CATALYST

BREAKTHROUGH COLLABORATIONS IN **HEALTH, ENERGY,** & THE **ENVIRONMENT**

Multidisciplinary research creates lasting impact for science, business, and people's lives.

CHAIR'S **WELCOME**

Dear UB CBE Community,

I am proud to share with you the latest edition of The Catalyst, our annual newsletter, this year in a digital-only format. Of course, that is a minor change on the scale of the events of 2020, but I think you will find this newsletter emblematic of the way in which our Department has been able to keep moving forward in the face of numerous changes and challenges. We were able to hire three outstanding new faculty members, just as our activities were shifting online last spring. All three will be joining the Department in January, bringing us to a total of 27 full-time faculty members.

Despite a three-month lab shutdown, our faculty and researchers remained productive, continuing to publish and write grant proposals while developing new patterns of interaction. As a result, our research expenditures and publication numbers continue to climb. Several groups re-directed research efforts to directly address the COVID-19 pandemic. The abrupt transition to online-only teaching in the spring was not without its problems, but our faculty members developed new skills fast, and I am proud of the way they were able to deliver the rest of the spring semester and put together online and hybrid courses for the fall in ways that maintain the quality of instruction while keeping everyone safe.

University at Buffalo
Department of Chemical and Biological Engineering
School of Engineering and Applied Sciences

I am confident that these skills and techniques will improve the educational experience for our students long after we have reached a new normal. While visa and travel restrictions led to small incoming graduate class sizes in other departments at UB and elsewhere, we ended up with a very solid incoming graduate class, with more to come in January.

Of course, there were lost opportunities that cannot be replaced, particularly for our spring 2020 graduates, who did not get an in-person commencement ceremony, AIChE banquet, or many other treasured end-of-the-year activities. Although UB held virtual commencement ceremonies, and the Department prepared our first-ever CBE yearbook, distributed to the graduates with a care package, these small tokens do not make up for all that they missed. We were unable to repeat our successful Chem-E-Camp for high-school students or our Alumni Happy Hour. We look forward to resuming these activities as soon as we can safely do so!

More challenges lie ahead, as UB navigates the financial impact of reduced state support and tuition revenue combined with increased costs, and we continue to bring more people onto campus, as safely as possible. However, based on what I have seen this year, I am fully confident that with the support of our alumni and friends, UB CBE is up to the challenge and will only continue to improve across all dimensions of our activities.

Cheers!

Mark T. Swihart
Chair, UB Distinguished Professor
and Empire Innovation Professor

new research funding **$9 million**

16% Publication Growth

GRADUATE ENROLLMENT **↑8%**

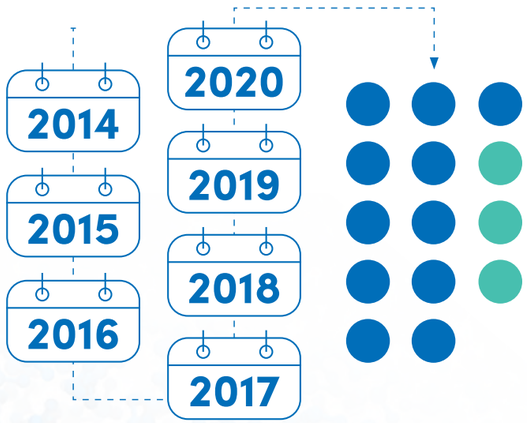
number of **Postdoctoral Scholars** has grown to 12

PROUD TO HOST **14 Scholars** from around the world

GROWING FACULTY

3 NEW HIRES starting January 2021

14 NEW FACULTY IN 7 YRS



ASHLEE FORD VERSYPT, Associate Professor, will lead the Systems Biomedicine and Pharmaceutics Laboratory. The long-term goal for her research program is to develop multiscale mathematical and computational models to enhance understanding of the mechanisms governing tissue remodeling and damage as a result of diseases and infections and to simulate the treatment of those conditions to improve human health. The Systems Biomedicine and Pharmaceutics Laboratory specializes in modeling kinetics and transport processes involved in biological and chemical interactions related to both physiological microenvironments and engineered biomedical and pharmaceutical systems, particularly those involved in tissue damage and treatment. Her research program is funded by the National Science Foundation and the National Institutes of Health.

Dr. Ford Versypt has been selected as the recipient of the 2020 Ray W. Fahien award from the Chemical Engineering Division of the American Society for Engineering Education (ASEE) for her vision and contribution to chemical engineering education. Her article, "Apps for Chemical Engineering Education: Off-the-Shelf and Do-It-Yourself Development Options," was published in the *Chemical Engineering Education* Summer 2020 issue. She has also been invited as keynote speaker for the 2020-2021 Thiele Lecture at Notre Dame University. The Thiele Lectureship was established in 1986 and is intended to recognize outstanding research contributions by a younger member of the chemical engineering profession. She will deliver the lecture next spring. Read more on Ashlee Ford Versypt's research ▶

UB IS PROUD TO WELCOME
THREE NEW FACULTY MEMBERS
IN JANUARY 2021:

VIVIANA MONJE-GALVAN, Assistant Professor, is active in the areas of computational biophysics and molecular biology. Her expertise is on realistic membrane modeling and the study of biological processes at the cellular membrane interface. She is especially interested in the role of lipids as active modulators of cellular processes. Prior to joining UB, she completed postdoctoral training in the Voth group at the University of Chicago, contributing important insights about the protein-lipid interplay during early stages of HIV-1 viral assembly as well as key biomolecular interactions within the lipid envelope of the SARS-CoV-2 viral particle. She completed her PhD under the mentorship of Dr. Jeffery Klauda at the University of Maryland-College Park, where she developed organelle-specific membrane models for yeast. Her simulations were the first to examine complex lipid mixtures at the atomistic level and showcase how the chemical structure and ratio of lipids of *in silico* models reproduce different mechanical and structural membrane properties, which, in turn, influence the interaction with other biomolecules. Read more on Viviana Monje-Galvan's research ▶

