



# DEPARTMENT *of* CHEMISTRY & GEOSCIENCES

VALDOSTA STATE UNIVERSITY

## 2024 Chemistry Newsletter

Welcome to the latest VSU Chemistry Newsletter! We have lots of updates to share with you about the outstanding accomplishments of our students, faculty, and graduates. Thank you for reading!

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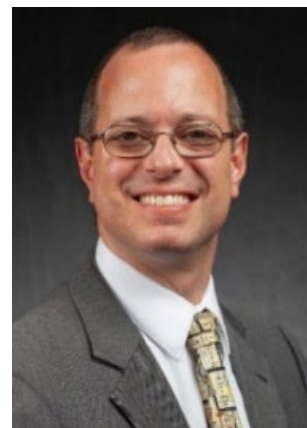
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## From the Department Head's Desk

Greetings, Blazers! I hope that you and your family are enjoying a relaxing summer. As we look ahead and prepare for the upcoming fall semester, I am pleased to share several pieces of good news with you.

First, our department is now fortunate to include faculty and students from VSU's Environmental Geosciences program. This degree focused on traditional fields of geography and geology. Starting this fall, we are expanding degree options to include climate science, sustainability, natural hazards management, and remote sensing technology and urban planning. Students enrolled in these new Environmental Geosciences degree options will study the Earth and how we interact with it, and they will be prepared for emerging career fields that use cutting-edge technology such as geographic information systems (GIS).



In addition to benefiting students, this brings opportunities for collaboration between Chemistry and Environmental Geosciences in areas such as geochemistry and environmental science. Designing processes for the chemical industry that reduce waste and energy consumption can result in higher profits and lower environmental impact. Chemistry students benefit when they learn how reactions that they perform in the laboratory impact our wider world. We are very excited to be collaborating with our new colleagues.

I am excited to report that we have a 45% increase in the number of Chemistry majors accepted into our growing program, compared to last year. Recruiting students is hard work but it is gratifying to see that our hard work is paying off.

Please stay in touch with us using the links below. VSU Chemistry alumni have their own private Facebook page. Email me so that we can add you to that group. Send us a note about what you're up to and your recent accomplishments. We always love to hear from you. If you are ever near Valdosta, it would be my pleasure to treat you to lunch and chat about your time at VSU.

Best wishes and Go Blazers!

A handwritten signature in black ink that reads "Kurt Winkelmann". The signature is fluid and cursive, with a long horizontal line extending to the right.

Kurt Winkelmann,  
Professor and Department Head

Web [www.valdosta.edu/chemistry](http://www.valdosta.edu/chemistry) and [www.valdosta.edu/chemistry/news-media.php](http://www.valdosta.edu/chemistry/news-media.php)

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## Recent Department News

Our Department had another great year! Here are some of our faculty and students' most notable accomplishments.

### Students Meet industry Professionals at Chemistry Mentoring Luncheon

We welcomed professional chemists to campus to meet students as part of our annual Chemistry Mentoring Luncheon. Drew Patterson from CJB Applied Technologies, Tasha Lott from Arbaugh LLC, and Roney Jones from Saft Batteries talked with students about their experiences working as professional chemists and each gave a presentation about their companies. We appreciate their willingness to share their expertise and advice with our students.



### Dr. Ligia Focsan Honored for Research

The International Carotenoid Society (ICS) recently honored Dr. Ligia Focsan with the prestigious ICS Fellowship. She received this award during the 19th International Symposium on Carotenoids held in Toyama, Japan. This is a momentous achievement in Dr. Focsan's distinguished research career.

Carotenoids are naturally occurring pigments found in plants, algae, and certain microorganisms. These compounds provide the familiar vibrant red, orange, and yellow colors seen in fruits and vegetables and play a crucial role in photosynthesis by capturing light energy and transferring it to chlorophyll for carbohydrate synthesis. Carotenoids act as antioxidants, protecting cells from oxidative damage caused by free radicals and contributing to overall human health.

Dr. Focsan's undergraduate research group has a reputation for productive collaborations among her peers in the carotenoid chemistry research community. Her groundbreaking research has shed new light on the properties and potential applications of carotenoids, offering valuable insights into their roles as natural pigments and antioxidants. The ICS Fellowship underscores her dedication to advancing and sharing scientific knowledge for the betterment of society.

### Local High School Students Join VSU Chemistry Classes

Local high schoolers can now take VSU Chemistry courses through our Dual Enrollment program. They earn college course credits while they complete their high school graduation requirements. This means they can start VSU up to two semesters ahead of their peers.

They also participate in class activities with our excellent Chemistry faculty. For instance, dual enrollment students joined Dr. Tom Manning for a visit to the Valdosta Mall to display their class research project about oysters and oyster bed restoration. They talked to shoppers about ways that we can help oysters thrive and the role that oysters play in the ecosystem.



This is an example of how our faculty bring Chemistry to life for our students and our community. Every college's first-year Chemistry course teaches pH, solubility, and ionic compounds. Our students learn how those topics apply to the real world, then they demonstrate what they learned in a way that makes a difference in their community.



### Chemistry Summer Camp

Our second Chemistry Summer Camp was a great success. Local high school students had fun while learning chemistry with Drs. Duncan, Gupta, Salami, Gosnell, and Woldman. Faculty led different activities each day, with campers studying renewable energy, using forensics to solve a mystery, performing some fun, energetic chemical reactions, and learning about the chemistry behind colorful materials.

Campers got a taste of college life each day by dining on campus for lunch and they met with faculty to learn more about VSU.

If you live in the Valdosta area, look for more science camps next summer!

