INTERSECTIONS

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THE NEXT GENERATION OF GLYCOMATERIALS

How GlycoMIP is making strides in organic materials for a more sustainable future. p. 2

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MACROMOLECULES
INNOVATION INSTITUTE

Discovery at the nexus of minds and molecules

A LETTER FROM THE DIRECTOR

ROBERT MOORE

Dear Colleagues,

It is with great excitement that I present to you the first issue of Intersections published during my time as Director of MII.

Since its inception in 2018, this publication has come to serve as a celebration of our achievements, and such a celebration is well deserved by our faculty, staff, and students, particularly after an unusual and challenging year. In the face of big changes, the innovative nature of our community has truly shone through.

Our MII affiliated faculty continue to build the significant prestige of Virginia Tech in the global macromolecular science arena. Maren Roman is the director of a new NSF-funded center, GlycoMIP, which will advance both glycomaterials technology and researchers' access to a new state-of-the-art user facility. We are delighted to feature the GlycoMIP center in this issue of Intersections. Since our last edition in 2019, dozens of new polymer-related projects have received external funding. Despite the challenges of the global pandemic, our 2021 research expenditures increased by 66% over 2020 expenditures. And excitingly, five new faculty members have recently joined MII's ranks.

Our newest 2021 class of MACR graduate students is already beginning to join research groups across campus. Those students, along with our current MACR students, will have access to world-class macromolecular science education, as well as cutting-edge equipment and facilities. In particular, our Materials Characterization Laboratory (MCL), recently opened as a joint venture between MII and the Institute for Critical Technology and Applied Science (ICTAS). The MCL currently houses over $4.5M worth of new instruments that will facilitate learning and research in many disciplines across our institutes.

2021 marks 20 years since the official approval of the MACR degree program, which has built up a large group of deeply engaged students and alumni. Thanks to their terrific efforts, specifically the MACR student run organizing committee, the National Graduate Research Polymer Conference, postponed from 2020 to 2021, was hosted by Virginia Tech as a tremendously successful virtual conference.

MII has been proud to continue holding the Solvay Seminar Series, which brought the same caliber of world-class speakers to our campus, albeit virtually over the past two semesters. Our MII Technical Conference & Review, although it was postponed, will be back in-person in March of 2022, and will once again showcase the advanced science and interdisciplinary collaborations that make us so powerful.

Our new tagline, "Discovery at the nexus of minds and molecules," gets to the heart of MII's contributions to the university and the broader scientific community. Just as macromolecules are composed of countless individual parts that create a distinct whole, research discoveries and achievements are the results of the combination of many people's intellectual contributions, expertise, and ideas. MII is the force that seeks to bring together those individuals, across disciplines and boundaries, to find where their interests in macromolecules intersect.

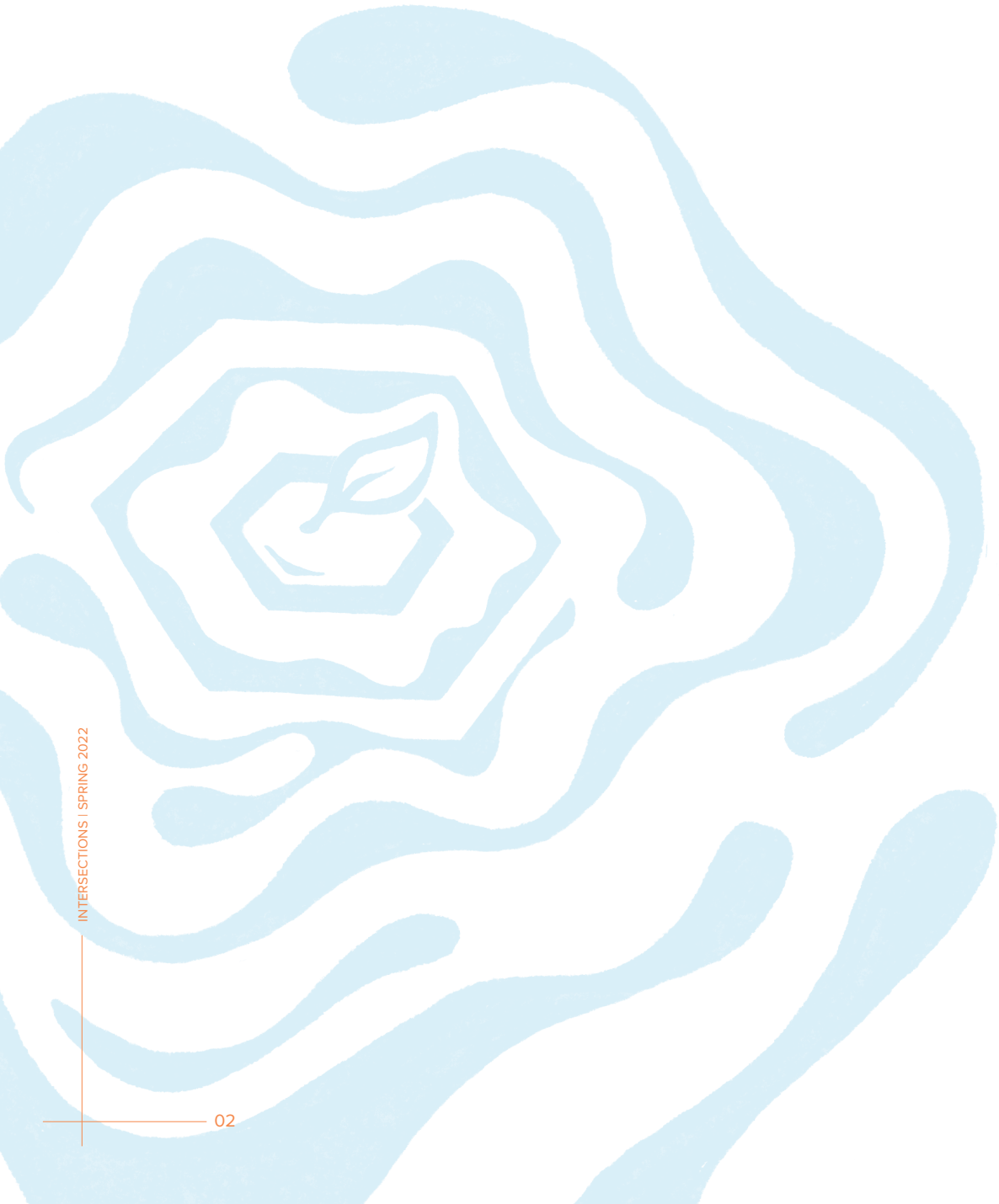
As we look to the future and the great potential that our members hold, we thank you for your continued support of the Macromolecules Innovation Institute.

