



DEPARTMENT *of* CHEMISTRY

VALDOSTA STATE UNIVERSITY

2022 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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From the Department Head's Desk

Greetings, Blazers! I hope that you and your family are enjoying a relaxing fall. I am excited to update you about the Chemistry Department's growth and engagement in student-focused teaching, research, and community service.

Like most schools, classes and day-to-day activities have largely returned to normal. Faculty are thankful that we are now back to providing our students with the best possible education in a face-to-face setting.

During the past year, the Chemistry Department accomplished a variety of goals, such as establishing collaborative relationships with the local chemical industry and professional schools, introducing new Chemistry degree options, and improving strategies for recruiting and retaining students. I'll talk about our ongoing efforts to achieve these goals in the next few pages.

Another ongoing effort is to reconnect with our alumni. During the past year, I spoke with many of you about how you would like to get involved in our Department. I appreciate all of your feedback, which included suggestions for more Chemistry alumni gatherings and opportunities for alumni to interact with our current students. You will hear from us soon about how we plan to implement these great ideas.

There are several ways for you to stay in touch with us. We share Department news in the News and Media section of our website and on social media. Student Members of the ACS (SMACS) are active on Facebook and Instagram. Our alumni have their own private Facebook page. Email me so that we can add you to that group. I will be working with VSU's Alumni Relations Office to get in contact with you, but why wait? Send us a note about what you're up to and your recent accomplishments. The faculty always love to hear from you.

I hope this Newsletter reminds you of fun times, college friends, and chemistry at VSU. If you are ever near Valdosta, it would be my pleasure to treat you to lunch and chat about your time at VSU. Whether it's a visit, email, or phone call, please stay in touch.

Best wishes and Go Blazers!



Kurt Winkelmann
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Recent Department News

It's been a great year for Chemistry faculty and students. Here are some of our latest accomplishments.

Award-Winning Faculty and Students

Dr. Linda de la Garza, advisor for our Student Members of the American Chemical Society (SMACS), received VSU's Advisor of the Year award. This is a highly competitive, university-wide award that recognizes the outstanding efforts that faculty provide to our student organizations. Dr. de la Garza goes far beyond expectations to advance SMACS by providing dedication and outstanding leadership. She is pictured fifth from the left with many of the SMACS members.



Congratulations Dr. de la Garza!

Princeton University awarded **Dr. Tolu Salami** a 2022 Summer Visiting Research Scholar position. Chemistry students Jayden Thomas and Jodeci Mitchel accompanied Dr. Salami to assist with research on cyanogels as a platform for synthesis of novel catalysts for CO₂ reduction. This is a wonderful opportunity for our students and a great research accomplishment!

In other research news, this spring, our students earned three out of a total of 15

awards given university-wide at the annual VSU Undergraduate Research Symposium. Congratulations to:

Dr. Yakov Woldman and his student Makenzee Page won Best STEM Poster

Drs. Gopee Sreenilayam, Ligia Focsan, and their student Jwalant Shah received 3rd place for Best Video Award

Dr. Thomas Manning and his students Jade Philips and Bethany Sharpe received 2nd place for Best Paper Award

Pharmacy School Recruitment

Pharmacy programs at Lake Erie College of Osteopathic Medicine (Bradenton FL), South University, and UGA have signed agreements that will enable our Chemistry majors to enter their Doctor of Pharmacy (PharmD) degree programs after only three years at VSU. Students' PharmD courses transfer back to VSU so they earn their VSU Chemistry degree while also completing a PharmD degree. This saves our Chemistry students a full year of tuition and time as they reach their academic and professional goals.

In May, VSU hosted representatives from UGA for a signing ceremony to [announce the new agreement](#).



PCOM's Doctor of Osteopathy program signed a similar agreement with both the Chemistry and Biology Departments.

Welcome New Faculty

Dr. Shipra Gupta, an organic photochemist, joined us in August 2021. You can read about her research and teaching interests in the Chemistry Faculty Updates section.

Dr. Gupta has already established a strong reputation as a teacher who cares and supports her Organic Chemistry students through innovative teaching methods. Her new VSU research group off to a similar good start, attracting students interested in organic photochemistry.

New Chemistry Degree Options

We are pleased to offer new degree options for our students based on their career aspirations. In addition to our Pre-Pharmacy, Pre-Professional, and ACS-certified Biochemistry and Chemistry degree options, we now offer options for students interested in:

- Business and Entrepreneurship
- Environmental Chemistry
- Chemistry Teaching
- Medical School
- Dental School
- Optometry School

All these options provide a well-rounded education in Chemistry but differ in the career-focused electives that students take.

