Grove City College
Chemistry eNewsLetter
Fall 2025

Departmental News

Dr. Charles Kriley, Chair

I have always imagined that as you get older time will start to slow down and I would be able to accomplish a lot more things. Sadly, I have found that as I get older, time seems to speed up, and I have less time to get things done than I thought. I am now in my second year as department chair and Dr. Falcetta has now become my assistant department chair. As always Mike is full of a lot of great ideas, and we just have to figure out which one of the many we want to spend our time on. This Fall we moved into the "new" Rockwell (now named Smith Hall, after a generous alumni donor). The move went well with only a few minor adjustments. The Vice President of operations helped our department with the move by hiring a company to help physically move the supplies and instrumentation that were in storage. We moved the inorganic lab into the space where the physics labs used to be on the second floor, and the analytical lab moved into the old physics lecture room just across the hall. Dr. Wong has spent a lot of time moving her many instruments into the new instrument lab space. The new building has many study spaces for the students, allowing for both group study and private study. Old Rockwell has never looked so good!

We are happy to have Dr. Wong back from her sabbatical and appreciate everyone that helped cover her classes while she was gone (to be honest most of the work fell on our newer chemist Peter Foster). Notice I did not say newest chemist! With the retirement of Dr. Homan at the end of this school year we The College permitted us to hire his replacement this year. Our search found an excellent chemist, Jonathan Dabbs, Class of 2018. After graduating from Grove City College Jonathan went on for his Ph.D. in Organic/Organometallic chemistry at the University of Virginia and then completed a postdoctoral research fellow at St. Jude Children's Research Hospital in Memphis, Tennessee. He will be working with Dr. Cramer teaching organic, advanced synthesis, advanced organic and some general chemistry.

Dr. Homan has been serving as Dean of the Hopeman School of Science, Engineering and Mathematics for the past year and half and will be retiring at the end of the Spring semester. This will be his 35th year teaching at Grove City College, an admirable career at a great college. It is hard to imagine the impact that Dr. Homan has had on students over three decades! The College will also be seeing the retirement of his wife, Dr. Kris Homan (psychology). We wish them both a happy retirement and many years to enjoy their bike rides and travel.

We are conducting yet another faculty search this year. Believe it or not, Dr. Augspurger has also announced his retirement at the end of this academic year. It seems impossible, but Dr. Augspurger is in his 30th year of teaching at Grove City College. He has taught Physical Chemistry, General Chemistry I & II, Engineering Chemistry as well as a variety of Chemical Engineering classes when we had a minor in that field. Lastly, he has also taught SCIC 203, what we lovingly call Baby Chemistry. It seems hard to believe but with their retirement I will be the longest serving professor in Chemistry, Biology and Physics. I am sure Joe and his wife Laura will enjoy their retirement by visiting their grandchildren in South Dakota and some trips to visit their son and his wife in Guatemala.

On a sadder note, we lost one of our chemistry faculty members (yes, he also taught in biology, but he was chemistry first). Dr. Arnold Sodergren passed away on September 13, 2025, at the age of eighty-three. He was a great teacher and one of the kindest individuals that I have ever met. If you are interested, you can read his obituary here.

We always look forward to seeing our alumni at homecoming, and this year was wonderful with old friends joining us for the STEM breakfast and tours of Smith Hall. Thanks to all who came!

