Dear Alumni and Friends,

I hope that this message finds all of you safe and healthy during these unprecedented times.

In March, due to the COVID-19 pandemic, UM switched to online classes and ramped down most research activities to protect our students, faculty, and staff. Thanks to the cooperation of all involved, we quickly pivoted to almost everything being offered virtually and were able to complete the semester safely. In mid-June, we gradually moved through phases of increased activity and were able to slowly resume research projects, although all offices remain closed. The University is planning a public health-informed, in-residence Fall 2020 semester composed of hybrid in-person and online classes. We hope everything will continue to go smoothly.

Recent racial turmoil has also raised concerns and anxiety among the UM community. Macro organized a town hall meeting in June for our graduate students and invited Lyonel Milton, Managing Director for the Center of Engineering Diversity and Outreach, and Geeta Mehta, Macro Faculty Diversity Ally, to discuss how we can be more sensitive to issues concerning diversity, equity, and inclusion. The attending Macro students made several good suggestions including adding a diversity/anti-racism requirement for both the Ph.D. and M.S. programs, suggesting a DEI/anti-racism/implicit bias module be added to the mandatory Responsible Conduct of Research and Scholarship training, and organizing a systemic racism journal club series. Moving forward, our faculty will discuss how we can implement these efforts into the Macro curriculum.

We had another successful admissions season for the 2020 cohort. We are pleased to announce that we will be welcoming 12 new students (6 Ph.D. and 6 Master’s) to the program. Thank you to our current Macro students for recruiting students of remarkable quality through virtual meetings and individual email exchanges. We appreciate Professors Zhan Chen and Kenichi Kuroda for once again serving on the admissions committee.

Macro students have continued their academic excellence, proactive community outreach, and efforts to create an inclusive environment in Macro that goes beyond just
Director’s Message (Continued from Page 1)

Academics. Together with faculty, they have continued their groundbreaking research; enjoy reading a selection of articles around their research later in this newsletter. Many awards have been given to our students: Abhisekh Dhyani and Alyssa Travititz received the prestigious Rackham Predoctoral Fellowship, Derek Frank and Da Seul Yang won the Overberger Student Research Award, and Mira Diah El Harakeh was awarded a Rackham International Student Fellowship. Three years in a row, 3M and PPG have generously provided valuable fellowship support to the Macro program. Sixteen Ph.D. students received these fellowships during the last academic year. We sincerely appreciate their support for our program.

We would like to welcome three new faculty members: Alan Taub, a Professor of Materials Science and Engineering; Jovan Kamcev, an Assistant Professor of Chemical Engineering; and Abdon Pena-Francesch, an Assistant Professor of Materials Science and Engineering. They enrich our already profound research portfolio. Geeta Mehta has been promoted to Associate Professor with tenure. Congratulations! Charles McCrory, Assistant Professor in Chemistry, has agreed to serve as the faculty advisor for the ACS POLY/PMSE Student Chapter. We are sure that he will make extensive contributions to the student chapter so that our graduate students will be provided valuable networking and career development opportunities.

Macro organized and hosted the ACS POLY Charles Overberger Award Symposium at the American Chemical Society’s Fall 2019 National Meeting. This event honored Professor Kenneth B. Wagener as the recipient of the ACS POLY Overberger International Prize. Professor Wagener is the George B. Butler Professor of Polymer Chemistry at the University of Florida and is well known for his pioneering development of the acrylic diene metathesis (ADMET) polymerization. Renowned international scholars were in attendance to celebrate this recognition.

The 43rd Annual Macro Symposium, “Polymer Design Interfaces,” was held on October 23rd and 24th, 2019. We appreciate Shamalie Goodetilleke, Violet Shefley, and Muru Zhou, our three student organizers, and Julie Pollak, the Macro Coordinator, for their hard work in planning the short courses, poster sessions, and research symposium. The event was a great success. Unfortunately, due to the ongoing COVID-19 pandemic and related restrictions, we have decided to postpone this year’s annual symposium until next year. The 44th Annual Macro Symposium will be held on October 20 – 21, 2021. We have already received commitments from several outstanding speakers and we are looking forward to yet another great symposium.

Stay safe and healthy. Go Blue!

Macro Welcomes Three New Faculty Members

Alan Taub is a Professor of Materials Science and Engineering. His major research interest is in understanding the inter-relationships among processing, microstructure and properties in materials; with an emphasis on mechanical, electrical and magnetic applications. Professor Taub’s current research focus is on lightweight structures for land, sea, and air transportation applications. Some of his projects include incremental forming of sheet metal and nano-particulate additions to aluminum alloys.

Jovan Kamcev is an Assistant Professor of Chemical Engineering. Motivated by the challenges of securing adequate, sustainable supplies of energy and water at affordable costs, the Kamcev research group aims to develop next-generation polymeric materials (e.g., membranes and sorbents) for water treatment and energy generation/storage applications.

