) and spySrtA$_{monocytogenes}$. Proteins are in cartoon representation, with side chains in the β7-β8 loops in stick (and colored by heteroatom). Highlighted residues are labeled.

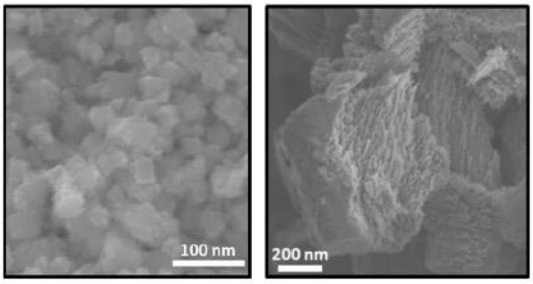
John Antos and **Serge Smirnov** received a grant from the National Science Foundation for their project titled "Sortase-Mediated Ligations for Probing Binding Mechanisms of Large Disordered Proteins" ($344,000 over 3 years). This award will support the study of proteins that lack single, well-defined shapes and structures. These disordered proteins are known to represent a significant fraction of naturally-occurring polypeptides, yet the study of their function and mechanisms of action has proven difficult due to their dynamic and disordered nature. To address this challenge, the Smirnov and Antos groups are utilizing enzymatic ligation reactions to build unique disordered protein derivatives that contain biophysical probes inserted in defined regions of the protein target. These derivatives will in turn enable new investigations of large, disordered proteins using techniques such as nuclear magnetic resonance (NMR) spectroscopy. As an initial target, these approaches will be used to characterize the cytoskeletal regulating protein dematin. In addition, this award will support the participation of undergraduate and master's-level research students, providing training and experience in a range of experimental techniques in biochemistry and biophysical chemistry.



Rob Berger received a grant from the National Science Foundation for his project titled "Confronting Structural Complexity in the Computational Design and Understanding of Perovskite Materials for Solar Energy Conversion" ($268,067 over 3 years). The Berger lab will investigate perovskite compounds, a technologically important class of materials with general formula ABX_3 that have the ability to absorb sunlight and convert it to electricity or chemical fuel. A unique property of perovskites is that their structure can be changed in many subtle ways – substituted with different elements, pulled and twisted, layered and decorated (see figure at right) – to optimize their ability to convert sunlight. With all of this freedom to modify perovskites, computers are valuable tools in predicting which of these materials will behave in desired ways. The Berger lab, including undergraduate and master's-level researchers, will use density functional theory to predict how and understand why substitutions and movements of atoms affect the ability of perovskites to absorb and convert sunlight. In addition, they will adapt the extended Hückel method, a particularly fast computational approach, to quickly and roughly search the huge variety of perovskite materials for properties of interest.



Mark Bussell received two grants from the Research Corporation for Science Advancement. The first is a Cottrell Scholar SEED Award titled "Metal Phosphide-Oxide Hybrid Catalysts for Solar Fuels Production" ($50,000 over 2 years), in collaboration with **Rob Berger** (WWU) and Brandi Cossairt (UW). The second is a Cottrell Instrumentation Award titled "Instrumentation for Raman Thermometry – Probing Photocatalysis at the Nanoscale" ($20,000 over 1 year), in collaboration with **Steven Emory** (WWU). In this research, the Bussell group is investigating the photothermal catalytic properties of metal phosphide nanoparticles dispersed on nanostructured indium oxide support materials. The aim is to develop a catalytic system with high light-to-chemical energy efficiency for the conversion of carbon dioxide to solar fuels such as methane or methanol. The hypothesis is that light absorbed by the photocatalyst can be used for localized heating of catalyst particles as well as to promote an alternate reaction pathway for converting carbon dioxide to solar fuels.



