Chemistry Department Newsletter

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GRAND VALLEY STATE UNIVERSITY
DEPARTMENT OF CHEMISTRY

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A Word from the Chair

By Deborah Herrington

I am certain that nobody predicted that 2020 would look anything like this! Everyone in the Chemistry Department joins me in hoping that all of you and your families are staying healthy, both physically and mentally, during these unprecedented and uncertain times.

I am sure you all remember what a dedicated, caring, and collaborative group of people makes up the GVSU Chemistry Department. Never was that more evident when in March we found ourselves with just a couple of days to get our courses, including all of our labs, ready for remote instruction. Faculty quickly came together to share resources and expertise, helping each other out any way they could. For example, Dr. David Leonard was skilled in developing online assessments through Blackboard, our course learning management system. He offered a workshop to help other faculty learn how to efficiently and effectively develop online assessments, and he graciously shared his extensive database of questions. Dr. Brittland DeKorver created a Facebook site called Strategies for Teaching Chemistry Online, for faculty globally to share resources; this site had over 1500 members by the end of the first week! It now has over 4000 members from around the world actively contributing to the conversations about online chemistry instruction.

Though summer in the Chemistry Department is generally when we focus more time on undergraduate research, much research was put on hold this summer. During May and June we were under a stay-at-home order, and for much of the summer the University was making plans to bring people back to campus gradually and safely. But that does not mean people were not hard at work. Over 25 faculty and staff (tenure track, affiliate, visitors, adjuncts, and AP lab coordinators) teamed up to develop online lab modules that were piloted this past summer, allowing our students to earn chemistry credits over the summer. These modules focus on skills, such as data analysis, that students can meaningfully develop outside of a physical laboratory. The online modules were used this fall, as our physically-distanced laboratories accommodate fewer students face-to-face. These online modules will help us create a full, rich laboratory learning experience even during a pandemic.

Several faculty and staff (Michelle DeWitt, Felix Ngassa, Tom Pentecost) joined me in serving on task forces this summer to develop policies, procedures, and resources to support faculty and students. Additionally, all Chemistry faculty completed certification in online education to help prepare us to meaningfully support students in the learning of chemistry in this challenging environment.

And we cannot let this summer pass without examining our role in fully supporting all members of the Laker community. As the Black Life Matters movement has shown us, implicit bias impacts us all. We recognize the need to continue our efforts to increase the

diversity of our Department and create a safe and inclusive environment for every faculty, staff, and student.

These times are hard. If you are someone who is in need of support, remember that you are a Laker for a Lifetime and GVSU offers many benefits and supports to its alumni (https://www.gvsu.edu/alumni/). If you are looking for a way to give back, many of our students are experiencing additional hardships. The Student Support Fund (https://www.gvsu.edu/giving/) is a special fund designed to help students who experience unexpected financial or personal hardship, as quickly as needs are identified. Supporting one another is the hallmark of a Laker - Lakers Together! (See page 11 for giving opportunities.)

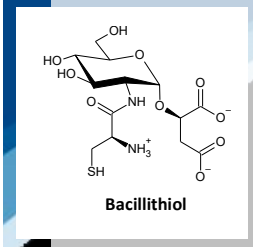
LAKER for a Lifetime
GRAND VALLEY STATE UNIVERSITY

Paul Cook receives $375,000 NIH grant

NIH National Institutes of Health

Professor Paul Cook, a biochemist in his 8th year at GVSU, recently had his NIH R15 grant renewed. This ~ $375,000 award from the Institute of General Medicine at NIH, will keep him and his students busy in the lab for over 3 years. We asked Paul a little more about his research program.

The subject of your grant is a compound called bacillithiol—can you tell us a little more about why that compound is interesting and important?

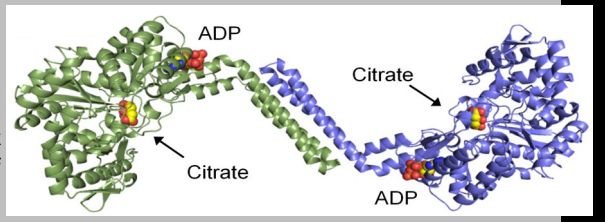


Bacillithiol

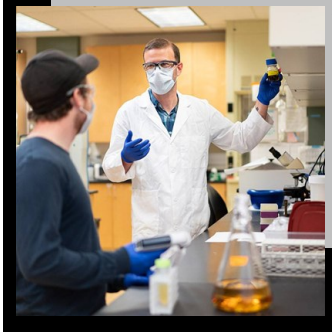
Bacillithiol is a glucosamine-based thiol antioxidant produced by many gram-positive bacteria, including the pathogenic organisms *Bacillus anthracis* and *Staphylococcus aureus*. It is involved in the maintenance of redox homeostasis and detoxification of endogenous or xenobiotic toxic compounds, including the FDA-approved antibiotic fosfomycin. My students and I use X-ray crystallography, small-angle X-ray scattering, and steady-state kinetics to further characterize the enzymes involved in the biosynthesis of bacillithiol. We are hoping our research will provide a foundational understanding of these enzymes and ultimately give direction to the design and characterization of inhibitors capable of disrupting bacillithiol metabolism in an effort to combat microbial resistance to fosfomycin and identify new therapeutic avenues.