### Chemistry at the Georgia Capitol

VSU students Capri Persaud, Akshil Patel, and Pearce Persaud - all members of Chemistry Dr. Tom Manning's research group - presented their research at the Georgia State Capitol in Atlanta. They are studying antibiotics, antivirals, and cancer drugs to be tested at the National Institutes of Health (NIH). They also developed a series of unique card games that are fun and useful chemistry educational tools. The students had the opportunity to interact with state politicians who stopped by to learn about their research. Projects presented at this annual event are competitively selected from around the state.

Congratulations to Capri, Akshil, and Pearce!



## Students' Summer Research Highlights

Many of our students pursue research during the summer, often working in faculty labs for course credit or as a paid position. This summer, two students, Edmund Wright and Fiona Brightman, are mentored by Drs. Ligia Focsan, and Gopee Sreenilayam to study the extraction of carotenoids from fruits and vegetables. (You can read more about this research in the Faculty Spotlight section of this Newsletter.) Dr. Tolu Salami is supervising Karli Icard as they study the synthesis of Pd-Co and Pd-Cr bimetallic electrocatalysts for CO<sub>2</sub> reduction. These students are supported by funding that their faculty mentors received from VSU's Blazer Summer Research Institute.

Chemistry students such as David Vasquez (pictured below, left) are hired as interns for local chemical companies. David works at Saft Batteries, an international company with a manufacturing plant right here in Valdosta. They make nickel-cadmium batteries for transportation and telecommunications systems.

David's work focuses on recycling active materials from electrode scraps to be re-

used in the production of new cells. He also tests new materials for production and for performance consistency between each battery produced.

Two students are participating in a Research Experience for Undergraduates (REU) program that funds students to perform lab research at other universities.

Caidyn Carr (pictured below, middle) is participating in an REU program at Virginia Tech. She joined Dr. Adrian Figg's lab to test the effect of acrylic monomers and polymers in the aggregation of a protein (alpha-synuclein) that is relevant to Parkinson's disease.

Airionna Fordham (pictured below, right) is participating in an REU program with the Sunshine Institute for the Interaction of Light with Matter program at FSU. She is gaining a lot of experience in organic synthesis in Dr. Igor Alabugin's research lab. His research interests include synthesis and catalysis, computational chemistry, energy and the environment, photochemistry, spectroscopy, and nanoscience.





## Meet an Outstanding Alum – Dr. Candicee Childs

Our Chemistry graduates always impress and inspire our students and faculty. This year, we highlight a rising star and recent alumna, Dr. Candicee Childs.

Dr. Childs remembers the moment in high school that she developed a passion for Chemistry. “I was watching my teacher balance equations and showing us real-world applications. His neat experiments captivated me. The more I read, the more excited I became.” A love of Chemistry runs in her family – her mother also studied it, so Candicee suspected that she would one day also. When thinking about her college major, she wanted to study something that is interesting and would challenge her. Chemistry was an obvious choice.

Dr. de la Garza remembers Candicee introducing herself on the first day of Chemistry class at VSU with a big smile.

Like many college students, Candicee was searching for a purpose in life. A VSU advisor recommended that she consider a career in medicine, given her talent for science and her interest in serving her community. While volunteering at the Youth Care Clinic in Valdosta, Candicee realized that she could see herself as a doctor. She graduated Magna Cum Laude from VSU in 2017, earning a Bachelor’s degree in Chemistry and a minor in Spanish. She went on to earn a Master’s degree in Health Administration from Georgia Southern in 2019. Her academic studies continued at the Medical College of Georgia, where she earned her Doctor of Medicine degree in 2023. She is now a Physician in the Massachusetts General Hospital Psychiatry Residency Program, specializing in child and adolescent psychiatry.

While her academic achievements are impressive, it’s what Candicee does outside the classroom and in her profession that



makes her stand out. Her undergraduate research with Dr. Manning led to her coauthoring a provisional patent for medical applications of redox reactions in carbon nanotubes.

As a junior at VSU, she volunteered to work with autistic youth as part of the SoloSurf Healthcare program in Cadiz, Spain. She led small group activities with autistic children to teach them to surf. This helped them develop social skills through play and by interacting with each other and their physical environment.

Dr. Childs has discovered a talent for teaching, inspiring, and motivating others. She tutored her Chemistry classmates at VSU and mentored incoming graduate students at Georgia Southern University.

In 2023, the TEDx Board of Savannah selected her to deliver a talk about “Embracing Empathy while Protecting Your Own Mental Wellness.” Last May, Dr. Childs gave the commencement speech for the GSU Jiann-Ping Hsu College of Public Health and the Waters College of Health Professions. (It was this address, which you can [view on YouTube](#), that caught the eye of VSU faculty at the same time that we were planning our 2024 newsletter.)

We are pleased that she has stayed in touch with our faculty after graduation and has volunteered to talk to the First Year Chemistry Seminar class about medical school.

Dr. Childs shares what Chemistry means to her. “What’s interesting about chemistry is its ability to explain the fundamental processes that govern our world, from the reactions that power our bodies to the development of new materials and medicines. The foundational concepts I learned at VSU helped me understand new information I was learning in medical school, as it related well to the field of medicine. As a resident doctor training to become a psychiatrist, I am constantly thinking about the chemical processes involved in psychopharmacology. Reactions are also involved in neurochemistry, which explores the chemical processes that occur in the nervous system, providing information into how these processes influence mental health and behavior.”