Sincerely,

Robert Moore

THE NEXT GENERATION OF GLYCOMATERIALS

In the summer of 2020, a set of adjoining labs on the Virginia Tech campus was set aside with a vision for a new type of research facility that bridged gaps between biologists and engineers.



Then, on August 1st, news came that the National Science Foundation had awarded nearly $23 million for a new NSF Materials Innovation Platform. The labs were destined to become the home base for this platform, known as GlycoMIP.

At the time, there were only two Materials Innovation Platforms (MIPs) in existence — now, with the simultaneous funding of GlycoMIP and BioPacificMIP in California, there would be four. MIP programs exist to elevate underdeveloped areas of scientific understanding by providing access to advanced facilities and expertise, and in the case of the two new MIPs, converge materials research with the biological sciences. By making state-of-the art equipment available to interested researchers, the MIPs serve as catalysts for breakthroughs in targeted scientific fields, and in doing so, training the next generation of interdisciplinary scientists.

GlycoMIP is unique in that it will not be limited to just the 2400 square feet of laboratory space at Virginia Tech's Fralin Life Sciences Institute; it spans institutions, thanks to a powerful collaboration with the University of Georgia's Complex Carbohydrate Research Center (CCRC), and research partnerships with Brandeis University, Rensselaer Polytechnic Institute, and the University of North Carolina at Chapel Hill.

Maren Roman, an associate professor inthe Virginia Tech Department of Sustainable Biomaterials, is the Director of GlycoMIP.

"Our vision for GlycoMIP is to bring together leading experts from the fields of materials and glycoscience for the development of new glycomaterials," says Roman. "We've strategically merged Virginia Tech's strengths in polymer and polysaccharide chemistry with world-leading expertise in glycan structure analysis and computational modeling at UGA, chemoenzymatic glycan synthesis at RPI and UNC, and machine learning approaches to glycoanalytics at Brandeis University. We are excited about these research collaborations and expect impactful scientific advances."

The most abundant materials on our planet are composed of carbohydrates. These "glycomaterials" are integral to our daily lives, so much so that we tend to not even think about their presence and impact on society. Glycomaterials are foundational to any biological system, providing basic cell structure, as well as the means to communicate, adapt to environmental changes, and replicate. While at the societal level paper products may be considered the most widely used glycomaterials, one finds carbohydrate-based materials in almost everything we taste and touch. That said, due to the structural complexities of carbohydrates, the field of glycoscience is particularly challenging, yet it holds the promise of significant advancements and discoveries that can positively impact our society.

GlycoMIP
NSF Materials Innovation Platform

Steger Hall is home to Virginia Tech's GlycoMIP facilities. The building is located at 1015 Life Science Circle.

So how will GlycoMIP jump-start new innovations in glycomaterials? Perhaps the biggest step will be in providing a unique user program and services to scientists across academia and industry. These services include the synthesis and testing of materials samples, providing curated structure-property databases, as well as more in-depth collaborations on long-term projects that make use of the facilities.

Users of GlycoMIP will benefit from expertise and equipment dedicated to glycomaterials synthesis, characterization, and modeling. The equipment, which is housed at both Virginia Tech and the University of Georgia, provides access to state-of-the-art tools that were previously not available or unaffordable to those interested in such instrumentation.

One such item, a glycan synthesizer designed and manufactured in Germany, is the first of its kind to be installed in the United States. Access to automated glycan synthesis is one of the services that GlycoMIP is most enthusiastic about providing; these molecules are difficult to produce, which makes the ability to create them a major draw for the facility. “Many researchers are in need of specific glycans but do not have the expertise or resources to prepare them,” explains Dr. Richard Helm, Virginia Tech Associate Professor of Biochemistry and GlycoMIP’s Director of Synthesis Services. “The availability of a tool to produce them will allow scientists to move deeper into their specific areas of research.”

Characterization services are also a big attraction; many different types of equipment, including computing facilities, are housed at Virginia Tech and the University of Georgia, both GlycoMIP-supported as well as synergistic equipment in other labs, allowing users to access a full suite of analytical techniques to meet their needs. The platform is also expanding greatly on an emerging emphasis in glycan modeling by integrating multiscale modeling, adding new focus areas, and providing more modeling and analysis capabilities from atomic- to mesoscale-level.

Although the user program and facilities will be open to scientists around the country, additional support will be available for successful proposals from non-R1 institutions and Historically Black Colleges and Universities (HBCUs). This is driven by the well-acknowledged need to increase diversity in the sciences, as well as to provide access to high-end resources to academics and students who might otherwise be unable to fully accomplish their research goals. A significant effort is already underway to diversify participation in GlycoMIP’s programs through direct connections with faculty outside R1 institutions.

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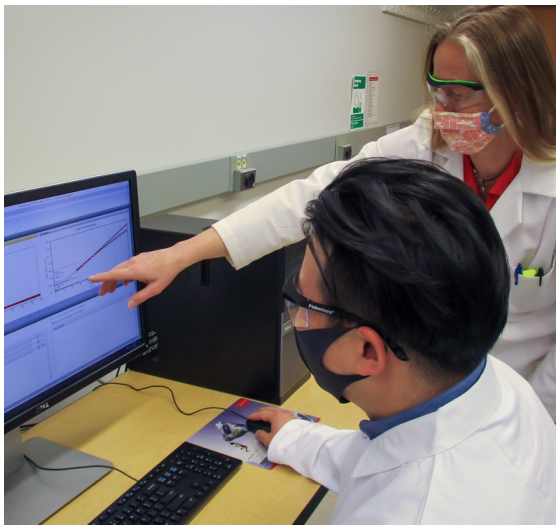
In addition to the user program’s support of external scientists, GlycoMIP’s in-house research will propel glycomaterials science to the next level. A team of faculty from the MIP’s five collaborating institutions will push forward four lines of research, each dedicated to advancing capabilities in distinct but related areas, including: the discovery of new glycomaterials, the development of designer glycomaterials, the ability to recognize and characterize glycans, and the automation of glycan synthesis.

