Chemistry Department Newsletter

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GRAND VALLEY STATE UNIVERSITY
DEPARTMENT OF CHEMISTRY

SOME FEATURES IN THIS ISSUE:

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A Word from the Chair.....

Students and Alumni: The Heart and Soul of the GVSU Chemistry Department

We are well into our "striving-for-normal" academic year, but we are still facing uncertainty about what our new normal might look like. Though we know that many people are still dealing with trauma from the past 21 months or dealing with new challenges, it is important to take time to reflect on some of the positives of the past two years. For some people it might have been the chance to spend more time with their family or to pick up a new hobby. For the GVSU Chemistry Department, our biggest positives were opportunities to reconnect with some of our alumni and celebrate with our newest chemistry and biochemistry graduates.

Reconnecting with Alumni: A COVID Silver-Lining

Ending the Winter 2020 semester remotely and moving most of our classes online for the 2020-2021 academic year was not something that brought great joy to our faculty, staff, or students. However, having classes on Zoom meant some extra freedom for our senior seminar course as we were able to invite speakers from across the country. One of the highlights of our year was the Fall 2020 GVSU Chemistry Alumni Seminar Series. Dr. Brittland DeKorver (GVSU Chem 2007), based on a suggestion from Dr. Stephanie Schaertel, organized a great line-up of GVSU Chemistry and Biochemistry alumni speakers including Dr. Andrew Berke (Smith College), Dr. Rebecca Quardokus (University of Connecticut), Dr. Brooke (Gartland) Rock (Amgen), Dr. Aydin Kavara (Pall Corporation), Dr. Anthony Schultz (3M) and Dr. Cynthia Luxford (Texas State University). When our current students saw former GVSU students doing such amazing things in the world, it provoked a very positive response. Because of that, we have become quite enthusiastic to leverage student/alumni interactions — whether virtual or in-person — as we move into the future. Who will be the next alum to present to our students—maybe you? (see below).

Improving our Alumni Connections

Our students — those with us now, and those who were here in times past — have always been the heart and soul of the GVSU Chemistry Department. In recent years we have made it a goal to find ways to stay connected with our alumni to highlight the exciting things they are doing, and to better integrate Laker chemists from different eras. To do this, we have initiated a new alumni portal on our website — a one-stop place where you will find a variety of different ways you might reestablish a connection to the GVSU Chemistry family. Please consider the opportunities listed below!

- **Highlighting alumni success**
  If you have not done so already, check out the Alumni-in-action section on our website (www.gvsu.edu/chem). Here you can learn about some of the great things our alumni are doing. Would you like to see your story there, or to nominate someone for this feature? We would love to hear from you, and there is a spot to let us know on the portal. By the way, the connections we make through telling these stories have been known to lead to more extensive alumni spotlight features in the newsletter (see p. 5).

Please check out the Alumni portal at www.gvsu.edu/chem.

- **Help promote opportunities for GVSU students**
  Does your company have an internship program? Are you looking to recruit students to your graduate program? Do you know of other opportunities that we can share? The new portal gives you a place to let us know!

Continued on next page…

- **Impact students with your experience**
  Many schools have informal networks for alumni to serve as a resource to current students. Are you interested in talking to a Chemistry or Biochemistry major who is applying to the graduate school you attended or the company you work for? Are you using your degree in a non-traditional field, and feel that you could speak to students who might be interested in that area? We need your wisdom! Please let us know in the portal.

- **Staying connected through social media**
  If you are looking for a low-key way to stay connected, we maintain a presence on two social media platforms. The departmental LinkedIn site is a spot for professional connections, job opportunities and news about Laker Chemistry accomplishments. The Chemistry Stockroom maintains a Facebook page for social connections with everyone in the GVSU Chemistry family, and fun news about what is going on in the department. Connect with these sites through the portal or search **GVSU Chemistry and Biochemistry** on LinkedIn and **GVSU Chemistry Stockroom** on Facebook.

By Deborah Herrington

RETIREMENT

Min Qi

Like many of her colleagues, Min Qi accepted a position on the Chemistry faculty at GVSU in large part because it was clear that the department placed a high value on both teaching and research. Joining the faculty in 1994, Min arrived in Allendale at a time when Grand Valley was starting to ramp up its research offerings for undergraduates. She notes that great support from the university made a big difference, allowing her and her students to present at national conferences and publish manuscripts in peer-reviewed journals. Min's research focused on analysis of toxins in natural waters and her work with students over the years explored a wide variety of interests. Early efforts to examine PCB accumulation in Michigan fish species led to collaborative efforts looking at the neurotoxicity of similar toxins on Goldfish. A later area of focus—analysis of drug residue contamination in waterways—grew from a 2016 sabbatical. Qi spent a semester in China collecting and analyzing water samples from the Miyun Reservoir located near Beijing. This body of water supplies 90% of water to the capital city, but is increasingly threatened by pollution.

On the teaching side, Qi regularly taught Quantitative Analysis, Analytical Chemistry and, not surprisingly, Environmental Chemistry lecture and lab. Later, as the department started to focus on Green Chemistry, Min helped cover CHM 421 (Green Chemistry For Sustainable Environment). With her strong interest in environmental toxins, one of her most important legacies is her work to strengthen the department's environmental chemistry offerings. Several successful grant applications that she spear-headed in 1996 made a big difference. The National Science Foundation funded an instrument upgrade bringing better Gas-Chromatography/Mass Spectrometry capabilities to laboratory classes and research efforts alike. Similarly, support from the Camille and Henry Dreyfus Foundation allowed Min to introduce Supercritical Fluid Extraction to the curriculum.

