INTER SECTIONS

TRACKING #'S

ISSUE NUMBER 2 / 2018

INTER SECTIONS

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A LETTER FROM THE DIRECTOR

Dear Colleagues,

Welcome to the second issue of *Intersections,* the magazine of the Macromolecules Innovation Institute (MII), and our 70 MII affiliated faculty and more than 130 graduate students relish the opportunity to impatiently sit at the intersection of science, engineering, and society. I am truly honored to serve as Director. MII remains steadfast at placing macromolecular science and engineering in the lens of every discipline, from architecture and packaging to health and energy sciences. Complex global challenges demand complex research teams, and MII strives to pave these intersections to cultivate international research prowess and education of future interdisciplinary innovators.

This issue is dedicated to the late Professor Garth L. Wilkes; his legacy remains strong across our Institute with a keen attention to structure-property-processing relationships. This approach to discovery and education demands fundamental science and engineering with a passion for translation to society. We will announce the first Garth L. Wilkes MII Interdisciplinary Scholars to an exemplary faculty member and graduate student during our April 2018 MII Technical Conference and Review. I know this conference, which occurs every 18 months on our beautiful campus, provides a glimpse into the diversity of our discoveries and their potential impact. We continue to deliver the ACS Principles Short Courses three times a year, welcoming leading industries and universities to appreciate the fundamentals intertwined with future technologies.

The newly formed Macromolecular Materials Discovery Center (MMDC) housed within the Institute for Critical Technology and Applied Science (ICTAS) aims to provide state-of-the-art instrumentation to the Virginia Tech community with interest in polymeric materials. Partnerships with TA Instruments, Waters, and Agilent have contributed to our success, and the center has evolved to welcome nearly 50 different students each month. We want to serve our industrial partners in our region, and our newly defined external advisory board reflects our desire to more effectively catalyze economic success with corporate partners. Our research portfolio is composed of more than 35 percent corporate funding, a strong indication of the relevance of our endeavors and the integrated training of our graduate students.

This issue also points to the many successes of our faculty and students with special attention to introducing you to the newest MII affiliated faculty. Our recent strategic initiatives for performance packaging systems, materials for future architecture, and materials at the food-energy-waters systems (FEWS) nexus serve as examples of a "molecules to manufacturing" paradigm. Our summer 2017 NSF-sponsored Research Experience for Undergraduates (REU) focused on the FEWS nexus, and we were delighted to welcome 17 students from across the country, selected from an exceptional pool of more than 100 students from our nation's leading institutions. Rest assured that the future is bright if these students represent the future of macromolecular science and engineering. We also welcome a diverse group of fall 2017 MACR students to our program, and this group even laughs at my corny chemistry jokes in MACR 5105!

I hope this issue catalyzes your excitement to visit Virginia Tech, kindles a fire for lifelong learning, and opens your eyes to many exciting activities of our MII faculty and students. We are thankful for our staff who continue to infuse our programs with excellence and facilitate these critical intersections.

Go Hokies!

Timothy Long

PRINTING THE UNPRINTABLE

VIRGINIA TECH TEAM DEVELOPS NOVEL 3-D PRINTED HIGH-PERFORMACE POLYMER THAT COULD BE USED IN SPACE

Steven Mackay, Rosaire Bushey, and Lindsey Haugh

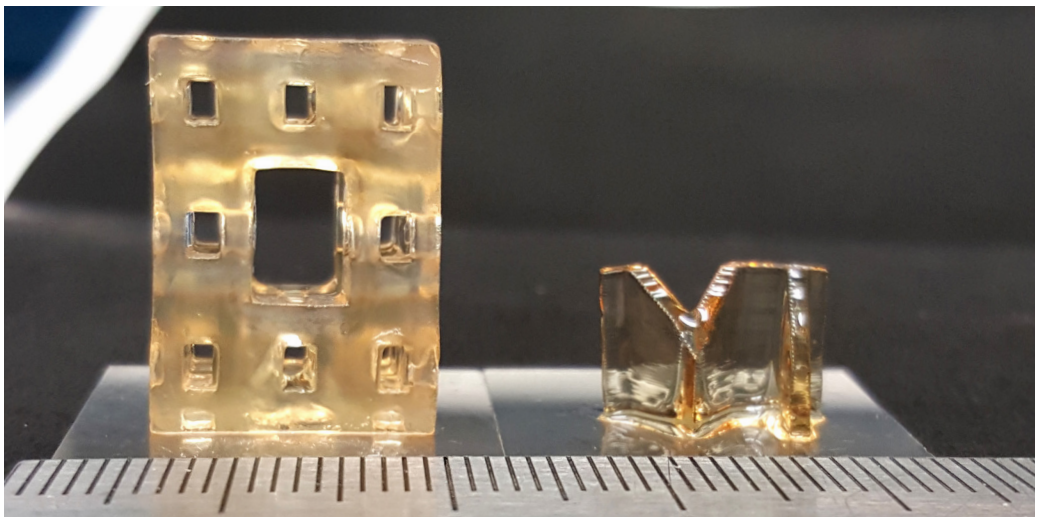
VIRGINIA TECH RESEARCHERS have created a novel way to 3-D print the type of high-temperature polymeric materials commonly used to insulate spacecraft and satellites from extreme heat and cold.