By developing new tools and methods for synthesizing, analyzing, and modeling glycomaterials, the team will continue to strengthen GlycoMIP’s capacity to facilitate advanced research. In this way, the platform is able to continually improve upon itself.

Hu Young Yoon holds a tray of samples from the Shimadzu preparative liquid Chromatography unit.



Left Image: GlycoMIP Director Dr. Maren Roman works with Hu Young Yoon, a PhD candidate in the MACR Program, at a computer reviewing data measured by the Anton Paar MCR 302 Rheometer.

Image Below: Hu Young Yoon, a PHD candidate in the MACR Program, and Dr. Sherry Heldreth, Research Associate with the VT Mass Spectrometry Incubator, load samples onto the Shimadzu preparative liquid Chromatography unit. The instrument is used to purify glycomaterials.

Robert Woods is a professor of Chemistry and Biochemistry & Molecular Biology at the University of Georgia, and is the Director of In-House Research for GlycoMIP. According to Woods, “Developing structure-function relationships for glycomaterials is essential for advancing the rational design of glycomaterials with defined or novel properties. We will achieve this by tightly integrating cutting-edge methods for 3D structure prediction, chWWmical synthesis, and characterization in a synergistic effort involving several teams of in-house researchers.”

Equally crucial to the platform’s mission is the training and support of students: the next generation of glycomaterials scientists. Whether attending an outreach event, visiting for a scientific collaboration, or conducting GlycoMIP research, students will enjoy access to state-of-the-art facilities and training.

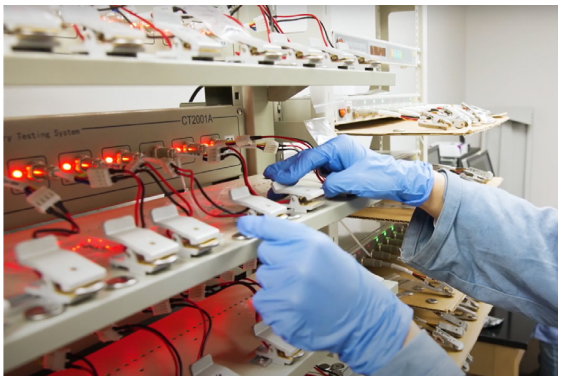
The experiences students have with GlycoMIP will help them as they consider career paths that best meet their skills and interests. Connections with new collaborators and experts in the field will enrich their professional lives while simultaneously diversifying the research landscape, facilitating interdisciplinarity, and building a strong pool of eager and informed researchers who will move the discipline forward. To enhance this process, the GlycoMIP Scholars program is being formed, with plans to engage guest speakers and host networking events for students.

“One of the best ways to build strong connections among students is through shared experiences,” says Program Coordinator Lauren Mills who will facilitate the GlycoMIP Scholar’s program. “Through the GlycoMIP Scholars program, we will expose students to a variety of glycomaterials-related research and career options. They will hear from professionals working in the field and be able to ask questions in a small-group setting. GlycoMIP Scholars will graduate having made connections that will serve them as they pursue their chosen career path.”

“The program will also support GlycoMIP’s overarching goal of broadening participation in glycosciences,” she adds, “by attracting and supporting students from schools that might not have the resources to conduct this type of research. Attracting these students to connect and participate in research can have immeasurable impacts on their future potential.”

MII FEATURED ON MATERIALS RESEARCH SOCIETY MRSTV FILM

MII was proud to be featured for the 2021 meeting in Boston alongside such other groups as the KAUST Organic Bioelectronics Laboratory, Air Force Research Laboratory, Hong Kong Polytechnic University, Helholtz Zentrum Berlin, and the Swansea University Institute of Structural Materials, Wales.



Each year, the Materials Research Society (MRS) collaborates with a video production company to create a few short films about outstanding organizations and institutes all over the world working in the field of materials science. In 2021, MII was the focus of one such video, which highlighted our institute, interdisciplinary research areas, graduate degree program, and shared facilities.

These films are featured during the annual MRS Fall Meeting, as well as distributed widely online, reaching a large audience of interested scientists. MII was proud to be featured for the 2021 meeting in Boston alongside such other groups as the KAUST Organic Bioelectronics Laboratory, Air Force Research Laboratory, Hong Kong Polytechnic University, Helholtz Zentrum Berlin, and the Swansea University Institute of Structural Materials, Wales. To create the video, MII worked with the production company WebsEdge. After facilitating the process of envisioning and planning the video, WebsEdge sent a videographer to the Virginia Tech campus to capture both interview and laboratory footage. Filming locations included the Materials Characterization Laboratory, GlycoMIP laboratories in Steger Hall, DREAMS Lab in Goodwin Hall, and the Battery Testing Facility and MII polymer conference room in Davidson Hall.

In addition to advancing MII's professional reputation by informing the MRS community about our work, this video also serves to document how far MII has come throughout its history. It highlights the diversity of projects that we support, the interdisciplinary nature of our research, and the importance of training the next generation of macromolecular scientists.