When asked what she plans she has for retirement, Min indicated she hoped to "travel and spend more time with family!". She also noted she was looking forward to "no more deadlines".

Steve Matchett

When Steve Matchett joined the Chemistry Department in 1991, GVSU was largely a commuter school with an enrollment approximately one third its current size. With construction of the spacious Padnos Hall years away, Steve found himself sharing an office with three other faculty members in what was then known as Loutit Hall. That was not a bad thing he says, noting the cooperative nature of the department: "I greatly appreciated the support that I received from the other faculty". Transitioning back to academia after a number of years as an industrial chemist, his decision to join the GVSU faculty was due to what he saw as the student-centric learning environment, as well as the freedom to innovate. "They told me that I could redesign the first semester of general chemistry—moving from a somewhat rote approach toward a deeper content with a major focus on why things were true, not just that they were true", he explains. Steve taught in the general chemistry sequence every semester for the last 30 years, earning an array of teaching awards, including University Outstanding Teacher in 1997.

Retirements continued on next page…

With his training in inorganic chemistry, Matchett was heavily involved in designing and teaching courses such as Advanced Inorganic Chemistry and Synthetic Inorganic Chemistry. He also played a major part in developing department instrumentation and facilities, spearheading the acquisition of a research-grade NMR and bringing air-free synthesis techniques to GVSU—a rarity for undergraduate programs. Matchett ran a very active research lab studying how bound metals affected the reactivity of olefins, and shared his love of organometallics with many students over the years in a course on that subject that he developed. He enjoyed one-on-one time with the many research students who worked in his lab, and says he "especially cherished long conversations about life and science as we worked on expanding their synthetic skills".

Matchett contributed much to GVSU life beyond his teaching and research endeavors. He participated in a large number of university and department committees, including stints chairing the College Faculty Council and University Teaching Effectiveness Committee. He also served as head instructor and faculty mentor for the GVSU Kung Fu club for over 25 years, twice taking groups of students to further their martial arts skills in China. These and many other contributions were acknowledged with the CLAS Lifetime Faculty Service Award in 2015.

Looking back over the last 30 years, Matchett sees much more than just growing enrollment and new buildings at GVSU: "Through hard work and commitment, our faculty have built a strong reputation for producing outstanding graduates, ready for success in graduate and professional schools." As he moves into retirement, Steve looks forward to travelling, attending music festivals, and continuing a long-time hobby of tie-dying. "What I will miss the most is my time in the classroom with students," he says. "The bond between student and faculty must be nurtured and grown each semester, and in its absence, the teaching can suffer. Teaching students to think deeply and the building of mutual trust are, for me, the heart of the art of teaching."

Karen Matchett

Karen Matchett retired in May 2021 after serving as Organic Lab Coordinator since 2006. She is widely acknowledged for keeping the organic lab courses running smoothly year-after-year through her dedicated efforts in curriculum development and instructor training. When asked what attracted her to the position at GVSU, she noted, "I liked the variety of teaching, writing, lab-work and especially troubleshooting!". Before she took on the coordinating duties, she was a long-time instructor, noting that over the years, she taught all of the organic lab offerings. She also had a significant impact in service efforts, including long stints as a key organizer of the Regional Science Olympiad tournament, as well as work on the Administrative Professional Committee. For these efforts, she received the CLAS Administrative and Professional Service to the Community Award in 2017.

With her office attached to the main department complex, Karen brought her upbeat energy in every morning, and she especially enjoyed hanging out with Michelle DeWitt, Jennifer Glaab and Janet VanRhee. While much has changed over her time at GVSU, she notes some important things have stayed constant: "Even though it has grown so much, our department remains a very caring group of people who always put students' interests first". Now that she is retired, she is looking forward to not grading so many labs, and "being outdoors as much as possible".

Jim Krikke

In September of 2020, Jim Krikke retired from his position as Instrument Specialist in the Chemistry Department. Jim honed his instrument skills working for Parke-Davis/Pfizer in Holland for 18 years before joining GVSU in 2004. When making the leap from industry, he found the atmosphere at the university much to his liking. "When I interviewed with Blair [Miller] and Harvey [Nikkel], I was impressed by the friendly working environment and the kind people in the department," he says. "It seemed a bit like Parke-Davis where everyone was on the same team".

Over the years, Jim spent roughly half of his time acquiring, fixing and upgrading department instruments, with the remainder of his efforts devoted to teaching Introduction to Organic and Biochemistry and Environmental Chemistry classes. Krikke notes that over the course of his tenure, the department changed in its utilization of instruments, and it was a challenge to keep control systems up-to-date. "When I started, almost all of the equipment had different operating systems, but I was able to work with vendors to get most of our equipment running on a single platform which eased the learning curve for using equipment." For his constant efforts to keep a vast stable of equipment smoothly functioning, Krikke received the Administrative and Professional Service Award in 2016. After finishing his time at GVSU, he and his wife Gale plan to travel and to help out their kids with home maintenance projects.

Annual Student Awards

In April of 2021, the Chemistry Department honored many of its most outstanding students for the 2020-2021 academic year. The award winners in the different categories were as follows:

Excellence in a Discipline Award: The top award for undergraduate Chemistry and Biochemistry majors. To be eligible, a senior, presenting in CHM 491 this academic year, must be a declared chemistry or biochemistry major and have an overall GPA of 3.5 or greater. **Pictured are award recipients Megan Shaw (Chemistry) and Colin McHugh (Biochemistry).**

ACS Analytical Chemistry Division Undergraduate Award: **Olivia Gordon** This award is given to a declared chemistry or biochemistry major who is outstanding in CHM 221 (Analytical Chemistry) and CHM 325 (Instrumental Analysis).