Chemistry Students Steal the Show

Our Chemistry students do great stuff outside the lab too. During the 2022 spring break, Chemistry major Hope Smith performed at Carnegie Hall. She performed with other choir singers from VSU and from across the East coast. A total of 150 singers and 60 orchestra members opened on March 20, 2022 for that Saturday night's performance with Poulenc's Gloria and Bougie's Requiem. They were in New York City for 5 days and had the trip of a lifetime!



Let's Party!

Students and faculty are thrilled to restart our tradition of graduation parties, student luncheons, and Mole Day events (below left, middle, and right). We plan to host more activities and events so that we continue to grow our Department community and celebrate all of our successes together.



Meet an Outstanding Alum

Accomplishments of VSU Chemistry alumni always impress and inspire our students and faculty. For this year's Newsletter, we highlight a recent alumnus and rising star, Dr. Kory Burns.

Kory was born in Atlanta and joined the VSU Chemistry Department in 2013. He earned an ACS-certified Chemistry Bachelor's degree (cum laude) in 2017. He pursued graduate studies at the University of Florida, receiving a Master's of Science in Materials Science and Engineering in 2020, then a Ph.D. in the same discipline in 2022. He is currently a research scientist at University of Virginia and has accepted an Assistant Professor faculty position there, beginning in 2024.

Dr. Linda de la Garza remembers that Kory "loved to share what he knows. He was always ready to work hard in the lab with great attention to detail and dedication to all his activities." Kory's focus on excellence is evident, given his academic success as a VSU Chemistry major and his involvement in research and other activities.

Kory served as PR Chair (2016) and Vice President (2017) in SMACS (Student Members of the American Chemical Society). Kory founded the Electrical Engineering Club at VSU in 2015.

Even as an undergrad, Kory had an interest in teaching. He prepared supplies and chemicals for the teaching labs. With other members of SMACS, he organized study sessions for students in first-year Chemistry courses and he tutored Chemistry at the Academic Support Center. Kory served as an instructional assistant for Drs. Tom Manning and de la Garza by helping students learn physical chemistry and supervising analytical chemistry lab sessions.

Kory performed research with two VSU faculty. He was part of Dr. Dean Duncan's research group studying organic-inorganic hybrid structures for magnetic storage devices. With Dr. Manning, Kory conducted research on low-dimensional carbon structures for drug carriers and electronic devices. He also helped Dr. Manning develop educational word and logic games related to Chemistry.



Prior to entering graduate school at UF, Kory took advantage of several opportunities to broaden his skills and learn new computational techniques. Kory first interned at the National Energy Technology Laboratory. As part of Dr. Dominic Alfonso's research group, Kory applied computational

methods to study the ability of gold nanoparticles to act as a catalyst for the electrochemical reduction of carbon dioxide. In 2018, Kory worked with Dr. Arvind Ramanathan at Oak Ridge National Laboratory as an artificial intelligence (AI) research resident. In this position, he used AI and machine learning to predict the growth of cancer cells.

Kory started his graduate research in 2018 under the mentorship of Professor Assel Altkaliyeva at the University of Florida. His Ph.D. research focused on the structure-property relationships of two-dimensional semiconductors, their fabrication in a clean room, modification using laser and ion beam techniques, and their characterization.

While in graduate school, Kory collaborated with researchers at Sandia National Laboratory to study nanoscale features on surfaces using high resolution imaging and machine learning algorithms. He worked at Texas Instruments as a Device Physics Research Affiliate to better understand properties of semiconductors and predict their performance in electronic circuits.

Although his research definitely keeps him busy, Kory finds the time to talk with younger students about science, research, and their professional goals. Kory has spoken several times to our students, including as a guest speaker for the 2020 Southwest Georgia LSAMP Alliance meeting at VSU.

Kory earned his Ph.D. in 2022 and joined the Department of Materials Science and Engineering at the University of Virginia as a research scientist. He continues to

collaborate on several projects with colleagues at Oak Ridge and Sandia. A few months ago, we were excited to learn that Kory accepted an Assistant Professor position at UVA.

At UVA, he will study the use of radiation to rearrange surface atoms in order to improve material properties. In the classroom, Kory hopes to convey his love of science to the next generation of scientists and engineers. He will develop new classes for students to learn about radiation damage to materials, the use of data science in materials engineering, and optical excitations in electron microscopy.

Kory advises students to be fearless - do not be afraid to send applications for internships and jobs and share your passion for science. You learn from every experience so even a failure can bring you closer to your goal.