Abdon Pena-Francesch is an Assistant Professor of Materials Science and Engineering, and will join the University and the Macro program in January 2021. His research is centered around biomaterials science, polymer chemistry, soft matter physics, and nanotechnology, with focus on exploring biology to develop advanced and programmable soft materials for robotic applications in healthcare, bioengineering, and environmental science.

Professor Kenneth Wagener Accepts Overberger Prize

Overberger Symposium at the ACS Fall 2019 National Meeting (L to R): Jinsang Kim, Erik Berda (University of New Hampshire), Edwin Thomas (Rice University), Kenneth Wagener (University of Florida), Robert Grabbs (Caltech), Richard Turner (Virginia Tech), Robert Waymouth (Stanford University), and Ginoanni Rojas (Universidad Icesi).
43rd Annual Macro Symposium
Polymer Design Interfaces

Macro hosted the 43rd Annual Symposium on October 23-24, 2019. The first day focused on professional development short courses with the theme, “The Well-Rounded Scientist.” Sessions were held concurrently throughout the day, allowing students to choose the speaker or panel most relevant to their interests. Following the event, attendees were invited to come together for a networking dinner.

The next day, the main research symposium, “Polymer Design Interfaces,” was held. Speakers from around the country gave invited talks, and 65 students presented their research in poster sessions. Together the events drew over 150 participants from programs across U-M, 15 external institutions, and several industry partners.

43rd Annual Macro Symposium
Industry Sponsors

A very special thanks to PPG and BASF for their generous support of the symposium. Their sponsorship provided support for poster awards, undergraduate travel grants, speaker travel, and more.

Planning Committee

Violet Sheffer, Shamalee Goonetilleke, Muru Zhou, and Julie Pollak
Professor Brian Love presented on “Where Do I Begin? Effective Research Engagement.” Love is a Professor of Materials Science and Engineering and Macromolecular Science and Engineering at the University of Michigan.

Dr. Eric Monberg, a scientist at OFS Optics, discussed with students “Where Might I Go? Materials Industry in the Telcom Era.”

Professor Joerg Lahann gave a presentation titled, “Act Like a Student, Think Like an Entrepreneur: How to Take Control of Your Grad School Experience.” Lahann is a Professor of Chemical Engineering and Macromolecular Science and Engineering at the University of Michigan.

Dr. Daniel Soltan (‘17 Li/Robertson) presented on “Walking in the Footsteps of a Professional Consultant.” Soltan is a Senior Project Leader at Yet2.

Professor J. Scott VanEpps gave a presentation titled “Science & Innovation: The Art of Thinking Outside the Box.” VanEpps is a Professor of Emergency Medicine, Biomedical Engineering, and Macromolecular Science and Engineering at the University of Michigan.

Dr. Nidaa Shaikh, a psychologist in the College of Engineering at the University of Michigan, gave advice on “Grad School – The Roller Coaster: The Ups and Downs of Graduate School and Dealing with Them.”

Professor Barry Belmont spoke about “The Multilingual Scientist: Engaging a Diverse Community Through Science & Education Outreach.” Belmont is a Professor of Biomedical Engineering at the University of Michigan.

43rd Annual Macro Symposium
Wednesday: The Well-Rounded Scientist

Professor Kirk Schanze, University of Texas at San Antonio
“Conjugated Polyelectrolytes in Biosensing and Distinction”

Jayan Karunarathna, Ph.D. Candidate, Bowling Green State University
“Iron(III)-Polyuronate Photochemistry for Greener Applications in Surface Modification of Soft Materials and Controlled Plant Nutrient Delivery”

Professor Jodie Lutkenhaus, Texas A&M University
“Emergent Properties and Applications of Polyelectrolyte Complexes”

Catherine Snyder, Ph.D. Candidate, University of Michigan
“Fabrication of Non-Spherical and Multiphasic Particles with Independent Control of Particle Size, Shape and Chemistry”

Professor Kenneth Wagener, University of Florida
“The ADMET Story”

Professor Gerard Wong, University of California, Los Angeles
“Nucleic Acid Complexes in Innate Immunity and Autoimmunity”
43rd Annual Macro Symposium

**Awards**

**PPG Awards for Polymer Engineering**

**Jayan Karunarathna**
Bowling Green State University
Iron(III) – Polyuronate Photochemistry for Greener Applications in Surface Modification of Soft Materials and Controlled Plant Nutrient Delivery

**Julie Rieland**
Macro, Love Group
Ionic Liquid Selection for Cellulose Processing

**Professor Albert & Mrs. Jessica Yee Awards for Polymer Science**

**Jonathan Sun**
Michigan, Chemistry, Kim Group
Frustrated Diamidophosphorane Octa-Ruthenium Supramolecules with Photoelectric Release Mechanism for Ultraefficient CO2 Sequestration