Catherine Clark received a grant from the National Science Foundation for her project titled "Cycling of Ethanol and Acetaldehyde in Coastal Waters" ($139,339 over 3 years). Increased use of ethanol in the USA and globally as a fossil fuel substitute and additive is expected to have an impact on ethanol levels

in the atmosphere. The primary sink for ethanol in the troposphere is reaction with OH to produce acetaldehyde, which is classified as a hazardous air pollutant by the EPA. Increased use of ethanol is expected to increase both ethanol and acetaldehyde levels in the troposphere. To understand future impacts, we need to understand current tropospheric budgets of these species. Current tropospheric budget estimates for both species have significant uncertainties; in both cases, one of the largest sources of uncertainty is the role of the oceans. Concentrations of ethanol and acetaldehyde in water are controlled by a complex interplay between biological sources and sinks, photochemical sources and sinks, and physical processes like air-water exchange. The goal of this work is to improve our process-level understanding of the cycling of ethanol and acetaldehyde in coastal seawater. The Clark group will measure the chemical and biological degradation rates of ethanol; the rate and efficiency of the biological production of acetaldehyde from ethanol in these waters; and the ethanol source strength of estuary and saltmarsh sediments. These measurements will also give a biological degradation rate for acetaldehyde and will increase the current database of ethanol and acetaldehyde concentration measurements. Ethanol and acetaldehyde concentrations will be measured by purge and trap GC/MS. Degradation rates will be measured by following the concentrations of isotopically labelled ethanol and acetaldehyde in seawater incubations.

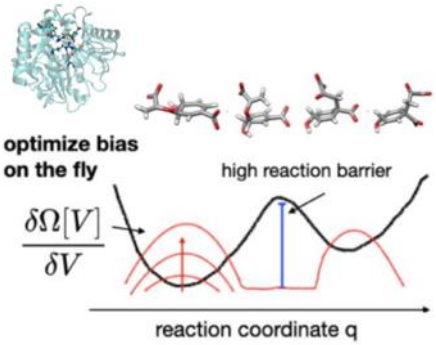
Erin Duffy (PI) and **Norda Stephenson** (co-PI), along with colleagues Lina Dahlberg (co-PI, biology) and Dimitri Dounas-Frazer (co-PI, physics), were awarded a National Science Foundation grant for their project titled “An Interdisciplinary Exploration of Student Engagement in Scientific Practices in Undergraduate Biology, Chemistry, and Physics Laboratory Courses” ($299,428 over 3 years). This project aims to serve the national interest in undergraduate STEM education by examining student learning in laboratory courses. Many students enroll in introductory laboratory courses for multiple disciplines at the same time. As a result, there is a need for interdisciplinary investigation into how students experience scientific practices in such courses. This project focuses on the eight scientific practices described in the Framework for K-12 Education and embedded in the Next Generation Science Standards. Scientific practices are important because they are fundamental to scientific discovery, inherently interdisciplinary, and applicable across scientific contexts in higher education. This project will investigate similarities and differences in the scientific practices incorporated into introductory laboratory courses in biology, chemistry, and physics. It will focus on how students, staff, faculty, and teaching assistants value scientific practices that are perceived as more technical (such as analyzing

data) or more social (such as communicating information). This project will determine whether and how students engage with specific scientific practices in biology, chemistry, and physics laboratory courses and how that engagement is encouraged and rewarded. The findings from this project will expand current understanding of scientific practices in introductory science courses. In doing so, this work will lay a foundation for making these laboratory courses more equitable and supportive of a greater diversity of learners.

John Gilbertson (PI) and **Tim Kowalczyk** (co-PI) received a grant from the National Science Foundation for their project titled "Nitrate/Nitrite Reduction Utilizing Hemilability and Redox-Activity" ($261,000 over 3 years). Nitrogen oxides such as nitrates exist naturally, and are utilized by plants for growth. Unfortunately, humanity is introducing large amounts of nitrates into the ecosystem through their use of nitrogen-based fertilizers. Nitrate loading into the environment results in massive blooms of algae, which can trigger catastrophic growth that chokes waterways. This is compounded when the algae dies and decays, robbing the water column of oxygen and resulting in large "dead" zones, hypoxic zones unable to sustain life. Converting nitrate to a less harmful form is therefore an area of intense investigation. This is the goal of the project. Drs. Gilbertson and Kowalczyk and their students are developing of set of coordination compounds that entice a reaction with nitrate to convert it to something less harmful. The work combines computational modeling and synthesis to help study and design these nitrate-reducing compounds. The work will support nine students over the three-year period.