MIAO YU, Empire Innovation Professor in the RENEW Institute, is focused on rationally designing and fabricating nanoporous materials/structures for precisely distinguishing molecules by size/shape differences, characterizing and understanding the nanostructures, and applying them for separation and for catalysis. His long-term goal is to commercialize more than two technologies to generate a profound impact on energy, environment, water, and food via design of novel and scalable functional nanoporous materials/structures, guided by a deep fundamental understanding of materials synthesis/growth mechanisms and structure/property relationships. Prior to joining the University at Buffalo, he was an Associate Professor and Priti and Mukesh Chatter '82 Career Development Chair in the Department of Chemical and Biological Engineering at Rensselaer Polytechnic Institute (RPI). He has published more than 60 peer-reviewed papers, with two in *Science* and others in *Nature Communications, Advanced Materials, JACS, Nano Letters, Angewandte Chemie,* and other top journals. He is a recipient of a 2015 NSF Career Award, and has recently been selected for a grant from the DOE NETL Direct Air Capture of CO_2 program. The 18-month, $800,000 project is entitled, "Direct Air Capture Using Trapped Small Amines in Hierarchical Nanoporous Capsules on Porous Electrospun Fibers." Read more on Miao Yu's research ▶

FACULTY ACHIEVEMENTS

PASCHALIS ALEXANDRIDIS, UB Distinguished Professor, was awarded a $2 million NSF grant for the project, "Valorization of Plastic Waste via Advanced Separation and Processing." The project aims to reduce both the amount of waste plastic that ends up in landfills or incinerators and the amount of virgin plastic required for new products by focusing on two challenging issues: (1) sorting of mixed plastic waste and (2) valorization of recovered plastic. UB CBE faculty who are co-investigators on the grant include Empire Innovation Professors Amit Goyal and Thomas Thundat, and UB CBE Associate Professor Marina Tsianou, along with Javid Rzayev and Luis Velarde, UB Department of Chemistry, and Karthik Dantu, UB Computer Science and Engineering. Alexandridis was also elected fellow of the Royal Society of Chemistry (RSC), an honor given to those who have made a great impact in fields of the chemical sciences. The distinction of Fellow recognizes members who have been in a senior position for more than five years and have made a demonstrated impact in the chemical sciences.

SUNY Distinguished Professor **STELIOS ANDREADIS** was awarded a $2.4 million R01 grant from the National Heart, Lung and Blood Institute to investigate the role of the immune system in successful implantation of tissue-engineered vascular grafts that were developed in his laboratory. This grant is in collaboration with Dr. Christopher Breuer of Nationwide Children's Hospital (Columbus, OH). He also received a second $2 million R01 grant from the National Institutes of Aging for "Restoring the regenerative capacity of the aged muscle." The project aims to develop strategies for restoring the capacity for regeneration of skeletal muscle, which is impaired by aging. This five-year grant is a collaboration with Drs. Kenneth Seldeen and Bruce Troen from the Department of Medicine Division of Geriatrics and Palliative Medicine at the University at Buffalo.

His paper on the role of monocytes in regeneration of vascular grafts, "Endothelialization of Arterial Vascular Grafts by Circulating Monocytes," was published in *Nature Communications.* This research discovered that blood monocytes, not endothelial cells, attached to the graft lumen and turned into endothelial cells that kept the grafts patent and functional. Given the abundance of monocytes in the blood (~20% of white blood cells), this discovery suggests that strategies to attract monocytes to the graft may promote successful replacement of cell-free, off-the-shelf vascular grafts.

In a second paper, "Cell-free Vascular Grafts that Grow with the Host," that was recently published in the journal *Advanced Functional Materials,* his laboratory showed that when implanted into the arterial system of neonatal lambs, these grafts grew in size with the host to a similar extent and with similar rate as native arteries. This is important for the treatment of congenital heart disorders to alleviate the need for repeated surgeries that are currently required to replace the vascular grafts with larger ones as infants grow into adults.

CHONG CHENG has been promoted to Full Professor. He is well known in the polymer science community for his creative synthesis of new polymeric nanostructures for biomedical applications, and for seamlessly combining cutting-edge materials synthesis with novel self-assembly techniques to create complex, multi-functional structures. He has recently taken over authorship of *Principles of Polymerization,* the most widely used textbook and reference work in polymer chemistry.

AMIT GOYAL, Empire Innovation Professor and Director of the University at Buffalo's RENEW Institute, was awarded nearly $2 million from New York State Department of Environmental Conservation (DEC) to assess the plastic recycling industry and educate the public. The work also calls for developing policy options for the state and leading education and public outreach efforts with the goal of helping to stimulate the state's regenerative economy while reducing pollution. Co-investigators on the project include Paschalis Alexandridis, Professor in the Department of Chemical and Biological Engineering; Aditya Vedantam, Assistant Professor in the Department of Operations Management and Strategy

FACULTY ACHIEVEMENTS

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in the UB School of Management; John Atkinson, Associate Professor in the Department of Civil, Structural, and Environmental Engineering; Alan Rae, Director of UB's Center of Excellence in Materials Informatics; and Michael Shelly, RENEW environmental economist and research Assistant Professor in UB RENEW.