**Arushi Gupta**
Macro, Sakamoto Group
 Compatibility Study Between LLZO Ceramic Electrolyte and Liquid Electrolytes with Potential to Enable Hybrid Electrolyte Batteries

**Frank E. Filisko Award**

**Ayse Muniz**
Macro, Lahann Group
Single Cell Analysis Reveals the Instructive Role of 2D and Novel 3D Engineered Microenvironments in Altering Stem Cell and Stem-Like Cell Behavior

**Best Poster Awards**

**Takunda Chazovachii**
Michigan, Chemistry, McNeil Group
An Industrially Practicable Method to Repurpose Sodium Polycrylates Based Super-Absorbent Materials

**Abhishek Dhyani**
Macro, Tuteja Group
Low-Interfacial Toughness (LIT) Materials for Effective Large-Scale Deicing

**Overberger Student Research Award**

**Derek Frank**
Macro, Matzger Group
Inhibiting or Accelerating Crystallization of Pharmaceuticals by Manipulating Polymer Solubility

**Da Seul Yang**
Macro, Kim Group
Controlled Alignment of Polymer Chains

**Nonna L. Hamilton Student Service Award**

**Alyssa Travitz**
Macro, Larson Group

**Best Poster Awards**

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Michigan, Chemistry, McNeil Group
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**Alyssa Travitz**
Macro, Larson Group
Kirigami Sensor Patch for Shoulders Could Improve Injury Recovery, Athletic Training

Kate McAlpine, Michigan Engineering

Inspired by a University of Michigan professor’s recovery after a cycling crash, an innovative patch could bring the assessment of human joints into the 21st century.

The patch uses electronic sensors to understand the functional range of motion as opposed to today’s static measurements. Influenced by kirigami, Japanese art of creating 3D structures from cut paper, the sensor can hug the curves of a joint and yet can be manufactured flat.

“The shoulder in particular moves in a very complex way. It’s one of the most well-articulated joints in the body,” said Max Shtein, a professor of materials science and engineering and macromolecular science and engineering at the University of Michigan, who crashed his bike and collaborated with his students on the work.

“Nobody’s really been able to track it properly with anything wearable, and yet it’s key to so many activities in sports and daily life.”

After breaking his collarbone, Shtein was dismayed to find that his physical therapist assessed the range of motion in his shoulder with a basic protractor. The method is prone to large errors, and he had no way of repeating the measurements at home.

He realized that a wearable sensor could have recorded the full scope of his motion and tracked his exercises, but it is expensive to build electronics onto curved structures. This sensor would need to be manufactured flat but still be able to follow the contour of a patient’s shoulder.

He and Erin Evke, a doctoral student in materials science and engineering, came up with a solution inspired by kirigami. She laser cut a thin sheet of plastic into a labyrinth of concentric ovals. The shape pulls apart almost like a Slinky, and the cuts open into a lacework over the shoulder.

“If you take a sheet of paper and try to wrap it around a sphere, it’s impossible to do so without folding or wrinkling the paper. This would significantly stress the sensors before your measurement even began,” Evke said. “Our cut pattern avoids this problem.”

Because these structures transform from a flat sheet to a wrinkle-free, 3D shape, they can be manufactured with existing, cost-effective technologies. Shtein estimates that the cost of individual sensors could be below $10, assuming mass production. That’s much less than the cost of a single physical therapy appointment. It could be an inexpensive way to improve patient outcomes.

As a proof-of-concept, the team equipped the kirigami patch with two strain gauges—one along the corner of the shoulder to capture the raising and lowering of the arm, and the other at the back of the shoulder to measure cross-body movements.

Collaborating with researchers working under Deanna Gates, an associate professor of movement science at U-M, Shtein’s team cross-referenced the data from the kirigami sensor with arm motions captured by a camera motion tracking system. The system uses reflective markers to track the angular positions of the arm and reconstructs them in a computer simulation.

The team envisions that this kind of inexpensive sensor could be given to physical therapy patients, enabling them to log exercises and see progress through a smartphone app. This could help keep patients honest about doing their exercises and also provide more detailed information to therapists about each patient’s progress.

Evke, who competed in college track and field, also considers how it could be used to help athletes improve their form.

“Since you can tune the cut design to match the curvatures of all different parts of your body, you can generate a lot of data that can be used to track your form—for instance while lifting—as well as the amount of strain applied on your joints,” she said. “The user could be alerted of improper form in real-time and therefore prevent injuries.”