Mike Larsen received a grant from the National Science Foundation for his project titled "Dynamic Guanidine-Based Polymer Networks" ($330,000 over 3 years). The accelerating global accumulation of plastic waste is a pressing environmental issue. Major contributors to this problem are a class of compounds called thermosets, which consist of crosslinked polymer networks with a fixed structure. As their name implies, once thermosets are formed they typically cannot be reprocessed or recycled and their potential for reuse is limited. One way to address this is to incorporate dynamic bonds into the network structure. Under specific conditions, these bonds continuously break and re-form, enabling the network to flow and thus be remolded or recycled. The Larsen group has discovered a new chemical reaction, which they call "thermal guanidine metathesis", which can serve as the basis for dynamic polymer networks. Projects supported by this grant will include exploring the effects of polymer structure on the properties of corresponding networks, synthesizing new types of guanidines to examine their influence on polymer dynamics, and in-depth examinations of the rheological behavior of these materials. These projects will involve 6-8 undergraduate students and a master's student over the lifetime of the grant.

Jay McCarty received a grant from the National Science Foundation for his project titled, "A Variational Enhanced Sampling Approach to Enzyme Kinetics and Protein Dynamics in Condensed Phases" ($342,131 over 3 years). Computer simulations of biological molecules can spur the design and optimization of engineered proteins and biomimetic nanomaterials. With this award, the McCarty group will develop molecular simulation algorithms, based on the statistical mechanics of rare events, to compute long-time dynamical observables for proteins in solution and biochemical reactions. A goal of this work is to provide a computational framework to bridge the gap between computer simulations and experiments that probe long-time dynamics. In addition, computational advances will be integrated into the undergraduate biochemistry lab, pairing computer simulation with experimental mutational screening data.



Greg O'Neil received an Undergraduate Research Grant from the American Chemical Society Petroleum Research Fund (ACS PRF) for his project titled, "Beyond Polypropylene: Advancing Propylene-Based Fine Chemical Synthesis Through Diallylsilane Rearrangements" ($70,000 over 3 years). Dr. O'Neil and his group will investigate new uses for propylene, one of the largest byproducts of oil refining and currently used primarily to make polypropylene plastic.

Margaret Scheuermann received a grant from the National Science Foundation for her project titled "The Role of Engineered Ligands in Putative Homogeneous Catalysis: Supporting a Homogeneous Catalyst or Modulating Nanoparticle Formation" ($230,000 over 3 years). Emerging technologies such as the ability to convert carbon dioxide into useful chemicals and the ability to use oxygen from the air as a reagent in chemical synthesis rely on catalysts that can speed up reaction rates and control which products are formed (selectivity). Catalysts can change structure and properties during a chemical reaction. The initial state of the catalyst may be known however, in general, far less is known about how catalysts might change over time under working conditions. The Scheuermann lab will identify and investigate catalysts while they are working, using both existing and newly developed techniques to characterize the resultant structures and understand their catalytic properties. The findings will give insight into the role and significance of catalyst structure. The undergraduate and master's-level students participating in this project are developing research skills that they will apply later as members of the STEM workforce.

Clint Spiegel was awarded a third, three-year grant for $390,000 from the National Heart, Lung, and Blood Institute (NHLBI) to continue his group's ongoing work on hemophilia A. Dr. Spiegel's group has

been focused on understanding the molecular basis of immune complications that arise due to therapeutic treatments for hemophilia as well as uncovering the mechanism of a rare autoimmune disease called acquired hemophilia. Dr. Spiegel's lab uses fundamental protein biochemistry and various structural biology techniques, such as X-ray crystallography, to uncover images in atomic detail of the proteins and antibodies involved in the blood clotting process as well as the pathogenic immune response due to treatment. Approximately 30% of severe hemophilia A patients receiving treatment develop an antibody response to the therapy, which can result in life-threatening complications. This three-year grant from the NHLBI funds undergraduate and graduate students working directly on this project throughout the academic year and through the summer for each year of the award. With students as co-authors, Dr. Spiegel's research has recently been published in the peer-reviewed journals *Blood* and the *Journal of Thrombosis and Haemostasis*. Based on this work, Dr. Spiegel was recently selected to give a "State of the Art" lecture at the International Society of Thrombosis and Haemostasis Congress in July 2021.