Previously, the polyimide could be made only in sheets. The material, formally known as Kapton, is an aromatic polymer composed of carbons and hydrogens inside benzene rings, which provides exceptional thermal and chemical stability. But because of this molecular structure, the material is notoriously difficult to produce in any format other than thin sheets. Kapton often is used in the multi-layer insulation that forms the outer wrapping of spacecraft, satellites, and planetary rovers to protect them from extreme heat and cold. It often is mistaken for "gold foil."

Researchers from the College of Engineering and College of Science were able to synthesize the macromolecules, allowing them to remain stable and maintain their thermal properties for processing in 3-D printing. The high-performance polymer now could theoretically be used in any shape, size, or structure, with small chess pieces and lattice bricks already produced inside Virginia Tech labs. Possible future uses are not limited to the aerospace industry. The same material can be found in scores of electronic devices, including cell phones and televisions.

"Conventional processing routes have limited engineers to make only thin films from these materials," said Christopher Williams, an associate professor with the Department of Mechanical Engineering in the College of Engineering and leader of the Design, Research, and Education for Additive Manufacturing Systems (DREAMS) Laboratory. "Now that we can 3-D print these materials, we can start designing and printing them into much more complex 3-D shapes, which allows us to take advantage of their excellent properties over a much broader range of applications."

Materials currently used in 3-D printing do not have the high strength and stiffness across broad hot-cold temperature ranges necessary for the extremes of space. Typically, printable polymers start to lose their mechanical strength at about 300 degrees Fahrenheit.



a.
A team of Virginia Tech College of Engineering and College of Science researchers have 3-D printed a polymeric material that could find heavy use in space because of its thermal properties. The team includes (left to right) Viswanath Meenakshisundaram, Charles Carfagna, Christopher Williams, Justin Sirrine, and Timothy Long

b.
3D printed Kapton parts.

This new polymer maintains its properties above 680 degrees Fahrenheit, the research team said. "We are now able to print the highest temperature polymer ever – about 285 degrees Fahrenheit higher in deflection temperature than any other existing printable polymer. Additionally, our 3-D printed material has equivalent strength to the conventionally processed thin-film Kapton material," Williams said.

(The material's heat-resistant ceiling before degradation is 1,020 degrees Fahrenheit.)

"We can imagine this being used for printing a satellite structure, serving as a high-temp filter or a high-temp flow nozzle," said Williams, the Electro-Mechanical Corporation Senior Faculty Fellow in Advanced Manufacturing Systems. "We can imagine using the wide geometric and microscale possibilities offered by 3-D printing to further improve existing designs – say, a more lightweight satellite, a filter that provides optimum/efficient flow, a nozzle with a designed flow path that allows greater exit velocity and efficiency."A key early breakthrough in the project occurred in the laboratory of Timothy Long, a professor with the Department of Chemistry, part of the College of Science, and also the director of the Macromolecules Innovation Institute (MII), located within Virginia Tech's Institute for Critical Technology and Applied Science. Williams is associate director of MII.

There, Long, working with then-post-doctorate researcher Maruti Hegde, now a research associate at the University of North Carolina at Chapel Hill, was exploring the possibility of making 3-D printed shapes from aromatic polymers, such as Kapton. The researchers, along with a graduate student team, were able to derive the novel polymer synthesis design, allowing the polyimide to be 3-D printed. Williams' lab, led by College of Engineering doctoral students Viswanath Meenakshisundaram, of Bangalore, India, and Nicholas Chartrain, of Westfield, New Jersey, then exacted the process for 3-D printing.