I hope that all of our current students and alumni can agree with Dr. Childs’s account of being a Blazer. “Now looking back on my experiences at Valdosta State University, studying chemistry transformed my life by deepening my understanding of the natural world and honing my analytical skills. The supportive faculty and hands-on lab experiences cultivated my passion for

scientific discovery, opening doors to exciting career opportunities and inspiring a lifelong commitment to learning, critical thinking, and innovation. Chemistry is truly everywhere and my experience at VSU helped me to appreciate that greatly!”

You can keep up with Dr. Childs through her [website](#) and by reading her book, *Lemons, Lemonade, & the Lemonade Stand*.



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We look forward to sharing with you more stories about our graduates making a positive difference in science and their community. Please nominate an alum (including yourself) deserving recognition.

## Student Award Winners

Join us in congratulating our 2023-2024 Chemistry Student Award winners. Chemistry faculty select each award recipient. It is always a difficult choice due to the strong competition. Scholarships are supported by generous donors. We also give awards for excellence in particular courses, overall academic performance, service to the community, and research.

The College of Science and Mathematics held its annual awards ceremony in April and broadcast on Facebook so that family and friends could participate.

We are grateful to the family of Dr. M. Elizabeth Derrick, Julia Wisenbaker Sumerford, Martha F. Robertson, and all of our VSU Chemistry donors for their generous financial support of our students.

Julia Wisenbaker Sumerford Scholarship      **Caidyn Carr, Alexa Luna, Kaylee O'Quinn, and Jay Rogers**

Given to outstanding Chemistry students biannually.

Dr. M. Elizabeth (Betty) Derrick Award      **Jacqueline Farmer and Airionna Fordham**

Provides a scholarship to an outstanding female student majoring in Chemistry.

Martha F. Robertson Scholarship in Chemistry      **Ezekiel Lott, Aurielle Kittles, Katherine Hollister, Allayna Henriquez, and Cole Branyan**

Awarded to academically talented first-year students.

Winners of this year's chemistry discipline awards demonstrate excellence in specific courses. The winners are:

Polymer Chemistry in Organic Chemistry Award	<b>Kaylee O'Quinn</b>
Undergraduate Award in Analytical Chemistry	<b>Kaylee O'Quinn</b>
Undergraduate Award in Inorganic Chemistry	<b>Alexa Luna</b>
Undergraduate Award in Biochemistry	<b>Nathaniel Dionne</b>
Undergraduate Award in Physical Chemistry	<b>Jason Phillips</b>
Organic Chemistry Excellence Award	<b>Mason Griffin</b>



Chemistry faculty recognize many aspects of student excellence, including research, service to the Department, and overall academic performance. Winners of this year's awards are:

American Institute of Chemists Award

**Jason Phillips**

Awarded to a student showing exceptional promise as a chemist.

Outstanding Chemistry Senior Award

**Hope Smith**

Given to a senior demonstrating overall excellent academic performance.

Outstanding Freshman Chemistry Award

**Natalie Lane**

Given for achievement in first-year Chemistry courses.

Southwest Georgia ACS Optima Chemical Award **Maya L. Stevens**

Recognizes outstanding service to the Chemistry Department and SMACS.

Chemistry Undergraduate Research Award

**Capri Persaud and Carlton Francis**

Awarded to a student showing superior skill as a chemical researcher.

We asked awardees to tell us their future plans, favorite Chemistry class, and their extracurricular activities. Here are their responses.

**Caidyn Carr** plans to attend pharmacy school or graduate school with a focus on cosmetic chemistry. Her favorite classes are the Chemistry Seminar classes.

**Nathaniel Dionne** graduated in fall 2023 and now works in Jacksonville. His favorite course at VSU was Biochemistry.

**Jacqueline Farmer** plans to earn a Master's degree and become a Physician's Assistant. Her favorite Chemistry class was Medicinal Chemistry.

**Airionna Fordham** plans to be a natural products chemist and her favorite class was Quantitative Analysis.

**Carlton Francis** plans to have a career in forensics and is enjoying the Forensic Chemistry course.

**Mason Griffin** plans to take a year off from school to gain experience before entering medical school. His favorite class was Organic Chemistry.

**Natalie Lane** will attend South University School of Pharmacy to earn her Doctorate in Pharmacy. Her favorite courses were General Chemistry I and II.

**Alexa Luna** plans to earn a PhD in chemistry. Her favorite class is Organic Chemistry.

**Kaylee O'Quinn** plans to go to dental school and her favorite course is Quantitative Analysis.

**Capri Persaud** plans to attend medical school to become a doctor. Her favorite chemistry course was Biochemistry.

**Jason Phillips** plans to work at Warner Robins Air Force Base in their chemical analysis lab. His favorite course was Biochemistry.

**Jay Rogers** plans to attend the Osteopathic Medicine (DO) Program at PCOM. His favorite course was Organic Chemistry.

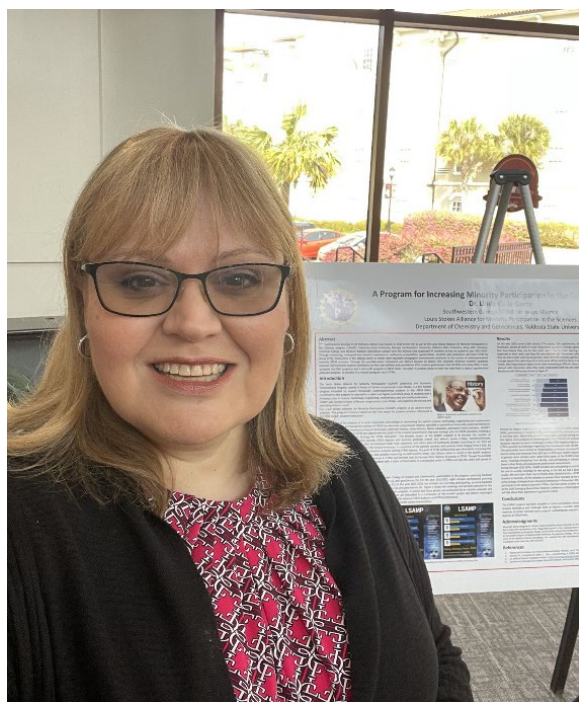
**Hope Smith** will attend graduate school at the University of South Carolina to perform inorganic chemistry research. She will also have a trainee position at Savannah River National Lab. Her favorite course was Physical Chemistry II.