FACULTY AND STUDENT PUBLICATIONS

In the past academic year, Chemistry faculty have published **27 peer-reviewed articles** detailing their research, which include **31 undergraduate (*) and 20 graduate (†) WWU student co-authors**.

*Gao, M; *Mackley, IGP; Mesbahl-Vasey, S; †Bamonte, HA; †Struyvenberg, SA; *Landolt, L; *Pederson, NJ; *Williams, LI; Bahl, CD; Brooks 3rd, L; **Amacher, JF**. "Structural characterization and computational analysis of PZD domains in *Monosiga brevicollis*". *Protein Sci.* **2020**, *29*, 2226-2244. Link

†Reed, SA; *Brzovic, DA; *Takasaki, SS; *Boyko, KV; **Antos, JM**. "Efficient sortase-mediated ligation using a common C-terminal fusion tag". *Bioconjugate Chem.* **2020**, *31*, 1463-1473. Link

*Cohen-Pope, S; †Crockett, JR; †Wang, M; *Flynn, K; *Hoff, A; **Bao, Y**. "Morphology control of SERS-active 2D gold nanosnoflakes". *J. Mater. Chem. C* **2020**, *8*, 12427-12436. Link

*Cirlincione, DV; **Berger, RF**. "Tuning the electronic structure of d^0 perovskite oxides by combining distortive modes". *Phys. Rev. B* **2021**, *103*, 045127. Link

Borda, E; Schumacher, E; Hanley, D; Geary, E; Warren, S; Ipsen, C; Stredicke, L. "Initial implementation of active learning strategies in large, lecture STEM courses: Lessons learned from a multi-institutional, interdisciplinary STEM faculty development program". *Int. J. STEM Educ.* **2020**, *7*, 4. Link

Hanuscin, D; Donovan, D; Acevedo-Gutiérrez, A; **Borda, E**; DeBari, S; Melton, J; Le, T; Morrison, W; Ronca, R. "Supporting the professional development of science teacher educators through shadowing". *Int. J. Sci. Math. Educ.* **2021**, in press. Link

†Topalian, PJ; †Carillo, BA; †Cochran, PM; *Takemura, MF; **Bussell, ME**. "Synthesis and hydrodesulfurization properties of silica-supported nickel-ruthenium phosphide catalysts". *J. Catal.* **2021**, in press. Link

*Miles, CE; *Carlson, TR; *Morgan, BJ; †Topalian, PJ; *Schare, JR; **Bussell, ME**. "Hydrodesulfurization properties of nickel phosphide on boron-treated alumina supports". *ChemCatChem* **2020**, *12*, 4939-4950. Link

De Bruyn, WJ; **Clark, CD**; Harrison, AW; Senstad, M; Hok, S. "The degradation of acetaldehyde in estuary waters in Southern California, USA". *Environ. Sci. Pollut. Res.* **2021**, in press. Link

Bain, K et al., including **Duffy, EM**. "Characterizing college science instruction: The three-dimensional learning observation protocol". *PLOS ONE* **2020**, *15*, e0234640. Link

Stephenson, NS; **Duffy, EM**; Day, EL; Padilla, K; Herrington, DG; Cooper, MM; Carmel, JH. "Development and validation of scientific practices assessment tasks for the general chemistry laboratory". *J. Chem. Educ.* **2020**, *97*, 884-893. Link

Duffy, EM; Cooper, MM. "Assessing TA buy-in to expectations and alignment of actual teaching practices in a transformed general chemistry laboratory course". *Chem. Educ. Res. Pract.* **2020**, *21*, 189-208. Link

*Marks, WR; †Baumgardner, DF; Reinheimer, EW; **Gilbertson, JD**. "Complete denitrification of nitrate and nitrite to N_2 gas by samarium(II) iodide". *Chem. Commun.* **2020**, *56*, 11441-11444. Link

†Baumgardner, DF; *Parks, WE; **Gilbertson, JD**. "Harnessing the active site triad: Merging hemilability, proton responsivity, and ligand-based redox-activity". *Dalton Trans.* **2020**, *49*, 960-965. Link

Hourahine, B *et al.*, including †Deshaye, MY and **Kowalczyk, T**. "DFTB+, a software package for efficient approximate density functional theory based atomistic simulations". *J. Chem. Phys.* **2020**, *152*, 124101. Link