Kory credits many VSU Chemistry faculty for inspiring him and giving useful career advice. Kory says, "Coming to VSU was the best decision I ever made."

Based on Kory's impressive array of research skills and experience, as well as his strong interest in teaching, we are confident that he will continue to accomplish great research and share that knowledge with his students. Good luck, Kory!

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) who deserves some recognition.

Student Award Winners

Join us in congratulating our 2021-2022 Chemistry Student Award winners. Chemistry faculty select each award recipient. It is always a difficult choice due to the strong competition. The College of Science and Mathematics held its awards ceremony on April 21 in the Bailey Science Center auditorium and broadcast on Facebook so that family and friends could participate.



Pictured, from left to right: Thomas J. Falkenhausen, Jason R. Phillips, Grant T. McReady, Kurt Winkelmann, Kahleel E. Guerrier, Estefani Quinones, Hope E. Smith.

We are grateful to the families of Julia Wisenbaker Sumerford and Dr. M. Elizabeth Derrick for their financial support of our students. Thanks to the generosity of these and other VSU Chemistry donors, students received over \$11,000 in awards and scholarships.

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

Physical Chemistry Award	Thomas J. Falkenhausen
Analytical Chemistry Award	Yeong Hun Jeong
Biochemistry Award	Kahleel E. Guerrier
Inorganic Chemistry Award	Jason R. Phillips
Organic Chemistry Award	Estefani Quinones

The Chemistry Department recognizes many other aspects of student excellence, including research, service to the Department, and overall academic performance. The winners of this year's awards are:

Freshman Chemistry Award	Michael Rice
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Given for achievement in first-year Chemistry courses.

American institute of Chemists Award	Grant T. McReady
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Awarded to a student showing exceptional promise as a chemist.

Southwest Georgia ACS Optima Chemical Award	Jayden Thomas
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Recognizes outstanding service to the Chemistry Department and SMAACS.

Dr. M. Elizabeth Derrick Award	Jacqueline J. Farmer
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Provides a scholarship to an outstanding female student majoring in Chemistry.

Chemistry Undergraduate Research Award	Estefani Quinones
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Awarded to a student showing superior skill as a chemical researcher.

Outstanding Chemistry Senior Award	Estefani Quinones
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Given to a senior demonstrating overall excellent academic performance.

Julia Wisenbaker Sumerford Scholarship Award	Hope E. Smith
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Recognizes an outstanding junior or senior Chemistry student.

We asked each awardee to tell us their future plans, favorite VSU class, and their extracurricular activities. Here are their responses.

Thomas J. Falkenhausen (Physical Chemistry Award) is starting his PhD this fall at Emory University, with the ultimate goal of becoming a professor at a major research university. Thomas thanks Dr. Gopee Sreenilayam for his research mentoring and Drs. Donna Gosnell and Linda de la Garza for guidance.

Yeong Hun Jeong (Analytical Chemistry Award) will graduate in December and plans to return to South Korea to work at the Korea Hydro & Nuclear Power company. He thanks Drs. Sreenilayam and de la Garza for everything that he learned in their classes.

Kahleel E. Guerrier (Biochemistry Award) performs research with Dr. Dean Duncan and was a peer mentor in Organic Chemistry. His favorite class is Biochemistry. Kahleel entered the PhD program at the University of Kentucky to study cancer biology and toxicology.

Jason R. Phillips (Inorganic Chemistry Award) says that his favorite course so far is Inorganic Chemistry and that there are so many good chemistry professors that he can't pick just one.

Estefani Quinones (Organic Chemistry, Chemistry Undergraduate Research, and Outstanding Chemistry Senior Awards) also received an award from the Georgia Academy of Sciences for Best Chemistry Poster at their 99th annual meeting held here at VSU. Her favorite class was Dr. Tom Manning's Environmental Chemistry. Estefani plans to get a PhD in the fields of neuroscience and biomedical engineering at Cornell University.

Michael Rice (Freshman Chemistry Award) retired from the Air Force after 25 years of

service. He is married with two kids (one will attend VSU this fall). He hopes to attend Pharmacy School at Campbell University, NC in 2023. His favorite chemistry course so far is Organic Chemistry.

Grant T. McReady (American Institute of Chemists Award) plans to work at Optima Chemical in Douglas, GA after he graduates. He credits Dr. de la Garza for encouraging him to get involved in SMACS and research. He enjoys the enthusiasm that Dr. Manning has for his research. He learned a lot about teaching as the peer-facilitator for Dr. Gosnell. Grant thanks Dr. Yakov Woldman for pushing him intellectually in Biochemistry.