It is pretty rare to have undergraduate students involved in protein X-ray crystallography—how does that work at GVSU?

The students can do almost all of the preparatory work—molecular cloning of genes, protein purification and protein crystallization—right in our lab in the CHS building in downtown Grand Rapids. The X-ray diffraction part is the key to getting good atomic-level structures, and we are fortunate to have a strong relationship with the Argonne National Lab just outside of Chicago. We pack our crystals up in liquid nitrogen and drive them down to Illinois to make use of the world-class synchrotron at ANL. The students get hands-on experience with everything: the safety procedures, handling the robots that move the crystals into the beam, and collecting the data.



Structure of BshC determined by the Cook lab



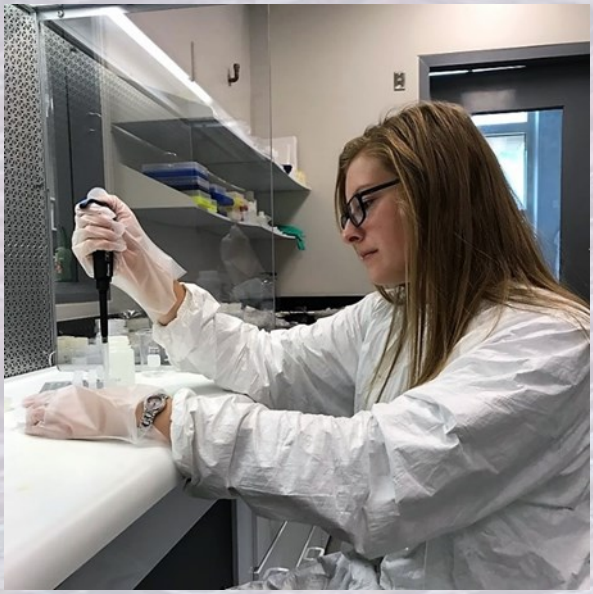
The R15 grant is targeted towards undergraduate-focused schools like GVSU. Why did you seek a position at such a school?

For me, the environment at GVSU provides a sweet-spot between two things I enjoy immensely: teaching biochemistry to undergraduates and being able to carry out research at the highest level. The students can make great contributions to answering important research questions. They often present their findings at research conferences, and even serve as co-authors on publications. This kind of immersive experience is huge for their professional growth.

Alumni Spotlight

Jody Wycech B.S. Chemistry, 2012

Geochemist with the United States Geological Survey



Why did you choose GVSU and what year did you graduate? I chose GVSU because the curriculum within the Chemistry Department and beyond provided me with a diverse background in the environmental sciences. Coming from a small all-girls Catholic high school I wanted to attend a larger college, but I felt like I would have been too overwhelmed to find my place in the huge state schools. GVSU offered a balance of big school opportunities with small class sizes and personalized attention from professors. I subsequently became a teaching assistant at a large state school (Wisconsin), which made me realize how lucky I was at GVSU to have professors leading labs and discussions as well as lectures. I graduated with a BS in Chemistry (environmental emphasis) and minors in Business and Geology in 2012.

What are you doing today, and how did your education at GVSU help prepare you for your current work? I am now a Chemist in the Petroleum Geochemistry Research Laboratory at the US Geological Survey in Denver. I assist a team of researchers by analyzing biomarkers and stable isotopes in oil and gas samples. On a daily basis I use the concepts and laboratory techniques that I learned in every chemistry class I took at GVSU. Although most of what I do is defined as analytical chemistry, I still apply my knowledge of organic, inorganic, and physical chemistry to understand the degradation and structure of biomarkers, rock mineralogy, and the partitioning of stable isotopes in nature. The laboratory classes at GVSU in particular provided me with a strong science foundation of critical thinking, writing, and notebook documentation. My first research and instrument maintenance experiences with Dr. Min Qi and Dr. Jim Krikke at GVSU were a critical first step for me to understand the demands of research and develop a comfort with the more mechanical aspects of instrumentation.