ACS Inorganic Division Chemistry Undergraduate Award: **Gabriel Heselschwerdt** This award is given to a chemistry or biochemistry major that has excelled in the inorganic chemistry courses (Principles of Inorganic Chemistry/Advanced Inorganic Chemistry/Synthetic Inorganic Chemistry).

ACS Physical Chemistry Division Undergraduate Award: **Megan Shaw** This award recognizes a declared chemistry or biochemistry major that has excelled in the upper level physical chemistry sequence (CHM 356/358).

ACS Outstanding Achievement in Organic Chemistry Award: **Jayce Efting** This award is given to a graduating chemistry or biochemistry major who has excelled in a combination of organic chemistry courses (Advanced Topics in Organic Chemistry/Synthetic Polymers/ Organic Synthesis and Characterization) and research and has a desire to pursue a career in chemistry.

Outstanding Undergraduate Research Award: **Michelle Dykstra** In order to be eligible for this award, a declared chemistry or biochemistry major must show outstanding skills, motivation, and progress in undergraduate research.

Green Chemistry Award: **Trevor Beardsley** This award is given to a declared chemistry major who has excelled in the green chemistry courses (Green Chemistry for Sustainable Environment/Green and Environmental Chemistry Laboratory).

Biochemistry Award: **Isabella Purosky.** This award is given to a declared chemistry or biochemistry major who has excelled in the Biochemistry I/Biochemistry II/ Biochemical Techniques sequence.

Senior Chemical Education Award: **Selin Turan** This award is given to a Chemical Education major, typically a graduating senior or other student who has successfully completed Physical Chemistry in Secondary Education (SCI 440) and who has demonstrated professionalism as a preservice teacher.

American Institute of Chemists Award: This award is given to a declared chemistry or biochemistry major who has made significant contributions in service to the department. This year, the winners were **Jayce Efting (Chemistry) and Michelle Dykstra (Biochemistry).**

Outstanding Service Award: This award will be given to a declared chemistry or biochemistry major who has made significant contributions in service to the department. This year's award was given to **Steven Balboa (pictured).**

ALUMNI SPOTLIGHT

DR. JOZLYN CLASMAN '14

B.S. Chemistry (Biotechnology and Biochemistry emphasis)

Associate Scientist, Structural Biologist Agios Pharmaceuticals

You were researching the biochemistry of coronaviruses long before most people had heard of COVID-19. Can you describe your graduate work in this field? At Purdue University in Prof. Andy Mesecar's lab, my research focused on the structure and function of viral proteases from human coronaviruses, MERS and SARS, and animal coronaviruses, FIPV and PEDV. My work identified potential sites for modified vaccine design and developed a guide for protein engineering. The latter can be applied to new emerging coronaviruses, such as SARS-CoV-2 causing COVID-19. My pre-pandemic work also paved the way for present COVID anti-viral drug discovery projects in the lab. Before COVID, there were no treatment options for those infected with a human coronavirus, such as MERS or SARS. It's been amazing to see the advancements in vaccine design and COVID research in such a short time. I am excited to have received the first human coronavirus vaccine in my lifetime.

Why did you choose GVSU and what year did you graduate? Coming from a smaller town out of high school, I was nervous about navigating a large campus at a Big Ten university. My AP statistics teacher highly recommended GVSU to me because it had the infrastructure and facilities you would normally see at a larger university. It also offered a more personalized learning experience with smaller class sizes and more direct interaction with professors. During graduate school (Purdue University), I found out that the graduate students run lab classes as well as study sessions, which made me realize how fortunate I was at GVSU. I graduated with a BS in Chemistry (Biotechnology and Biochemistry emphasis) with a minor in Psychology in 2014.

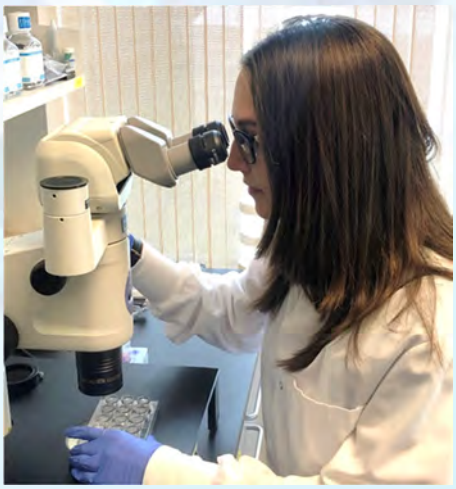
What are you doing today, and how did your education at GVSU help prepare you for your current work? Today, I am an Associate Scientist, Structural biologist at a mid-size biotech company, Agios Pharmaceuticals, located in Cambridge, Massachusetts. I work with a team of chemists, biochemists, and biologists focusing on structure-based drug design and investigating early exploratory targets implicated in genetically-defined disease. On a daily basis, I apply biochemistry and X-ray crystallography techniques and fundamental concepts that I originally learned at GVSU in my biochemistry courses and labs. My first research experience through the Student Summer Scholars (S3) program with Dr. Dave Leonard and Dr. Rachel Powers sparked my initial passion for biochemistry and gave me a clear understanding of what research entails. I felt lucky to have been able to apply graduate level skills as an undergraduate student and develop my skill set early in my career.