"We chose a fairly ubiquitous high-temperature and high-strength polymer because we wanted to enable a rapid impact on existing technologies," Long said, adding that being able to create such 3-D printed materials in any shape could serve a key market, such as the aerospace industry. Indeed, Long said companies have already shown early interest in the new material, which has a U.S. patent filed.

The two teams spent a year testing the material's performance in extreme heat and cold temperature scenarios and fine-tuning how the material is machine printed. Williams' and Long's work recently was published in the Advanced Materials Journal under a fitting title: Processing the Nonprocessable.

Williams and Long have collaborated on numerous projects involving 3-D printing.

"At the end of the day, we are each other's biggest cheerleaders," Williams said of his work with Long's lab in the College of Science. Long added, "We challenge each other with how polymer structures must be invented, or reinvented, to enable 3-D printing. We often joke that I am a post-doctorate researcher in the DREAMS lab and he is a post-doctorate researcher in my lab. It is truly a partnership for innovation."

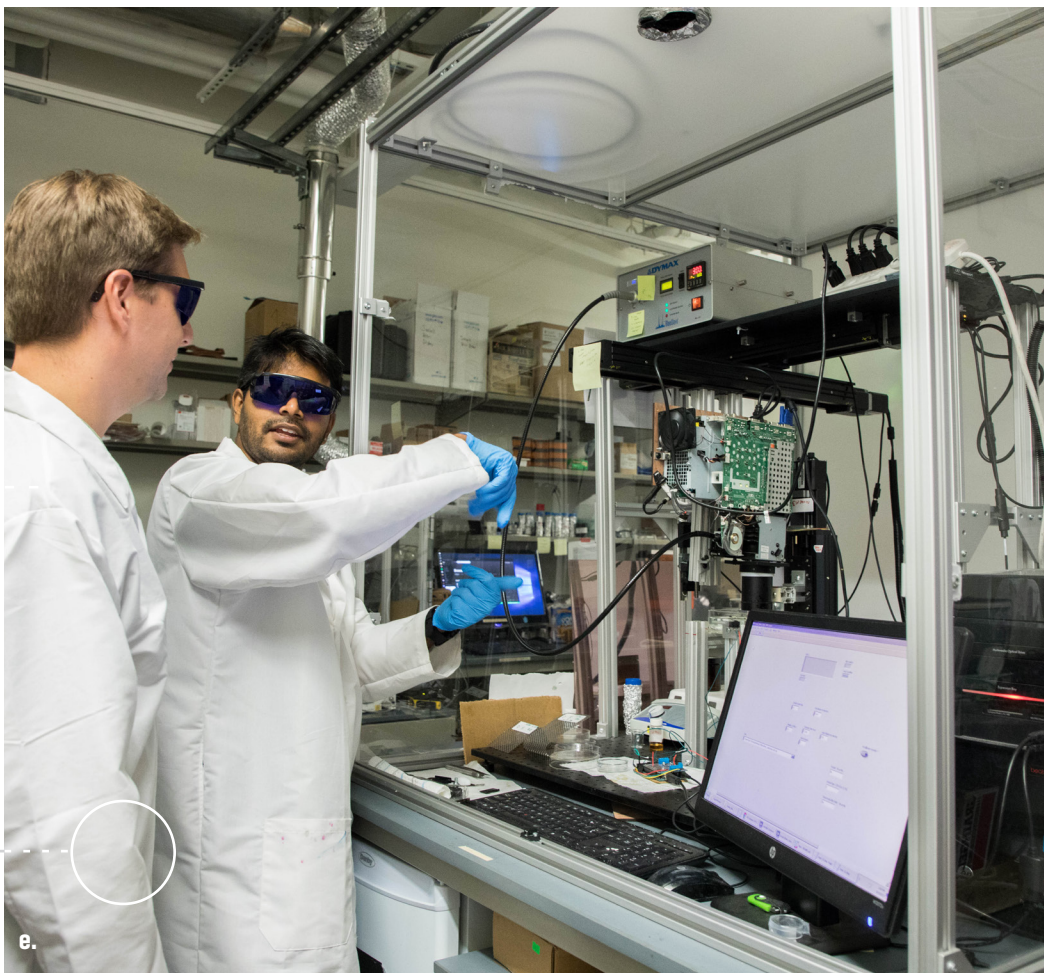
c.
Christopher Williams, Mechanical Engineering (left)

d.
Timothy Long, Chemistry (right)

e.
Inside the DREAMS Lab at Goodwin Hall, Associate Professor Christopher Williams and doctoral student Viswanath Meenakshisundaram stand at a high-tech 3-D printing machine. Using the machine to print out the polymeric material requires users and onlookers to wear filtered eyewear, because of the machine's use of lasers.


c.


d.


e.