**Congratulations to all of our awardees!**

## Chemistry Faculty Updates

Chemistry faculty teach, engage in research, and perform service to benefit our students, VSU, our profession, and our community. We want to share with you our latest accomplishments.

**Dr. Linda de la Garza**



Dr. Linda de la Garza, Associate Professor of Chemistry, received her doctorate in Chemistry from Arizona State University in Tempe, AZ. She worked as a post-doctoral appointee at

Argonne National Laboratory, located in the Southwest Chicago suburbs.

Dr. de la Garza is the co-principal investigator of the Southwestern Georgia STEM Pathways Louis Stokes Alliance for Minority Participation (LSAMP) program sponsored by the National Science Foundation. During 2023-2024, the program served ten students in the College of Science and Mathematics, including three chemistry majors. The LSAMP group at VSU attended the 2023 Southeastern Regional Meeting of the American Chemical Society (SERMACS) in October 2023 (Durham, NC) and the Alliance Summit in February 2024 hosted by ABAC (Tifton, GA) to present their research. During 2023-2024, Dr. de la Garza's own research students presented seven posters and a talk at local and regional meetings on the analysis and synthesis of iron oxide colloidal materials and fabrication of photoelectrodes.

Dr. de la Garza gave an invited oral presentation at 2023 SERMACS titled "Activities to Promote Active Learning in the Quantitative Analysis Course" and a guest oral presentation at the 2024 Lunch Hour Talk Series of the Council of Undergraduate Research titled "LSAMP: The Power of Mentoring and Community

to Develop Scholars". Dr. de la Garza also presented a poster at the 2024 Black History Month Poster Symposium titled "A Program for Increasing Minority Participation in the Sciences".

During the 2023-2024 academic year, Dr. de la Garza implemented a community engagement activity for the CHEM 1211 Principles of Chemistry I course designed to spark student's curiosity and interest in chemistry. The formal Experiential Learning activity has been endorsed for the Fall 2024 course.

Dr. de la Garza is a Governor's Teaching Fellow (2021-2022), a VSU Leadership Academy Scholar (2019-2020), past President (2019-2020) of MESA, a faculty and staff group focused on Hispanic/LatinX students at VSU, and is currently serving as SMACS advisor, and Councilor of the Southwest Georgia Local Section of the American Chemical Society (2024-2026).

#### **Dr. Dean Duncan**

Dean Duncan taught Inorganic Chemistry in the Fall during Dr. Salami's sabbatical. He also teaches Chemistry courses for first-year students studying sciences and allied health sciences.

In the Fall, he piloted an adaptive-learning approach (ALEKS) to online homework in the introductory Chemistry course for allied health sciences. In the summer, he prepared activities for Chemistry Summer Camp students to learn about batteries, fuel cells, and photovoltaics. He also participated as a science fair judge at the local middle school and continued to serve as Secretary of the local section of the American Chemical Society.

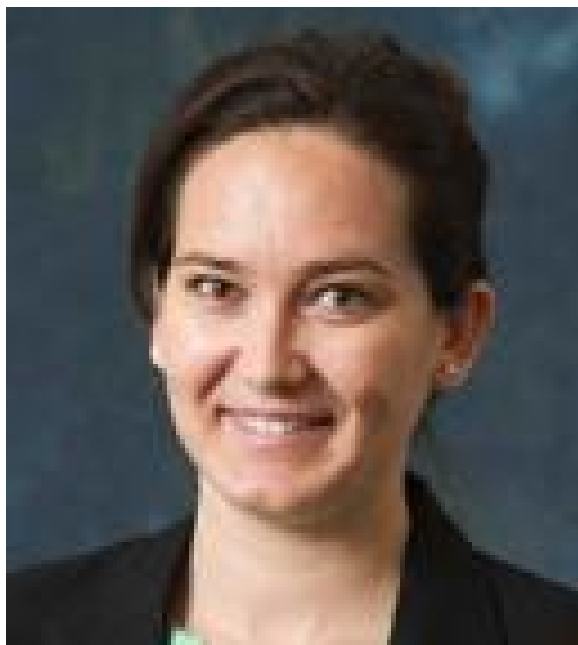


#### **Dr. Ligia Focsan**

Last year I was named a 2023 Fellow of the International Carotenoid Society (ICS). This honor is given for significant, career-long contributions to research of carotenoids. It was formally announced at the 19th International Symposium on Carotenoids held in Toyama, Japan. With only about 100 recipients worldwide, this unexpected award underscores the impact of my work on carotenoid radicals. This award serves as validation that the dedication and effort I have invested in studying carotenoid radicals have resonated on an international level.

In December 2023, the book I have been working on for the past couple years, "Chemistry of Carotenoid Radicals and Complexes", was published. It presents four decades of carotenoid radical research, with the last 13 years dedicated to contributions made while at Valdosta State University.