Shtein pointed out that we don’t have good ways to measure joints and understand how to care for them. Recent work suggests that tears in the anterior cruciate ligament, a serious knee injury experienced by many athletes, occur as a result of cumulative stresses rather than a single excessive force. Similar issues occur with the shoulder joint. Inexpensive sensors could measure stresses so that athletes and trainers could recognize evolving problems and head off major injuries.

The paper is titled, “Developable rotationally symmetric kirigami-based structures as sensor platforms,” and is published in the journal Advanced Materials Technologies. The research was funded in part by the National Science Foundation.

Shtein is also a professor of chemical engineering and art and design. Gates is also an associate professor of biomedical engineering.
In work that upends materials design, researchers have demonstrated with computer simulations that they can design a crystal and work backward to the particle shape that will self-assemble to create it.

It could lead to a new class of materials, such as crystal coatings that produce colors that never fade.

“These results turn materials design and our understanding of entropy on their heads,” said Sharon Glotzer, the Anthony C. Lembke Department Chair of Chemical Engineering at the University of Michigan and senior author on the paper in Science Advances.

Materials with truly new properties typically have to be discovered by accident. For example, it took a playful experiment with cellophane tape and a lump of graphite to discover graphene in 2004—now a Nobel-winning wonder material for its combination of strength, flexibility, transparency and conductivity.

Rather than waiting around for serendipity, materials scientists would like to dream up a wonder material and then figure out how to make it. It’s this “inverse” approach to designing materials—working backward from the desired properties—that the team is calling “digital alchemy.”

“It really allows us to focus on the outcome and leverage what we know to find a starting point to building that material,” said Greg van Anders, a corresponding author on the paper and an assistant professor of physics at Queen’s University in Kingston, Ontario. The research was done while he was at U-M previously.

Glotzer is a leader in studying how nanoparticles self-assemble through the surprising mechanism of entropy. While entropy is commonly thought of as a measure of disorder, Glotzer’s team harnesses it to create ordered crystals from particles. They can do this because entropy is not really disorder, but rather, it’s a measure of how free the system is. If the particles had a lot of space, they’d be distributed across it and oriented randomly—the collection of particles has the most freedom when the individual particles have the most freedom.

But in the systems Glotzer focuses on, the particles don’t have a lot of space. If they’re randomly oriented, most of them will be trapped. The system of particles is most free if the particles organize themselves into a crystal structure. Physics demands this, and the particles obey.

Depending on particle shapes, Glotzer’s team and others have shown how you can get a variety of interesting crystals—some similar to salt crystals or the atomic lattices in metals, and some apparently new (such as “quasicrystals,” which have no repeated pattern). In the past, they’ve done this the usual way by choosing a particles shape and simulating the crystal it would make. They spent years discovering the design rules that enable particles of certain shapes to build certain crystals.

Now, they’ve turned it around so that they can plug a crystal structure into their new program, and it gives them a particle shape that will build it. By reframing the question from “What crystal will this shape make?” to “Will this shape make my crystal?” – the team explored more than 100 million different shapes in the study.

“In a single day, on a regular computer, we were able to study more different kinds of particles than have been reported in the last decade,” said van Anders.

They used the software to identify particle shapes for building four common crystal lattices (simple cubic, body-centered cubic, face-centered cubic and diamond) and two more complex lattices (beta-manganese and beta-tungsten). When these worked out, they tried a lattice that isn’t known in nature, one of their own design—a variation of the crystal known as “hexagonal close packed.”

The team anticipates that experimental nanoscientists will be able to make these crystals by producing a batch of particles in the right shape and adding them to a fluid. In the fluid, the nanoparticles will assemble themselves. As long as they remain confined, they will keep their structure.

This could lead to advances in human-made structural color, similar to how butterfly wings produce their brilliant hues through interactions with light. Unlike pigments, structural color doesn’t fade. The color could also be turned on and off with a mechanism to either confine the particles so that they form the crystal or give them space so that the crystal falls apart.

This research is reported in Science Advances, in a paper titled, “Engineering entropy for the inverse design of colloidal crystals from hard shapes.”

This research was supported by the US Army Research Office and the Simons Foundation. Computational resources were provided by U-M Advanced Research Computing.

Glotzer is also the John Werner Cahn Distinguished University Professor of Engineering, the Stuart W. Churchill Collegiate Professor of Chemical Engineering and professor of materials science and engineering, macromolecular science and engineering, and physics.
Just Add Water: U-M Chemists Suggest a Fix for Insoluble Drugs
Morgan Sherburne, University of Michigan

Stable metal organic frameworks are prized for their ability to capture carbon dioxide or harvest atmospheric water, but U-M researchers have developed a use for unstable metal organic frameworks: as a system for drug delivery.