Jayden Thomas (Southwest Georgia ACS Optima Chemical Award) appreciates Dr. Manning for his research mentorship, Dr. de la Garza for professional guidance, and Dr. Theresa Grove (Biology) for her support and advocating on his behalf.

Jacqueline J. Farmer (Dr. M. Elizabeth Derrick Award) plans to attend the Physician Assistant program at UT Knoxville then become a physician assistant in Valdosta. She has a strong interest in medicine and a love for helping people. Her favorite professor is Dr. Gopee Sreenilayam.

Hope E. Smith (Julia Wisenbaker Sumerford Scholarship) will graduate in May 2024 with degrees in Chemistry and Biology, then seek a PhD. Hope is performing research with Dr. Shipra Gupta and is interested in internships next year.

Congratulations to our outstanding 2021-2022 student awardees!

Chemistry Faculty Updates

Chemistry faculty engage in teaching, scholarship, and service to VSU, their profession, and the Valdosta community. We want to share with you our latest accomplishments.

Dr. Linda de la Garza



Dr. Linda de la Garza, Valdosta State University 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 was selected to the Governor's Teaching Fellows Program 2021-2022. She recently coauthored an article, "Principles of Chemistry I Course Redesign at Valdosta State University", with Drs. Focsan, Gosnell, Salami, and Zheng in

the Gateways to Completion Case Study Anthology Volume 2. During 2021-2022, her students presented one poster at a national meeting and five posters at local and regional meetings describing their work on photoelectrochemical cells and methods of water analysis.

Dr. de la Garza was awarded the Student Life 2022 Advisor of the Year Award for her work as SMACS advisor. Dr. De la Garza and SMACS students hosted a mentoring luncheon for chemistry majors in September 2021 with support from ACS Innovative Grants.

Dr. de la Garza is a leader in the National Science Foundation's (NSF) Southwestern Georgia STEM Pathways Louis Stokes Alliance for Minority Participation (LSAMP) program. She serves as VSU's LSAMP Data Liaison and Research Coordinator. In that role, she organized a summer research camp in June 2021 and a virtual summit in February 2022.

Dr. de la Garza is a VSU Leadership Academy Scholar (2019-2020) and past President of MESA (2019-2020), a faculty and staff group focused on Hispanic/LatinX students at VSU. She is currently serving as SMACS advisor and Councilor of the Southwest Georgia Local Section of the American Chemical Society (2021-2023).

Dr. Dean Duncan

Dr. Dean Duncan teaches first-year Chemistry lecture and laboratory courses for science majors and the General, Organic, and Biochemistry (GOB) courses for Allied Health Science majors. In consultation with the VSU Nursing program, he and Dr. Winkelmann have continued to restructure



This Fall, Kahleel Guerrier entered the doctorate program in Cancer and Toxicology at the University of Kentucky. A former research student, Dr. Kory Burns, recently earned a PhD from the University of Florida and will join the Chemistry faculty as an Assistant Professor at the University of Virginia beginning in 2024. (See the Meet an Outstanding Alum on page 5 for more about Dr. Burns.)

the GOB courses to better serve the needs of these students. He pilot-tested a new online homework system from McGraw-Hill over the summer, which faculty now use for both GOB courses. This system permits working multiple problems of the same type for practice and incorporates a user-friendly drawing tool for generating Lewis structures. Faculty use other online teaching platforms to deliver lectures and for engaging students via online responses to questions during lecture.

Dr. Duncan's research addresses fundamental questions on chemical bonding, reactivity, and dynamics in molecular metal-oxides and supra-molecular assemblies. He and an LSAMP student scholar, Kahleel Guerrier, made further progress on the Sonogashira coupling of alkynes to the arylimido-functionalized polyoxotungstate (Ar-POT), α -[PW₁₂O₃₉(NAr-I)]³⁻. This will enable two Ar-POTs to be tethered by an arylalkynyl bridge for investigating long-range electron transfer between the metal-oxide units and their mixed-valence electronic structure and dynamics.