The video can be viewed at
mii.vt.edu/About.html

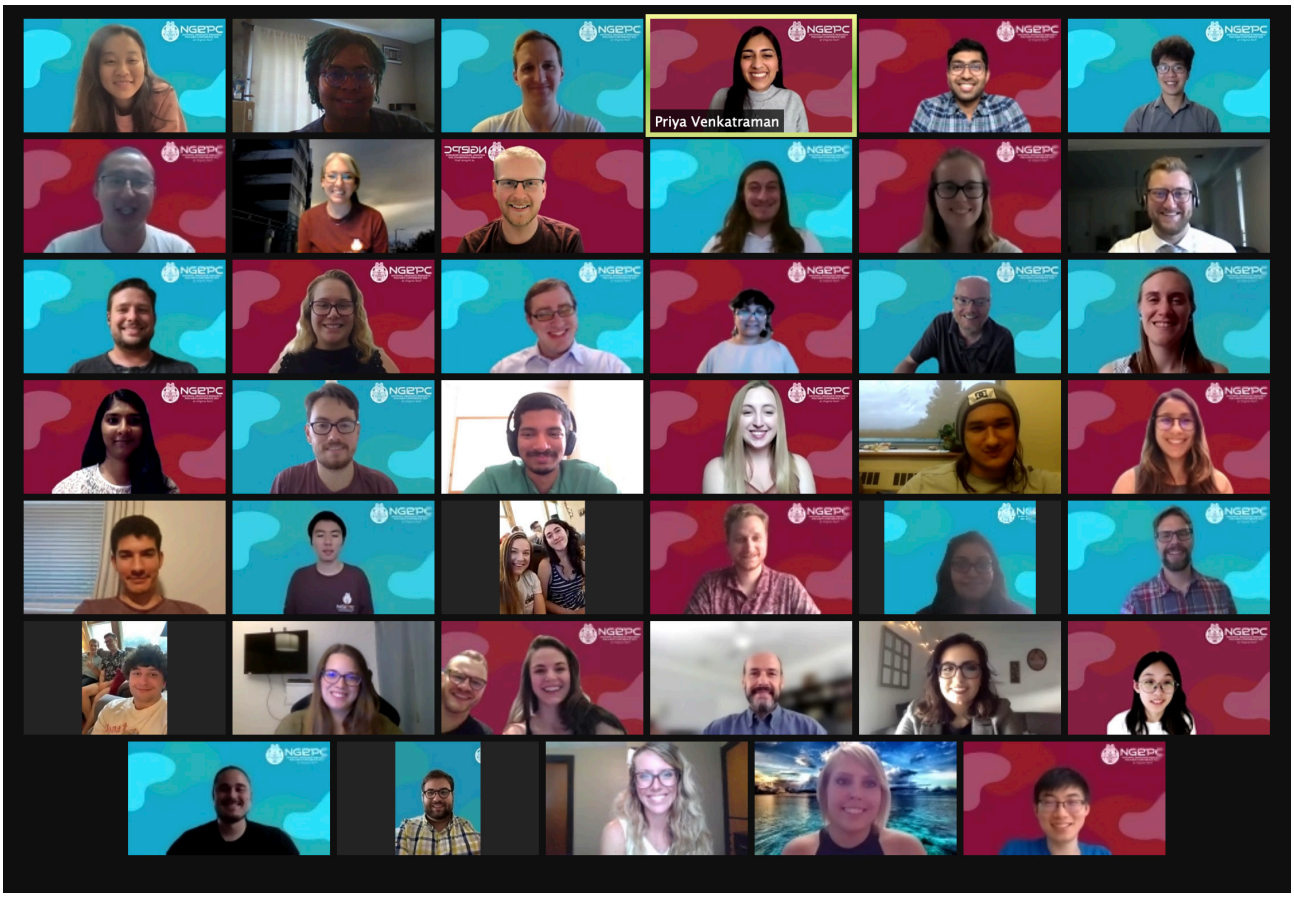
2021 NATIONAL GRADUATE RESEARCH POLYMER CONFERENCE

By Priya Venkatraman

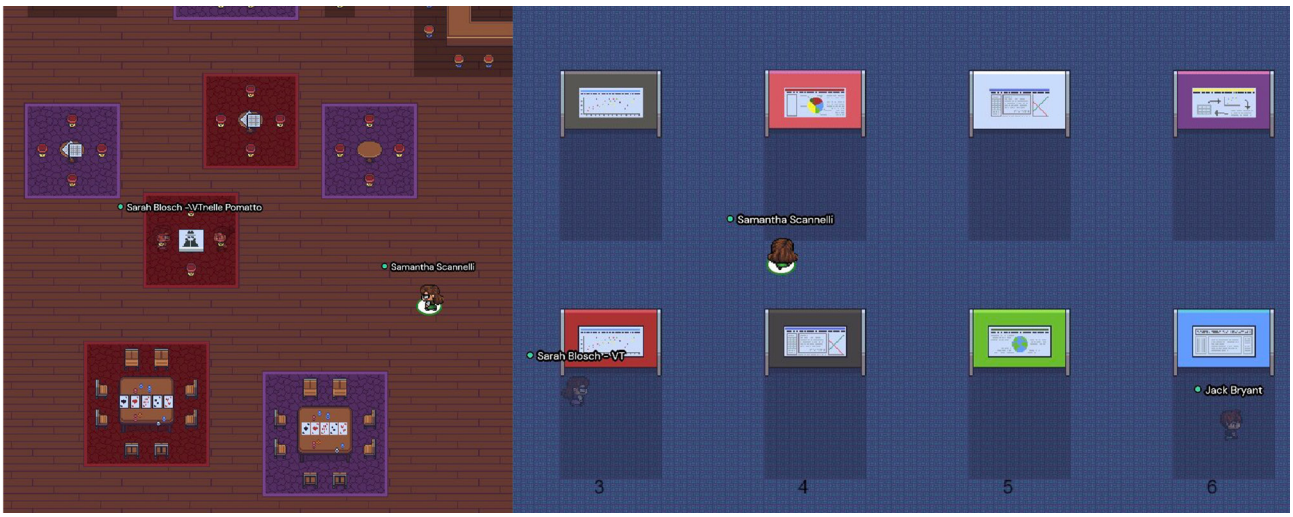
Virginia Tech hosted the National Graduate Research Polymer Conference (NGRPC2021) in July 2021, with the goal of bringing together early-career polymer scientists and engineers from all subsets to share their science, foster collaborations, and network with each other. The conference (in virtual format) hosted 240 attendees from 50 different universities. Generous sponsors from 28 different organizations including industry, government agencies, and academia participated in a fruitful career fair and tech expo while also furnishing over $7,000 in cash prizes for students.