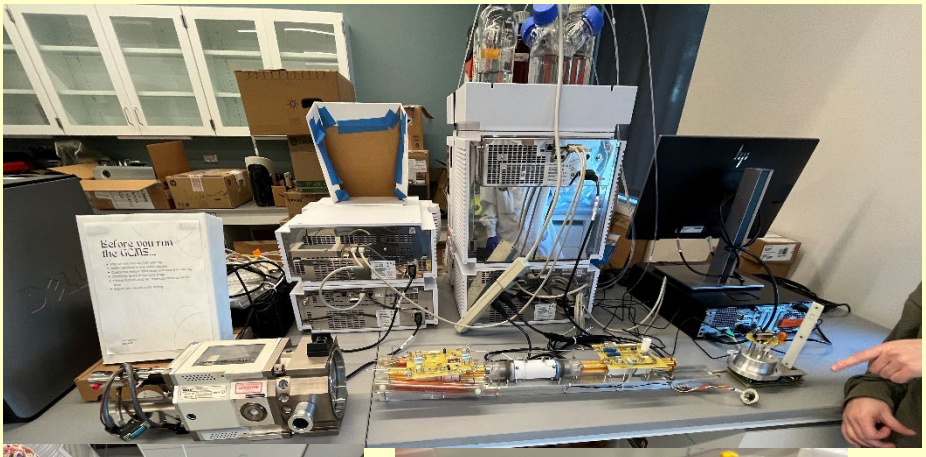
Sincerely,

Dr. Charles Kriley

Smith Hall Opens!

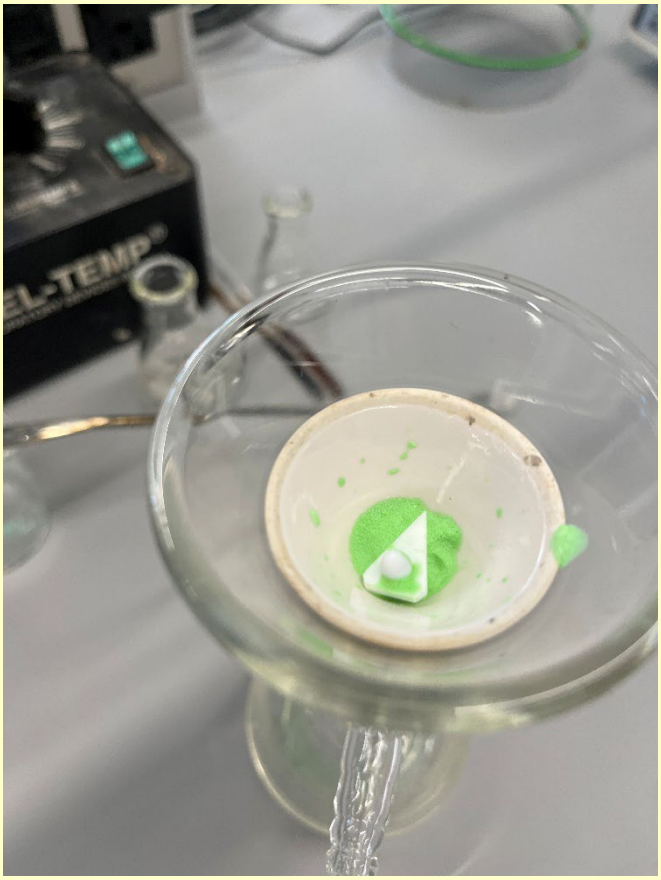
This fall Smith Hall, the newly named and renovated Rockwell Hall opened for classes and labs with the generous gift of Mr. Bill Smith (¢69) shown to the right. Mrs. Sara Naegele was also present and shown below with Dean Homan.

Dr. Wong has been moving into the new Analytical Labs shown below.



Smith Hall Opens! (part 2)

Of course, Dr. Kriley has been moving into the new synthetic laboratory space as well.



Congratulations, Class of 2025 Graduates!

On Saturday, May 10th, the Chemistry Department Class of 2025 took the annual picture of our graduates on the central stairs in STEM after our Graduates & Families Breakfast.

Top Row (left): Edward Lyon, Caleb Voges, Ryan Pirger, Ezekial Esteban
Second from Top (left) Cameron DeCarlo, Samantha Logue, Alex Blank, Sophia Applegate
Bottom Row (left):Emma Manwaring, Riley McCullough, Grace Beach, Mara Donley, Lexi Zook, Janele McCray
Not pictured: Shane Cato, Emmitt Everton, Isabella Gault, Will Herman, David Leslie, and Trey Zabrowski

Of our 21 graduates:
5 earned ACS certified chemistry degrees (15 in last 5 years)
2 started PhD programs
3 are employed in the chemical industry
1 is working for the FBI
2 entered medical school programs
1 will teach in Central America and apply to Med School for 2027

Congratulations, Graduates!