Dr. Ligia Focsan



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

Dr. Donna Gosnell

In the fall of 2021 I began a new research project that I have long wanted to pursue. Aquaporins are proteins that selectively transport water across membranes. Long term, I am interested in developing a biomimetic membrane that incorporates aquaporins to desalinate water. A number of labs across the world have been pursuing the same goal, but there is still much to be discovered and improved before these types



of membranes can be commercially viable. I began by growing *Ulva lactuca*, a sea lettuce (sea weed/macroalgae) with the intent of purifying its aquaporins. I chose this plant because it thrives in salt water. However, the potential yield of aquaporin directly from sea lettuce is quite low. One of my students completed a bioinformatics study and discovered aquaporin genes in a different species of sea lettuce, *Ulva mutabilis*. Over the summer of 2022, a student and I were supported by a Blazer Summer Research Institute grant (VSU) and used the genes studied in the bioinformatics project to clone an algal aquaporin gene into *E. coli* and yeast. We were successful with the bacterial clone and are working to clone the gene into yeast, which we hope will be a better expression vector. It has been invigorating and exciting to get into a new research path and I'm sure it will keep me busy for a few years.

Dr. Shipra Gupta

My group is currently working on two different research projects. One pertains to the photocycloaddition reaction. This reaction is the fundamental cause of DNA mutations that can cause skin cancer. In our lab, we are studying photocycloaddition of different molecules, starting from simple

organic molecules, to complex molecules, followed by the actual bases like thymine, which is one of the constituents of a DNA. We aim to optimize conditions of these reactions to eventually introduce them in undergraduate teaching labs. In the second project we are aiming to study the complexation properties of pro-vitamin D (a precursor to vitamin D) with different host molecules. We then plan to irradiate these complexes to study the effect of different media on the very famous vitamin D field reactions.



I am spending most of my research time learning to use and maintain various spectroscopic instruments, including NMR, UV-Vis, fluorimeter, GC, and HPLC. I believe that learning is a life-long process. In order to enhance my teaching skills further, I will be attending the ACS New Faculty Workshop (competitive invitation). A Faculty Research Scholarship awarded by VSU is supporting my attendance.

I love to serve my community. I helped with the 2022 National Science Bowl Competition and judged the Valdosta Middle School Science Fair. With the help of Dr. de La Garza, I organized a fun chemistry workshop for elementary school students to educate them about chemistry and develop their interest in the subject. I also serve as Title IX Advisor for the university.

Dr. Tom Manning



We had a busy year, between teaching and projects with our students. In chronological order:

Last summer we were in the Florida Keys for 5 days camping and checking out our coral restoration site. We have a permit from NOAA to test our novel approach. In the fall, two students advanced to the national finals of the Ocean Exchange business pitch contest that was held in Fort Lauderdale over three days. We had a paper published in the *Journal of Ocean Technology* entitled "Pharmaceutical Aquaculture," with two students were co-authors. We had our 22nd and 23rd novel cancer drug complexes get accepted for pre-clinical trials at the National Cancer Institute. We filed a New Drug Application for a COVID treatment developed and utilized by a medical doctor off label, with good results. Unfortunately, the EUA (Emergency Use Application) we filed with a pulmonologist from Mississippi was declined.

Teighlor Livingston, a VSU grad, completed her Master's thesis for a biomedical degree at PCOM in Moultrie. She conducted her thesis at VSU in our lab. The title was "Synthesis and Characterization of Novel Reformulated Bioactive Paclitaxel Complexes and Considerations for

Administration Via Inhalation Method for Targeted Lung Cancer Treatment." She passed with flying colors and is in DO school now. We've submitted a paper to a journal for potential publication. Teighlor also co-authored a short paper for an education journal entitled "Turning Element Abbreviations into a Strategic Exercise." We also had two student groups (five students total) advance to the second round of a business pitch contest held in Atlanta. Competing in Atlanta with groups from UGA, GA Tech, Emory, Auburn, Clemson, etc. in front of investors was an exciting experience. Two students were selected for the hour long "Spot Light" interview during the VSU Undergraduate Symposium in the spring.

Our oyster restoration project, which is based on the EPA's 12 Principles of Green Technology is in full throttle. A single oyster can filter up to 50 gallons of water per day, is a keystone species for many species of valuable marine life, and can prevent shoreline erosion. We have developed materials that can attract and grow oysters quickly. We recently delivered three types of novel materials to the UGA Marine Lab near Savannah for testing. We've proposed a technique using our material to attract and grow oysters in one location rather than move to a region where the oysters are needed to grow out. There are two students working on this project now, including an international student from South Korea.