Goyal has also been named a SUNY Distinguished Professor, the highest faculty rank in the SUNY system. In 2018, he was elected to the National Academy of Engineering for groundbreaking scientific advances and technological innovations enabling the worldwide commercialization of high-temperature superconductors. He is also a fellow of the National Academy of Inventors, with 87 issued patents and additional patents pending.

JOHANNES HACHMANN received the SUNY Chancellor's Excellence in Teaching award, which recognizes consistently superior teaching at the graduate, undergraduate, or professional level in keeping with the State University's commitment to providing its students with instruction of the highest quality.

"Johannes Hachmann is clearly having a significant impact on our students through outstanding teaching efforts, and for that I am truly grateful. He is providing a standard of excellence that is aspirational for all faculty in SEAS and at UB." –Kemper Lewis, Dean of the School of Engineering and Sciences at UB. Professor Hachmann has also recently been promoted to the rank of Associate Professor with tenure.

Assistant Professor **ELINA KYRIAKIDOU** has been awarded a $1.2 million grant from US DOE-NREL (US Department of Energy National Renewable Energy Laboratory) for low-temperature CH_4 conversion by developing a novel aftertreatment system for future natural gas vehicles using palladium-based catalysts.

Associate Professor **HAIQING LIN** was selected for the AIChE Separations Division Innovation Award for his continuous contributions to the development of high-performance membrane materials for CO_2 capture from fossil fuel-based processes and their impact on industrial membrane technology. He was also elected a board member of the North American Membrane Society (NAMS) and will serve from 2020–2023.

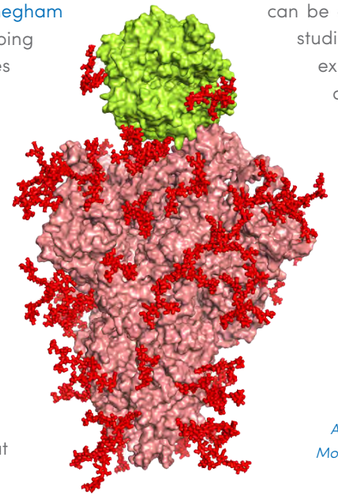
Professor Lin has also been selected for an $800,000 grant from the DOE NETL Direct Air Capture of CO_2 program. The project title is, "Membrane Adsorbents Comprising Self-Assembled Inorganic Nanocages (SINCs) for Super-fast Direct Air Capture Enabled by Passive Cooling."

GANG WU was selected for the UB Exceptional Scholar: Sustained Achievement Award. Criteria for receiving the award include (1) the work, individually and collectively, must have garnered public and/or professional accolades beyond the norm for other bodies of work in the identified genre (e.g., citation analysis, critical reviews signifying the work is of enduring importance, completion of the work under the auspices of a highly prestigious fellowship or grant) and (2) for a body of work completed over a number of years. In 2019, he was once again named as a Highly Cited Researcher in Web of Science by Clarivate Analytics, after also receiving this distinction in 2018.

He was recently promoted to the rank of Full Professor in recognition of his prolific work in the study of functional materials for electrochemical energy storage and conversion, electrocatalysis for renewable energy and environmental science, materials electrochemistry, batteries, and fuel cells.

Inhibition Strategies to Reduce Coronavirus Entry into Host

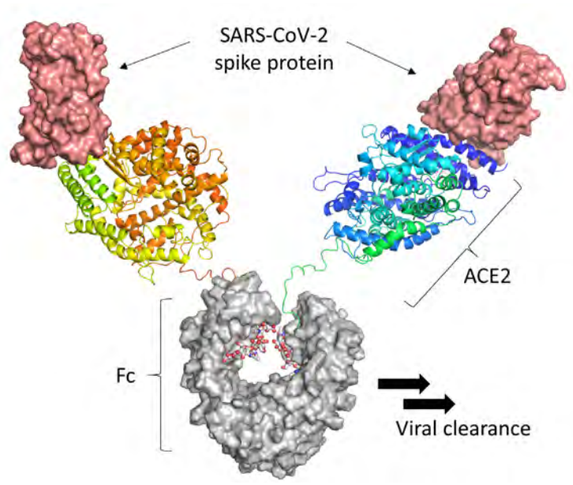
The Sriram Neelamegham lab is developing molecular strategies to inhibit SARS-CoV-2, the virus that causes COVID-19. The spike protein of this virus has several carbohydrates or glycans attached to it (see Figure). Like many research laboratories that have turned all available resources to address this global crisis, Neelamegham lab researchers have been studying the SARS-CoV-2 virus. Their overarching goal is to identify weaknesses in viral binding, entry, and replication that can be exploited for therapeutic benefit. Their studies have revealed that glycan epitopes expressed on the virus may serve as novel druggable targets. They observed that modifying carbohydrate epitopes using both genetic approaches and small molecules may enable fine-tuning of viral entry into host cells. The small molecule inhibitors they are evaluating represent potential drugs that could be used to ameliorate COVID-19 and other viral infections. The lab group is seeking funding to continue this effort.



Viral Spike protein bound to its primary receptor, ACE2 (Angiotensin-Converting Enzyme 2). Model developed by Prof. Sheldon Park, UB CBE.

Urgent Treatment for COVID-19

The human immune system has a capacity to fight off numerous infections, and there are worldwide efforts to combat COVID-19 through vaccine development. The Sheldon Park lab, in collaboration with other labs at UB, is developing drugs to neutralize SARS-CoV-2 and treat individuals with severe COVID-19 infection. The therapeutic strategy behind the study is to engineer novel protein molecules that can interact with the host immune apparatus and recruit immune cells and components to accelerate the clearance of free virus and infected host cells. These molecules are engineered by fusing the cellular target of SARS-CoV-2, ACE2, to the antibody fragment Fc. The molecules carry specialized mutations to improve the immune response to SARS-CoV-2 infection, thus achieving rapid reduction in the viral load.