SOCIETY OF PLASTICS ENGINEERS STUDENT CHAPTER

CAMDEN CHATHAM

PEOPLE ASK,
"What is it about polymers that make them special?" The best answer: connections. Any polymer scientist or engineer knows the power of all those little monomers connected together in long chains or a network. The same is true for the Society of Plastics Engineers (SPE). Connections.

As part of being a top-regarded polymer program, students of the Macromolecules Innovation Institute have come together to relaunch the Virginia Tech student chapter of SPE after its charter had lapsed around five years ago. The student chapter has two primary goals: connect the graduate and undergraduate students around campus to each other and connect the students here at Virginia Tech to companies in the polymer industry, first here in Virginia, and second around the country. As we kick-off our first year of officially being re-chartered in the eyes of both the SPE national chapter and as a Virginia Tech student organization, the executive board hopes that SPE will become a place to go for undergraduates looking to get involved in polymer research to connect with potential graduate student mentors and will also be the catalyst for study groups as the semester ramps up.

On the professional side, the SPE student chapter will be partnering with the Virginia professional chapter (with members representing Klann Plastics, Canon, and others) to engage in their events throughout the year. Events will include a visit to Virginia Tech, a visit to the National Institute for Highway Safety in the spring, as well as other networking events.

SPE publishes three technical journals: Polymer Engineering and Science, Polymer Composites, and Vinyl and Additive Technology. In support of research in the field of polymers, SPE hosts the ANTEC conference each year. ANTEC 2017 in Anaheim was attended by MACR Ph.D. student and SPE executive board member Barb DeButts who presented her work with compression molded protein-PVA nanocomposite films and self-assembled protein-rubber nanocomposites. The 2018 ANTEC conference has been announced for May 7-9, 2018, in Orlando, Fla. With the closer location, the Virginia Tech student chapter plans to send a much larger contingent to this conference.

Joining SPE is easy! Go to **www.4spe.org** to become a member. Currently, the organization has received funding that covers the $31 annual student membership fee for US citizens. For more information, please contact one of the 2017-2018 executive board members listed below.

2017-2018

STUDENT CHAPTER EXECUTIVE BOARD:
Barb DeButts
Samantha Talley
Camden Chatham
Jake Fallon
Eric Gilmer

FACULTY ADVISER:
Michael Bortner, Ph.D.

MII FACULTY IN JAPAN

えさ大学へようこそ
(Welcome to Waseda)

ON SEPTEMBER 8, 2017, a team from MII, comprised of Professors Timothy Long (Chemistry), Michael Bortner (Chemical Engineering), Amanda Morris (Chemistry), and Johan Foster (Materials Science and Engineering) visited Waseda University, Japan. The aim of the workshop and visit was to discuss international collaboration and potential exchange of research personnel, given the strong international reputation of both Virginia Tech and Waseda University.

Following a joint workshop on "Energy and Nanomaterials," with the Energy and Nanomaterials Unit, Top Global University (TGU) Project in Waseda, there were tours of the campus, visits of research laboratories, and tours of the surrounding areas. Faculty from both universities gave introductions to research, as well as introductions to both universities, initiating new, synergistic collaborations. The team was hosted by faculty from the Department of Applied Chemistry and the Waseda Institute for Advanced Study (WIAS).

The Virginia Tech team is very excited to investigate international collaboration with the well-ranked, highly-regarded Waseda University. In parallel to our visit, we are working on a memorandum of understanding between the two universities to not only share research opportunities, but also exchange personnel.