“Just Add Water” is a strategy to deliver insoluble drugs in an amorphous form, meaning that the drugs are kept from crystallizing. Once the drug compounds crystallize, they become less soluble—and therefore less bioavailable, which means less of the drug crosses into the bloodstream.

Metal organic frameworks, or MOFs, are rigid, porous structures composed of metal linked by organic ligands. While researching unstable MOFs, U-M chemist Adam Matzger realized they may work as a delivery system for these kinds of drugs.

“It struck us that while everyone was shooting for stable MOFs, we could use what we had learned about instability of MOFs to get a degradable substance that would rapidly release drugs. It was a really unexpected finding,” said Matzger, the Charles G. Overberger Collegiate Professor of Chemistry and a Professor of Macromolecular Science and Engineering.

The MOF delivery system takes advantage of one strategy of delivering insoluble drugs, Matzger says. The strategy is to deliver them in an amorphous form, meaning that the drugs are kept from crystallizing. Once the drug compounds crystallize, they become less soluble—and therefore less bioavailable, which means less of the drug crosses into the bloodstream.

MOFs are able to keep these drugs in an amorphous state because of their porous structure. MOF-5 in particular looks like a set of cubes stacked on top of each other: picture an endlessly repeating 3D grid. When the researchers load a drug into this grid, the pores in the MOF compartmentalize the drug molecules, holding the compound in the desired amorphous state.

Researchers have previously used polymers to hold drug compounds in an amorphous state, but drug molecules could still migrate and crystallize in the polymer, which affects solubility and therefore how much of a drug is bioavailable. Because MOF rigidly holds drug molecules apart but quickly decomposes, drug dosage is easily controlled, Matzger says. The compound itself crosses into the bloodstream, while the MOF decomposes in the body.

The researchers, who include postdoctoral fellow Kuthuru Suresh, decided to use MOF-5 for a few reasons. First, its metal component is zinc, a metal with low toxicity used in many supplements, and the organic component is an acid called terephthalic acid. Second, MOF-5 is relatively unstable, which the researchers demonstrated in separate work that examined the stability of different MOFs.

“What we do here is we increase the solubility while guaranteeing dosage stability,” Matzger said. “This approach is relatively universal. We show it for three drugs, but the fact that the pores are too small to allow a crystal to form is going to be true for all drugs.”

The researchers’ study is published in the journal Angewandte Chemie.
How Rod-Shaped Particles Might Distract an Out-of-Control Immune Response
Kate McAlpine, Michigan Engineering

When white blood cells don’t know when to stop, an injection of rod-shaped particles may draw them away from a site of excessive inflammation.

A long-ignored white blood cell may be central to the immune system overreaction that is the most common cause of death for COVID-19 patients—and University of Michigan researchers found that rod-shaped particles can take them out of circulation.

The No. 1 cause of death for COVID-19 patients echoes the way the 1918 influenza pandemic killed: their lungs fill with fluid and they essentially drown. This is called acute respiratory distress syndrome (ARDS). But a new way of drawing immune cells out of the lungs might be able to prevent this outcome. This research is among the essential projects at U-M that have continued through the pandemic uninterrupted.

ARDS is a manifestation of a condition known as cytokine storm, in which the immune system overreacts and begins attacking the person’s own organs. In ARDS, out-of-control white blood cells break down lung tissue and cause fluid to build up. Helping to lead the charge is a type of white blood cell called the neutrophil, which makes up 60% to 70% of intruder-eating “phagocyte” cells in humans.

“Neutrophils aren’t specialized, which enables them to respond to many threats, she explained. But sometimes, that lack of specialization means they don’t know when to quit.

“They’re like the Coast Guard—they’re main job is to make sure your boundaries aren’t breached,” said Lola Eniola-Adefeso, University Diversity and Social Transformation Professor and a professor of chemical engineering, who led the research.

As long as there’s cues, neutrophils keep acting. In some instances, the feedback loop is broken, and that turns what is meant to be a good response into a bad response,” said Eniola-Adefeso.

One of their actions is to emit signaling molecules called cytokines that tell cells to break down barriers and let blood and fluid into a problem site. When that response turns bad, the neutrophils need to be stopped so that other cells can step in and repair the damage.

Previously, Eniola-Adefeso’s group showed that plastic microparticles injected into the blood of mice could distract neutrophils, diverting them away from areas of severe inflammation in their lungs. The neutrophils would grab the particle and head to the liver to dispose of it. Microplastics used in this way eased acute lung injury in mice.

But any type of blood phagocyte, such as monocytes, neutrophils or dendritic cells, might take up a sphere—which means a sphere-based therapy is likely to affect other parts of the immune response. However, it was already known that other phagocytes aren’t fond of rod-shaped particles. Eniola-Adefeso said they “get lazy” with the long wrapping process around a rod.

“We asked, do neutrophils also have a disdain for eating rods?” she said. “We found the complete opposite. They actually have a preference for eating rods.”