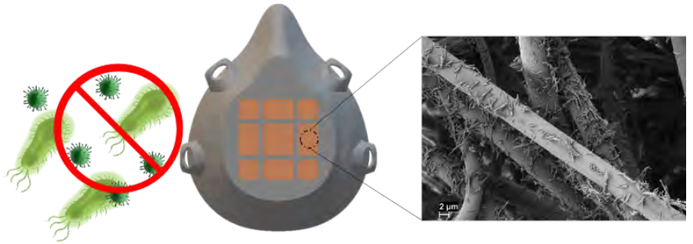
The binding of an engineered molecule (ACE2+Fc) leads to the clearance of SARS-CoV-2.

Studying COVID-19 Tissue Damage

The 2019 novel coronavirus, SARS-CoV-2, is a pathogen of critical significance to international public health. Knowledge of the interplay between molecular-scale virus-receptor interactions, single-cell viral replication, intracellular-scale viral transport, and emergent tissue-scale viral propagation is limited. Moreover, little is known about immune system-virus-tissue interactions and how these can result in low-level (asymptomatic) infections in some cases and acute respiratory distress syndrome (ARDS) and other tissue damage in others, particularly with respect to presentation in different age groups or pre-existing inflammatory risk factors like diabetes. Read more about the work in this area from the Ashlee Ford Versypt lab.

Making Safer Masks

SARS-CoV-2 and other respiratory viruses spread via droplets and short-range aerosols generated when infected people talk, exhale, cough, or sneeze. Face masks are effective in limiting transmission. However, most medical-grade face masks are not self-sterilized or reusable. Their widespread use consumes tremendous resources and generates a corresponding amount of waste. To address this challenge, the Mark Swihart group has developed a novel material for treating the blown polypropylene filtration media used in medical-grade masks to impart antimicrobial activity. They have produced thin copper@ZIF-8 core-shell nanowires, where ZIF-8 is a zinc-based metal organic framework. When a virus- or bacteria-laden droplet contacts these nanostructures, they slowly release copper and zinc ions, which can kill bacteria and deactivate viruses. These were applied to filtration media by simple dip-coating to uniformly cover the filter fibers. This ensures any deposited droplets will contact the nanomaterial, while requiring miniscule amounts of the material. The filtration performance of the media was maintained or improved. The proposed low-cost and scalable synthesis of Cu@ZIF-8 NWs and straightforward deposition onto filter media has great potential for creating reusable face masks and other medical textiles to reduce disease transmission, resource consumption, and environmental impact of waste.



Schematic illustration (left) and scanning electron micrograph (right) of copper@ZIF-8 core-shell nanowire decorated mask material.

Advancing COVID-19 Diagnostics

UB CBE alumnus Mingfu Chen, MS 2015, is responsible for the execution of diagnostic biosensor research at Boston University (BU), where he now works as a biomedical engineer. The National Institutes of Health (NIH) has launched the Rapid Acceleration of Diagnostics (RADx) Initiative. In response to NIH's RADx Initiative, Chen is working with other researchers to develop rapid, easy-to-use testing technologies for SARS-CoV-2. Their method of CRISPR-based RNA detection amplified by plasmon resonance and silicon photonic resonator readout delivers speed, sensitivity, and specificity. If successful, such testing will facilitate the speedy identification and quarantine of infected individuals and their contacts.

Enhanced CO_2 Conversion to Liquid Fuels by Zeolite Membranes

Zeolites are porous, crystalline structures with uniform molecular-sized pores ranging from 0.35 to 1.3 nm. Zeolite crystals have been assembled into continuous membranes by hydrothermal synthesis onto porous supports for chemical separation. Because of the complex crystallization and crystal intergrowth processes and intricate interactions between zeolite crystals and porous supports, which may be affected by gel composition, aging time, and hydrothermal synthesis conditions, preparing high quality zeolite membranes with negligible defects is notoriously difficult. Miao Yu's research in this direction is focused on optimizing zeolite membrane growth processes, developing novel synthesis methods, and exploring the potential of these membranes for separations of difficult-to-separate mixtures, such as N_2/CH_4, or for separations conducted under harsh separation conditions.

The Miao Yu group has made significant contributions to the zeolite membrane research field during the past eight years. They were able to show the potential of high-aspect-ratio zeolite seeds for high quality SAPO-34 membrane growth and molecular sieving behavior of the membrane for N_2 and CH_4 mixtures. They designed a novel process to selectively block defects in zeolite membranes to improve their separation performance. They also developed a gel-modulated growth process to optimize the separation performance of zeolite membranes. In a recent pioneering study, they found a Na^+-gated water-conducting zeolitic nanochannel that only allows passage of H_2O and NH_3 while blocking other molecules as small as H_2. When these nanochannels were assembled into defect-free membranes, H_2O and NH_3 molecules were selectively removed from the gas mixture. This can have tremendous impact on CO_2 conversion to liquid fuels such as methanol, because both CO_2 conversion and the methanol production rate are greatly increased when the byproduct H_2O is removed directly from the reaction system by the zeolite membrane. A similar concept can be used in many other systems, including NH_3 synthesis, to greatly boost reaction rate and conversion.

The Miao Yu research group's future work on zeolite membranes is focused on developing novel strategies for superfast membrane synthesis and exploring various strategies of scaling up zeolite membrane production.