a. Professors Johan Foster (left) and Mike Bortner (right)

b. Faculty gathering at Waseda

NEW FACES OF MII

STAFF

KRISTIN CADDICK

Program Support Administrator,
T.E. Long Research Group

KIM FELIX

MACR Graduate Program Administrator

JANIKA SIMMONS

Fiscal and Business Manager

ANDREW TIE

Communications Coordinator

FACULTY

COY ALLEN

Assistant Professor
Dept. of Biomedical Sciences
and Pathobiology

SANKET DESHMUKH

Assistant Professor
Dept. of Chemical Engineering

RAFFAELLA DE VITA

Associate Professor
Dept. of Biomedical Engineering and
Mechanics

SUSAN DUNCAN

Professor
Dept. of Food Science and Technology

JOE MARCY

Department Head
Dept. of Food Science and Technology

RUI QIAO

Associate Professor
Dept. of Mechanical Engineering

FACULTY

LI SHUAI

Assistant Professor
Dept. of Sustainable Biomaterials

MICHAEL SCHULZ

Assistant Professor
Dept. of Chemistry

DANESH TAFTI

William S. Cross Professor
Dept. of Mechanical Engineering

CAROLINA TALLON

Assistant Professor
Dept. of Materials Science and Engineering

ZHITING TIAN

Assistant Professor
Dept. of Mechanical Engineering

HANG YU

Assistant Professor
Dept. of Materials Science and Engineering

TECHNICAL CONFERENCE

THE MACROMOLECULES Innovation Institute (MII) holds a technical conference and review every 18 months. The upcoming conference will be held April 16-18, 2018, at the Inn at Virginia Tech. This event showcases MII faculty and student's research and features plenary lectures from various industry and academic leaders across the country.

The theme for this year's conference is "Macromolecular Science and Engineering at Virginia Tech: From Molecules to Manufacturing." The plenary speakers will be Dr. Christopher Bowman, clinical professor of restorative dentistry at the University of Colorado at Boulder; Dr. Sudhin Datta, senior research scientist at ExxonMobil Chemical; Dr. Bradley Lokitz, research scientist at Oak Ridge National Laboratory; Dr. Samuel Stupp, Board of Trustees Professor of Materials Science and Engineering, Chemistry, Medicine and Biomedical Engineering at Northwestern University; and Dr. Nancy Zhang, research scientist at Carbon3D.

In addition to these talks, the conference will include a student poster session, student oral presentations, faculty lectures, and a meeting by the External Advisory Board to discuss the future of MII.

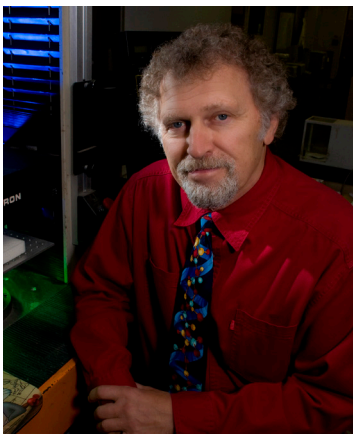
***5 PLENARY SPEAKERS**

***29 ORAL PRESENTATIONS**

***113 POSTER PRESENTATIONS**

a. The location of the conference: The Inn at Virginia Tech

GARTH L. WILKES AWARDS



MII Awards the Inaugural Garth L. Wilkes Interdisciplinary Scholar Awards MII will bestow two prestigious awards in honor of Professor Garth L. Wilkes, who was an internationally-recognized interdisciplinary scholar, faculty colleague, and personal friend to many people around the world. Garth played a leadership role in the formation of the Polymeric Materials and Interfaces Laboratory (PMIL) at Virginia Tech, which was a predecessor to our current Institute. He also was instrumental in the construction of our Macromolecular Science and Engineering (MACR) degree, which serves as a university model for interdisciplinary graduate education. His legacy is truly immense for the university, faculty, staff, and students across the campus. He was an advocate for tackling complex problems with attention to structure-property-processing relationships, demanding working relationships between faculty and industrial partners. Garth proudly "wore four hats" as an academic; he was a teacher, a researcher, an industrial consultant, and an expert witness in the courtroom. He exceptionally demonstrated the importance of wearing four hats as a successful academic, and he continued to pursue these passions up to the weeks prior to his passing. In the words of Albert Einstein, "The only way to escape the corruptible effect of praise is to go on working." Garth certainly adhered to Einstein's advice. He was truly selfless in his pursuit of excellence.