Finally, we continue to develop novel educational activities for students. The first is a chemistry card game that involves 118 unique cards (one for each element, see example to the right) that can be played by those with little or no knowledge of chemistry. It is designed

Einsteinium Es <small>²⁵³Es was first produced by ²³⁸U during the detonation of nuclear weapons. Es is paramagnetic; [Rn] 5f⁷ 7s² Es halides has +2 or +3 oxidation state, EsF₃ and EsCl₃ Dr. A. Ghiorso (Lawrence Berkeley National Laboratory), co-discoverer of a 12 elements, including Es. Es found at natural nuclear fission reactor</small>
Actinide
Low Electronegativity
High Electronegativity
Low Natural Abundance
Allotropes
Component in Oxyacid's
Magic Number
Famous Isotope
Sketch the electron configuration for [Rn] 5f ⁷ 7s ² and explain why it is paramagnetic?

to familiarize students of all ages with different chemistry facts so they feel comfortable with the topic. We have proposed to co-develop it with the ACS National Education Committee and they have expressed a strong interest in the project.

Dr. Tolulope Salami



Our current research focus is on the synthesis of electrocatalysts for the electrochemical reduction of carbon dioxide.

Another area of interest is the synthesis of two-dimensional porous materials that can be used in sensor applications and drug delivery. One important highlight is the successful modification of porous materials using halochromic dyes and the adhesion of the hybrid material to a fabric towards the development of fabric sensor with potential for chemical recognition.

We also work extensively in chemical education research, specifically in the development of project-based upper-level chemistry laboratories and the development of new strategies for improved instruction.

I spent the summer of 2022 at Princeton University as a Visiting Research Faculty, with two of my research students, Jodeci L. Mitchel and Jayden Thomas. We conducted research on utilizing cyanogels as a platform

for the synthesis of novel catalysts for carbon dioxide reduction at the Frick Chemistry Laboratory in collaboration with the Bocarsly group.

Dr. Gopeekrishnan Sreenilayam



Gopeekrishnan (Gopee) Sreenilayam completed his PhD with Prof. Gregory Friestad in 2011 (synthetic organic chemistry) from the University of Iowa. He then did postdoctoral research with Prof. William Wuest (currently at Emory University) at Temple University, Philadelphia in medicinal chemistry from 2011-2013 and a second postdoc with Prof. Rudi Fasan at University of Rochester in biocatalysis from 2014-2017. Gopee started his independent academic career as a visiting assistant professor at Indiana University South Bend from 2017-2018 and moved to Valdosta State University during the fall 2018 as a tenure-track Assistant Professor. At Valdosta State University, Dr. Sreenilayam teaches Organic Chemistry I and II, Survey of Chemistry I for non-majors, and Senior Seminar courses.

Dr. Sreenilayam is very active with undergraduate research and a member of the VSU Undergraduate Research Council. He received a \$2000 Experiential Learning Seed Grant and a \$5000 Blazer Summer Research Institute Grant from VSU for the

natural product extraction project in collaboration with Dr. Focsan. Research in the Sreenilayam lab is focused on developing protein-polymer nano-constructs as reusable biocatalysts in non-aqueous media. We are also investigating the feasibility of performing aerobic biocatalysis in novel deep eutectic solvents. Last year, our lab started a collaborative project with Dr. Focsan's lab to explore the extraction of natural products using environmentally friendly, biodegradable, green solvents. We are really excited about this project! One of our students, Mr. Jwalant Shah, won third place in the three-minute video contest organized by the Undergraduate Research Council in the spring of 2022.

Besides research, Dr. Sreenilayam is actively participating in professional service and community outreach programs. He was the chair of VSU's Environmental Issues Committee last year and was also a member of the Faculty Senate, Athletic Committee, and the Committee for Internationalization and Globalization. In his free time, he is learning how to maintain Chemistry Department instruments such as NMR, GC, GC-MS, and HPLC!

Dr. Kurt Winkelmann

I continue to teach introductory chemistry for non-majors and I am teaching Physical Chemistry for the first time at VSU. Serving as Department Head keeps me very busy so I really enjoy the opportunity to leave my office and interact with students.

I am currently involved in two chemical education research projects. Coincidentally, the first project is led by Dr. Julie Donnelly, one of my former students and now a Chemistry professor at the University of Central Florida. (You never know when you'll meet your old students again.)