What was the biggest surprise for you in the path you have chosen? Although I completed a PhD and post-doc, I was most surprised that my primary job duties require laboratory skills and instrumentation experience that I gained at GVSU.

What is the most exciting (or gratifying) part of your current work? I love working at the USGS because I'm directly contributing to an important public service objective - assessing energy resources. The results that I generate better inform researchers and ultimately government policy about the future of oil and gas resources in the US. The assessment includes considerations for ecological impacts and water use, which are important and often overlooked issues in the oil and gas industry.

What advice do you have for GVSU Chemistry students who wish to pursue the same path as you have? I recommend pursuing any opportunity that will provide you with new skills. Geochemistry is a multi-disciplinary science and you never know what opportunities will arise when it comes time to look for a job. Although I am currently focused on analyzing organic biomarkers, the fact that I was familiar with stable isotopes made me a stronger candidate for my current position.

What do you like to do with your time outside of work? My fiancé (Andrew) and I recently bought a house in Denver, so most of our time is spent learning the joys of home ownership. We love to eat and Andrew is a professional brewer so we make a point to visit our local breweries and restaurants on the weekends. We adopted a blue heeler named Pecan who is very attached to us (i.e. needy) and demands that we relax on the couch with her after dinner. Pecan and I enjoy the outdoors so we go on hikes in the mountains and she loves to supervise me as I work in my garden.

Annual Student Awards

In April of 2020, the Chemistry Department honored many of its most outstanding students for the 2019-2020 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. The award recipients were **Andrew LaDuca** (Chemistry) and **Erin Fish** (Biochemistry).

ACS Analytical Chemistry Division Undergraduate Award: **Andrew LaDuca** 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: **Lauren Miling** 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: **Jon Chiaramonte** 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: **Brock Stenfors** 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.

American Institute of Chemists Award: This award is given to a senior chemistry major and a senior biochemistry major who meet all or most of the criteria for the Outstanding Senior Award. This year, the winners were **Brock Stenfors** (Chemistry) and **Shea Siwik** (Biochemistry).

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

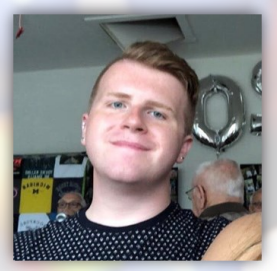
Green Chemistry Award: Nathaniel Dietlin This award is given to a declared chemistry major who has excelled in the green chemistry courses (Green Chemistry for Sustainable Environment/Green and Environmental Chemistry Laboratory).

Organic Chemistry Majors Undergraduate Award: Olivia Gordon. This award recognizes a student that excels in the majors organic chemistry sequence (CHM 245/246/247/248).

Biochemistry Award: **Morgan Klein**. 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: **Charissa Kashian** 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.

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 **Christopher Nostrant** and **Sabrina Jenkins**.



Alumni Spotlight

Steve Asiala B.S. Chemistry 2009

Faculty Engagement Associate with the IDEA Center at the University of Notre Dame

Why did you choose GVSU and what year did you graduate? I earned my degree from GVSU in 2009, and went on to earn a PhD in Chemistry at the University of Notre Dame in 2014. I chose Grand Valley for a number of reasons, but chiefly, it seemed like a good launch pad for someone like me; I was an ambitious kid from a super small town in northern Michigan. When I traveled to Allendale for an indoor track meet as a high school student, GV's farm-surrounded campus made it feel like home, but the main campus was still only a 30 minute ride on the Campus Connector bus from the second largest city in the state, with its people, concert venues, restaurants, nightlife, etc. This was really appealing to me, and GV turned out to be a great fit in many ways.

What are you doing today, and how did your education at GVSU help prepare you for your current work? Today, I work as the Faculty Engagement Associate in the IDEA Center at the University of Notre Dame. The gist of my role is to work alongside faculty and researchers to disclose inventions and technologies (i.e. intellectual property) emanating from their academic research so that our team can help build them into successful commercial ventures. I support the work of the IDEA Center to build a hub for commercialization, entrepreneurship, and innovation amongst the extended Notre Dame and regional communities. My education at GVSU prepared me well by giving me a strong base for building new understandings, including depth of knowledge in technical subject areas, and a breadth of awareness in a number of others. Deep technical knowledge has been incredibly useful in previous roles I've held pursuing an academic career (PhD student here at ND, postdoc at the University of Strathclyde in Glasgow, Scotland), and the combination of depth and breadth is critical to success in my current role.

