



# Hope COLLEGE

## CHEMISTRY AND BIOCHEMISTRY

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# WINTER 2022 NEWSLETTER

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or find us at [hope.edu/chemistry](https://hope.edu/chemistry).



Hope College  
Chemistry Department

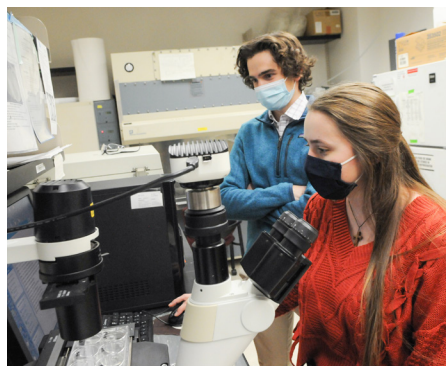
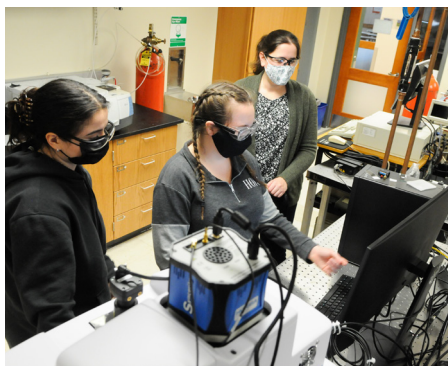


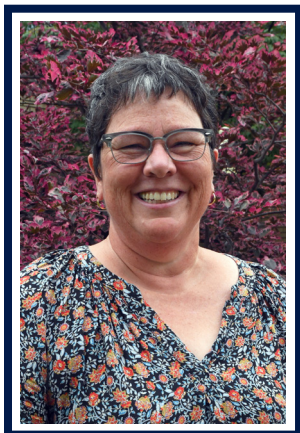
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## MESSAGE FROM THE CHAIR

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DR. ELIZABETH SANFORD

Dear Friends,

With the cooperation and diligence of students, faculty and staff and guidance from the wastewater testing program (read more in this newsletter), we made it through the fall semester without major disruptions. We still faced challenges that made teaching and learning more difficult, such as lower capacities in rooms, masking, and people in isolation and quarantine. We had to teach general chemistry to over 300 students in five sections of General Chemistry in the old Kletz—minus the fries and burgers. Overall, it was better than last year. Our seminar program went back to being in person, and we were able to have more departmental events with students. This spring we're teaching General Chemistry in the Schaap Science Center! We recognize that our nearly "normal" existence is not universal, and our thoughts go out to alums and friends of the department who are experiencing severe impacts, particularly those working in healthcare.

Our junior faculty continue to bring excitement to the department. Dr. Meagan Elinski was awarded seed money from the American Chemical Society Petroleum Research Fund to support research investigating the role of hydrocarbon chemical structure in composite film-forming surface reactions, Dr. Natalia Gonzalez-Pech along with co-PIs in Biology and Engineering were awarded an NSF-MRI for a new scanning electron microscope that will enhance materials characterization on campus, and Dr. Kristin Dittenhafer-Reed was awarded a prestigious NSF-early CAREER grant to study mitochondrial function and enhance biochemistry education.

An exciting addition to the Division is Bridget Calendo-Spaeth, the new Senior Philanthropy Advisor for the Natural and Applied Sciences. Bridget has an office on the 3rd floor of Schaap and regularly interacts with members of all departments—she is getting to know us well! We look forward to working with Bridget to continue to support science programs at Hope.

Outside of the science center, the Chemistry family welcomed four new babies in 2021—Matthias (Christopher Turlington), Lily (Mike Philben), Solei (Clayton Piehl), and Landon (Kristin Dittenhafer-Reed), who have brought joy to all.

A highlight of my spring will be a sabbatical leave. I am headed to Furman University to work with Dr. Beth Anderson on the surface characterization of electropolymerized films with electron microscopy and then will be traveling to Malaga, Spain, to do a Spanish language immersion program. Dr. Jeff Johnson is graciously taking over as interim chair until July 1. With the planned installation of the new electron microscope, I hope to be able to continue the sabbatical research in my lab when I return. Jeff and I are both excited about a short change of roles.