The NGRPC2021 committee, made up of 15 graduate students, originally spent 3 years planning an in-person event before switching gears to a virtual conference in early 2021, and ultimately planning a conference unlike any before it. A Gather (www.gather.town) interface created an engaging environment almost equivalent to an in-person event, where attendees could use avatars to virtually "walk up" to poster presenters and interact with our career fair and tech expo attendees. All attendees received a swag box filled with items befitting the sustainability theme of the conference. The banquet event featured a three-course meal shipped to all participants from A Virtual Toast (www.avirtualtoast.com), and during which Director of MII, Bob Moore, and Director of Sustainability at P&G, John Layman, spoke about current goals and sustainability efforts. Conference chairs Emily Wilts, Priya Venkatraman, Brad Sutliff, and Phil Scott were honored to plan this event and are looking forward to the next NGRPC in 2023.

NGRPC
NATIONAL GRADUATE RESEARCH POLYMER CONFERENCE 2021
at Virginia Tech®



Conference attendees meet virtually during an NGRPC 2021 session.



Virtual poster session participants explore the Gather interface.

MATERIALS CHARACTERIZATION LABORATORY

In 2019, an initiative from the Office of the Vice President for Research and Innovation sparked the development of a new shared core research facility: the Materials Characterization Lab (MCL). Amanda Morris, a professor in the department of chemistry and a faculty affiliate of MII, led the team that planned and created the MCL, collaborating with both of the supporting organizations behind the lab. Those organizations were MII, led by Robert B. Moore, a professor of chemistry, and the Institute for Critical Technology and Applied Science (ICTAS), led by Stefan Duma, the Harry Wyatt Professor of Engineering. To turn the idea behind the MCL into a reality, the team consulted with a variety of faculty members to evaluate what instruments would be most beneficial to acquire for the lab. After all, the motivation behind the shared research facility was to enable Virginia Tech researchers to use instruments that would otherwise be difficult or impossible to access. The team also hired Rituraj Borgohain as the core lab research manager, bringing his expertise in materials science and chemistry to the MCL. The lab officially opened its doors in Spring 2020,

The lab officially opened its doors in Spring 2020, and has now been used by more than one hundred researchers from sixteen departments across the university, which is a number that continues to grow.

and has now been used by more than one hundred researchers from sixteen departments across the university, which is a number that continues to grow. Currently, the MCL is home to over $4.5M worth of state-of-the-art instruments. Students, postdocs, and faculty all work with Borgohain to get trained on the lab's instruments, use those instruments in their research, and identify new instruments to bring into the lab. In this respect, the Virginia Tech research community benefits not only from the state-of-the art facility itself, but also from the education and expertise provided by MCL staff. Unlike many service center facilities at other universities, the MCL requires no fee from its Virginia Tech users. The advantages of the MCL go even further: by providing a central location where researchers can work and learn, the lab fosters new and ongoing collaborations. Many of those collaborations are interdisciplinary, since the MCL is home to such a wide variety of instruments that can be used in any number of areas of study, including soft materials, hard materials, and quantum studies. These collaborations directly further the university's research goals and provide a major incentive for faculty to come to Virginia Tech. The MCL also accommodates science and engineering undergraduate and graduate lab courses on request.

In the future, the MCL hopes to provide opportunities to host poster competitions, internships, and other events that support its mission to educate and foster collaborations. It also seeks to open its doors to external users for fee-based services.

For more information on the facility please visit **https://mcl.ictas.vt.edu/.**

NEW MII HEADQUARTERS IN DAVIDSON HALL

While the MII staff offices and operations have been situated in ICTAS II for the last decade – a state-of-the-art building that houses interdisciplinary research labs, office space, and meeting rooms – many of our alumni recall the headquarters of MII back in the dark old wings of Davidson Hall. With completion of the newly-renovated Davidson Hall project, MII returns to its origins with a second showcase headquarters in the 313 Davidson Suite. The Director of MII, Robert Moore, is a member of the Chemistry Department, with his office in 313F Davidson Hall. The new MII space consists of a suite on the building's third floor, also occupied by the offices of several MII affiliated faculty as well as the MII Communications Coordinator. This MII space also includes a large conference room and Polymer Library.

This space has undergone notable updates, including the dedication of wall space to display MII faculty members' journal cover art, the installation of a large-screen monitor showing MII news and updates, and upgrades to the suite's conference room. Visitors to MII may now experience both the ICTAS II and Davidson Hall spaces, which give a good representation of the integrative and interdisciplinary nature of the institute.


ARS
Soft Matter


FRESH HOT PIZZA

MACR STUDENT COUNCIL

The MACR Student Council is a student-run organization that helps facilitate a seamless and engaging experience for prospective, new, and current MACR students. It gives student voices a platform for interacting with program administration, and works to further the group's interests in education, research, diversity, inclusion, and community.

During spring of 2021, while travel and social distancing restrictions were still in place, the MACR program held its second-ever completely virtual recruitment event for prospective students. Although this format limited attendees' ability to truly experience the campus and the MII community, MACR Student Council (SC) members rose to the occasion, bringing together students' knowledge, stories, and advice so that prospective students could get a fuller picture of the MII and Virginia Tech experience.

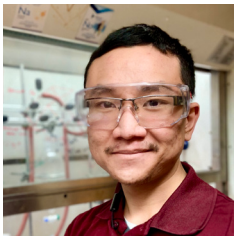
The SC also hosted a MACR Welcome Party for graduate students during the spring 2021 semester, putting together a virtual game night during which students and faculty played a mix of games online. They also distributed food to the participants, allowing everyone to celebrate fully while remaining safely distanced.

With the return of in-person experiences to the Virginia Tech campus, the SC organized an ongoing twice-monthly social event for MACR students. These gatherings bring the students together to discuss the program, socialize, and plan future events. In addition to being a draw for prospective students, these regular meetings foster cohesion within the group, as well as a sense of ownership over the MACR experience.

Michelle Pomatto's research focuses on the fundamental understanding of structure-property relationships of semi-crystalline, high-temperature isothermally gelled, blocky functionalized polymers. Robert B. Moore is her advisor.

Garrett Godshall investigates and applies thermoreversible gels and aerogels made with engineering thermoplastics. He is advised by Robert B. Moore.

Jack Bryant researches powder bed fusion of polyolefins. He is co-advised by Christopher Williams and Michael Bortner.



Clark Vu studies the synthesis of bottlebrush polymers for novel applications. John Matson is his advisor.