I am now focusing my research on extracting carotenoids from natural sources, a collaborative project with Dr. Sreenilayam that has already involved about 10 students since it was initiated in 2022. Students presented results at the Georgia Undergraduate Research Conference (GURC), SERMACS in Durham, North Carolina, and at VSU's 30th Annual Undergraduate Research Symposium. We are also happy to announce that our BSRI project "Extraction of carotenoids from fruits and vegetables" has been funded and two undergraduate students worked on it over the summer of 2024.

#### **Dr. Donna Gosnell**

My students and I continue research on aquaporin proteins. It has been very invigorating to embrace a completely new area of research. This year, we successfully cloned our algal aquaporin gene into yeast. We are now in the process of comparing the expression of aquaporin in the bacterial and yeast

systems. It's been a big learning curve for using new techniques, such as the purification of membrane proteins; they are much more challenging than cytosolic proteins! Western blotting and stopped-flow work are on the horizon this summer. Once we have a good vector for aquaporin expression, we will begin designing biomimetic membranes for the desalination of water. It has been a pleasure to work with my research students. Some are participants in the Louis Stokes Alliances for Minority Participation (LSAMP) program, which I like to support. They have presented their work at the VSU undergraduate research symposium, SERMACS, and GURC conferences.

Teaching continues to be my main focus. I still enjoy the fast and furious Maymester Biochemistry, Pchem 2 in the spring and all the rest. Retirement isn't on the radar yet.

In my spare time I do a lot with music: Valdosta Choral Guild and church organist. I also had my first winter garden ever.....radishes galore!



## Dr. Shipra Gupta



The year from Summer 2023 to the end of Spring 2024 has been my third year here at VSU. And it is amazing how much I had learned and being a part of such diverse experience! I was awarded BSRI Summer Research Grant. My student, Ms. Lanier Baker, and I worked all through the semester to get my research officially started here at VSU. She presented her work at the BSRI symposium and received a lot of praise for her research, presentation, and question/answer session. I was a part of a very successful Chemistry Summer Camp and taught high school students how to extract caffeine from tea and coffee.

The Fall semester started with a bundle of ideas learned at the Governor's Teaching Fellowship, bubbling to be applied to the classroom. I then realized that I have already been using many of these ideas intuitively.

As the chair of the local ACS section, I was excited to invite two guest speakers, Dr. Michael Roper from Florida State University and Dr. V. Ramamurthy of University of Miami, for our seminar

series. Both the events were well attended, and hopefully our students enjoyed listening about "How to be a Scientist" from Dr. Ramamurthy. It was a truly inspirational talk.

I attended the SERMACS research conference, and Ms. Lanier Baker presented her poster there.

In the Spring semester, I was excited to experiment using i-clickers in the classroom for first time. Also, Dr. Sreenilayam and I adopted a new Organic Chemistry textbook. It was a much-needed change. With that came the challenge of creating new lecture content, new assignments, learning to incorporate new online learning tools, new exams, so on and so forth. The small size of the class made the transition easier and I tried hard to make it an easy transition for students. I think the semester was exceptionally smooth, with respect to all new changes introduced.

I also guided five new extremely talented research students and it was very challenging but we thankfully got some meaningful work done by the end of the semester. All of the students presented their research at VSU's Undergraduate Research Symposium. Lisa Shepherd and Alexandra Rivero received 1st place for Science and Mathematics poster presentations. I hope to use the results for further investigation and submit an article based on that by the end of December.

I also got an Experiential Learning Seed Grant, and will soon be developing an experiential learning activity for my Fall 2024 Organic Chemistry course. Hopefully, this activity will enrich the course even more.

## Dr. Tom Manning



It was a productive year in teaching, research, and service. We developed art activities and games involving sea shells for Girl Scouts and young students at Science Saturday.

Our coral research project in the Keys was knocked out by hurricanes Irma then Ian. In the fall we rejuvenated it by partnering with a coral restoration company in the Bahamas. We have made tetrabromopyrrole, a compound that corals release in order to attract larvae to their location. We'll ship 20 plates to the company in mid-summer. Odd fact: coral only reproduce (release sperm and larvae) after the full moons in August and September. Our oyster project along the Florida panhandle is going strong.

We continue to develop, with help from students, a series of puzzles related to Nobel Laureates that the ACS publishes on their web site. I've been giving students chemistry-related AI projects so they learn the technology, but it is scary how quickly they can get a full report generated in a minute or two, and it survives a plagiarism check. We had

two student groups enter an Atlanta based business plan competition and work on it through the spring semester. It's great experience to prepare for and go in front of potential investors.

We have a paper coming out entitled "Bioactive Excipients for Increasing the Efficacy *in vitro* of Tecovirimat against Pox Viruses." Our compounds were tested at NIH. Four students are co-authors on the paper. There is a growing concern for the use of POX virus's uses in bioterrorism. We also published a book chapter entitled "Inhalation Therapy in Pulmonary Tuberculosis" last April that included several undergrads and a medical school student as co-authors.

Our marine natural product work took a big bump up when NIH tested it against 13 viruses that are responsible for various infection diseases, and it tested positive against only one (specificity). The one it tested positive against is correlated with several neurological diseases. We grow the bacteria that synthesizes the molecule (as a chemical defense) in the ocean, and harvest it in the lab. Our copper-based cancer drugs are still going strong at NCI. We recently applied for a partnership with NCI to develop the drug. Odd fact: cancer patients have higher than normal Cu levels in their serum. The formulation that we have developed uses this to our advantage. We had several student groups present at the Georgia Undergraduate Research Conference, in the fall. Finally, two of our student posters were selected from around the state to present at the Georgia State Capitol. This is timed with the legislative budgetary sessions, so students can show politicians what is happening at their campus.