And that preference is useful for targeting neutrophils and leaving other white blood cells to do their jobs. They found that when they offered rods to different phagocytes, 80% of the neutrophils ate them, whereas only 5% to 10% of other phagocytes did. The comparisons included macrophages, another cell that eats intruders, and dendritic cells, which capture intruders and then show the other immune cells what to look for.

The team is currently exploring whether neutrophil-distracting particles can be made from medications rather than plastic. Eniola-Adefeso is now working with U-M Office of Technology Transfer to advance her delivery system toward clinical trials, in hopes that it may prove useful in the fight against COVID-19. The University of Michigan has applied for patent protection and has jointly launched the start-up company Asalyxa with the inventors and Orange Grove Bio, a NY-based venture company.

Eniola-Adefeso is also a professor of biomedical engineering and professor of macromolecular science and engineering.

The paper is titled, “Neutrophils preferentially phagocytose elongated particles—opportunity for selective targeting in acute inflammatory diseases,” and is published in the journal Science Advances.

The research is funded by the Falk Medical Research Trust, the National Institutes of Health, and the University of Michigan.
Faculty News

Lola Eniola-Adefeso - Professor Eniola-Adefeso was named an inaugural recipient of the University Diversity and Social Transformation Professorship. The designation was created to recognize senior faculty who have shown a commitment to the university’s ideals of diversity, equity and inclusion through their scholarship, teaching, or service and engagement.

Sharon Glotzer - Professor Glotzer was named the Stuart W. Churchill Collegiate Professor of Chemical Engineering, effective September 1, 2019 through August 31, 2024.

Joerg Lahann - Professor Lahann was appointed the Wolfgang Pauli Collegiate Professor of Chemical Engineering and was honored at a ceremony last October where he delivered a lecture on “Materials, Surfaces, and Converging Interfaces.”

Robert Kennedy - Professor Kennedy was awarded the Martin Medal for Achievements in Separation Science at the International Symposium on High Performance Liquid Chromatography. He was recognized for his “outstanding contribution to the development of innovative techniques in miniaturization of chemical separations and microfluidics for highly sensitive analysis of biological compounds.”

Geeta Mehta - Professor Mehta was promoted to Associate Professor of Materials Science and Engineering, Macromolecular Science and Engineering, and Biomedical Engineering.

Brian Love - Professor Love and Macro Ph.D. student Julie Rieland authored an article on the severe impact the pandemic has had on the recycling industry, “COVID-19 is laying waste to many US recycling programs.”

2019 Ph.D. Graduates

Rose Cersonsky (Sharon Glotzer)
Designing Nanoparticles for Self-Assembly of Novel Materials.
Rose is a postdoctoral researcher at Ecole Polytechnique Federale de Lausanne in Lausanne, Switzerland.

Derek Frank (Adam Matzger)
Functionalization of Polymeric Materials to Control the Kinetics of Pharmaceutical Crystallization.
Derek is now working as a Senior Scientist at Merck in Rahway, New Jersey.

Ryan Hall (Ronald Larson)
Experimental Assessment of Constraint Release Physics in Entangled Polymers and its Implication for Rheological Modeling.
Ryan is a Senior Research Specialist at Dow in Lake Jackson, Texas.

Taesu Kim (Theodore Goodson III)
Analysis of Energy Distribution in Molecular Level for Light-Harvesting and Emitting Organic Molecular Systems.
Taesu is employed by LG Chem in Korea.

David Krug (Richard Laine)
Synthesis, Recycling, and Modification of Thermoset Silicone Resins via Fluoride Ion Catalyzed Rearrangement.
David is employed as a Senior Materials Scientist at Continental Structural Plastics in Auburn Hills, Michigan.

Harry van der Laan (Timothy Scott)
Developing Low Shrinkage Stress Thiol-Ene Dental Resins and Two-Color Photopolymerization Chemistries.
Harry is now working as a Polymer Scientist for Readily3D in Lausanne, Switzerland.
2020 Ph.D. Graduates

Yasmine Doleyres (Kenichi Kuroda/Jinsang Kim)
Temporal and Spatial Nanobiomaterials for Tissue Engineering and Drug Delivery.

Yasmine is currently working as a research intern in the Biologic and Materials Science Department at the University of Michigan’s School of Dentistry.

Taeyong Ahn (Mark Banaszak Holl/Ellen Arruda)
Understanding Nanoscale Hierarchical Nature of Pore and Chemical Homogeneity in Bone as a Function of Tissue Ages.

Tayeong is a postdoctoral scholar at Indiana University School of Medicine in Indianapolis, Indiana.

Da Seul Yang (Jinsang Kim)
Semiconducting Polymer Design and Interface Engineering for Efficient Charge Transport.