The Garth L. Wilkes Interdisciplinary Scholar awards recognize an MII affiliated faculty member and graduate student who represent interdisciplinary excellence in research, teaching, and engagement. Professor Robert B. Moore (Department of Chemistry) and Mr. Jake Fallon (Department of Chemical Engineering) will receive their awards at the MII Technical Conference and Review on April 16-18, 2018. Prof. Moore is an internationally recognized scholar in the morphological and mechanical characterization of macromolecules. Bob is an exceptional teacher in the classroom and plays a critical role in the American Chemical Society Polymer Principles short courses. Industries regularly invite him as a consultant and expert witness due to his unique synergy of intellect and ability to describe complex scientific problems in easily digestible terms. Mr. Jake Fallon is currently a MACR graduate student in Professor Michael Bortner's research group in the Department of Chemical Engineering. Jake worked at Braskem prior to returning to graduate school at Virginia Tech, and Professor Wilkes was instrumental to attracting Jake to the MACR program. Jake represents the highest ideals of this award: he is committed to teamed discovery and exudes passion for the intersection of science and engineering. He was also recently selected to join an international MII contingent to visit Waseda University in Tokyo and foster an international student exchange program.

Please join MII in congratulating Bob Moore and Jake Fallon for this distinction, and please join us at their award ceremony at the MII Technical Conference and Review at the Skelton Conference Center at the Inn at Virginia Tech.

MR. JAKE FALLON
Department of Chemical Engineering

PROFESSOR ROBERT B. MOORE
Department of Chemistry

CP2S

DEPARTMENT OF ENERGY AWARD FUELS THE RECENTLY-FORMED MII CENTER FOR PERFORMANCE PACKAGING SYSTEMS

Packaging, in the broadest sense, touches nearly every facet of society. From food and fluids to pharmaceuticals and freight, packaging is utterly ubiquitous. At the heart of this phenomenon are polymeric materials in rapidly escalating amounts, and future materials for packaging will require unprecedented multifunctional performance. Despite many significant advances in polymer synthesis, manufacturing, polymer processing for package design, and distribution, the average recycling rate for plastics remains below 10 percent. Virginia Tech and the Office of the Vice President for Research and Innovation (OVPRI) have recently announced our tier-one membership in a Department of Energy REMADE Institute in partnership with the Rochester Institute of Technology (www.remadeinstitute.org). The REMADE Institute is committed to tackling the many challenges associated with the recycling of plastics, e-waste, pulp and paper, and separation technologies.

The DOE REMADE Institute strategically aligns with our recently chartered Center for Performance Packaging Systems (CP2S), which is administratively housed within MII and collects four colleges across the campus for interdisciplinary graduate research. The College of Natural Resources (CNRE) boasts a burgeoning packaging degree program at the undergraduate level, and CP2S will provide vast opportunities for packaging research across the campus. CP2S will nurture interdisciplinary research efforts and scholarship across the College of Science, College of Engineering, College of Nature Resources and the Environment (CNRE), and the College of Agriculture and Life Sciences (CALS). Professors Laszlo Horvath (CNRE, Sustainable Biomaterials) and Joseph Marcy (CALS, Food Science and Technology) play critical leadership roles in the administration of CP2S.

CP2S welcomes the opportunity for corporate partnerships in alignment with the DOE REMADE program, and interested companies should contact Prof. Tim Long within MII for further details.

2017 REU RECAP

SUMMER 2017 was ablaze with fun, active, and verdant undergraduates from all over the country. MII hosted its National Science Foundation-funded Research Experience for Undergraduates program for the twenty-ninth year right here in Blacksburg, Virginia. Nothing says summer in the 'Berg quite like breezy weekend hikes at the Cascades complemented by sweat-inducing, heart-pounding research-filled days in the lab. Our applicant pool was at an all-time high this time around, stocked with highly competitive applications from across the nation. Ultimately, seventeen students were selected representing scholastic institutions including: Case Western Reserve University, Christopher Newport University, College of Charleston, Delaware State University, Elizabethtown College, Florida State University, Michigan State University, Saint Bonaventure University, Texas A&M University, The Pennsylvania State University, University of California-Davis, University of Cincinnati, University of Florida, Virginia Commonwealth University, and Virginia Tech. Our pool was richly diverse with African-American, Asian-American, Cameroonian-American, and Puerto Rican students. These students represent the best and brightest undergraduates our country has to offer and they stepped up to the plate and delivered incredibly creative research projects.

This year's theme was Materials Innovation at the Intersection of Food-Energy-Water Systems (MII-FEWS). Students conducted research throughout the summer that focused on providing solutions to real world problems such as the anticipated agricultural/food shortage, our inconceivably vast need for more sustainable energy sources, and finding ways to address shrinking water reserves. They worked in the lab daily – putting in full 8-hour work days and taking to the weekends to complete as much research as possible to invent meaningful solutions to this ever expanding problem.