We are studying how disruptions caused by the COVID-19 pandemic affected college science education (e.g., the use of Zoom

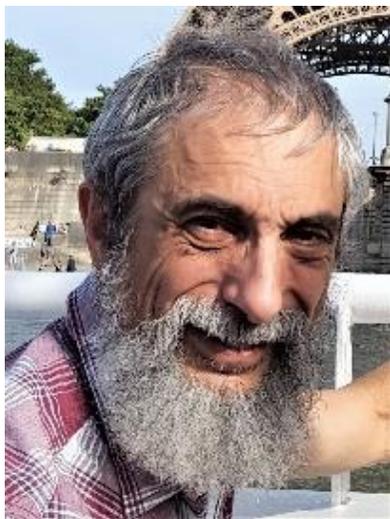


instead of face-to-face lectures). This past spring, I conducted focus groups of VSU science and math students. During the summer, I reviewed syllabi of physical chemistry courses taught before and after the pandemic to see how faculty have changed their approach to teaching. Preliminary results indicate that students suffered from a lack of connection with their peers and professors that led to decreased learning. Students are having trouble getting back to their normal study habits. One silver lining is that faculty appear to be making more of an effort to help students by offering video recorded lectures, more office hours, and making students feel more welcome in the classroom.

My other project is the development of a new experiment that undergrads can perform in a lab course to learn how silver nanoparticles affect the respiration of yeast. It's a simple set up that yields lots of interesting outcomes that students can explore. Two VSU undergraduate research students have worked on this project.

When I am not teaching, researching, and department heading, I like to spend time with my wife and daughter, watch football, play role playing games, and enjoy our Valdosta community.

Dr. Yakov Woldman



Hello, reader! My name is Yakov Woldman. I got my undergraduate and graduate degrees in Chemistry from Novosibirsk State University, one of the leading Russian universities in Natural Sciences. I am teaching at VSU now for 18 years, biochemistry and general chemistry lecture and lab courses. My teaching principles are based on my belief that chemistry is an experimental science and experiment goes first, only later to be explained by theory. From here is my attention to experimental details in teaching laboratory and my love of laboratory work with students.

Last summer I worked with a collaborator at West Virginia University to develop a technique for detecting aggressive short-lived molecules in living organisms. These molecules play an important role in an organism's chemical warfare against invading bacteria and viruses. They are also involved in inflammation, Alzheimer's, and Parkinson's diseases.

Every semester, several students work with me on research projects; their work is always presented on the Undergraduate Research Symposium at VSU and sometimes at regional and national research conferences.

Dr. Xiaomei Zheng

Dr. Xiaomei Zheng received a PhD in chemistry from Wesleyan University in Middletown, Connecticut. Before joining VSU, Dr. Zheng was a faculty member at Albany State University (ASU) and served as a laboratory and research skills trainer for the NIH RIMI program, as well as a co-leader for an NSF supplemental grant to the Targeted Infusion program at ASU.



She joined VSU in 2017 as a lecturer in chemistry, and currently teaches both Principles of Chemistry I and II, and Survey of Chemistry I and II labs. She is the lab coordinator of the Chemistry Department. In this role, she coordinates lab activities for first-year chemistry courses, she supervises and mentors stockroom student assistants to provide essential services for faculty teaching and student learning, and she provides stockroom student assistants with hands-on training.

Dr. Zheng's research interests are in synthesis, characterization, and antiviral/antibacterial activity of phenoxyimine Schiff Base ligands and their transition metal complexes. She has applied Schiff Base (salen) transition metal complexes along with ZnO nanoparticles in dye sensitized solar cells to improve solar cell efficiency.

Chemistry Faculty Spotlight

VSU's Chemistry faculty embody the dual purposes of a university: to share knowledge (teaching) and create knowledge (research). Learning in the classroom is important but participating in research - creating knowledge that did not exist before - is another critical component of a 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 VSU research students are contributing to the mission of VSU and our Chemistry Department.



For this issue, Dr. Ligia Focsan shares with us her knowledge and research of carotenoids.

The simplest definition I like to give to carotenoids is "Carotenoids are the natural red, yellow and orange pigments other than the green pigment chlorophyll found in leaves and other plant organs". Everyone has heard of chlorophyll when learning about photosynthesis in middle school, but not many have heard of carotenoids. Yet, carotenoids are, I say it and I do not care if you say that I am biased, more important than chlorophyll. You will see after reading this, that carotenoids are more important. At least to me, they are.

Like chlorophyll, carotenoids carry out a variety of photosynthesis functions in higher plants. But carotenoids' benefits do not stop with photosynthesis. They are also antioxidants in your body. They keep you well and alive.