What was the biggest surprise for you in the path you have chosen? The path I've chosen is surely not the one I envisioned when I started at GV; in the fall of 2004, my dream gig was to teach high school chemistry and coach a school's track team! Some surprises since that fall include catching the "research bug" working with Prof. Schaertel, pushing my boundaries to play music in public, enrolling in a PhD program, somehow finishing that, moving to Scotland for a postdoc job to pursue the academic career track, abandoning that same track approximately nine years in, and finding a really gratifying role at the interface between primary research and commercialization. I don't know that anything in that long sentence felt like that big of a surprise in the moment, but millions of subtle shifts, and a handful of big ones, have resulted in a surprising change over time.

What is the most exciting (or gratifying) part of your current work? Exciting? I love learning about the specific challenges academic researchers are working to address, and the myriad ways they pursue solutions. There are SO many really smart and creative people-- at Notre Dame, Grand Valley, and across the world-- working on incredibly hard problems, and it gives me a jolt every time I learn about a new, clever problem/solution combination. Gratifying? For a long time, I thought that having broad interests and knowledge-base were a detriment to my professional development-- if I could put my blinders on, focus my energies, and care about only one thing, then I'll be successful-- but I've really come around on this as of late. Being able to zoom in and out on a particular scene, and seeing things in multiple contexts, has been a great asset and differentiator as I've carved out a career path.

What advice do you have for GVSU Chemistry students who wish to pursue the same path as you have? I have two thoughts that come to mind immediately, though perhaps they're not specific to the path I've chosen personally- 1) Stay curious and interested! If something makes you tilt your head sideways and go "Hrmm...", latch onto it! And 2) work to find the sweet spot between "being gritty" when things aren't working, and pivoting toward new, different, and maybe even better things.

What do you like to do with your time outside of work? My wife, Heather (GVSU '10, ND MNA '15), and I just bought a house in South Bend earlier this year, so I spend an embarrassing amount of time trying to get grass to grow and/or not grow in incredibly specific places. In addition, I keep busy running, listening to podcasts about sports, culture, economics, and politics, playing the guitar, and when allowed, traveling. Remember traveling?! However, we're also expecting our first child in early 2021, so I'm anticipating that my answer to this question will be wholly different in just a few months, and that's super exciting.

Wishing everyone in the GVSU Chemistry community all the best for the remainder of 2020, and 2021! Stay safe and healthy!

Dr. Laurie Witucki broadcasting her organic chemistry lecture through her iPad.

Faculty Awards

Sue West—Pew Teaching Excellence Award for Part-Time Faculty

Professor Elizabeth "Sue" West is a 2020 recipient of the Pew Teaching Excellence Award for Part-time faculty. In choosing West, who has worked at GVSU since 2003, the selection committee noted that she is able to connect and guide Grand Valley students, whether in entry-level chemistry courses or organic chemistry for upper-level students. Using a variety of pedagogical tools, her empathy and personal connections invite these students into complex material requiring mastery before advancing. Despite these high stakes, students praise and express gratitude for the opportunity to learn with her. In the words of a student, "I am extremely thankful to Professor West for investing in my education and supporting me as a person, not just another student. She is a remarkable professor who truly cares for her students."

Dave Leonard—Pew Teaching Award

Professor Dave Leonard was selected as a recipient of the Pew Teaching Excellence Award for 2020. 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. In choosing him for this award, GVSU notes that Leonard's teaching style incorporates active learning and evidenced-based pedagogies that ensure every chemistry student has the opportunity to succeed. One student noted that Leonard "excels at the information he is teaching and truly explains it in the best way possible. The way he teaches allows for students to succeed and retain what truly matters." Leonard, a biochemist who joined the Chemistry department in 1998, maintains an active research lab and has mentored more than 50 undergraduates in the study of protein chemistry and enzymology.

Tom Pentecost—Student Award for Faculty Excellence

Professor Tom Pentecost was selected as the GVSU Student Award for Faculty Excellence recipient for 2020. The GVSU Student Senate solicits nominations from students and then selects the winner. This award is then presented by the GVSU Student Senate at the President's Ball. Tom brings his in-depth knowledge of Chemical Education research to a number of Chemistry and Honors courses. One student noted "it is apparent from his teaching and the enthusiasm he brings to class every day that he enjoys what he does and is very passionate about it. That rubs off on the students and makes learning more fun and enjoyable."

Professor Felix Ngassa leads the University Academic Senate

The GVSU Chemistry Department has long history of faculty leadership at the College and University level. During the last year—one of the most turbulent periods in the history of the University—our colleague Felix Ngassa has served as Chair of the University Academic Senate (UAS) and the Executive Committee of the Senate (ECS). We asked him to give some insight into the role of faculty governance in steering an academic institution through a crisis.

When did you first get involved in faculty governance, and what motivated you to do so?