In addition to conducting research, taking courses, and participating in seminars and technical trainings throughout the summer, students were tasked with producing a 30-second commercial theorizing their research in an audio/visual format. Their commercials consisted of two components: an educational element that informed the consumer of the food-energy-water crisis and a call to action that challenged the viewer to actively contribute to the solution through social change and activism.

Needless to say, it was a busy and productive summer for these students! Their presentations proved originative and clever with results ranging from eco-friendly food packing from Catherine Dadmun (junior, College of Charleston) and Rachel Hand (junior, Michigan State University) to presentations that focused on incorporating piezoelectrics to harvest energy like Elizabeth Ventrella's (senior, Florida State University) project. It was evident that this group of students invested much thought into self-sustaining, highly-functional, intellectual solutions as the results included publications, as well as posters presented at conferences such as Ashley Saunders (freshman, The Pennsylvania State University) and Jared May (senior, The Pennsylvania State University) and new inventions! Ben Adams (junior, Christopher Newport University), the co-inventor of Oxidized Polysaccharides for Biomedical Applications and who was advised by Dr. Kevin Edgar and graduate mentor Brittany Nichols, has filed for a provisional patent!

The impact that the REU has on students remains immeasurable. We enjoy hosting astute, innovative students and providing them with exposure to our world-renowned faculty. We look forward to 2018 and the next crop of student innovators.

Kim Felix
REU Program Director, MII

MMDC
MACROMOLECULAR MATERIALS DISCOVERY CENTER

IN THE CONTINUING effort to provide cutting-edge instrumentation to our MII affiliated faculty and students, the Macromolecular Materials Discovery Center (MMDC) is a state-of-the-art, shared facility for the furtherance of research and exploration in the Virginia Tech community. From the only rheological solids analyzer on campus (RSA-G2, pictured), to the differential scanning calorimeter with photocalorimetry capabilities (DSC-PCA), our aim is to provide cutting edge instrumentation that is not readily available anywhere else on campus. Additionally, we look to invest in the MMDC annually, through the guidance of our faculty, to continue to add capabilities to our suite of instruments. In this vein, our purchases of the Advanced Polymer Chromatography (APC – March 2016) instrument and the Micromeritics 3Flex surface area and porosity instrument (March 2017, pictured) prove our commitment to shared facilities.

Students will be trained in use of the instruments, development of methods, sample preparation, and running their own samples so that from start to finish the students will be involved in process. We not only want to provide the instrumentation, we want to improve the understanding of the instruments and the techniques necessary for proper data acquisition. With a goal of further expansion, and the acquisition of more specialized pieces of equipment already planned, the MMDC can grow as a function of our discoveries. With a scheduled opening in the next few months, look for more information about the MMDC in the near future. It truly is an exciting time to be affiliated with the MII.

a. Charles Carfagna, MMDC Facilities Manager

FACULTY AWARDS & ACHIEVEMENTS

SCOTT CASE, professor of biomedical engineering and mechanics in the College of Engineering at Virginia Tech, has been awarded the Reynolds Metals Professorship by the Virginia Tech Board of Visitors. The Reynolds Metals Professorship in the College of Engineering was established in 1979 by a gift from the Reynolds Metals Company and recognizes teaching and research excellence. Recipients hold the professorship for a period of five years.

SUSAN DUNCAN has been named associate director of the Virginia Agricultural Experiment Station at Virginia Tech. The mission of the Virginia Agricultural Experiment Station is to engage in innovative, leading-edge research to discover new scientific knowledge, and in collaboration with Virginia Cooperative Extension, to create and disseminate science-based applications to ensure the wise use of agricultural, natural, and community resources while contributing to economic and environmental viability and enhancing quality of life. It was created in 1886.

RAFFAELLA DE VITA, has received the university's 2017 Alumni Award for Outreach Excellence. With support from the Virginia Tech Alumni Association, the Alumni Award for Outreach Excellence is presented annually to recognize outstanding contributions by Virginia Tech faculty members who have extended the university's outreach mission throughout the commonwealth, the nation, and the world. Recipients are nominated by their peers, receive a $2,000 cash prize, and are inducted into the university's Academy of Outreach Excellence.