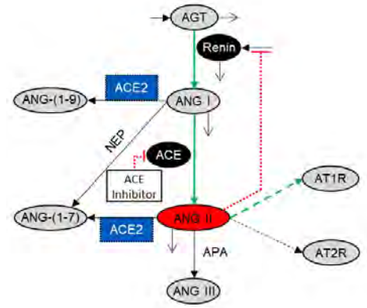
Ball-and-stick representation of a single channel in a representative zeolite

Multiscale Computational Modeling to Connect Disruptions of Biochemical Networks to Tissue Damage: From Diabetes to COVID-19

A biochemical network called the renin-angiotensin system (RAS) is important for controlling blood pressure in human physiology. In healthy conditions, the RAS carefully balances the amount of a chemical called angiotensin II (ANG II), which constricts blood vessels to increase blood pressure. When the body needs to lower blood pressure naturally, it slows down production of ANG II through a network of interactions in the RAS to allow the blood vessels to dilate. A class of pharmaceuticals called ACE inhibitors are commonly prescribed for lowering blood pressure and are designed to reduce the amount of ANG II. Chronic disruptions to the RAS lead to hypertension and other illnesses associated with the tissue damage that results from inflammation and fibrosis induced by elevated ANG II.

The Ashlee Ford Versypt lab is building a multiscale computational model of kidney damage due to diabetes. The model connects the impacts of high glucose on disrupting the RAS and the subsequent inflammation and fibrosis that damage the kidney tissues. In the figure, the RAS is illustrated. Green arrows indicate the portions of the RAS that are stimulated by high glucose in diabetes, leading to dangerously high amounts of ANG II. ACE inhibitors aim to block the function of Angiotensin Converting Enzyme (ACE) that is required to produce ANG II.

SARS-CoV-2, the novel coronavirus that causes COVID-19, enters human cells via ACE2 receptors. Normally, these receptors play an active role in the RAS (blue boxes in the figure) to reduce the amounts of ANG II either by preventing its formation or by decomposing it. The interactions between SARS-CoV-2 and the RAS are being widely investigated to better understand the mechanisms by which patients with pre-existing conditions such as diabetes or hypertension and those who may or may not be taking ACE inhibitors may respond differently to SARS-CoV-2 infection and may progress to severe COVID-19 at different rates than otherwise healthy adults. The Ford Versypt lab is studying the impacts of ACE2 disruptions on the RAS in the lungs in COVID-19-induced severe acute respiratory distress and in other organs that can experience acute injury due to COVID-19.

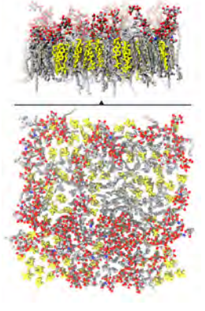


Sketch of the renin-angiotensin system (RAS), an important biochemical network involved in balancing several physiological processes. SARS-CoV-2, the novel coronavirus that causes COVID-19, affects ACE2 receptors (blue boxes) to disrupt the RAS, leading to potentially damaging chemical imbalances in COVID-19 patients.

Modeling the External Surface of Cells for Cancer Diagnosis and Treatment: Dynamics of Glycosphingolipids

Lipids are the main components of cellular membranes, they store energy and participate in several signaling cascades in the cell. Lipid species and composition vary among different cell compartments and across different organisms. Such diversity results in different structural and mechanical properties for a given cell membrane, which, in turn, modulate its interaction with other biomolecules. The finely tuned equilibrium of lipid species in the cell ensures it remains healthy. An altered lipid distribution is indicative of certain diseases. For example, an excess of glycolipids in the plasma membrane, the outer-most barrier of the cell, has been noted in several cancers. This membrane is of special interest to the Viviana Monje-Galvan group in the study and development of drug therapies, as drug carriers have to penetrate this barrier to deliver the desired cargo.

Current cancer research is centered on the development of early diagnostic tools as well as more efficient ways to monitor treatment progress. Lipids are promising molecules in this area and have been identified as key modulators for drug permeation and may even be responsible for development of drug resistance. Glycosphingolipids have received special attention due to their bulky headgroup that can range from a short linear chain to a complex branched structure of sugars. This headgroup complexity results in interesting extracellular structures that interfere with membrane permeation and lipid-protein interactions at the plasma membrane interface. The Monje group uses molecular dynamics simulations to study the interaction mechanisms of key lipid species and various proteins in different cellular compartments. One of their key molecules of interest is GM3, a monosialated glycosphingolipid involved in signaling pathways in cancer cells. GM3 has a linear chain of sugars as headgroup and is a precursor to more complex lipids of its metabolic family, which are also involved in cancer signaling cascades. The main research goal is to provide fundamental understanding of the effect of glycosylation on the external surface of the cell as well as how it modulates the mechanical and structural properties of the membrane. Moving forward, the aim is to use realistic membrane models to explore the interaction of small peptides and protein binding domains with specific glycolipids, and develop computational tools to aid in the development of lipid-based diagnostic and treatment-monitoring tools for cancer.



Single leaflet of a membrane model showing small clusters of cholesterol (yellow), and glycolipid aggregates at the end of a multi-microsecond trajectory. The glycolipid headgroups (red) adopt a mixture of extended and bended configurations on the membrane surface.

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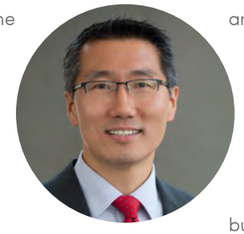
UB CBE GRADUATE PROGRAM
EXCEEDS EXPECTATIONS DURING PANDEMIC ▶

The COVID-19 pandemic placed significant stress on our graduate program by shutting down labs and impeding travel, both domestic and international. We were all forced into a lockdown in March, which halted all experimental research activity overnight. However, UB and CBE have since developed a procedure to safely re-open and resume their research, and now most labs in UB CBE are back to being operational, although students and faculty need to be mindful of new constraints.