FACULTY SPOTLIGHT

Growing up, Michael Bartlett had a fascination with the materials used in sports equipment. From bike tires to skis, all types of manmade materials were used to create the gear that athletes relied upon to achieve maximum performance. So how could we engineer a better piece of equipment? How could we push the boundaries of material performance to increase what is possible in athletics? Questions like these fueled the future engineer's interest in materials science.

Michael Bartlett is now an asswwistant professor in Virginia Tech's department of mechanical engineering, as well as a faculty affiliate of MII. His research has evolved to include the development and study of advanced materials that can be used in robotics, electronics, adhesives, and more.

"I've always been fascinated by polymers," said Bartlett, "and the ability to make composites that can be responsive, and display unique functionalities that can't be achieved with any other types of materials."

After completing a graduate degree at the University of Massachusetts Amherst in Polymer Science and Engineering, Bartlett embarked on a career that would involve both academic and industry work. The pull of Virginia Tech was strong due to its prestigious engineering programs, combined with its reputation for research on polymers and soft materials, embodied by MII.

A major branch of Bartlett's current research pertains to soft materials, and more specifically soft electronics. As he is quick to point out, many traditional engineering materials for electronic devices do not hold up very well to bending, puncturing, dropping, or excessive force. A cell phone, for instance, will generally break if run over by a car. What's more, wearable electronics that can do things like monitor a person's heart rate are still constrained by their rigid structures, making them difficult to integrate well with the body. With soft electronics, Bartlett envisions a world where devices are durable and robust to damage, and wearables can seamlessly monitor or assist the wearer without disruption.

One project underway involves a collaboration with Robert B. Moore of the chemistry department (and Director of MII), funded by the Institute for Critical Technology and Applied Science (ICTAS). This investigation looks at how soft electronic materials, such as liquid metals, interact with polymers at small scales. The features of this particular interface are still relatively unknown, and a deeper understanding of those dynamics will lay the foundations for better-informed engineering of soft electronics that employ these materials.

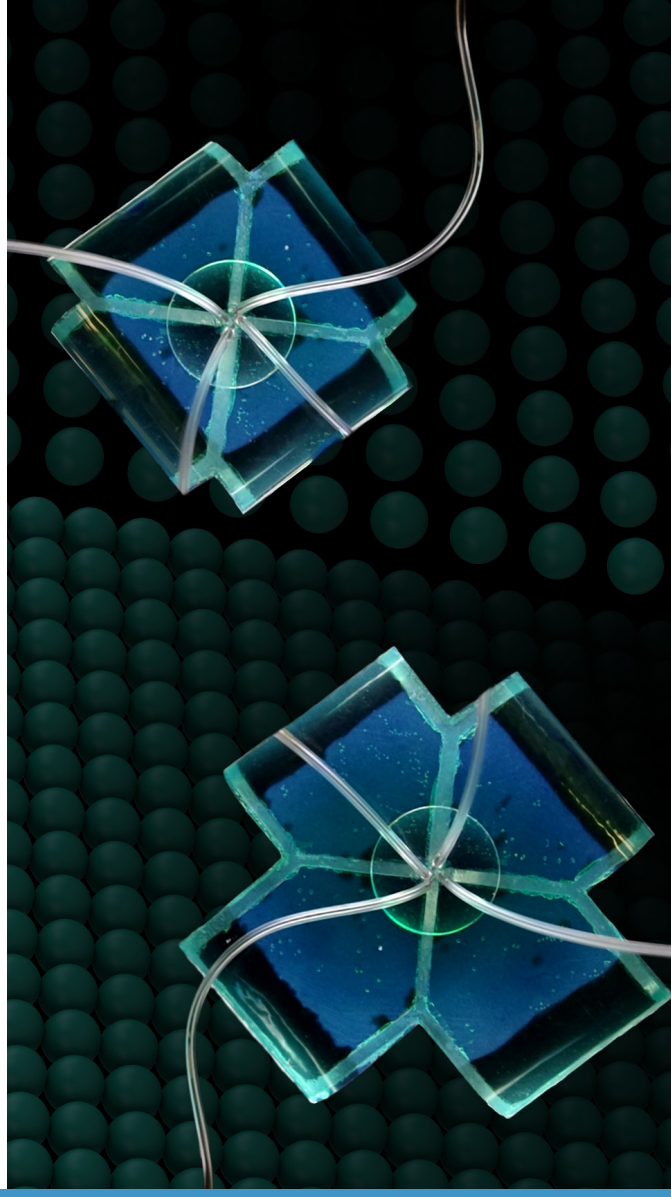
Bartlett's research often draws inspiration from the natural world, too. For instance, many of the qualities he hopes to achieve with his advanced materials are already present in certain animals. For example, an octopus can process complex information about its surroundings, use that information to camouflage itself using the optical properties of its skin, and do all of this while fitting through openings in its environment much smaller than its body. A manufactured device that could do all of this would be transformative.

Adhesives are a particularly intriguing piece of bio-inspired technology. Virginia Tech has a rich history in adhesion science, making it a natural home for this sort of research. Bartlett works on advanced adhesives that have incredibly strong adhesion under normal circumstances, but remove easily with specific stimuli. There are also adhesives being

developed for underwater use, or for use with very delicate objects. These materials have applications in medicine (e.g., bandages), manufacturing (e.g., moving objects around without damage), and more.

These endeavors – whether in bio-inspired technology, soft materials engineering, or polymer science – are highly interdisciplinary. As Bartlett explained, “I’m always looking for new ways to look at a problem I’ve been studying, and that’s why Virginia Tech was so exciting for me. From the first time I visited, it was easy to see that people were engaging with each other and working together on interdisciplinary problems.”

Bartlett’s research has resulted in publications, patents, media coverage, and awards including a DARPA Young Faculty Award and Director’s Fellowship, ONR Young Investigator (YIP) Award, the Early Career Scientist Award from the Adhesion Society, a 3M Non-Tenured Faculty Award, an ICTAS Junior Faculty Award, and an Outstanding Faculty Award (student nominated). He is excited to see where his research continues to take him, hoping to make great strides toward a world with robust, seamless, and powerful materials that enhance performance in all aspects of life.