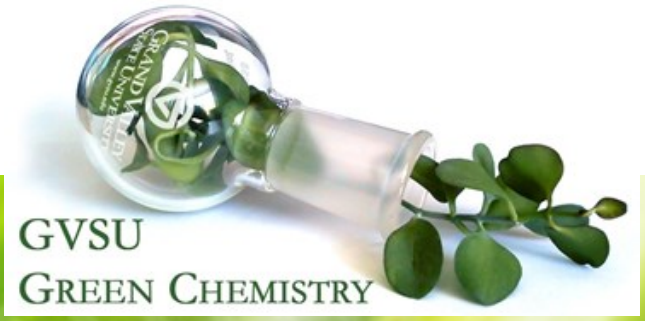
I first got involved in faculty governance when I was elected to the University Faculty Grievance Committee for a 3-year term in 2005-2008. Faculty in the Grievance Committee are in a pool and are called to serve only when selected in the event of a grievance. The first semester of my election, I was selected to serve in a grievance. The work of the Grievance Committee was coordinated by Human Resources and our report was submitted to the President. Serving in the Grievance Committee gave me a broad perspective about the university as I interacted with university administrators and faculty from other colleges. I realized that I liked that kind of service that did not confine me to the Chemistry Department. Also, it should be noted that during that period, I started my MBA at the Seidman College of Business in 2005, which I completed in 2007. From the courses in Leadership, Organizational Dynamics, Strategy, Management, etc. from my MBA education, I had a renewed interest in leadership and was motivated to seek more opportunities in faculty governance. I was elected to serve in the University International Education Committee from 2007-2013. I was elected to serve in the University Academic Senate and the Executive Committee of the Senate in 2013 for an initial 3-year term. I was subsequently reelected in 2016 and 2019. My current term expires in winter 2022.

How has faculty governance made a positive difference in the GVSU Response to the COVID-19 Pandemic?

Before answering this question, it is important to explain how faculty governance through our Shared Governance Process deals with academic issues and faculty concerns. The University Academic Senate (UAS) is the highest faculty governance body, which has authority to deal with any academic issue or faculty concern. Actions from the UAS result in recommendations to the Provost and/or the President. When we got hit by COVID-19 in Winter 2020, the university had to take emergency measures to ensure that our operations would remain functional and teaching/learning would continue safely. Faculty governance was very instrumental in its partnership with the administration to make sure that we had policies and guidelines in place to make seamless transition from traditional learning to remote learning. The UAS unleashed the power of its standing committees to help in the formation of policies within the framework of our Shared Governance Culture. The Academic Policies and Standards Committee (APSC) made sure there were temporary COVID-19 policies for attendance and grades to protect the students. The Faculty Personnel Policy Committee (FPPC) put together temporary personnel policies dealing with teaching evaluation, contract renewal, salary evaluation and tenure and promotion. The Faculty Salary and Budget Committee (FSBC) provided guidance on faculty workload as it relates to university budget and also provided guidance on some general strategies to protect the fiscal health of the university. The ECS/UAS and its standing committees also worked in collaboration with the administration to design and implement policies for the health and safety of the GVSU community. The policy on mask and the policy on assessment and testing are just a few examples. Working in partnership with the administration, faculty governance made sure that our response to the pandemic followed the science, such as the guidelines from the CDC. Faculty governance advocated for flexibility and accommodation; this is shown in the multiple options in teaching modalities in order to accommodate faculty and students.

In what ways do you think university level education will be permanently changed by the crisis we are going through?