What was the biggest surprise for you in the path you have chosen? It's surprising to me that I continue to use techniques I learned at GVSU in my job today. I've been a trained X-ray crystallographer for nearly nine years, and my experience started at GVSU. I also met my postdoc advisor (Dr. Karen Allen, Boston University) at a Chemistry seminar lunch years before I worked in her lab.

What is the most exciting (or gratifying) part of your current work? I love being able to collaborate with people from all different backgrounds that are working towards a common goal in drug discovery. The successes I've had at Agios have been so much more rewarding because everyone can get excited about them.

What advice do you have for GVSU Chemistry students who wish to pursue the same path as you have? For those that are planning to go to graduate school, I would recommend joining a program that offers laboratory rotations because the environment that you work in is just as important as the science. I would also encourage GVSU chemists to go out of their comfort zone to network with people (something as simple as an informational call) to help build your network and learn what opportunities are out there. I was surprised to learn that many scientists in Boston Biotech join the industry right out of their bachelor's degrees.

What do you like to do with your time outside of work? I spend most of my time hanging out with my fiancé, Dan and two kitties, Indy and St Patrick. During the shutdown, I started up Kombucha brewing and cooking HelloFresh meals. Since I'm a Michigander at heart, I love going to the beach and swimming. I recently traveled to Lake Winnipesaukee in New Hampshire. It reminded me of lakes back home but with mountain views.



Faculty Awards

Randy Winchester—Distinguished Undergraduate Mentoring Award

Professor Randy Winchester is a 2021 recipient of the GVSU Distinguished Undergraduate Mentoring Award. Since arriving at GVSU in 2002, Dr. Winchester has mentored 30 undergraduate students in projects focused on synthetic methods of organo-silicon compounds. He notes that his goal is to help students experience the joy and excitement of independent discovery. In receiving this award, Randy was cited for taking the mentoring of undergraduate students very seriously, giving each student the time and attention needed to flourish and find success in their research project. In the words of one of his former research students, "If someone ever asked me if I had ever had a mentor who went above and beyond and really took an interest in my life, my mind would go immediately to professor Winchester".

Laura Hawk—Pew Teaching Excellence Award

Professor Laura Hawk was selected as a recipient of the Pew Teaching Excellence Award for 2021. The criteria for this award stress the use of multiple approaches in instruction and evaluation, as well as the ability to stimulate intellectual curiosity in students. Laura, who splits teaching assignments between organic and biochemistry classes, was recognized for thinking deeply about how to structure her class to optimize student learning. She promotes an actively-engaged classroom, where students regularly work on problems to better explore lecture material and construct their own knowledge. One student noted "Dr. Hawk's own passion for teaching chemistry radiated to me, fueling my own enthusiasm when discussing complex technicalities or real-world applications of chemistry." Professor Hawk joined the Chemistry Department in 2017 and mentors students on a variety of projects involving peptide synthesis and 19F NMR labelling of proteins to study their structure and function.

Felix Ngassa— Glenn A. Niemeyer Award

Professor Felix Ngassa was chosen as the Glenn A. Niemeyer Award winner for 2021. One of the highest honors at GVSU, the Niemeyer Award recognizes faculty who maintain excellence, enthusiasm and loyalty to teaching, scholarship and service. Dr. Ngassa's innovation in the classroom is exemplified by his development of inquiry-based activities for organic chemistry labs and his use of web-based tools for both formative and summative assessment. He mentors a large number of undergraduates on organic synthesis projects, resulting in numerous conference presentations and published manuscripts. In addition to these extensive efforts in the classroom and research lab, Felix is known for a robust commitment to service opportunities. Most notably, his long-term involvement in faculty governance has been capped by a four-year stint as Chair of the Executive Committee of the Senate. Noting the difficult circumstances faced by the University during the pandemic, one colleague praised his "unwavering optimism and positive attitude as he has taken on these unimaginable challenges".

Jill Morris—CLAS Teaching Excellence Award for Affiliate Faculty

The 2020 recipient of the CLAS Teaching Excellence Award for Affiliate Faculty was Jill Morris. This award was established to recognize the work of distinguished Affiliates teaching the introductory level classes. The award is given to instructors who connect with students to provide positive relationships and academic support, who use highly effective practices in teaching and who engage students and stimulate intellectual curiosity. One of her colleagues in the organic group notes her dedication and hard work: "Jill will always do what she feels is pedagogically correct for her students, regardless of the level of work it requires of her". Students praise her organization and clarity, and appreciate her willingness to connect with them as individuals: "Professor Morris is amazing at lecturing and clearly shows she cares about how well we do."

Brad Wallar— CLAS Lifetime Faculty Service Award

Professor Brad Wallar was selected as the College of Liberal Arts Lifetime Faculty Service Award for 2021. In receiving this award, Wallar was recognized for a broad array of diverse service activities in his 18 years at GVSU. Many of these efforts reflect his passion for the support and development of programs that promote undergraduate research at GVSU, such as starting a Biochemistry-themed student club, heavy involvement with the McNair and RISE student research programs and leading the University Research and Development Committee. He has developed a reputation for energy and competence in a long list of other service work including Science Olympiad event supervisor, Transitions leader, first-year faculty mentor and much more. One colleague remarked that "through it all, the central theme on almost all of his service endeavors is the well-being and growth of our students".

Biochemistry major first to explore Genetic Counseling Internship

This past Winter semester, Junior Biochemistry major Molly Lombard participated in an internship with the Genetic Counseling Department at Spectrum Health in Grand Rapids. Because genetic counseling is a fast-growing field that few know about, we asked Molly to share a little about her internship.

What do genetic counselors do?