I first heard of carotenoids as a graduate student at the University of Alabama (UA) in Tuscaloosa when I was 22 years old. I have studied carotenoids since. I studied the physical chemical properties of carotenoids,

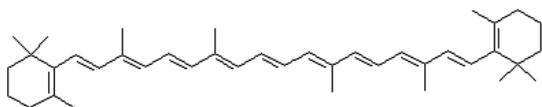
focusing on carotenoid radicals. I used advanced EPR, electrochemical and optical methods for analysis, and DFT calculations for data interpretation. It was in 2005 when scientists at Berkeley discovered the carotenoid radical cations' role in quenching excess sunlight. Soon after this, I proposed an additional quenching mechanism that involves radicals formed by deprotonation of the radical cations. That mechanism was never validated with experiments *in vivo*, but all my advanced EPR experiments on artificial matrices and all my DFT calculations on carotenoid radicals point in that direction.

During the 2022 Fall semester, I will gather all research performed at UA and at VSU to write a book on carotenoid radicals. It will comprise results from my 20 published research articles on carotenoid radicals in the past 20 years in collaboration with Prof. Kispert at UA, half of them published since I joined VSU. It will also contain the incipient research done by my predecessors 10 years before me in Prof. Kispert's lab, and any up to date research in the literature that relates to ours.

I call carotenoid radicals "the good radicals" because usually when students hear the word "radicals" they think of free radicals, aka "the bad radicals" that cause oxidation or damaging reactions in the human body, for example. Carotenoid radicals are just the opposite. They prevent oxidation and they sacrifice themselves to fight the free radicals. In the human organism, carotenoids are part of the antioxidant defense system and they reduce inflammation in the body. They keep away diseases like heart disease, cancer, and diabetes. They maintain your eye health, boost your mental health, and increase longevity.

Carotenoids are definitely worth researching. And the least you can do is what your mama tells you, "eat your fruits and vegetables" because they all contain

these good carotenoid radical species. You have most probably heard of the carotenoid called beta-carotene found in carrots, that gives its orange color and is a precursor to vitamin A. As seen in its structure shown below, it is made of just carbon and hydrogen, with long conjugated double bonds and cyclohexene rings at both ends. Carotenoids made of just carbon and hydrogen like beta-carotene described here, are called carotenes, while carotenoids containing oxygen groups are called xanthophylls, and give a more yellow color. Fruits and vegetables with high levels of carotenes and xanthophylls, like carrots, peppers, yams and oranges, are yellow, red or orange.



Structure of beta-carotene.

Most carotenoids' structures look similar to the structure above with a long polyene chain and ring(s), but there are subtle differences that make each carotenoid unique. There are more than 850 natural carotenoids discovered to date. If you ever want to find out what carotenoids you eat, join my research group and analyze any fruit or vegetable, any leaf, any food sample for

the content of carotenoids. My latest research projects involve extraction of carotenoids from natural sources using green solvents prepared in Dr. Sreenilayam's lab. Traditional methods of extracting carotenoids use typical volatile organic solvents, some toxic, but we try to advance a greener method for extracting carotenoids using procedures with non-harmful and non-toxic solvents. Extracting these pigments is a fun way of getting hands-on practice in the lab by using all the common organic lab procedures like weighing, filtration, separation, sonication, centrifugation, evaporation, etc. We use UV-Vis and HPLC for their detection, two basic analysis methods that are well sought by employers in the chemical industry.

In our most recent project, we extracted pigments from spinach leaves using green solvents and compared them to those extracted using traditional volatile organic solvents (see pictures of spinach extracts on the next page). The green color of spinach leaves that we see is actually a combination of several plant pigments, including chlorophylls and carotenoids. Using HPLC and UV/vis spectroscopy, we have detected chlorophylls a and b, and carotenoids of both types - carotenes (beta-carotene, alpha-carotene) and xanthophylls (lutein, neoxanthin, zeaxanthin).



Grinding Spinach with solvent.



Filtration of the extract.



Ground spinach in six different solvents.



Separation of the top organic phase containing the carotenoid from the aqueous phase at the bottom.

Congratulations to Our Graduates!

We celebrated seven Chemistry students becoming our newest alums this year! 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!

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



Thomas Falkenhausen, ACS Certified Biochemistry

Grant McReady, ACS Certified Chemistry

Daeshe' McCoy, Pre-Professional Chemistry

Danielle McKay, ACS Certified Chemistry

Brandy Perez, Pre-Professional Chemistry

Guillermo Sanchez, Pre-Professional Chemistry

Chris Telusma, Pre-Professional Chemistry

Congratulations!

Show your Support

Would it be a school 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 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 Department. Here are some giving options:

#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.

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. Donating \$15 per month pays for a student's hotel room at a research conference. It does not take much to make a difference.

I am sure that you have lots of great ideas for helping our students and improves their experience at VSU. Please share them with me or your favorite faculty member. We look forward to working with you to support our students.

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

Kurt Winkelmann
Professor and Department Head