Lisha Zhang (Henry Sodano)

Lisha is a Senior Product Development Engineer at 3M in St. Paul, Minnesota.

2019 Master’s Graduates

Wang Li graduated with a Masters in Macromolecular Science and Engineering and a Masters in Applied Economics. Wang works as a health data analyst at the University of Michigan’s School of Nursing.

2020 Master’s Graduates

Tianyu Yuan - Tianyu is going to pursue her doctoral studies at Ecole Polytechnique Federale de Lausanne in Fall 2020.

Jukai Zhou - Jukai will begin the Macro Ph.D. program in Fall 2020.

Arushi Gupta (Jeff Sakamoto)
Analyzing the Stability and Kinetics of Ceramic Electrolyte/Organic Interfaces for Li Metal Batteries.

2019 Master’s Graduates

Wang Li

2020 Master’s Graduates

Tianyu Yuan

Jukai Zhou

Sunghyun Nam (Jay Guo)
Engineering of Self-Healing Adhesives and Polymeric Sensors with Stretchable Applications.

Sunghyun works as a research scientist at LG Chem in Korea

Renato Navarro (Kenichi Kuroda/Jinsang Kim)
Tissue Engineering Simplified: Biodegradable Polymers and Biomimetic Scaffolds Made Easy, Tailorable, and Economical for Tissue Engineering.

Renato is currently working as a research intern in the Biologic and Materials Science Department at the University of Michigan’s School of Dentistry.

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Lisha Zhang (Henry Sodano)

Lisha is a Senior Product Development Engineer at 3M in St. Paul, Minnesota.
Fall 2019 New Students - Ph.D.

Anthony Berardi – B.S., Chemistry, Canisius College. Anthony was awarded a National Science Foundation Graduate Research Fellowship in April 2019.

Boon Jae Jang – B.S. and M.S., Chemistry, Seoul National University

Richard Kaplan – B.S., Molecular Engineering, The University of Chicago

Cecelia Kinane – B.S., Chemistry, University of St. Thomas

Jiwon Lim – B.S., Biomaterials Engineering, and M.S., Materials Science and Engineering, Seoul National University

Ting Lin – B.S.E. Materials Science and Engineering, Southwest Jiaotong University, and M.S., Macromolecular Science and Engineering, University of Michigan

Jennie Paik – B.S., Chemistry, University of Massachusetts-Amherst

Mengjie Yu – B.E. Polymer Material and Science Engineering, Qingdao University, and M.S., Macromolecular Science and Engineering, University of Michigan

Shuqing Zhang – B.E. Polymer Materials and Engineering, Sichuan University, and M.S., Macromolecular Science and Engineering, University of Michigan

Fall 2019 New Students - Masters

Jiayue Huang – B.E., Polymer Materials and Engineering, Sichuan University

Kristen Kelsall – B.S.C., Chemistry, Lebanon Valley College

Huiling Li – B.E., Polymer Materials and Engineering, Wuhan University of Technology

Xingkang She – B.E., Polymer Materials and Engineering, Beijing University of Chemical Technology

Fall 2020 New Students - Ph.D.

Carey Cassidy – B.S., Chemical Engineering, University of Cincinnati

Azam Hussain – B.S., Chemical and Biomolecular Engineering, Johns Hopkins University

Kristen Kelsall – B.S.C., Chemistry, Lebanon Valley College

Sungmin Kim – B.S., Polymer Science and Engineering, Case Western Reserve University

Jukai Zhou – B.E., Polymer Materials and Engineering, Sichuan University, M.S., Macromolecular Science and Engineering, University of Michigan

Dijia Zou – B.E. Macromolecular Materials and Engineering, Zhejiang University

Fall 2020 New Students - Masters

Aolin Hou – B.E., Materials Science and Engineering, Zhengzhou University

Tianhao Li – B.S., Materials Physics, Sun Yat-Sen University

Jinxu Liu – B.E., Polymer Materials and Engineering, Sichuan University

Ying Sun – B.E., Polymer Materials and Engineering, Sichuan University

Chonghan Xin – B.E., Polymer Materials and Engineering, Beijing University of Chemical Technology

Kexin Yu – B.E., Polymer Materials and Engineering, Sichuan University
Candidacy

Congratulations to the following students for advancing to candidacy:

Mira Diab El Harakeh (Jinsang Kim)  
Yanan Gong (Ronald Larson)  
Shamalee Goonetilleke (J. Scott VanEpps)  
Jaehyun Jung (Henry Sodano)  
Dukhan Kim (Anne McNeil)  
Chukwuma Nweke (Jan Stegemann)  
Julie Rieland (Brian Love)  
Violet Shelley (Lola Eniola-Adefeso)  
Kelly Wang (Sharon Glatzer)  
Muru Zhou (James Weiland/Jinsang Kim)

Industry Fellowships

Macro received generous gifts from PPG and 3M that provided $5,000 in stipend support. Students were recognized for their productivity and excellence in research.