Genetic counselors combine skills in counseling, genetics, and education in order to support a patient on their journey in determining if they have a genetic condition and what it may be. They will often take a family medical history/pedigree and a personal medical history looking for any clues that may point them in a possible explanation for what the patient is experiencing. These professionals then counsel their patients on the different types of genetic testing they can undergo and what they might uncover. Counseling is so important in this step of the process because it is possible that unexpected results will be obtained from the testing. You might see a genetic counselor if you have a family history of a certain kind of cancer or a certain genetic condition, if a condition is picked up for your child on a newborn screen, if you are planning for a family and want to know of any risks, or if you are experiencing symptoms that another physician may suspect are genetic. Genetic counselors receive referrals for patients and are able to look at their symptoms and prepare for their sessions by researching conditions that may match the patient's medical history.

What areas of medicine does Genetic Counseling cover?

The areas of medicine are really unlimited. Our genes are instructions for our entire bodies, therefore a genetic counselor will ask about every system of the body. The specialties for genetic counselors are mainly pediatric, prenatal, and cancer. Within the specialties there are different clinics that patients can attend for their specific conditions such as a cystic fibrosis clinic or a general neuromuscular clinic. Genetic counselors do not prescribe any medications, however they can help identify a patient's risks or condition so that they can be followed by a specialized provider. A genetic counselor can also work in a lab setting where they can analyze the genetic variants that are picked up on tests that other genetic counselors have ordered.

What kind of science background is helpful for a genetic counselor?

I found that biochemistry provides a very helpful background for a lot of information that will come up in a genetic counselor's research. Being able to explain a condition to a patient in an understandable and educational way requires an in-depth knowledge of how genes and proteins are related and how proteins transcribed affect the body. Having a general understanding of the human body through biology and chemistry classes is also very helpful. Genetic counselors put a lot of time into preparing for sessions with patients by researching conditions and the different variants that can cause them. I found that any science class that involves scientific research will be very helpful. Obviously, genetics classes will be very helpful as well.

What did you enjoy about your internship?

I enjoyed everything about my internship. I was given a genetic counselor at Spectrum Health as my mentor and she ensured that I was able to visit and/or interview every specialty including biochemical, prenatal, pediatric, and cancer. She also set up days where we would both read a journal that is relevant to genetic counseling currently and then we would discuss it. I learned a lot about a plethora of conditions and the genetic variants that cause them. It was interesting to learn about the specific websites that the genetic counselors use to understand the genetic variants their patients have. With all of the information I learned in my internship I was able to complete a final internship project in the genetics of psychiatric disorders and how genetic counseling may help that.

Did anything surprise you about your work as a Genetic Counseling intern?

I was slightly surprised by the amount of insurance work that a genetic counselor does. However, I know that this work is to make sure that patients are able to afford their genetic testing. I was also happily surprised by the amount of research and reading that go along with working in this profession. I spoke with the other genetic counselors and they all say that they are constantly learning new things, and that is something I really value in a future profession.

What kind of training do you have to have beyond a bachelors?

Your bachelor's degree can be in pretty much anything, but I know some common ones are biology, biochemistry, psychology, etc. There are some certain classes you'll need to have including biology, chemistry (general and organic), biochemistry, psychology, statistics, and genetics. Once you obtain your bachelor's degree and complete all the necessary prerequisites you'll need to apply for a genetic counseling master's degree from an accredited university. Something interesting about the genetic counseling application process is that it is a match process—you are only "accepted" to one school. You can apply to as many as you want and then you are offered interviews. You and all of the schools you interview with then rank each other and it is entered into an algorithm that will match you to the school you'll go to.

What does the future of genetic counseling look like?

Genetic counseling is a rapidly growing field with a projected growth rate of 21% between 2019 and 2029. This is much higher than the average career path in the United States. I am also very hopeful that some new specialties will develop within the field including psychiatric genetic counseling (my internship project).

Richard Lord Receives International Collaborative Grant

Prof. Richard Lord recently learned that he and his collaborators Stanislav Groysman (Wayne State University) and Dimitri Gelman (Hebrew University, Jerusalem) have been awarded a grant from the U.S.-Israel Binational Science Foundation (BSF). BSF promotes scientific relations between the U.S. and Israel by supporting collaborative research projects, focusing on both basic and applied approaches.

What are the scientific goals for this work? The research proposed by the team seeks to develop more efficient methods to oxidize carbon monoxide (CO) in industrial processes. Current catalysts, such as those used in automobile catalytic converters, use metals which are mined in geopolitically-sensitive areas, fairly rare in the environment, and very expensive (*ie.* Pd, Pt, and Rh). Chemists are often inspired by elegant solutions found in nature, and Lord and his collaborators are using the highly efficient enzyme Mo-Cu CO dehydrogenase for insight (Figure 1). This

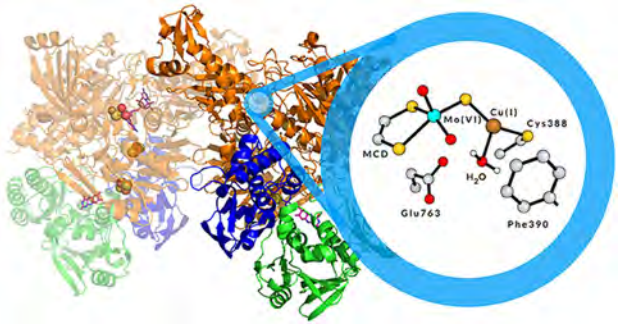


Figure 1. Image of the MoCu-CODH enzyme with Mo(VI)/Cu(I) active site modified from Rovaletti, A.; Bruschi, M.; Moro, G.; Cosentino, U.; Greco, C. *Front. Chem.* **2019**, *6*, 630.