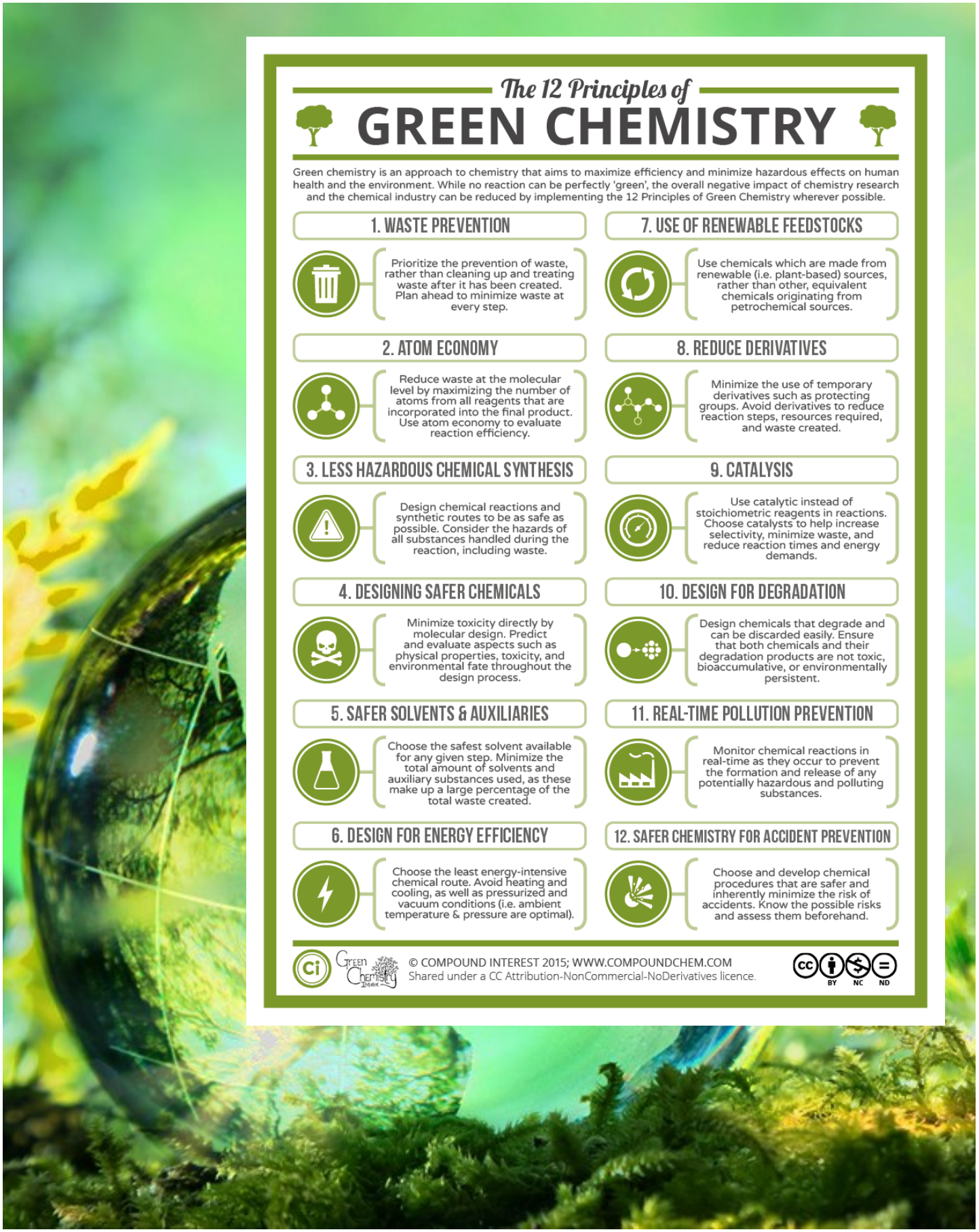
Higher education is going through a transformative period as a result of the COVID-19 pandemic. With many classes offered through remote teaching modalities, many faculty and students are missing that very special connection between faculty and students, which is only possible through face-to-face teaching. In some cases, the quality of education offered through remote and online teaching has been called to question. A major change I see in university level education going forward is a shift to blended teaching and learning; more online and in-person hybrid formats. I think going forward, there would be an increase in accelerated programs and more students preferring part-time options. I also see a rise in the interest of academic programming that is much more focused; micro-credentials that are tailored to specific career goals, for example. The public will continue to question the need, relevance, return-on-investment, and value of higher education. Universities will have to make changes to adapt to the current generation of students who have been exposed to remote learning options that were not considered very viable a couple of years ago.



Did you know?...in addition to three majors and a minor, the GVSU Chemistry Department offers a Certificate in Green Chemistry. Our emphasis on Green Chemistry training is part of the larger GVSU commitment to Sustainability and can provide outstanding value to an already highly-marketable degree. This training centers around the 12 principles of Green Chemistry (see opposite page), which have grown increasingly important as companies and other institutions seek to decrease their environmental footprint, and increase responsible uses of resources. Paying attention to the principles of Green Chemistry is about much more than environmental impact—it can affect the bottom line. The use of less solvent or more efficient catalysts not only reduces the amount of waste to be disposed, but cuts costs and can increase competitiveness. According to GVSU professor and Green Chemistry expert Dr. Dalila Kovacs, "Every single employer—big or small—is aware of the need for sustainable business, and sustainable business means Green Chemistry".