3M  
Taeyong Ahn, Weijie Feng, Yanan Gong, Shamalee Goonetilleke, Jiwon Lim, Ting Lin, Alyssa Travitz, Shuqing Zhang, and Yichuan Zhang.

PPG  
Abhishek Dhyani, Mira Diab El Harakeh, Dukhan Kim, Philyong Kim, Julie Rieland, Lisha Zhang, and Muru Zhou.

Peer Mentorship Program

We would like to thank the following students for serving as peer mentors to our new Master’s and Ph.D. students in the 2019 cohort: Kanat Anurakparadorn, Abhishek Dhyani, Mira Diab El Harakeh, Shamalee Goonetilleke, Nisha Hollingsworth, Dukhan Kim, Ying Liu, Alyssa Travitz, Mengjie Yu, Tianyu Yuan, Lisha Zhang, and Muru Zhou.

A special thanks to Julie Rieland for her contributions as the Mentorship Coordinator. We are excited to announce that Cecelia Kinane will take over for Julie in the coordinator role for the upcoming academic year.
ACS POLY/PMSE Student Chapter

This was another productive year for our student chapter. We would like to thank Shamalee Goonetilleke (Co-President), Muru Zhou (Co-President), Julie Rieland (VP Outreach), Kristen Kelsall (VP Student Affairs), Anthony Berardi (Treasurer), and Cecelia Kinane (Secretary) for their many contributions to the chapter this year.

Last fall, the chapter hosted Dr. Rachel Pricer who conducted a Scientific Illustration Workshop. Students learned how to use scientific graphic design in order to visually communicate their research. Dr. Pricer is a U-M alum who owns a small business specializing in producing scientific graphics for presentations, posters, grants, and journal articles. The chapter also hosted industry research talks with research scientists from PPG and DuPont. A special thanks to Dr. Adam Crowe, Dr. John DeMeglio, and Dr. Leanna Foster for sharing their expertise with our students.

The chapter continued its outreach efforts by visiting elementary schools in Southeast Michigan. This winter, the chapter piloted a new teaching module of states of matter.

Social events included the annual apple picking and pie baking, student appreciation dinner hosted by Director Kim, and a Lunar New Year celebration. In addition to these traditional favorites, the students hosted a science picnic and a “paint your research” event. These events offered some new opportunities for students to discuss and showcase their research, as well as providing them an avenue to reduce stress and socialize.

Alumni News

Sarah Calve ('06 Arruda) accepted a position as an Associate Professor in the Department of Mechanical Engineering at the University of Colorado Boulder.

Apoorv Shanker ('17 Kim) was selected for the prestigious Mazumdar-Shaw International Fellows Program. Apoorv has worked as a postdoctoral researcher at MIT since graduating from U-M.

Dena Shahriari ('16 Sakamoto) accepted a position as an Assistant Professor in the Departments of Biomedical Engineering and Orthopedics at the University of British Columbia.

Anongnat Somwangthanaroj ('03 Solomon) is an Associate Professor of Chemical Engineering at Chulalongkorn University in Thailand. In November 2018, Anongnat founded Garden Fresh which supplies biodegradable plastic package that extends the shelf-life of products such as fresh produce, fresh-cut raw meat, and processed food.

The business began with Anongnat’s desire to help contribute to the world’s growing problem of food and plastic waste. She was given 2 million baht ($66,000 USD) grant from the government as seed money for her start-up. In 2019, Garden Fresh participated in the 47th International Exhibition of Inventions in Geneva and received a gold medal. The company is continuing to expand their products and their team is currently working on developing biodegradable plastic bags for dried fruit.

We would like to feature our alums on the website and in future newsletters. Please send us your updated contact information and let us know more about your current activities and news. Updates can be sent to jpollak@umich.edu.
Support Macromolecular Science & Engineering

Each year we strive to offer our students the best possible education and research opportunities. Your gift to the program provides the funding for that margin of excellence that prepares our graduates to compete in today’s world and make substantial contributions to society.

We are grateful for your continued support of the Macro program and count on you to help us offer these exceptional opportunities!

Macro has several endowed scholarships and awards that are given in honor of Macro founder Charles G. Overberger, former Director Frank E. Filisko, and longtime Macro Coordinator Nonna Hamilton.

We invite you to visit macro.engin.umich.edu/giving to contribute and learn more about the ways in which your gift can support Macro. You may also give by calling 888-518-7888.

Macromolecular Science & Engineering
3006E Building 28 NCRC
2800 Plymouth Road
Ann Arbor, MI 48109