New Faculty – Dr. Jonathan Dabbs

This fall the department is pleased to welcome Dr. Jonathan Dabbs (Biochemistry, ‘18) as assistant professor of chemistry. Jonathan completed his doctoral work at the University of Virginia in 2024 in organic (and organometallic) chemistry and then completed a postdoctoral research fellowship at St. Jude Children’s Research Hospital in Memphis, Tennessee. This semester he is teaching one section of organic chemistry lecture as well as organic and general chemistry labs. In the future he will also teach advanced courses in organic chemistry. To help you get to know Jonathan a little bit better, he has kindly answered a few interview questions.

What are the main focuses of your research, if applicable?
My primary research interest is centered on aromatic molecules. The planar geometry of this class of molecules is a problem in drug design. Additionally, the stability of these molecules due to their aromaticity presents a challenging reagent, but if they can be coaxed to react, they could be ideal scaffolds for assembling molecules with rich druglike properties. Accessing this type of chemistry requires a strategy to dearomatize, or “turn off” the aromatic state that makes these molecules so stable. A variety of strategies exist to perform this. One such method involves coordinating aromatic molecules to an electron-rich transition metal complex. When coordinated to a dearomatizing metal complex, aromatic molecules “lose” their aromaticity and can undergo a wide variety of highly selective chemical reactions. We can harness this strategy to generate libraries of novel molecules rich in druglike properties while exploring the unique chemical reactions used to assemble them.

What specific courses or specialties do you teach, and/or what has drawn you to those specialties?
Broadly, I’m drawn to synthetic chemistry, which explores new methods for generating molecules. It’s like playing with Legos but with the building blocks of life (atoms)! The nearly limitless capacity for exploration combined with the notion that chemical knowledge has already transformed our society on numerous occasions creates an optimism that any given day of research in this field may produce a paradigm-shifting discovery. I look forward to sharing my passion for this by teaching organic chemistry this semester and the advanced synthesis laboratory next spring.

In your opinion, what is the most important piece of advice you give your students to help them succeed? How do you weave this advice into your classroom?
Understanding that the amount of time spent studying does not necessarily directly correlate to quality study. Quality study in chemistry is having organized notes that you know back and forth and blitzing practice problems under simulated test conditions. My courses will emphasize these by providing lectures and notes that are organized as clearly as they can be as well as guidance for practice problems. If you combine this with pursuing wholistic health and you surround yourself with a community that loves you unconditionally, you’ve got a great foundation for success.

Please list a *selection* of your publications.

Dabbs, J. D.; Taylor, C. C.; Holdren, M. S.; Brewster, S. E.; Quillin, B. T.; Meng, A. Q.; Dickie, D. A.; Pate, B. H.; Harman, W. D. W. Designing chemical systems for precision deuteration of medicinal building blocks. *Nat Comm* **2024**, *15* (1) DOI: 10.1038/s41467-024-52127-6

Dabbs, J. D.; Ericson, M. N.; Dickie, D. A.; Harman, W. D. Synthesis of 1-Azatriene Complexes of Tungsten: Metal-Promoted Ring-Opening of Dihydropyridine. *Organometallics* **2024**, *43* (9), 1051-1056. DOI: 10.1021/acs.organomet.4c00108

Dabbs, J. D.; Ericson, M. N.; Wilde, J. H.; Lombardo, R. F.; Ashcraft, E. C.; Dickie, D. A.; Harman, W. D. The Tungsten-Promoted Synthesis of Piperidyl-Modified erythro-Methylphenidate Derivatives. *ACS Cent Sci* **2023**. DOI: 10.1021/acscentsci.3c00556.

Is there any additional personal experience you would like to share?

Being back at GCC is such a tremendous blessing! I'm so grateful to return and join in the rich teaching tradition here to train up the next generation of scientists and health care professionals while pointing them to Christ.