enzyme uses a heterobimetallic active site combining a late metal (Cu) for CO binding and an early metal (Mo) for oxidation. Previously, the Groysman and Lord groups reported a synthetic compound featuring the same two metals that oxidizes an imine in the ligand backbone (*Dalton Trans.* **2018**, *47*, 10017-10024). Their goal is to build on this initial success and nudge the compound toward CO catalysis, and rational ligand improvements showed that Cu can bind exogenous ligands (Figure 2, *Inorg. Chem.* **2021**, *ASAP*). The hope is

Figure 2. Image of the ligand designed by Groysman and Lord with Cu(I) (gold sphere) and Mo(VI) (teal sphere) bound to the second generation ligand.

that eventually such catalysts might find a role removing CO from waste streams in power plant scrubbers and other similar applications.

How is this grant unique? The collaborative nature of this grant is key, and each of the three labs brings distinct skillsets. In the U.S., the Groysman group has expertise in designing biomimetic metal catalysts, and through a long-standing collaboration, Lord's group uses computational methods to provide predictions of reactivity and mechanism for these new compounds. As the newest addition to the team, the Gelman group in Israel will use synthetic approaches to improve the ligands holding the metals, hopefully moving proof-of-concept compounds closer to the ultimate goal: efficient elimination of CO.

How will this impact GVSU students? The grant provides funds for four years of research, providing research supplies and a stipend, and conference travel funds for one student per summer. Lord has a long history of training undergraduates in using computational approaches for tough research challenges, but notes that students will benefit whether or not they become full-time computational chemists. "Thinking about how chemistry happens at an atomic level helps us better understand macroscopic observations of new chemicals", he notes.

RESEARCH SPOTLIGHT

Professor Marshall Werner

What is the goal of your research?

Our research examines natural snake venom inhibitors found in the North American opossum (*Didelphis virginiana*). The N. American opossum is highly resistant to most poisonous viper species of snakes including Eastern and Western diamondback rattlesnake, copperhead, and cottonmouth as well as many South American viper species. There are several proteins that opossums produce that inhibit the most destructive components in these viper venoms. We are interested in better understanding the structure and mechanism of action of these opossum proteins with the hope of developing novel snakebite envenomation treatments. To do this, we have put the DNA that encodes these proteins in the opossum into bacteria allowing us to obtain large quantities of these proteins for further study.

Prof. Werner and Biochemistry major Allison Soffa purifying anti-venom proteins.

How did you get interested in this project?

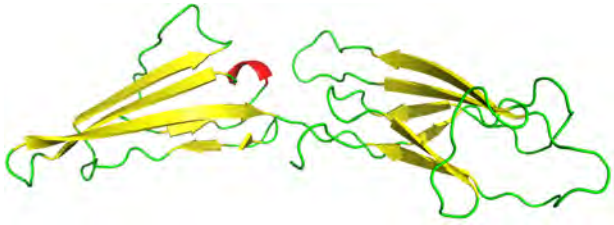
My father was a veterinarian in the US Army, and in the mid-1970s his research showed that the opossum was resistant to viper venom, in some cases up to 100-times the lethal dose, as determined in mice. Since that time, several other research groups have identified and characterized the protein inhibitors found in the opossum, but they have not been able to explain their mechanism of action. Fortunately, my father is still able to participate in the research as a consultant.

What is the Eastern Massasauga rattlesnake?

The Eastern massasauga (*Sistrurus catenatus*), sometimes called the "Michigan Rattler", is a small poisonous rattlesnake that lives in shallow wetlands throughout the Mid-West, with the largest populations being found in Michigan. Their numbers have been steeply declining over the past several decades due to loss and fragmentation of its wetland habitat, and in 2016 they were classified as "threatened" under the Endangered Species Act. It is not known if the opossum proteins we are working on would provide resistance to massasauga venom, and we are currently working with the folks at the John Ball Zoo here in Grand Rapids to address this question.

What do you like about doing research at GVSU?

Since many of our biochemistry majors ultimately plan on attending medical school, I felt this type of research would provide a "real-world" medical application for undergraduates interested in biochemistry research. Fortunately, the world-class facilities at GVSU's Cook-DeVos Health Sciences (CHS) center are a perfect environment to introduce undergraduates to this type of research. Honestly though, most of my students have simply expressed that they think working on snake venom research is "cool". I have to admit, I think so too!



A model of the viper venom inhibitor protein from the North American opossum

Faculty News and Research Highlights

Dr. Shannon Biros and her research group, in collaboration with Chemistry colleague **Dr. John Bender**, continue to synthesize novel compounds for use as lanthanide and actinide extraction agents.

Dr. Paul Cook and his students continue to use X-ray crystallography and steady-state kinetics to study enzymes involved in the metabolism of bacillithiol, a low-molecular-weight thiol found in gram-positive bacteria. These projects include studies of several enzymes that utilize bacillithiol as an antioxidant or detoxifier as well as a collaboration with **Dr. Mary Karpen** focusing on the mysterious BshC enzyme, which catalyzes the final step in bacillithiol production.

Dr. Julie Henderleiter delivered an oral presentation at the virtual American Educational Research Association Annual Meeting 2021, April 11, 2021: Interdisciplinarity, Artistry, and Curricular Complexity: A Design and Evaluation Model Using Educational Criticism and Connoisseurship, Amy Masko; Julie Henderleiter; Lisa Kasmer; Keith Oliver; Kristofer Pachla; Tamara L. Shreiner; Janet Vigna; Paul Woo Dong Yu.