MICHAEL BARTLETT

Top right:
An examination of adhesive crack propagation. Haverkamp, C. B.; Hwang, D.; Lee, C.; Bartlett, M. D., Deterministic control of adhesive crack propagation through jamming based switchable adhesives. Soft Matter 2021, 17 (7), 1731-1737.

Bottom right:
A liquid metal composite for soft electronics. Tutika, R.; Haque, A. B. M. T.; Bartlett, M. D., Self-healing liquid metal composite for reconfigurable and recyclable soft electronics. Communications Materials 2021, 2 (1), 64.

Michael Bartlett
Office of Naval Research (ONR) Young Investigator Award

John Matson
National Science Foundation – Binational Science Foundation award

Guoliang Liu
MII Interdisciplinary Collaborative Seed Program Funding

Sanket Deshmukh
2021 Jeffress Trust Award in Interdisciplinary Research

Christopher Williams
REMADE Institute award

Rana Ashkar
National Science Foundation – Binational Science Foundation award, 2021 Jeffress Trust Award in Interdisciplinary Research

Michael Bortner
Army Research Laboratory (ARL) & Office of Naval Research (ONR) awards

William Ducker
MII Interdisciplinary Collaborative Seed Program Funding

Robert B. Moore
National Science Foundation Grant Opportunities for Academic Liaison with Industry (GOALI) program, NSF Critical Aspects of Sustainability (CAS) program award

Jiangtao Cheng
MII Interdisciplinary Collaborative Seed Program Funding

FACULTY HIGHLIGHTS

Michael Schulz
MII Interdisciplinary Collaborative Seed Program Funding

STUDENTS

Ryan Carrazzone was selected as a winner of the ACS Excellence Award, and presented at the 2021 ACS Excellence in Graduate Polymer Research Symposium.

Deyang Yu published two first-author papers, one appearing in ACS Applied Energy Materials, and one in Advanced Energy Materials.

Joseph Sarver was the lead author on two papers, one appearing in the Journal of Applied Polymer Science (in which it was featured on the cover), and one in the Journal of Supercritical Fluids.

Michelle Pomatto was selected as a winner of the PMSE Poster Award for her poster, "Morphological control of poly(ether ketone ketone) gels as a means to tailor blocky functionalization in the gel state," presented at the ACS Fall 2021 meeting.

Dohgyu Hwang received the Peebles Award from the Adhesion Society, as well as the 2021 Adhesion Society Distinguished Paper Award. Dohgyu also had articles featured on covers of Soft Matter and Nanoscale Horizons.

Arit Das received two prestigious recognitions for his research in 2021: an invitation to the AIChE Excellence in Polymer Graduate Research Symposium, and the Peebles Award.

Jennifer Galford has served as MII's Business Manager since June 2019. Her background is in business administration with a concentration in accounting, and she obtained her Bachelor's Degree from Bluefield State College in 2010. She has working in the accounting field for the last 11 years. She was born and raised in West Virginia, where she still currently lives with her family and enjoys being outdoors.

Reilly Henson is MII's Communications Coordinator and Administrative Assistant, and has been in this role since late 2020. She has a background in both science communications and project management, having studied biology at William & Mary and environmental management at Duke University. She has been located in Blacksburg for about four years, and now enjoys the beautiful view out of Davidson onto the Drillfield.

Kim Felix is the MACR Degree Program Administrator and Research Experiences for Undergraduates Program Director. She works closely with students, staff, and faculty, sharing detailed knowledge and guidance as well as orchestrating events and career development opportunities.

STAFF

ALUMNI

JONATHAN GOFF

Jonathan Goff, an alumnus of the Macromolecular Science and Engineering (MACR) Degree Program, has recently been named President of Gelest, Inc. He earned his Ph.D. at Virginia Tech in 2009, advised by Judy Riffle. The subject of his graduate research was the synthesis and characterization of novel polyethers and polydimethylsiloxanes for use in biomaterials. Gelest, headquartered in Morrisville, Pennsylvania, is an innovator, manufacturer, and supplier of silicones, organosilanes, metal-organics, and specialty monomers for advanced technology end markets including medical devices, life sciences, microelectronics, and personal care. Recalling his education at MII, Goff states, “MACR gave me a deep understanding of all aspects of polymer chemistry/materials science. It also gave me the chance to learn how to work effectively with cross-functional/interdisciplinary teams on research projects. This has been invaluable in my career.”

WILLIAM HARRISON

William Harrison has a Ph.D. in chemistry from Virginia Tech, where he studied with James McGrath, and graduated in 2002. He was recently promoted to the Vice President of Polymer Science and Laboratory Operations Supervisor at NanoSonic, Inc., which is an innovative research and manufacturing company, located in Giles County, VA, with focus on the design and development of advanced materials and sensor systems. His specific research area is the development of materials and membranes applicable to alternative energy and water purification systems. Harrison says, “I enjoyed learning from renowned experts in the chemistry, engineering and MSE departments through Virginia Tech’s MII. While I have many fond memories, the relationships that started at VT are still cherished today.”

JAKE FALLON

Jake Fallon is a technology development engineer on the 3D printing team at Braskem. Jake attended graduate school at Virginia Tech, where he was advised by Michael Bortner and received his Ph.D. in Macromolecular Science and Engineering and graduated in 2019. While attending Virginia Tech, Jake Fallon received the Garth L. Wilkes Interdisciplinary Scholar Award and received 1st place in the Society of Manufacturing Engineers Digital Manufacturing Challenge in 2017. Jake now has over 8 years of experience in the 3D printing industry and has developed expertise in areas ranging from fundamental material research to end-use application development. Fallon states, “With the polymer structure process property knowledge I gained during my time at Virginia Tech, I am able to solve important technical challenges the 3D printing industry needs to continue to progress.”

YEH-HUNG LAI

Yeh-Hung Lai graduated from Virginia Tech in 1994 with a Ph.D. in engineering mechanics, having studied with David Dillard in the area of adhesive and sealant sciences. Lai is now a technical fellow at General Motors, where he has been a leader of research related to the mechanics of fuel cell materials. Inspired by what he learned at Virginia Tech, Lai began a new collaboration with Dillard in 2004 which involved a research team that produced 23 publications and contributed to improving durability in 3 generations of GM’s Hydrotec® fuel cell systems. Lai himself is now an author of 57 academic papers, 3 book chapters and an inventor of 55 US patents.