What has been the most enjoyable part of teaching at GCC so far?

The community atmosphere and seeing old friends! The years come and go, but the faculty and student body remain so warm and welcoming.

What is the strangest thing about teaching at your alma mater?

Having to rewire my brain to call my former professors by their first name. That took (and is still taking) some serious focus.

Can you write about two sentences explaining your essential research program for nonspecialists?

In order to give future drug candidates the *best* chance to successfully pass the rigorous clinical trial process, we need to produce better quality drug candidates. One key factor is developing drugs that are <u>not</u> flat as these tend to have increased toxic off-target binding (which usually causes drug side effects). I explore organometallic methods for adding 'more tools to the toolbox' in synthesis for developing molecules with rich 3-D properties.

We are excited to have Jonathan join us and contribute his expertise, enthusiasm, and exhaustion (halfway through his first semester).

Sabbatical Update:

To start, I would like to express my gratitude to Grove City College for the time and support that afforded me the opportunity to realize my sabbatical proposal in the Spring of 2025.

In brief, the main focus of this sabbatical was to learn and explore new techniques in analytical and instrumental chemistry including extraction methods, antibacterial analyses, liquid chromatography (LC), transmission electron microscopy (TEM) imaging, and multi-tiered gas chromatography-mass spectrometry (GCMS). These techniques are valuable in advancing current research projects and course materials at Grove City College (CHEM 151, 227, 370, 406, 408, 470).

Firstly, I had the privilege to gain insights into various kinds of natural product analysis involving extracting bioactive compounds, specifically with antibacterial properties. A common way of extracting antibacterial microorganisms involves soaking the leaf, stem, and root of the plant to obtain tissues that were further sterilized in ethanol followed by rinsing with copious amounts of sterile distilled water. These tissues were inoculated onto agar plates and then cultured in broth [1].

Next, is to conduct minimum inhibition concentration (MIC) and minimum bacterial concentration (MBC) analyses. Starting with a reasonable concentration of antibacterial compound in µg/mL, a two-fold serial dilution system was applied into a labeled 96 well plate starting from the top row of the plate. Following the results of the MIC plates, the well with concentration with no visible growth is the MBC for the antimicrobial against the pathogen. Thus, both the optimal concentrations of antibacterial substance and pathogens are determined.

In addition to this, at the genomic center, I was trained in various bacteria DNA characterization methods. Conventional methods would involve utilizing a commercially available DNA extraction kit followed by PCR, purification, and identification based on a sequencing program (at least 1-2 days per sample). In contrast, using the LC-MS-MS instrument, a liquid chromatography coupled with two mass spectrometers, the characterization time can be reduced to between 30 – 45 minutes per sample (depending on sample size and type). I also had the opportunity to tour the genetic sequencing facility that has three LC-MS-MS instruments for research.

Apart from research pertaining to bacterial pathogens, I was incredibly fortunate to also cooperate on research involving a new marker for cancer called extracellular vesicles (EVs). Over the past decade, EVs have gained recognition as a potential cancer marker because all cells secrete EVs. Therefore, the secretion of various molecules like proteins, lipids, and nucleic acids contained in EVs can provide valuable information about the origin of the cell. Namely, this can be information regarding the health of the cell and diseases like cancer. I find this research fascinating for its simple approach in utilizing Fourier Transform Infrared Spectroscopy (FTIR) and Principal Component Analysis (PCA), a statistical modelling analysis, to develop a method to help in screening for cancer. Since EVs can be found in all types of body fluids, the most recent studies successfully detected EVs from urine of prostate cancer patients. I learned how to set up a low-cost extraction method utilizing portable pumps to extract EVs from urine samples from patients suspected of prostate cancer. Next, the EVs were scanned and

analyzed with FTIR. Along with this simple approach, transmission electron microscopy (TEM) imaging was utilized to verify the EVs. I was able to learn sample preparation and image analysis techniques involving proper characterization and identifying EV particles. This new research and analysis experience will be a valuable incorporation into my course material.