Stop by and visit if you are in the area!



### **Dr. Tolulope Salami**



Our research into carbon dioxide reduction continues. During the fall of 2023, I undertook my sabbatical at Princeton University, specifically in the Department of Chemistry at Frick Laboratory. I investigated the use of Prussian blue analogs as electrocatalysts for carbon dioxide reduction. Our findings concerning the bimetallic (Pd-Cr) electrocatalyst were presented at the Southeastern Regional ACS Meeting (SERMACS) held in Durham, North Carolina, in October 2023.

We maintain an active collaboration with the Bocarsly group at Princeton University. Additionally, I am engaged in a collaboration with Dr. Sreenilayam, exploring the use of deep eutectic solvents to extract phyto-active compounds from tropical plants. These plants are provided and processed by our collaborator, Dr. Ladokun, who serves as the Dean of the Department of Natural and Applied Sciences at Lead City University, Nigeria.

### **Dr. Gopeekrishnan Sreenilayam**

Dr. Gopee Sreenilayam's research is featured in the Faculty Spotlight section of this issue.

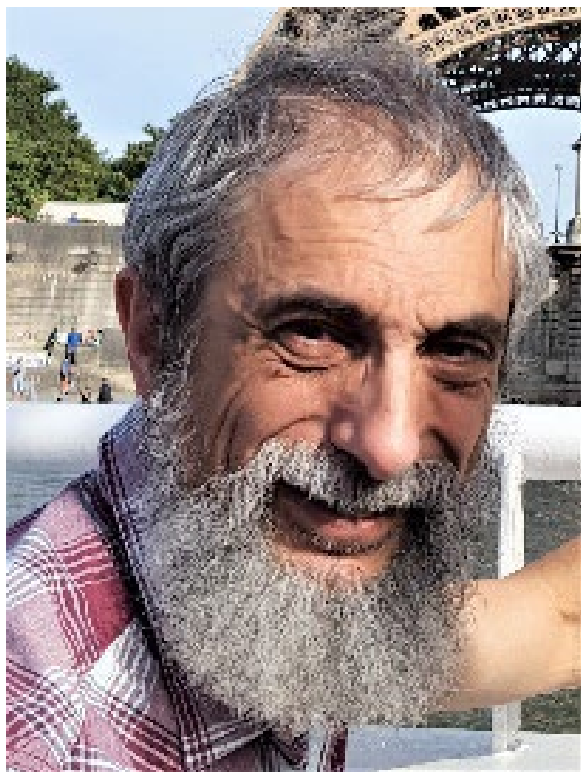
### **Dr. Kurt Winkelmann**

I am looking forward to beginning my fourth year at VSU. I continue to teach introductory chemistry for non-majors and for Chemistry majors. Serving as Department Head keeps me very busy so I really enjoy the opportunity to leave my office and interact with students.

My research group is studying ways that physical chemistry faculty convey supportive, learner-centered attitudes to students through their syllabus. We found that many faculty overlook the fact that a syllabus is part of a student's first impression of the class, as well as an informational document. In many cases, physical chemistry syllabi improved after the pandemic due to faculty becoming more aware of students' needs for better support and communication with their professors. My collaborator and I shared our findings with faculty at a workshop that we organized at the 2024 Biennial Conference on Chemical Education in Lexington, Kentucky.

### **Dr. Yakov Woldman**

I taught multiple chemistry classes during the 2023-2024 academic year. I mostly enjoy teaching the labs, as that is where you apply your knowledge to solve real problems. You experience chemistry not by studying the textbook, but by doing things with your own hands. In organic chemistry lab I asked students to use different analytical methods, like Infrared Spectroscopy and Nuclear Magnetic Resonance to confirm (or disprove!) the structure of the synthesized product. It makes our students ready for work in real industrial or academic laboratories with sophisticated analytical equipment.



### **Dr. Xiaomei Zheng**

Dr. Xiaomei Zheng is a Lecturer and the lab coordinator for the Chemistry program. She teaches introductory lab and lecture courses for non-majors and for science majors. As lab coordinator, she coordinates all lab activities for first-year chemistry courses. She mentors and supervises stockroom student assistants to provide essential services for faculty teaching and student learning.

Dr. Zheng's research focuses on antibacterial activity of Schiff Bases and herb plants. During the past year, she collaborated with Dr. Sreenilayam to mentor 5 undergrad research students. The students presented their research on antibacterial activities of chiral Schiff Bases and the compounds extracted from herb plants against three bacterial targets at the 2024 VSU Undergraduate Research Symposium.

I also substantially changed the biochemistry course, introducing new a textbook that brings together structural topics and metabolism. I believe that it allows students who are aspiring to work in the allied health fields to be better prepared for the challenges of their chosen professional school.

Our small research group (my student and I) keeps working on identification and quantification of reactive oxygen species that play important roles in many pathological conditions. We appreciate the financial support from Southwestern Georgia STEM Pathways Alliance (LSAMP) that allows us to buy some necessary chemicals. Results of the research were presented by VSU student Carlton Francis at two research conferences.



## Chemistry Faculty Spotlight: Dr. Gopee Sreenilayam

VSU's Chemistry faculty embody the dual purposes of a university: to share knowledge (teaching) and create it (research). Learning in a classroom is obviously important but participating in research - the creation of knowledge that did not exist before - is another critical component of an undergrad student's education. In each Newsletter, we will take a deep dive into the research of a faculty member so that you can learn how students are contributing to the research mission of our Department and VSU.