In 2014, the Chemistry Department signed the Green Chemistry Commitment, an initiative started by the organization Beyond Benign. In doing so, the department pledged to include training in Green Chemistry throughout our curriculum. In some cases this has led to the creation of new courses such as CHM 421 *Green Chemistry for Sustainable Environment* and CHM 442 *Synthetic Polymers: Life Cycle and Emerging Sustainable Technologies*. In other cases, the principles have been infused into core courses. Professor Dave Leonard developed a set of modules surrounding the core principles of toxicology for use in his CHM 461 Biochemistry lecture course, and notes "it is easy to make connections between toxicology and most all biochemical topics, and students find these connections very interesting". According to the Beyond Benign website, the GCC allows colleges and universities to "band together to share resources and experiences to shift how and what the next generation of chemists learn." In making this commitment, GVSU joins over 70 institutions of higher education from five continents, a cohort that is continuously growing.

Ultimately, any initiative is successful only if it works for students, and by that measure, the focus on Green Chemistry has paid off. Andrew Freiburger '19 used his GVSU degree to secure a sustainability-themed internship at Berkeley and subsequently, entrance into a Civil Engineering graduate program at the University of Victoria. "The systems-level thinking of Green Chemistry has been imperative for my engineering work, and the emphasis of sustainability in Green Chemistry has been highly valued by my employers", he notes. "The intimate Green Chemistry community has fostered my post-graduation opportunities in industry and academia, and will continue to propel my career in the near future."



The 12 Principles of GREEN CHEMISTRY

Green chemistry is an approach to chemistry that aims to maximize efficiency and minimize hazardous effects on human health and the environment. While no reaction can be perfectly 'green', the overall negative impact of chemistry research and the chemical industry can be reduced by implementing the 12 Principles of Green Chemistry wherever possible.

1. WASTE PREVENTION

Prioritize the prevention of waste, rather than cleaning up and treating waste after it has been created. Plan ahead to minimize waste at every step.

2. ATOM ECONOMY

Reduce waste at the molecular level by maximizing the number of atoms from all reagents that are incorporated into the final product. Use atom economy to evaluate reaction efficiency.

3. LESS HAZARDOUS CHEMICAL SYNTHESIS

Design chemical reactions and synthetic routes to be as safe as possible. Consider the hazards of all substances handled during the reaction, including waste.

4. DESIGNING SAFER CHEMICALS

Minimize toxicity directly by molecular design. Predict and evaluate aspects such as physical properties, toxicity, and environmental fate throughout the design process.

5. SAFER SOLVENTS & AUXILIARIES

Choose the safest solvent available for any given step. Minimize the total amount of solvents and auxiliary substances used, as these make up a large percentage of the total waste created.

6. DESIGN FOR ENERGY EFFICIENCY

Choose the least energy-intensive chemical route. Avoid heating and cooling, as well as pressurized and vacuum conditions (i.e. ambient temperature & pressure are optimal).

7. USE OF RENEWABLE FEEDSTOCKS

Use chemicals which are made from renewable (i.e. plant-based) sources, rather than other, equivalent chemicals originating from petrochemical sources.

8. REDUCE DERIVATIVES

Minimize the use of temporary derivatives such as protecting groups. Avoid derivatives to reduce reaction steps, resources required, and waste created.

9. CATALYSIS

Use catalytic instead of stoichiometric reagents in reactions. Choose catalysts to help increase selectivity, minimize waste, and reduce reaction times and energy demands.

10. DESIGN FOR DEGRADATION

Design chemicals that degrade and can be discarded easily. Ensure that both chemicals and their degradation products are not toxic, bioaccumulative, or environmentally persistent.

11. REAL-TIME POLLUTION PREVENTION

Monitor chemical reactions in real-time as they occur to prevent the formation and release of any potentially hazardous and polluting substances.

12. SAFER CHEMISTRY FOR ACCIDENT PREVENTION

Choose and develop chemical procedures that are safer and inherently minimize the risk of accidents. Know the possible risks and assess them beforehand.

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.

A new collaboration between **Dr. Brittland DeKorver**, fellow department member **Debbie Herrington** and GVSU student Ariel Chaney involves analysis of data from the Strategies For Teaching Chemistry Online Facebook group that was initiated by DeKorver last Spring in response to the pandemic. The results were published in a Special Issue of the Journal of Chemical Education focusing on collecting insights gained during the emergency transition to remote teaching.

Dr. Julie Henderleiter is one of several faculty from across campus involved in launching a grade 6 - 8 STEM Academy in Battle Creek, MI. The STEM Academy is funded by a portion of a W.K. Kellogg Foundation grant between GVSU and Battle Creek Public Schools.

Dr. Debbie Herrington continued work on projects focused on faculty development for Gateway STEM courses, developing assessment items to evaluate student proficiency in using science practices, and the development and testing of a high school chemistry curriculum that meets Next Generation Science Standards. The emergency transition to remote teaching has placed increased importance on the ChemSims project, focused on the use of chemistry simulations to support of student learning outside of the classroom. This work was carried out with **Dr. Jessica VandenPlas** (GVSU) and Dr. Ryan Sweeder (MSU) along with GVSU students Elizabeth Sielaff, Lauren Milling, and Megan Shaw. Another project on the use of text messaging to provide formative assessment was carried out in collaboration with Dr. Ryan Sweeder (MSU). These projects resulted in three publications for 2020 including *Development and validation of scientific practices assessment (SPA) tasks for the general chemistry laboratory* (Journal of Chemical Education).