Best wishes,

*Elizabeth M. Sanford*

## FACULTY SPOTLIGHT – WASTEWATER TESTING TEAM

*By Hope College Public Affairs and Marketing, published July 2021*

**Hope College will expand its role providing wastewater monitoring as an early-warning system for the presence of COVID-19 not only locally but across southwest Michigan for the next two years through a \$7.5 million grant from the State of Michigan.**

The award to Hope is among 19 for projects across the state that have received a total of nearly \$49 million in grant funding announced by the Michigan Department of Health and Human Services on Thursday, June 24. The funding from the Centers for Disease Control supports the

ongoing development the state's SARS-CoV-2 Epidemiology – Wastewater Evaluation and Reporting Network, which uses locally coordinated projects to conduct wastewater surveillance for COVID-19. Partners include local health departments, tribal nations, wastewater treatment and environmental engineering agencies, colleges and universities, and public, private and academic laboratories.

“Wastewater surveillance is so important to identifying COVID-19 infections and community transmission early, and is especially important as we move to a new phase of fighting this pandemic,” said Dr. Joneigh Khaldun, [former] chief medical executive and chief deputy for health at MDHHS, in the announcement. “If our rates of infection start to increase, this network may provide an early warning sign and help communities target public health actions to prevent further spread.”

Hope's program was developed and is led by a team of Hope biologists and chemists, and was established in August 2020 as a central component of the college's effort to mitigate the presence of COVID-19 on campus. Daily throughout the 2020-21 school year, the college collected and analyzed wastewater coming from residence halls, cottages and apartments, which were divided into nine residential zones each containing approximately 250 students. Results were returned within 24 hours, and if elevated levels of the virus were detected in a sample, the college then tested that zone's individual students.

“Wastewater monitoring can detect the presence of COVID-19 before people even realize that they're infected,” said Dr. Aaron Best, who is the college's Harrison C. and Mary L. Visscher Professor of Genetics and is overseeing the Hope project. “There were multiple times on campus over the past year that we detected a signal in the wastewater, and could then take appropriate actions to identify cases and mitigate further spread.”





Hope has also been conducting testing in partnership with the Holland Board of Public Works and the City of Holland, analyzing samples collected at the city's wastewater treatment plant. In addition, Hope participated in a fall 2020 pilot project with funding from a \$700,000 grant from Michigan's Department of Environment, Great Lakes and Energy (EGLE) funded from Michigan's allocation of federal money under the Coronavirus Aid, Relief and Economic Security Act that expanded the college's 2020-21 program to include the cities of Allegan and Zeeland, and the Allegan County and Ottawa county health departments.

The new grant, which will run through July 31, 2023, will further expand Hope's program to include six local health departments serving nine counties, including Allegan, Berry, Branch, Calhoun, Eaton, Hillsdale, Kalamazoo, Ottawa and St. Joseph. During 2020-21, the college based its program in a laboratory on campus in the A. Paul Schaap Science Center, but, with the expansion more than doubling the number of samples tested daily from 150 to approximately 360, Hope will establish a second site in space rented at the Michigan State University Bioeconomy Institute in Holland.

The college's wastewater testing program builds on expertise developed through water-quality research conducted at Hope across the two decades. In addition to Best, it is led by faculty members Dr. Benjamin Kopek, associate professor of biology; Dr. Brent Krueger, professor of chemistry; and Dr. Michael Pikaart, associate professor of chemistry. The additional staff of program and laboratory managers and technicians includes recent Hope graduates who had participated in the research as students as well as others.



**Aaron Best**



**Ben Kopek**



**Brent Krueger**



**Mike Pikaart**

## ALUMNI SPOTLIGHT – BRI BARBU

By Grace Purdue '21



Brianna Barbu (Class of '16, pictured at left), although interested in chemistry, has always felt deeply connected to writing, grammar, and words. Currently, Bri works for Chemical & Engineering News, the flagship newsweekly of the American Chemical Society. This passion for the intersection of science and journalism was confirmed through an internship at Fermilab and a position with Discover magazine through the prestigious American Association for the Advancement of Science Mass Media Fellowship. Bri sometimes asks herself, “Why didn’t I go into this earlier? I knew for a long time that I wanted to be a writer.” The answer can only be found through looking back on her past experience in a PhD program. “I felt a lot of social anxiety and shyness that would have prevented me from becoming a great journalist. I needed tenacious negotiation and advocacy skills to learn how to do this well.” Leaving her PhD program was, in retrospect, the action needed to learn the skills to become a great journalist.