The lab of **Dr. Andy Lantz** continued its focus on three broad research projects including a) the development of organic redox electrolytes for energy storage in flow batteries, b) the development of a capillary electrophoresis based method for analysis of microorganisms, and c) the analysis of primate olfactory compounds using portable gas chromatography-mass spectrometry instrumentation. With support from the Student Summer Scholars (S3) Program, Andy and student Olivia Gordon worked on a project "Development of a Method for Detection, Characterization, and Quantitation of *Streptococcus mutans* via Capillary Electrophoresis."

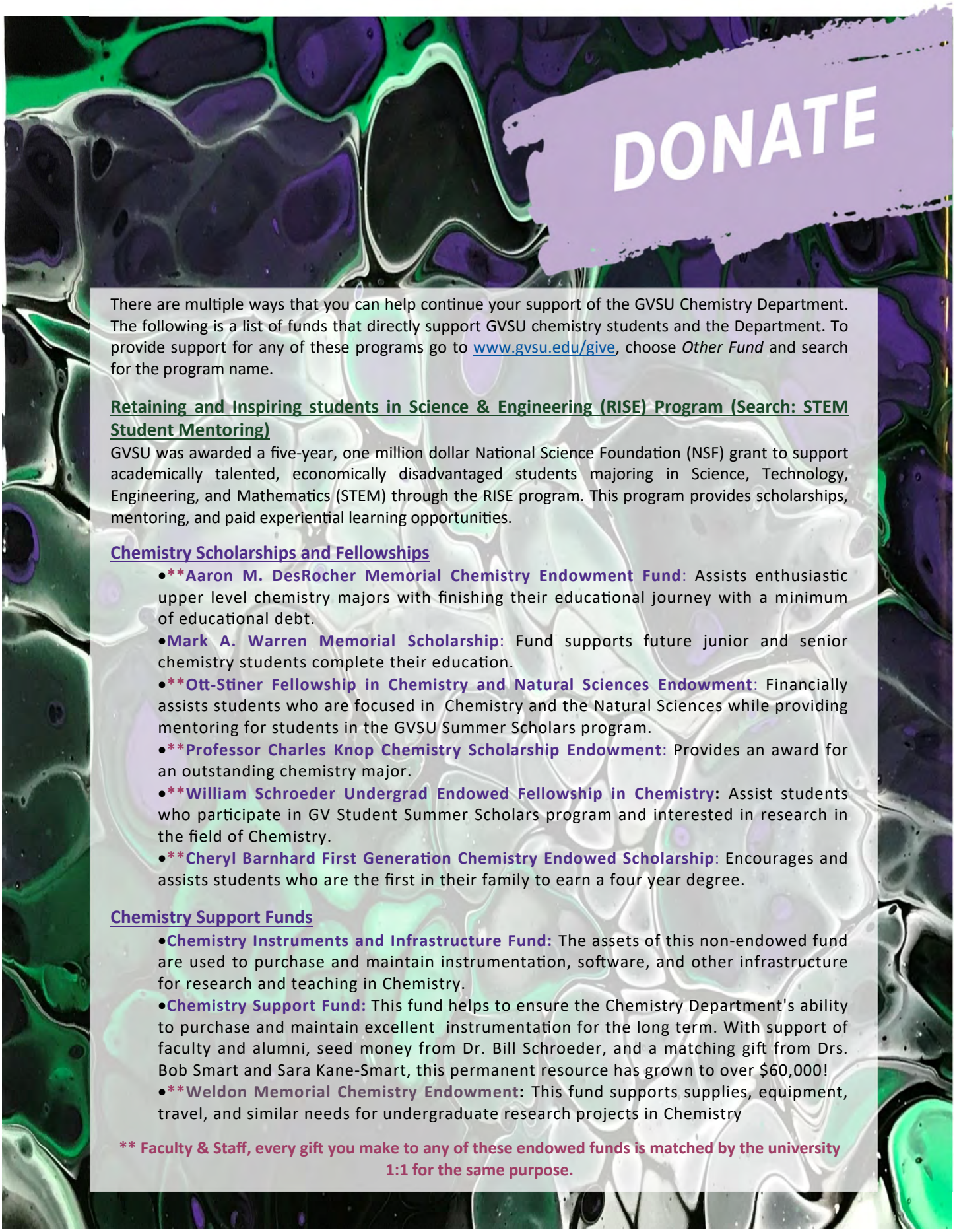
Dr. Felix Ngassa continued his work in synthetic organic and computational chemistry. Together with former student Brock Stenfors, Ngassa published a manuscript in the European Journal of Chemistry titled “The Synthesis and Crystallographic Characterization of 4-methylbenzenesulfonamide Derivatives”. Felix is serves as the Chair of the University Academic Senate (UAS) and the Executive Committee of the Senate (ECS), and was co-chair of the Search Committee for the Provost and Executive Vice President for Academic Affairs.

Dr. Rachel Powers continues to work with GVSU colleagues **Drs. Dave Leonard** and **Brad Wallar**, and collaborators Dr. Robert Bonomo (Case Western) and Drs. Fabio Prati and Emilia Caselli (University of Modena) on a recently renewed NIH R01 grant to study resistance mechanisms in *Acinetobacter baumannii*. Rachel reports: “In March 2020, I had just begun work on my Fulbright project with Drs. Gabriel Gutkind and Pablo Power at the Universidad de Buenos Aires in Argentina when all Fulbright scholars were required to return to the U.S. due to the pandemic. This was unfortunate since we had been making plans for this project for almost two years. However, Pablo and I decided to apply for an NIH grant (R01 International Research in Infectious Diseases; IRID) as way to continue our collaboration. We submitted this grant in July 2020 and received mostly favorable reviews.”