Lastly, in an electrochemical research lab, I developed a deeper understanding of operando spectroscopy instrumentation. The term operando spectroscopy utilizes analytical tools like various types of gas chromatographs (GC), liquid chromatographs (LC), X-ray Photon Spectroscopy (XPS), and related instrumentation to monitor electrochemical reactions and processes. The main system of interest conducted in this lab is the reduction of carbon dioxide to multi-carbon chemicals and fuels, typically developed by efficient, robust, and catalytic compounds. These reduction reactions are very complex in nature, but I am largely interested in how this research lab configured and attached multiple detectors onto a GC while monitoring an ongoing electrochemical cell reaction. I was able to become adept in understanding the various attachments of gas tanks linking to columns, configuration of two flame ionization detectors (FIDs) onto the same GC instrument, and system set up of a mass spectrometer (MS) onto a headspace-GC. This arrangement is highly customized to specifically detect small gaseous molecular products, catalytic compounds used, and every single unwanted gaseous by-product separated by three specialty columns resulting from one ongoing electrochemical reaction cell sample. This newly acquired design and layout of components is essential to a current research project involving electrochemical reactions of batteries.

I thoroughly enjoyed learning through conversations and lab experiences. Now, it's my turn to share these knowledge and techniques learned to my students here at Grove City College. Outside of the chemistry lab, my family and I "endured" basking in the sun halfway around the world while Grove City endured ice storms. At some point though, my two little boys were wishing they could play in the snow.

In summary, this sabbatical experience was integral in the process of developing current research projects, mentoring research students, and expanding lecture topics and coursework.

References:

1. Akinsanya, M.A.; Goh, J.K.; Lim, S.P.; and Ting, S.Y. Diversity, antimicrobial and antioxidant activities of culturable bacterial endophyte communities in Aloe vera. FEMS Microbiology Letters, 2015, 362, 184.
2. Yap, X.A.; Wood, B.; Ong, T.A.; Lim J.; Goh, B.H.; and Lee, W.L.; Detection of Prostate Cancer via IR Spectroscopic Analysis of Urinary Extracellular Vesicles: A Pilot Study. Membranes, 2021, 11, 591.

ACS updates

The ACS has had a busy year with current officers Erin Hunt (Presidentt), Alex Fix (VP), Wade Springer (secretary), Annalina Brant (Treasurer) and Hannah Slisher (Historian). Here are a few highlights of the groups activities and seminar speakers. There has been the traditional Periodic Table of Brownies for Homecoming for which Simon seems to be center stage both years!

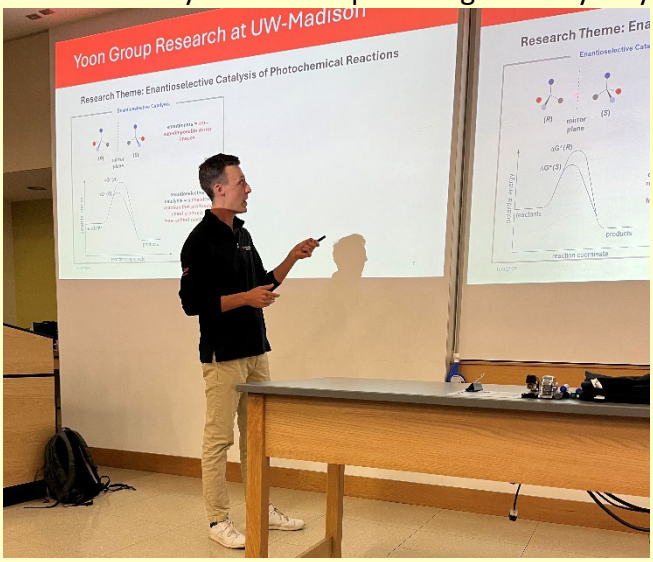
Those Brownies don't decorate themselves, so there is also the traditional night of decorating!

The Chem Connects program is still going strong, as GCC students led local kindergartners in the “Magic Milk Experiment” on Mole Day 2025.