The lab of **Dr. Andy Lantz** focused 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. Andy and Chemistry major Sydney Shevalier presented their work at the Pittsburgh Conference in March and published a manuscript titled *Evaluation of an Aqueous Biphenol and Anthraquinone Based Electrolyte Redox Flow Battery in ACS Applied Energy Materials*. The olfactory work in collaboration with GVSU Biomedical Sciences Professor Cynthia Thompson led to publication of the manuscript What smells? Developing in-field methods to characterize the chemical composition of wild mammalian scent cues in the journal Ecology & Evolution.

The lab of **Dr. Dave Leonard** continued its focus on the study of proteins involved in antibiotic resistance. Senior Biochemistry major Hannah Lute analyzed potential boronic acid inhibitors of class D β-lactamases from *Acinetobacter baumannii.* She also used 19F-indole labelling to probe the conformation of key tryptophan residues from another class D enzyme, OXA-66. Dave is currently serving as Associate Chair of Student Affairs in the Chemistry Department.

Dr. Felix Ngassa worked with five undergraduate researchers on projects in synthetic organic and computational chemistry. Various projects completed with Chemistry major Brock Stenfors and in collaboration with fellow GVSU professor Shannon Biros led to the publication of six manuscripts in peer-reviewed journals including Acta Crystallographica Section E Crystallographic Communications, European Journal of Chemistry and Chemistry. Felix is in his fourth year as the Chair of the University Academic Senate (UAS) and the Executive Committee of the Senate (ECS).

Dr. Tom Pentecost continues to teach introductory chemistry, CHM 100-116, as well as Chemistry in Perspective for the Honors College. He has continued his collaboration with the ACS Exams Institute, those people that produce the organic and general chemistry final exams! This project has led to the development of a novel method for identifying items that perform differently on different versions of the exams. Work is also continuing on the application of Rasch Modeling techniques to assessments of students understanding of chemistry concepts. He continues to work as a faculty fellow in the Pew Faculty Teaching and Learning Center. In this role he facilitates faculty learning community and serves as consultant for faculty conducting scholarship of teaching and learning projects.

Research in the lab of **Dr. Rachel Powers** focuses on the structure and function of β-lactamases for inhibitor discovery and design. These projects involve collaborations with her GVSU chemistry colleagues, **Drs. Brad Wallar** and **Dave Leonard**, infectious disease expert Dr. Robert Bonomo at the Louis Stokes Cleveland VA Hospital, and medicinal chemists Drs. Fabio Prati and Emilia Caselli at the University of Modena, Italy. This collaboration is supported by an NIH R01 grant from the National Institute of Allergy and Infection Diseases, and resulted in the publication of two manuscripts in the journals ACS Infectious Disease and Antimicrobial Agents and Chemotherapy by Powers and Wallar. The latter paper, titled *Structural insights into inhibition of the Acinetobacter derived cephalosporinase ADC-7 by ceftazidime and its boronic acid transition state analog* was co-authored by GVSU students Brandi Curtis, Kali Smolen and Sara

Faculty news continued on next page…

Faculty news continued…….

Barlow. Another article authored by Powers and former Biochemistry major Josie Werner titled *Exploring the potential of boronic acids as inhibitors of OXA-24/40 β-lactam*ase was featured in a special "Women in Protein Science" edition of the journal Protein Science. During her sabbatical, Dr. Powers' Fulbright Scholar award provided an opportunity to begin a new international collaboration with Dr. Pablo Power (Universidad de Buenos Aires). While her time in his lab was cut short due to the pandemic, they continue to collaborate remotely and have just submitted a proposal to the NIH that would allow them to focus on understanding how antibiotic resistance evolves in nature.

In mid-March, with the community reeling and the local health-care providers short on supplies, there was a call put out for desperately-needed PPE. Michelle DeWitt, Lead Lab Supervisor in the Chemistry Department (left) and her cousin Danielle DeWitt, a Spectrum Health foundation employee and GVSU alum (right), jumped into action. After securing approval from the administration and finding a truck, the pair oversaw the donation of approximately 90,000 nitrile gloves to Spectrum Health and other West Michigan hospitals.

Supporting our Students and the Chemistry Department

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 fund is matched by the university 1:1 for the same purpose.**

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