†Melchor Bañales, AJ; **Larsen, MB**. "Thermal guanidine metathesis for covalent adaptable networks". *ACS Macro Lett.* **2020**, *9*, 937-943. Link

*Leonard, C; *Phillips, C; **McCarty, J**. "Insight into seeded tau fibril growth from molecular dynamics simulation of the Alzheimer's disease protofibril core". *Front. Mol. Biosci.* **2021**, *8*, 624302. Link

†Leitch, MA; **O'Neil, GW**. "Substrate-dependent stereospecificity in samarium-mediated allylic benzoate reductions". *Tetrahedron* **2020**, *76*, 131707. Link

Meyer, GF; Nistler, MA; Samoshin, AV; McManus, BD; Thane, TA; Ferber, CJ; **O'Neil, GW**; Clark, TB. "β-Silyloxy allylboronate esters through an aldehyde borylation/homologation sequence". *Tetrahedron Lett*. **2020**, *61*, 152082. Link

Huynh, A; Maktabi, B; Reddy, CM; **O'Neil, GW**; Chandler, M; Baki, G. "Evaluation of alkenones, a renewably sourced, plant-derived wax as a structuring agent for lipsticks". *Int. J. Cosmetic Sci*. **2020**, *42*, 146-155. Link

†Stockdale, TF; †Leitch, MA; **O'Neil, GW**. "Chelation and stereodirecting group effects on regio- and diastereoselective samarium(II)-water allylic benzoate reductions". *Synthesis* **2020**, *52*, 1544-1560. Link

McIntosh, K; Sarver, J; Mell, K; Terrero, DJ; Ashby Jr, CR; Reddy, CM; **O'Neil, GW**; Ramapuram, JB; Tiwari, AK. "Oral and dermal toxicity of alkenones extracted from Isochrysis species". *Front. Biosci*. **2020**, *25*, 817-837. Link

†Reed, G; *Littleton, M; †Doran, H; *Keay, K; Hughes, GM; **Patrick, DL**. "Bottom-up growth of shape-engineered molecular single crystals". *Cryst. Growth Des.* **2020**, *20*, 5043-5047. Link

*Gitnes, RM; †Wang, M; **Bao, Y**; **Scheuermann, ML**. "In situ generation of catalytically relevant nanoparticles from a molecular pincer iridium precatalyst during polyol deoxygenation". *ACS Catal.* **2021**, *11*, 495-501. Link

†Gish, JS; *Jarvis, L; Childers, KC; *Peters, SC; *Garrels, CS; †Smith, IW; Spencer, HT; Doering, CB; Lollar, P; **Spiegel, PC**. "Structure of blood coagulation factor VIII in complex with an anti-C1 domain pathogenic antibody inhibitor". *Blood* **2021**, in press. Link

†Starchman, ES; *Marshall, MS; **Vyvyan, JR**. "Synthesis of (±)-rupestines B and C by intramolecular Mizoroki-Heck cyclization". *Tetrahedron Lett.* **2020**, *61*, 151837. Link

†Shelton, PMM; *Grosslight, SM; †Mulligan, BJ; *Spargo, HV; *Saad, SS; **Vyvyan, JR**. "Synthesis of guaipyridine alkaloids (±)-cananodine and (±)-rupestines D and G using an intramolecular Mizoroki-Heck reaction". *Tetrahedron* **2020**, *76*, 131500. Link

PHOTOS FROM RESEARCH GROUP MEETINGS

It hasn't always been easy to stay connected and to keep our research going this year. But we've done our best (with an assist from Zoom).

Joint meeting of the Bussell and Berger research groups

Murphy research group

Amacher research group

DEPARTMENT DONORS

We wish to extend a special thank you to alumni and friends of the department who donated to Chemistry Department Western Foundation funds from April 2020 through March 2021.

Our program has grown, and your donations are more crucial than ever. Our Foundation funds support a variety of activities including student scholarships and academic awards, undergraduate summer research stipends, student travel to conferences, department seminars, equipment purchase and repair, and events for department majors and alumni. We appreciate your support!

If you would like to make a gift, please visit foundation.wwu.edu or call (360) 650-3027.

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