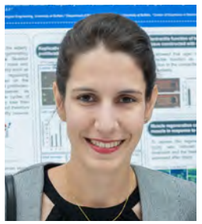
One area that was most adversely affected by the pandemic is new enrollment. Our student body has a strong international presence, and once the borders were closed and students could no longer obtain a visa to enter the country, there was a serious concern that our incoming class would be severely downsized, having both short- and long-term impact on our research. We braced for a hard-landing of a sort, as did the rest of the school of engineering that reported a large number of deferrals.

As expected, we lost many potential new students who decided to wait until spring or fall 2021 to start their study. We benefited, however, in a twist of fate from those who decided to take advantage of the economic downturn to return to academia and further their education. Both domestic students and international students who were already in the country contributed to this drove, which helped boost our enrollment and exceed expectations with a comparable enrollment to previous years! This strong turnout is a testament to the strength of our program, which continues to appeal to not only Chemical Engineering undergraduates but to those from other disciplines in science and engineering. If battle is the fiery crucible in which true heroes are forged, as Master Sergeant Farell would say, then this pandemic may just prove to be one such challenge that tests our resolve as a department and a scientific enterprise.

–Sheldon Park, Director of Graduate Studies

James Tran Received the 2020 AIChE Separations Division GSRA Award ▶

The award recognizes outstanding graduate students in many separation areas including adsorption and ion exchange, crystallization and evaporation, distillation and absorption, extraction, fluid-particle separations, membrane-based separations, and bioseparations. James is a PhD student studying under Dr. Haiqing Lin, and his research focuses on enhancing antifouling properties of water purification membranes via surface modification. After his recent graduation, he will be returning to the Lin lab as a postdoctoral scholar to assist in the DOE NETL (Department of Energy National Energy Technology Laboratory) Direct Air Capture of CO_2 program.



Nika Rajabian Won the UB SEAS (UB School of Engineering and Applied Sciences) Graduate Student Poster Competition ▶

Entitled "Bioengineered Skeletal Muscle as a Model of Muscle Aging and Regeneration," UB CBE PhD student Nika Rajabian's research explores a senescent model of bioengineered skeletal muscle that can be used to investigate the biological impact of aging on metabolic or genetic diseases. She is conducting her research in the Stelios Andreadis lab.

Gaurav Vishwakarma Selected for the 2020 Computational Chemistry and Materials Science Summer Institute ▶

The 2020 Computational Chemistry and Materials Science Summer Institute is conducted at Lawrence Livermore National Laboratory (LLNL). Vishwakarma, a PhD candidate in the Johannes Hachmann research group, spent ten weeks at LLNL working under his assigned mentor, Dr. Tadashi Ogitsu. One "perk" of a computational research project is flexibility to work remotely, and Vishwakarma participated virtually. His work was focused on "Clean Energy Storage Using Hydrogen," currently of great interest and consequence in the scientific community, and he was quite excited to work with a host of new software tools and techniques. He was also in touch with researchers and scientists from other national labs and institutions via virtual networking and research seminars organized by LLNL.

Junjie Chen's Work Accepted for Oral Presentation at the 17th International Congress on Catalysis (ICC) ▶

Junjie Chen's research in the Elina Kyriakidou research group focuses on elucidating the mechanism of methane combustion over Ni/CeO based catalysts. It was accepted for an oral presentation in June 2020 at the 17th International Congress on Catalysis (ICC) in San Diego, CA (cancelled due to COVID-19 restrictions).

Hien Nguyen Won the First Prize Poster Award of the Separations Division at the 2019 AIChE Annual Meeting ▶

As a PhD student in Haiqing Lin's research group (conferral August 2020), he received the best poster award of the Separations Division at the 2019 AIChE Annual Meeting in Orlando, Florida, for his work on carbonized membrane materials. His areas of study include (1) confined crystallization in polymeric membranes for gas separation and (2) design and optimization of carbonized materials for hydrogen recovery and carbon capture. While at UB, Hien Nguyen has won awards such as the First Prize Poster Award for Excellence in Materials Research at the 2019 UB CBE Graduate Student Research Symposium, Third Prize Poster Award at the North American Membrane Society (NAMS) 2018 Conference, and the Elias Klein Traveling Award from NAMS 2018 Conference.

UB CBE GRADUATE STUDENT ASSOCIATION UPDATE ▶

What a year it has been!

We had some great times at the start of the 2019 academic year—there was the "Welcome Back Bash," where I was elected President and began this journey with the other executive board members, followed by the CBE Research Symposium After Party a month later. The party had a record turnout (for any CBE-GSA event, ever) with around 80 people turning up. At one point, the manager of the Brickhouse Tavern told me, "We can get you as much food and drinks as you want, just no more people please, or we'll exceed the fire code." We actually stayed until closing time. What a fun night. At the turn of the new year, as we all tracked the spread of COVID-19 across the world, I remember scrambling with the CBE-GSA E-board to host another event before the inevitable lockdown struck. We managed to do so just in time with the annual bowling event, again, so much fun, with even some professors turning up and showing off their skills. Sadly, the lockdown did strike, and we were forced to cancel the remaining events for the year. Altogether, it was quite an exciting year for me; I got to meet and interact with so many people from the Department, which I do not think would have happened had I not taken on the role. So, as I step down this year, I want to thank everyone who voted me in and reassure them that they will be in great hands with the new CBE-GSA E-board (the first-ever all-female CBE-GSA E-board!). Stay healthy and wash them hands!