Dr. Stephanie Schaertel devoted most of academic year 2020/2021 research time to a theory project involving the construction of a semi-classical treatment of non-resonant terms in light absorption. She is happy to be back in the lab again with a student for Fall 2021, measuring pressure broadening coefficients for carbon monoxide.

Dr. Brad Wallar continues collaborative work with fellow GVSU chemists **Rachel Powers** and **David Leonard**, as well as the labs of Robert Bonomo at Case Western Reserve University and Fabio Prati and Emilia Caselli at Università Degli Studi di Modena, Italy. Their work on class C and class D β-lactamases is supported by NIH R01 collaborative grant "Understanding β-lactam resistance in *Acinetobacter baumannii*". This collaboration lead to a journal article in Diagnostic Microbiology & Infectious Disease entitled *A comprehensive and contemporary snapshot of β-lactamases in carbapenem resistant Acinetobacter baumannii*. A second article, Structural insights into inhibition of the Acinetobacter derived cephalosporinase ADC-7 by ceftazidime and its boronic acid transition state analog, was published in Antimicrobial Agents and Chemotherapy by Wallar and Powers and student co-authors Brandy Curtis, Kali Smolen and Sarah Barlowe. Current lab member Micah Fernando was a recipient of the Goldwater Scholarship.

Dr. Marshall Werner’s lab is investigating the snake venom inhibitors from opossum blood. He and GVSU students Lauren Miling, Brianna Elliot and Mitchell Hawes published a paper titled "Bacterial Expression of a Snake Venom Metalloproteinase Inhibitory Protein from the North American Opossum (*D. Virginiana*)" in the journal *Toxicon*.



There are multiple ways that you can help continue your support of the GVSU Chemistry Department. The following is a list of funds that directly support GVSU chemistry students and the Department. To provide support for any of these programs go to www.gvsu.edu/give, choose *Other Fund* and search for the program name.

Retaining and Inspiring students in Science & Engineering (RISE) Program (Search: STEM Student Mentoring)

GVSU was awarded a five-year, one million dollar National Science Foundation (NSF) grant to support academically talented, economically disadvantaged students majoring in Science, Technology, Engineering, and Mathematics (STEM) through the RISE program. This program provides scholarships, mentoring, and paid experiential learning opportunities.

Chemistry Scholarships and Fellowships

- ****Aaron M. DesRocher Memorial Chemistry Endowment Fund**: Assists enthusiastic upper level chemistry majors with finishing their educational journey with a minimum of educational debt.
- **Mark A. Warren Memorial Scholarship**: Fund supports future junior and senior chemistry students complete their education.
- ****Ott-Stiner Fellowship in Chemistry and Natural Sciences Endowment**: Financially assists students who are focused in Chemistry and the Natural Sciences while providing mentoring for students in the GVSU Summer Scholars program.
- ****Professor Charles Knop Chemistry Scholarship Endowment**: Provides an award for an outstanding chemistry major.
- ****William Schroeder Undergrad Endowed Fellowship in Chemistry:** Assist students who participate in GV Student Summer Scholars program and interested in research in the field of Chemistry.
- ****Cheryl Barnhard First Generation Chemistry Endowed Scholarship**: Encourages and assists students who are the first in their family to earn a four year degree.

Chemistry Support Funds

- **Chemistry Instruments and Infrastructure Fund:** The assets of this non-endowed fund are used to purchase and maintain instrumentation, software, and other infrastructure for research and teaching in Chemistry.
- **Chemistry Support Fund:** This fund helps to ensure the Chemistry Department's ability to purchase and maintain excellent instrumentation for the long term. With support of faculty and alumni, seed money from Dr. Bill Schroeder, and a matching gift from Drs. Bob Smart and Sara Kane-Smart, this permanent resource has grown to over $60,000!
- ****Weldon Memorial Chemistry Endowment:** This fund supports supplies, equipment, travel, and similar needs for undergraduate research projects in Chemistry

**** Faculty & Staff, every gift you make to any of these endowed funds is matched by the university 1:1 for the same purpose.**

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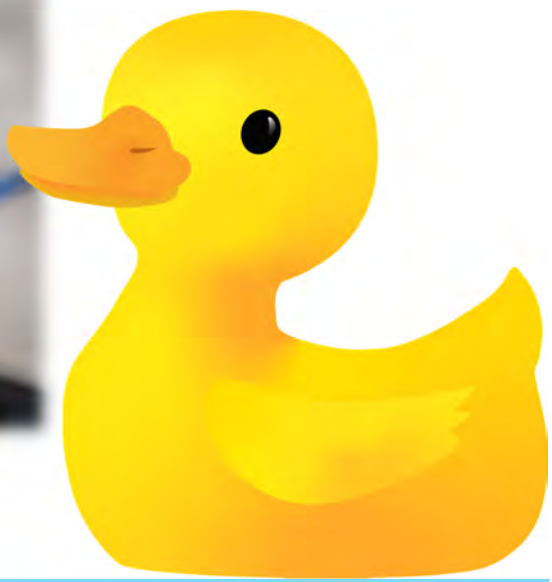

CHM 115 student Julia Woolman's service dog Zeek wears "doggles" so he can help out in the lab

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