Bri’s story goes back a lot farther than parting ways with her graduate studies. At Hope, she jumped into chemistry because she believed science to be constant and fixed. “Science was constant, it was true, so I went for science. I didn’t realize that science research is the exact opposite of that until much later.” Bri had great experiences at Hope, especially in organic photochemistry and electrochemistry research with Dr. Jason Gillmore, where she was a first author on a collaborative article highlighting a new colorimetric analysis she helped discover. She earned many accolades during her undergraduate years including ACS Undergraduate Awards in Organic and Analytical Chemistry and the A.T. Godfrey Award for the top senior chemistry student. Bri’s continued curiosity and drive for discovery, led her to start graduate school at the University of Michigan in the fall of 2017.

Right away, she says, there was a demand to be more devoted to her research than she really felt. “There was a pressure, I’m still not sure from what, that if you were going to be a scientist, you had to devote yourself to science and nothing else. I knew instinctively that that wasn’t true.” After experiencing the nature of her classes, she noticed that successful students were able to achieve their goals by bringing an element of creativity into their work. The colleagues who seemed so rigidly devoted to their research were not as happy as the colleagues who had creative outlets outside of work. “I reconciled that science, when done right, is an inherently creative act.” This led her to recognize that her skills in both writing and science fit well into a very specific field. She liked breaking down jargon and figuring out how to put things in language that non-experts could understand. “[Science journalism] is a really good mix of what I enjoy thinking about: Issues in science and how they affect people, how to communicate them to the world, and how to speak truth to power.”

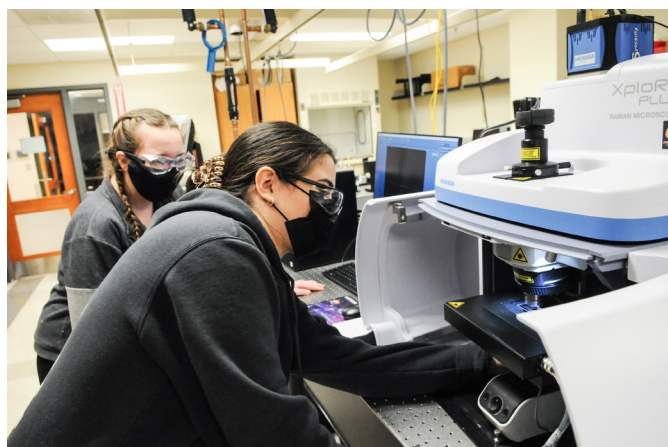
Finally, the most rewarding part of Bri’s job is “being able to open people’s minds up to ideas that they wouldn’t have considered before, and tell stories that wouldn’t have otherwise been told,” she says. She’s finally found the ultimate combination: a crossroads between constantly learning and educating others. “Writing about science is my *thing*. It’s what I love to do.”

# ANALYSIS AT THE NANO SCALE: EXPANDING MATERIALS CHARACTERIZATION INSTRUMENTATION AT HOPE COLLEGE

*By Dr. Meagan Elinski*

The 2021-2022 academic year is seeing exciting, substantial growth of the department's and division's materials characterization capabilities. A new confocal Raman microscope was installed in August 2021 and a new scanning electron microscope is due for installation in spring 2022. Both instruments will provide students with transformational, cutting-edge materials-related research experience, and allow for the development of experimental demonstrations to complement fundamental concepts covered in basic and advanced courses in Chemistry, Biology, Physics, Engineering, and Geological and Environmental Sciences. Funding for the confocal Raman microscope was provided by the Hope Chemistry Department's Schaap Research Endowment. The scanning electron microscope was funded by the National Science Foundation's Major Research Instrumentation (NSF MRI) Program.

The Horiba XploRA Plus Confocal Raman Microscope provides Raman spectroscopy measurements with high surface spatial resolution. In the instrument Raman spectroscopy – a type of vibrational spectroscopy utilizing light scattering – is coupled with a confocal microscope. This allows for two-dimensional mapping of surface features as small as 500 nm lateral dimensions. Current research applications include single point measurements of nanoparticle samples and localized chemical mapping of thin films.



*Students Morgan Platz '22 and Alana Policastro '24 setting up the confocal Raman microscope.*

The JEOL IT700HR field-emission scanning electron microscope (FESEM) will have low vacuum, low voltage, energy dispersive x-ray spectroscopy (EDS), and scanning transmission electron microscopy (STEM) capabilities. SEM utilizes an electron beam to generate high resolution, high magnification images, with EDS providing complementary elemental analysis. Research to be enabled includes characterizing multifunctional nanomaterials, fine particles to assess environmental water quality, examining film morphology of perovskite films and liquid crystal polymers, and much more across multiple disciplines.