—Ronel Zachariah Samuel, CBE GSA president, 2019–2020

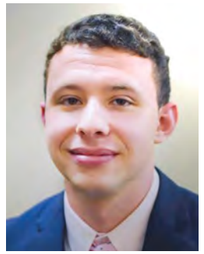
UB CBE UNDERGRADUATE PROGRAM UPDATE ▶

Like everything else, our undergraduate program was disrupted in mid-March with the COVID-19 shutdown. We were fortunate to have a week of Spring Break to adjust, as we moved all of our classes online in a hurry. The faculty put in a monumental effort to present all the courses and meet the expected outcomes using online technologies. The senior Plant Design class had to complete the semester without the students having access to the process simulator (they did have a lot of instruction on it, though, prior to the closure). Labs had to move to a virtual format, with Prof. T. Kofke making videos of the remaining lab activities while collecting data for the students to analyze. The students were incredibly patient and accommodating, and we were grateful for how much they worked with us to keep everything going. It was particularly disappointing for our seniors, though, who had to miss out on a lot of the last-semester rituals, not the least of which was commencement. The University and the Department did a lot to compensate, with virtual ceremonies and honors presentations on Zoom, many faculty-made videos with inspirational messages, and a Department-produced yearbook. We hope that when this all passes, we'll be able to invite the seniors back for an in-person event. Now that we're in the fall semester, we're busy providing our courses using a mix of in-person and online methods, and, so far, it's working. We're also preparing for an ABET (Accreditation Board for Engineering and Technology) re-accreditation visit, which will be done virtually, in December.

While there's a lot to regret about the situation, I'm hopeful that we'll come out better for it, as we've been forced to accelerate changes over a matter of months that might have otherwise evolved over a period of five to ten years. We've learned a lot through these adjustments, and I expect we'll make the best use of our new skills and practices as we move ahead.

–Dave Kofke, Director of Undergraduate Studies

Joshua Hazelnis Awarded the NSF Graduate Research Fellowship ▶



Joshua Hazelnis, a 2020 CBE graduate, was one of seven UB students who were awarded the National Science Foundation (NSF) Graduate Research Fellowship.

The highly-sought-after award provides a three-year annual stipend of $34,000 and a $12,000 cost of education allowance for tuition and fees paid to the student's institution. The fellowship provides recipients with the freedom to conduct the research of their choice, a valuable incentive that has helped make the program one of the most competitive and prestigious for US students in the sciences.

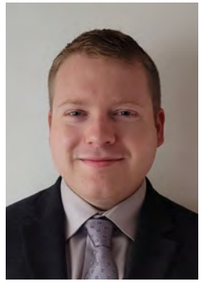
Joshua will pursue a PhD in chemistry at the University of Michigan. Hazelnis' research interests involve understanding molecular interactions that could improve the performance of redox flow batteries, a promising technology for storing energy produced by renewable sources such as wind and solar. While at UB as a Provost Scholarship recipient, he conducted research in chemistry and chemical engineering labs, with a focus on optimizing the performance of redox flow batteries. His presentation on this technology won first place in the 2019 Transforming Our Tomorrow competition at UB. Hazelnis chose to attend UB as an undergraduate in part because he wanted to be in a diverse environment. He hopes to pursue a career as a research professor, and has shared his passion for science with other young people by volunteering at a UB sustainability camp for middle school students, developing demos for science classrooms, and mentoring fellow UB undergraduates, including students he tutored while serving as a resident advisor. In 2019, he was awarded the first annual Edward P. Furlani Scholarship.

UB CBE UNDERGRADUATE PROGRAM

CBE Undergraduate **Noah Seiler** Won 2nd Place in the AIChE Student Co-op Presentation Competition ▶

Last fall, the 2019 AIChE Virtual Local Section (VLS) student competition invited top undergraduate student co-ops and interns to present their work in a 10-minute format focusing on the results of their summer or co-op project. The contestants then answered questions from a live audience. Noah Seiler worked as a Process (Chemical) Engineering Co-Op employee at McGard LLC and stayed with the group through the summer. Seiler's project at McGard was focused on decreasing stains on electroplated lug nuts and wheel locks. McGard says about Noah, "We as a company were proud to witness his professional growth in project management, problem solving, team building skills, task delegation, and presentation skills. His project work was very successful, and we were sorry to see him go. Noah took on the Co-Op, which was not mandatory, as a challenge and was able to very successfully apply the knowledge he has gained in the university environment to the manufacturing environment here at McGard. We are confident that he will be successful in all future professional ventures, and we hope to see him in the future." *—Tom Lanham, Process Engineering Department Manager at McGard*

New Leadership for AIChE Student Club ▶



Our chapter is trying to keep as many of the same activities that we have performed in the past such as hiking and apple picking, as these can be accomplished while social distancing. We have submitted an entry to the AIChE K-12 STEM Outreach Competition. This competition helps create fun and educational experiences to help kickstart the next generation of chemical engineers. This year's competition had a special focus on experiments that could be performed at home or over video conferencing, which gave an interesting twist from years past. Finally, we will be trying something new—face-to-face study hours. While we haven't yet worked out all the details, we would still like to give club members a safe place to get out of the house and connect in a way that doesn't require a screen.

—Joseph Kulczyk, incoming president, 2020–2021

MAKE A CHARITABLE CONTRIBUTION ▶

Your support is vital to UB CBE's success, providing the difference between funding what is necessary and what is possible. Donors to our annual fund allow bright, hardworking students to fulfill their dreams and complete their degrees through scholarships and fellowships. They advance the profession by funding groundbreaking research, and they provide resources to furnish facilities and purchase the latest technologies for faculty and students. A gift from you in any amount helps UB CBE make critical investments and recruit and retain the best students and faculty.