Dr. Gopee Sreenilayam completed his Bachelor's degree in Chemistry (1998) and Master's degree in Analytical Chemistry (2000) from Mahatma Gandhi University in India. During the next four years, he worked as a R&D scientist at Biocon International (2001-2004) and at Aurigene Discovery Technologies (2004-2005). Later, he continued his education and earned a PhD in Organic Chemistry from the University of Iowa (2011) under

the supervision of Dr. Gregory Friestad. He continued his scientific pursuits as a postdoctoral fellow at Temple University in Medicinal Chemistry (2011-2013) and as a postdoctoral associate at University of Rochester in biocatalysis (2013-2017).

Dr. Sreenilayam started his teaching career as a Visiting Assistant Professor at Indiana University at South Bend, Indiana (2017-2018) and in 2018 moved to Valdosta State University as a tenure-track Assistant Professor. He was recently promoted to tenured Associate Professor (2024). At VSU, he teaches Organic Chemistry I and II, Survey of Chemistry, Advanced Spectroscopy, and Seminar courses for freshmen and seniors.

Research in Dr. Sreenilayam's lab focusses on developing environmentally sustainable (green chemistry) chemical syntheses and processes. Undergrad students, mainly Chemistry and Biology majors, conduct research in the lab either on a volunteer basis or for course credit. Our research is inter-disciplinary, and we collaborate with other Chemistry faculty. Undergraduate research students in our lab gain valuable, practical experiences in the areas of organic, analytical, medicinal, and biochemistry. They also get hands-on experience operating and analyzing results from instrumentation such as ultraviolet-visible (UV-Vis) and infrared (IR) spectroscopy, gas chromatography (GC), gas chromatography - mass spectrometry (GC-MS), high performance liquid chromatography (HPLC), and nuclear magnetic resonance spectroscopy (NMR).

One of the main projects in our lab aims to develop novel green solvents



(deep eutectic solvents, DES) for biocatalysis or enzyme catalysis. This is the use of biologically active enzymes or proteins to catalyze various chemical transformations or reactions. Biocatalysis can occur by using purified enzymes or inside the cells that express the desired enzyme in large quantities. Biocatalysis represents a useful alternative to traditional chemical catalysis, which involves harsh reaction conditions, greater waste, higher cost, increased toxicity associated with metal catalysts, and higher energy demands. On the other hand, biocatalysis is a renewable and economical reaction method with exceptional regio-, chemo-, and stereo-selectivity, and with little waste and toxicity. These reactions are environmentally sustainable and follow green chemistry principles.

DES are sustainable and tunable solvents formed from a mixture of a hydrogen bond acceptor, typically a quaternary ammonium salt ( $\text{NR}_4^+$ ), and a hydrogen bond donor. Once formed, the resulting solvent has many favorable properties like low volatility, flammability, and toxicity. They are also easy to prepare, partially biodegradable, cost-effective, and have very low vapor pressure. DES have proven to be safe and effective solvents for enzymatic reactions.

This project is trying to answer a few pertinent questions that will further improve the desirability of biocatalysis in organic synthesis. (1) Is the engineered myoglobin biocatalyst stable in DES? If yes, then how does its stability compare with aqueous phosphate buffer solvents? (2) What is the activity of the engineered myoglobin biocatalyst in DES? How is its activity compared to that of aqueous phosphate buffer solvents? (3) Current engineered myoglobin biocatalysis is

conducted under anaerobic conditions due to the atmospheric oxygen-storing properties of the heme group and is difficult to perform especially at larger scale. The aerobic myoglobin-catalyzed reactions will be simple to operate but an aqueous solvent produces extremely low yields. Hence, can we improve the yields of aerobic myoglobin-catalyzed reactions using DES solvents?

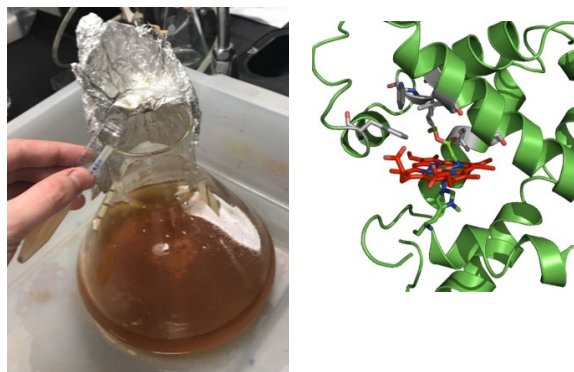


Fig 1: Growing *E. coli* cells programmed to make the myoglobin biocatalyst (left) and myoglobin biocatalyst surrounding a target molecule (right).

This project employs a modified myoglobin protein to complete a set of complex organic reactions that are useful in industrial and pharmaceutical settings under mild reaction conditions. For this experiment, we grew mutant Sperm Whale Myoglobin, harvested it from *E. Coli* bacteria, and purified using nickel affinity column chromatography. We then used the purified enzyme as a biocatalyst to facilitate a cyclopropane-ation reaction with ethyl diazoacetate (EDA) and styrene. We performed this reaction under both anaerobic and aerobic conditions in phosphate buffer as well as various DES solvents to collect baseline data. We analyze reaction progress by GC equipped with a chiral column

Other projects that are currently active in our laboratory include:

1. Carbon dioxide capture project using algae balls: The increased usage of fossil fuels has led to an increase in the atmospheric concentration of CO<sub>2</sub>, a greenhouse gas responsible for global warming. Algae-based CO<sub>2</sub> conversion is a cost-effective option for reducing our carbon footprint. In addition, algae-based CO<sub>2</sub> mitigation strategies have the potential to form valuable chemical products at the end of the process.