*Drs. Jeff Christians, Michael Philben, Natalia Gonzalez-Pech, and Ben Kopek prepare the lab space for the SEM installation.*



# FALL DEPARTMENT HAPPENINGS

*By Dr. Kristin Dittenhafer-Reed*

## CHEM CLUB EVENTS

The Chem Club, led by students James Bird ('21), Ivan VanderKolk ('21), Erin Ramey ('22), Paulina Kozan ('22), Isabelle Dial ('22) and Maddy Kokmeyer ('22) with the aid of faculty mentor Dr. Chris Turlington, had a very active fall semester. They kicked off the fall with a welcome dinner for students and faculty. They organized a number of outreach events including making dry ice bubbles and slime at a science fair event at the Woodland Mall, hosting a hot cocoa and coffee bar for students in the science center, and a leading a holiday social gathering on the last day of classes. In October, the Chem Club partnered with Hope multicultural student organizations to host "Fostering an Inclusive Community in Chemistry." Dr. Elizabeth Sanford, Dr. Ken Brown, and students led a panel discussion exploring diversity and inclusive work environments.



*Diversity and Inclusion in Chemistry panel*



*Students James Bird, Paulina Kozan and Ivan VanderKolk demonstrate their experiments for kids at the Woodland Mall*



*Holiday gathering in Schaap Atrium*

## 2022 ADMISSIONS UPDATE

The Chemistry faculty had the opportunity to write holiday cards to 230 students who were admitted to Hope for matriculation in Fall 2022 and indicated Chemistry or Biochemistry as one of their top interests. Please help us continue this high level of interest in the sciences by referring high school students at [hope.edu/refer](https://hope.edu/refer) or connecting them directly with the Chemistry Department.

## SEMINAR PROGRAM

After over a year of remote seminars we were pleased to return to in-person presentations in Fall 2021. Twelve speakers from a range of institutions across the country joined us for our weekly seminars. Students and faculty were exposed to topics from a variety of chemistry disciplines, including organometallic functionalization of nanocrystal surfaces, understanding protein function through fluorine NMR, investigating luminescent materials as optical temperature sensors, and chemical signaling in protozoans. The fall seminar series ended with author Stephanie Deutsch who presented on her book "You Need a Schoolhouse", a story about Booker T. Washington, Julius Rosenwald, and the building of schools in the segregated south. This presentation provided the opportunity for us to think about equity issues related to the access to education. If you are interested in joining us for a seminar, please view the schedule on the Hope Chemistry Department website.

# 2021 FACULTY AND RESEARCH HIGHLIGHTS

*By Dr. Kristin Dittenhafer-Reed*

## GRANTS & PUBLICATIONS

In 2021, the Chemistry faculty published 14 articles, 10 of those with undergraduate co-authors. Manuscripts were published in peer-reviewed journals including Environmental Monitoring & Assessment, Proteins, Tropical Medicine and Health, MRS Advances, SynOpen, and the International Journal of Molecular Sciences. Students and faculty presented their research at external meetings, including American Chemical Society regional meetings, the Midstates Consortium for Undergraduate Research Symposium, and Advancing Earth and Space Science Meeting. Finally, faculty earned funding to support research on campus from numerous external sources including:

- Jeff Johnson and Jason Gillmore led efforts securing a record ninth Beckman Scholars Program award from the Arnold and Mabel Beckman Foundation. This \$104,000 award supports two years of intensive research by a total of 4 students spanning 3 years.
- The Wastewater Team of Brent Krueger, Mike Pikaart, Aaron Best (Biology) and Ben Kopek (Biology) was awarded over \$685,000 from the Michigan Department of Environment, Great Lakes, and Energy for the implementation of digital droplet PCR technology for screening wastewater in Ottawa and Allegan Counties. An additional \$7.5 million was awarded in July to expand testing to an additional 6 counties (see article on page 2).
- Multiple faculty were awarded student research fellowships and seed grants from the Michigan Space Grant Consortium. Awardees include Carrie Dummer, Meagan Elinski, Natalia Gonzalez-Pech, and Michael Philben.
- Natalia Gonzalez-Pech led a team to secure \$321,000 from the NSF Major Research Instrumentation program for the purchase of a scanning electron microscope (see article on page 5).
- Meagan Elinski was awarded \$55,000 in seed money from the American Chemical Society Petroleum Research Fund to support research investigating the role of hydrocarbon chemical structure in composite film-forming surface reactions.
- Mike Pikaart and the national BASIL (Biochemistry Authentic Scientific Inquiry Laboratory) consortium was awarded a Improving Undergraduate STEM Education (IUSE) grant from the NSF. The goal of this \$2 million grant is to expand the BASIL biochemistry lab curriculum to new institutions.
- Kristin Dittenhafer-Reed was awarded a CAREER grant for \$540,000 from the NSF to support research in her lab and to enhance the biochemistry lab curriculum at Hope over the next 5 years.