To make a gift, simply go online to cbe.buffalo.edu/donate or call us at 716.645.1174. ▶

THANK YOU!

ALUMNI NEWS

MANOJ CHOUDHARY
A LEGEND IN THE GLASS INDUSTRY ▸

Manoj K. Choudhary, MS '76, is no stranger to the spotlight. He has earned many transformative achievements, made countless keynote addresses, and holds prestigious honors recognized globally.

He recently received the President's Award from the International Commission on Glass (ICG) in recognition of "outstanding lifetime contributions to the international glass community in areas such as scientific discoveries, engineering developments, artistic accomplishments, leadership, and communications."

After graduating from UB CBE, Choudhary obtained his ScD in Materials Science and Engineering from Massachusetts Institute of Technology. After post-doctoral research at MIT, he worked at Owens Corning's Science and Technology Center as a member of its Senior Technical Staff, and his contributions were at the core of some of the most significant glass and polymer process technology and product developments during the past 35 years. Choudhary is currently the President of MKC Innovations, LLC and Senior Advisor for Strategic Affairs to the Board of Directors of Glass Service. He is also an Adjunct Professor of Materials Science and Engineering at the Ohio State University and a Fellow of the British Society of Glass Technology and the American Ceramic Society. He has presided over several professional organizations including the International Commission on Glass, Industry-University Center for Glass Research at Alfred University, the Glass and Optical Materials Division of the American Ceramic Society, and the Glass Manufacturing Industry Council, of which he is also a founder.

Reflecting on his time at UB, Dr. Choudhary says, "I am an alumnus of your great Department (MS, 1976) and have very fond memories of the time I spent there. Buffalo was the first place I came to in the US after leaving India and was treated most kindly by the UB community. I remain grateful for the education I received from UB CBE. I have tried to keep in touch and even now, some 43 years later, when I pass by the Buffalo area, I drop by the main campus."

ALUMNI HONORS & ACHIEVEMENTS

Advancing COVID-19 Diagnostics

UB CBE alumnus Mingfu Chen, MS 2015 from the Blaine Pfeifer research group, is responsible for the execution of advancing diagnostic biosensor research at Boston University (BU), where he now works as a biomedical engineer. See more on CBE's research related to COVID-19 ▸

Emmanuel Nsengiyumva Selected as SUNY PRODiG Fellow ▸

Emmanuel Nsengiyumva has been selected as a SUNY PRODiG Fellow and is starting at SUNY Brockport this fall where he will spend one year, then choose to stay or move to another university to continue his growth as a professor. The SUNY PRODiG (Promoting Recruitment, Opportunity, Diversity, Inclusion, and Growth) Fellowship Initiative is an effort to reduce the pronounced gap between the racial/ethnic diversity of SUNY faculty members compared to the diversity of the students they instruct. It launched last academic year with more than 60 faculty members joining college campuses. The Fellowship was created to fund late-stage pre-doctoral and post-doctoral students interested in exploring academic careers, creating a more robust pathway into the academy for historically under-represented minority faculty and women in STEM fields. Nsengiyumva is a third-year PhD student from the Paschalis Alexandridis lab. His research focuses on utilizing high salinity water in order to reduce the use of fresh water in hopes of a long-term benefit to the environment and energy resources.

Rohitesh Gupta Recently Published in *Molecular Omics* ▸

Rohitesh Gupta, PhD, Summer 2015, was recently published in *Molecular Omics* for research that was done at UB in the Sriram Neelamegham lab. The piece is titled "Robustness in glycosylation systems: Effect of modified monosaccharides, acceptor decoys and azido sugars on cellular nucleotide-sugar levels and the pattern of N-linked glycosylation."

Carla Ng Received the NSF CAREER Award ▸

Carla Ng has been awarded a $500,000 NSF CAREER Award. She graduated from the University at Buffalo after working in the Mark Swihart lab at CBE with a BS in 2001 and earning an MS in 2002. She then went on to Northwestern University to earn a PhD in Chemical Engineering in 2008. Ng is now an Assistant Professor at the University of Pittsburgh and her research interests include PFAS, bioaccumulation, environmental chemistry, and ecosystem modeling.

Ken-Tye Yong Elected OSA Fellow ▸

Ken-Tye Yong, PhD 2006, was elected as a Fellow Member of The Optical Society (OSA) at the Society's recent Board of Directors meeting. His work at CBE focused on synthesis of optically-active nanomaterials for bioimaging applications in the Mark Swihart lab. He is currently an Associate Professor and Provost's Chair at Nanyang Technological University.

ALUMNI HONORS & ACHIEVEMENTS

Milind and Raj Ajinkya
Recognized with Delta Award

Inspired by the engineering term meaning "the difference," this award is given annually to donors who have made a significant difference for the school, our students, and our culture through their generous philanthropy. Milind Ajinkya graduated from UB CBE with a PhD in 1975 and MS in 1972. He established the Amol Ajinkya Memorial Fund in his son's memory to support Fellowships and Lectures. He is also an active member of the Department's advisory board.

JOIN THE DELTA SOCIETY

Members of the Delta Society—those who give $1,000 or more annually—make critical investments in the continued success of the Department. The society represents distinguished donors who share our vision and commitment to high-quality education, innovation in research, and community service. Delta—a commonly used engineering term—means "difference." By becoming a member of UB CBE's Delta Society, you're making a difference for students and for the future of our school. To make a gift, simply go online to **cbe.buffalo.edu/donate** or call us at 716.645.1174. Thank you!

ALUMNI NEWS

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