And students always enjoy the ACS Fall Party hosted by Dr. Cramer!

This fall we welcomed Kirk Shelhamer (’97) from Sherwin-Willaims to discuss careers in the paint and coatings industries.(Left) Dr. Michael Van Stipdock from Duquesne University shared about his research using mass spectrometry.(Right)

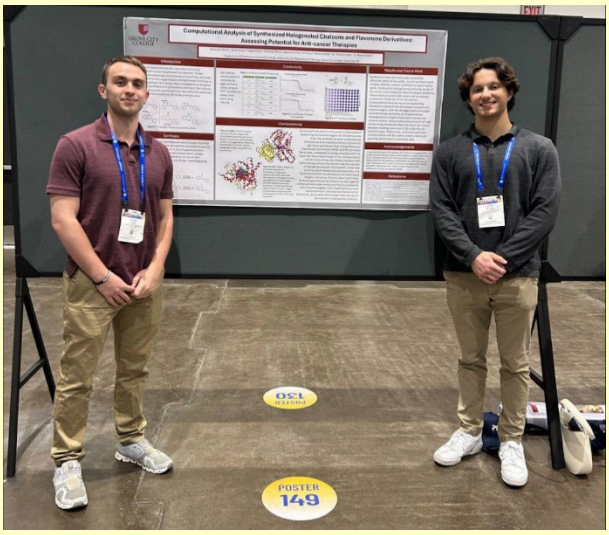
Dr. Matt Genzink (’18) from Eli Lilly and Company shared about his path from GCC to becoming a process chemist at Lilly. All of our speakers graciously stayed afterwards to talk with our students.



Finally, the national ACS offered a new type of event: a seminar in a box – The Secret Life of Spices! Several of our adventurous students gave this a try , and one even won a prize – go Alex! Along with the fun, there was pretty cool science shared via the web feed.

Last Spring, Dr. Kriley and 15 of our students attended the national ACS meeting in San Diego and presented their research posters. Our ACS student chapter earned a Commendable award for the 2023-2024 year and picked up their plaque (Cameron and Erin's poster was on our Chapter)!
We don't have pictures of all the students but here's a few!