## WHY I GIVE: SPOTLIGHT ON MARY KOLEAN '77 AND JOHN '75 KOEPPE

*Interview performed and article written by Dr. Kristin Dittenhafer-Reed*

*Mary Kolean Koeppe and John Koeppe are philanthropic advocates of Chemistry and Biology. Mary graduated from Hope College in 1977 with degrees in Chemistry and Biology. John graduated with a degree Chemistry in 1975. After earning her PhD, Mary enjoyed a stellar career at DuPont as a bio-analytical chemist. John earned a Master's degree and taught mathematics and computer science at Immaculata University in Pennsylvania. Together they established the Koeppe-Kolean Scholars Program at Hope. Their program provides a summer student researcher stipend and supports student research during the academic year. I asked Mary and John to share how giving back keeps them connected to transformational moments.*



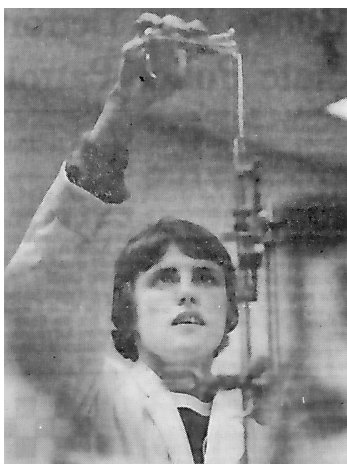
*John and Mary (far left) pictured with students Paula Nolte, Koeppe Scholar Paulina Kozan, and Victoria Parker at the 2019 Schaap Summer Research Symposium.*

**CONNECTION:** John has a deep Hope family tradition, starting with his paternal grandparents. His father and two uncles majored in chemistry and five cousins majored in science or mathematics. Mary, on the other hand, was the first in her family to attend college. Both Mary and John participated in undergraduate research. Mary spent summers immersed in biology and environmental toxicology research with Dr. Eldon Greij and Dr. Krogh Derr, experiences that provided the interdisciplinary knowledge base she would need in her future career.

John spent a summer doing research with Dr. Michael Doyle. That experience helped John realize chemistry research was not where he would blossom. Nonetheless, the collective liberal arts experience and strong analytical skills cultivated at Hope helped fuel his path as a college instructor of math and computer science. Today, they feel fulfilled and engaged through interactions with talented students benefiting from their endowed fund. John and Mary enjoy attending the summer research symposia to witness first-hand what is being revealed in campus labs.

**MOTIVATION:** The research experiences and faculty mentoring Mary received at Hope opened doors she couldn't even imagine as a girl from a poor family. Mary and John enjoy equipping and empowering first generation students from financially disadvantaged backgrounds to actively pursue undergraduate research.

**IMPACT:** In addition to the sciences, John and Mary were impacted by the full spectrum of the liberal arts curriculum. Mary played four varsity sports and was the first woman to participate in track. Her tenacity on the sports fields paved the way for generations of female athletes who followed in her footsteps. These experiences proved invaluable as she entered her career at a time when females were a significant minority in the field of scientific research. John and Mary fondly reflect on their passion for music and writing courses. John and Mary give back as a way of saying thank you to those who mentored them. They find great value in investing in the next generation of bright and passionate liberal arts scholars.



*Mary performing research at Hope College (1977)*




*Mary and John pursuing one of their many hobbies - whitewater kayaking*



*Mary competing for Hope's first women's track team (1977)*

***"I think this interest in a variety of activities, things learned and fostered while at Hope, helped me have a rewarding life and achieve balance – a skill that is invaluable in this increasingly hectic and stressful society." – Mary***

The Hope College Chemistry Department is grateful for donors who generously give back to support our mission of providing excellent undergraduate chemistry education and research experiences for our students.



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