Fig 2: Balls of immobilized algae.

2. Evaluation of antibacterial and anti-biofilm properties of ethnomedicinal plants: This is a collaboration with Chemistry professors Tolu Salami and Xiaomei Zheng.

As modern medicine continues to evolve, there is a push for new treatments that are better suited for their intended uses. To aid in this search we have employed traditional knowledge of ethnomedicinal plants to find natural products that could benefit modern healthcare. This project aims to extract and identify possible antibacterial agents from a panel of ten different ethnomedicinal plants that play a major role in the communities across Africa where they grow. They are known for their antiseptic and astringent properties and are traditionally used for treating inflammation, wounds, and mucus build-

up in bronchial tubes. We extract the natural products using organic solvents to yield the most product then we used the antibiotic disk assay method to test their properties. We will test extracts with promising activity and use GC-MS to identify major components.

3. Extraction of carotenoid pigments using hydrophobic and hydrophilic DES solvents: This is a collaboration with Dr. Ligia Focsan.

Carotenoids are pigments found in algae, photosynthetic bacteria, and plants. Fruits and vegetables that are rich in carotenoids include spinach, carrots, watermelon, oranges, tomatoes, and kale. Carotenoids are widely used in pharmaceutical and food industries worldwide due to their health benefits. For example, carotenoids are natural antioxidants in the human body to help prevent chronic diseases. Since people cannot naturally synthesize them, we must consume fruits and vegetables. This project uses green solvents, commonly known as deep eutectic solvents (DES), to extract carotenoids successfully and efficiently from fruits and vegetables using an ultrasound-assisted extraction (UAE) method. There are many advantages to using these "green friendly" DES solvents such as their biodegradability, low cost, and straightforward preparation. Once they are extracted, we will analyze carotenoids using HPLC.

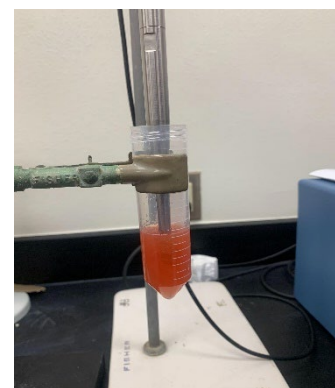


Fig. 3: UAE extraction of watermelon in DES.

## Congratulations to Our Graduates!

We celebrated sixteen Chemistry majors becoming our newest alums last year! As you know, a Chemistry degree is challenging enough but these students also persevered through a pandemic that disrupted learning and campus activities for over a year. We are very proud of them!

We invited graduates and their families to a catered lunch prior to the graduation ceremony. It was fun to see the students one last time and meet their parents and siblings.



Students were exuberant about their achievement, parents were thrilled and relieved that their children reached this milestone, and faculty were gratified that students really did pay attention in class, after all. There was even a noisy chemistry demonstration afterwards, otherwise known as a fireworks show.



## Fall 2023 and Spring 2024 Chemistry Graduates

Alyssa Cooper

Nathaniel Dionne

Jacqueline Farmer

Tyler Knight

Alexa Luna

A'Lentra Mitchell

Savanna Mitchell

Thomas Mancil

Isabella Najar

Jason Phillips

Shelby Raybon

Jay Rogers

Hope Smith (cum laude)

Maya Stevens

Hayes Sumner

John Watts

**Congratulations!**

## Show your Support

Would it be a department newsletter without an appeal for your support? You can make a difference with VSU Chemistry. Giving is easy and all donations benefit our students. Donations from generous alums like you provide financial support for student awards, fund undergraduate research projects, and enable students to attend research conferences. These are just some examples of how your giving positively impacts our students. Imagine all the ways that your donation can help.

To make a donation, visit VSU's website <https://community.valdostastate.org/give>. In the Designation section of the form, select Other and indicate the Chemistry Account number and name in order for your donations to help the Chemistry program. Here are some options for giving to a Chemistry account:

**#20063 Chemistry** is our main donation account. It supports student awards, travel to research conferences, outreach events like Science Saturday, and other important activities.

**#20067 Manning Chemistry Research Fund** supports research by Dr. Tom Manning and his students.

**#20070 SMACS** supports the Student Members of the ACS.

**#20066 Dr. M. Elizabeth (Betty) Derrick Scholarship Fund** provides an annual award to outstanding female Chemistry majors. The fund was established in memory of Chemistry Professor Emeritus Dr. Elizabeth (Betty) Derrick.

**#20071 Jim and Judy Baxter Chemistry Student Scholarship Endowment** will fund annual scholarships for academically talented, first-year Chemistry students. Scholarship funds come from the interest and earnings of this this endowment so that the principal remains, allowing it to fund new scholarships each year. *Dr. and Mrs. Baxter are generously matching every donation to this fund, up to \$10,000.*

No donation is too small - just \$10 per month allows us to give a nice award each year to an excited and deserving Chemistry student or pays for a student's hotel room at a research conference. Any amount makes a difference.

A more generous donation can fund a special project for helping our students and improving their experience at VSU. I am sure that you have lots of great ideas. Please share them with me or your favorite faculty member. We look forward to working with you to support our students.

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Thank you for reading! I hope you have enjoyed learning about the activities and accomplishments of our Chemistry students, alumni, and faculty. Please stay in touch and ...

**Go Blazers!**

Kurt Winkelmann  
Professor and Department Head