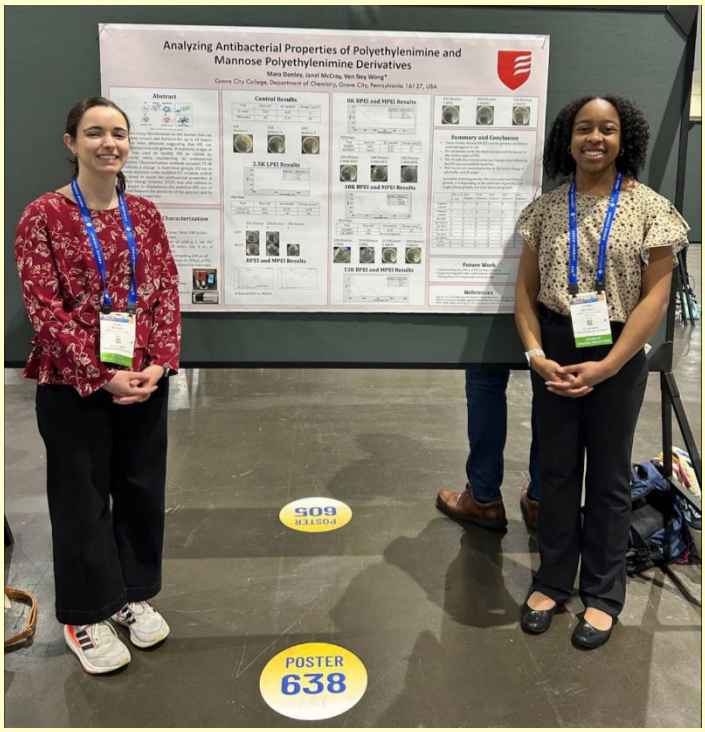
Erin Hunt



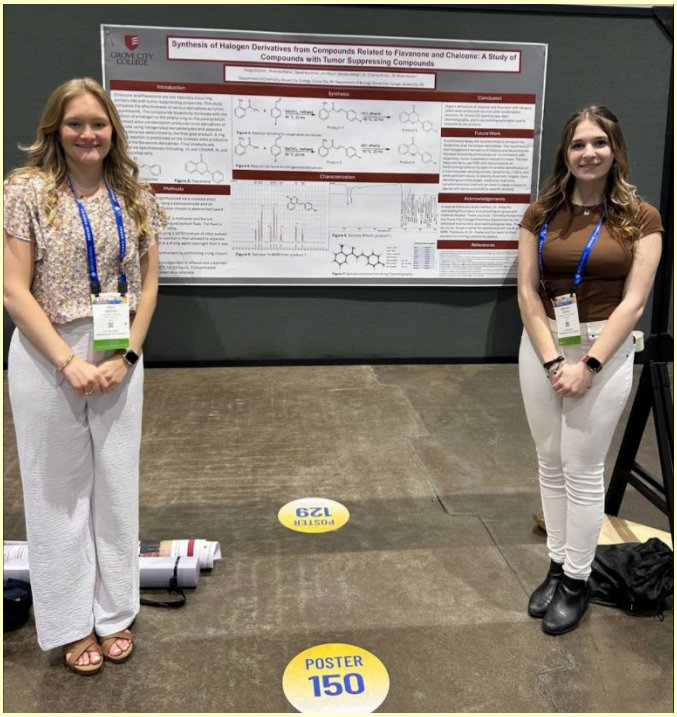
Cameron DeCarlo

Noah Vessey

Alex Blank



Mara Donley

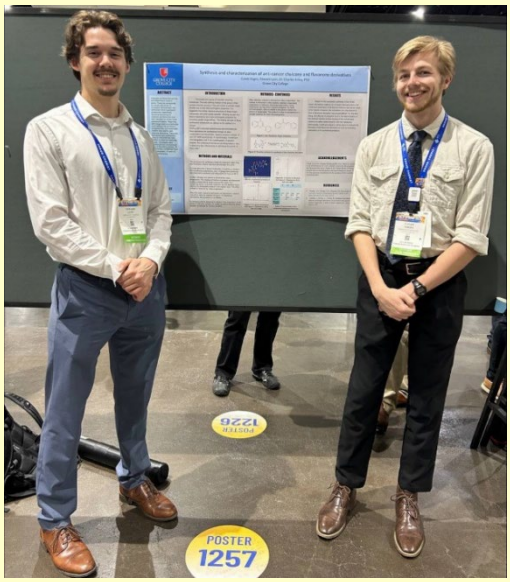


Janele McCray

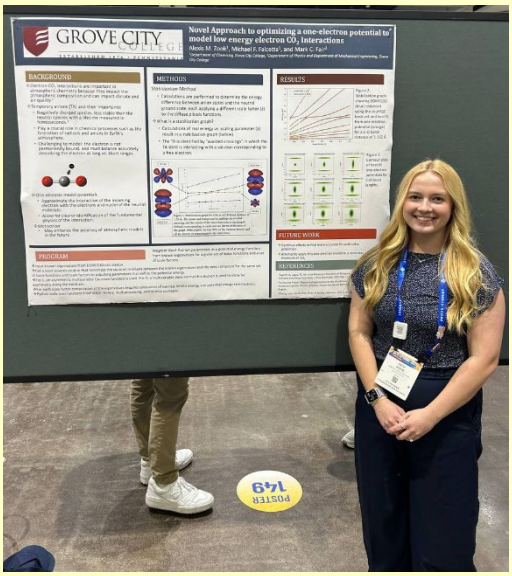
Paige Doleno

Miranda Metro

Olivia Landis



Edward Lyons Caleb Voges



Lexi Zook (now Gleason)

Scarlett Cohen (Left), Hannah Slisher (center) and Alex Fix

Had to have this picture!