SCOTT TRENOR

Scott Trenor is currently a Principal Scientist & Global Sustainability Lead in Plastics Additives R&D at Milliken & Company. He earned his Ph.D. in Macromolecular Science and Engineering from Virginia Tech in 2004, working under the combined advising of Brian Love in Materials Science & Engineering and Timothy Long in Chemistry. Trenor now has over 18 years of experience in research and development in the polymer industry. His functional experience includes discovery, development and commercialization of novel polymers and polymer additives as well as in technology scouting, acquisition, and licensing. He drives R&D efforts in sustainability-enabling technologies and serves on working committees of the Association of Plastics Recyclers, The Recycling Partnership, RecyClass, and the Alliance to End Plastic Waste.

OUR NEWEST FACULTY

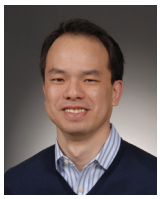
Sanket Deshmukh, *Chemical Engineering*
Research areas: Development of novel computational tools by integrating Multiscale Modelling, Machine Learning, and Optimization Algorithms to Study and Design Soft-Material Composites and Architectures relevant for Energy, Environment and Biomedical Applications

Valerie Welborn, *Chemistry*
Research areas: Biologically relevant materials, Modeling and computation

Adrian Figg, *Chemistry*
Research areas: Biologically Relevant Materials, Design & Synthesis of Novel Polymers, Nanomaterials, Smart & Responsive Materials

Rebecca Cockrum, *Dairy Science*
Research areas: Design & Synthesis of Novel Polymers, Biologically Relevant Materials, Modeling & Computation, Packaging, Polymer Characterization

The Solvay Seminar Series is proudly presented by the Macromolecules Innovation Institute (MII), and is made possible by generous support from Solvay Materials. The Fall 2021 series included the following invited lectures.

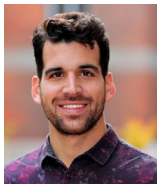


September 8, 11:15 AM
"Impulsive Deformation and Puncture of Soft Materials"
Edwin Chan, NIST
Virtual via Zoom - Hosted by Michael Bartlett

September 15, 11:15 AM
"Polymer crystallization and nucleation: New insights from fast scanning calorimetry"
Christoph Schick, University of Rostock, Germany
Virtual via Zoom - Hosted by Robert Moore

September 29, 11:15 AM
"Catalytic Routes to Main-Chain Functionalized Polyolefins from Plant Oils for Closed Loop Recycling and Degradability"
Stefan Mecking, University of Konstanz, Germany
Virtual via Zoom – Hosted by Greg Liu

October 27, 11:15 AM
"Interactive Materials for Environmental and Biological Applications"
Michael Schulz, Virginia Tech
In person – Hosted by Lou Madsen



November 3, 11:15 AM
"Modern Approaches to Functional and Sustainable Thermoplastics"
Frank Leibfarth, University of North CarolinaSolvay Seminar Series
In person - Hosted by John Matson

November 10, 11:15 AM
"High-throughput Characterization of Hydrogel Rheological Properties and Sol-Gel Phase Transitions"
Blake Johnson, Virginia Tech
In person - Hosted by Lou Madsen

December 1, 11:15 AM
"Bio-inspired and Sustainable Design: Towards Functional Materials"
LaShanda Korley, University of Delaware
Virtual via Zoom - Hosted by David Dillard

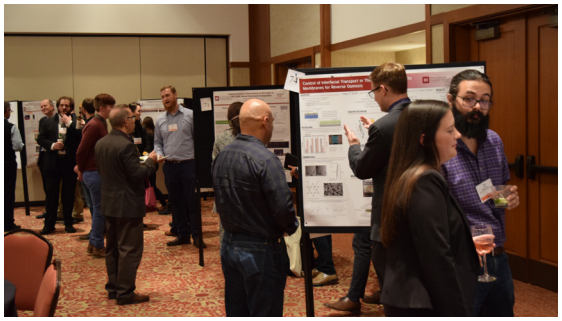
SOLVAY SEMINAR SERIES

UPCOMING MII EVENTS

TECHNICAL CONFERENCE & REVIEW

March 1 – 3, 2022

MII organizes a technical conference and review meeting on the Virginia Tech campus every 18 months to provide an opportunity for scientists and engineers from industry and government to learn about the activities of MII through 25+ faculty presentations and 100+ student posters. The event also features plenary talks, a banquet, networking opportunities, and a pre-conference workshop.



ACS POLYMER PRINCIPLES AND PRACTICE SHORT COURSE

March 13 – 18, 2022

Three times a year, MII faculty lead a hands-on educational outreach program to early career or transitioning industrial/academic scientists and engineers that provides a comprehensive overview of polymer chemistry through a novel combination of lectures and corresponding laboratory time. The course is taught at the Inn at Virginia Tech and various University labs across campus, including the new Materials Characterization Lab in Kelly Hall. Key topics include polymer synthesis, polymer structure and morphology, fundamentals of rheology and processing, and more.

ADHESION SCIENCE SHORT COURSE

May 15 – 20, 2022

The Adhesion Science Short Course is a lecture-laboratory learning opportunity for those who produce or utilize adhesives and sealants. Topics include adhesives and polymer design parameters, analysis of surfaces, frontiers in adhesion science, and more. Sessions are taught by MII faculty.

COVESTRO LECTURE

Fall 2022

Covestro sponsors the distinguished lectureship as a way to help enhance its connection to the Macromolecules Innovation Institute (MII) and encourage its faculty and students to look beyond traditional boundaries.

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MII serves the research and education enterprise of Virginia Tech, with a focus on macromolecular materials and interfaces. MII is dedicated to advancing fundamental knowledge and technical innovations in macromolecular science and engineering through the synergistic pairing of interdisciplinary teams, impactful support of cutting-edge discoveries, valued partnerships with industry and national labs, and state-of-the-art education of our future leaders.

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VIRGINIA TECH

MACROMOLECULES INNOVATION INSTITUTE

Discovery at the nexus of minds and molecules