KEVIN EDGAR, professor of biomaterials and bioprocessing in Virginia Tech's College of Natural Resources and Environment, received the Anselme Payen Award from the Cellulose and Renewable Materials Division of the American Chemical Society. The award honors outstanding professional contributions to the science and technology of cellulose and other polysaccharides.

AMANDA MORRIS, of the Virginia Tech College of Science, has been selected as a 2016 Camille Dreyfus Teacher-Scholar, an award that honors emerging young leaders in the chemical sciences. Morris is one of 13 honorees this year to be selected by the Camille and Henry Dreyfus Foundation. Faculty honored by the foundation are "within the first five years of their academic careers, have each created an outstanding independent body of scholarship, and are deeply committed to education," according to the nonprofit organization. The foundation adds, "The frontier research accomplishments of the 2016 award recipients span the broad range of contemporary research in the chemical sciences."

RUI QIAO, associate professor of mechanical engineering and director of the Laboratory of Transport Phenomena for Advanced Technologies in the College of Engineering at Virginia Tech, has been awarded the John R. Jones III Faculty Fellowship in Mechanical Engineering by the Virginia Tech Board of Visitors. The Jones Faculty Fellowship was established in 2006 to acknowledge and reward mid-career faculty who have shown exceptional merit in research, teaching, and/or service. Jones, a member of the Class of 1967 who earned his bachelor's degree in mechanical engineering, is a retired executive of American Electric Power. He has been a member of the Department of Mechanical Engineering Advisory Board since 1998. Recipients hold the title of Jones Faculty Fellow for a period of five years.

DANESH K. TAFTI, professor of mechanical engineering in the College of Engineering at Virginia Tech, has been reappointed as the William S. Cross Jr. Professor of Engineering by Virginia Tech President Tim Sands and former Executive Vice President and Provost Thanassis Rikakis. The professorship was created by Cross Sales and Engineering Co., which established in 1984 an endowment for the College of Engineering as a tribute to William S. Cross Jr., a member of the Virginia Tech Class of 1941, on the occasion of his retirement from the company. Tafti has held the Cross Professorship since 2009.

CHRISTOPHER WILLIAMS has been awarded the John R. Jones III Faculty Fellowship in Mechanical Engineering by the Virginia Tech Board of Visitors. The Jones Faculty Fellowship was established in 2006 to acknowledge and reward mid-career faculty who have shown exceptional merit in research, teaching, and/or service. Jones, a member of the Class of 1967 who earned his bachelor's degree in mechanical engineering, is a retired executive of American Electric Power. He has been a member of the Department of Mechanical Engineering Advisory Board since 1998. Recipients hold the title of Jones Faculty Fellow for a period of five years.

XIAOYU (RAYNE) ZHENG, assistant professor of mechanical engineering in the College of Engineering at Virginia Tech, won a grant through a winning research proposal submitted to the Air Force's Young Investigator Research Program (YIP). The program is open to U.S. scientists and engineers who received a Ph.D. in the last five years and show exceptional ability and promise for conducting basic research. Rayne will use the $450,000 grant to develop functional lightweight materials that are ultralight and strong, yet being able to carry soft-to-stiff capabilities while surviving in harsh environments.

SOLVAY SEMINAR SERIES 2017-2018

AUGUST 14, 2017

Prof. Serkan Ünal
Sabancı University

AUGUST 30, 2017

Prof. Ting Xu
UC-Berkeley

SEPTEMBER 6, 2017

Prof. Valentin Rodionov
KAUST

SEPTEMBER 20, 2017

Prof. Luis M. Campos
Columbia University

SEPTEMBER 22, 2017

Dr. Andrew Meyer
Wyatt Technology

SEPTEMBER 27, 2017

Prof. Joshua Sangoro
University of Tennessee-Knoxville

OCTOBER 4, 2017

Dr. Joannie Chin
NIST

OCTOBER 11, 2017

Dr. Jan-Michael Carrillo
Oakridge National Labs

OCTOBER 18, 2017

Prof. Kathryn Uhrich
UC-Riverside

NOVEMBER 15, 2017

Prof. Bryan Vogt
University of Akron

NOVEMBER 29, 2017

Prof. Alexander Kabanov
University of North Carolina

JANUARY 17, 2018

Prof. Deb Kelly
Virginia Tech Carilion Research Institute

JANUARY 31, 2018

Prof. Alicyn Rhoades
Penn State Behrend

FEBRUARY 7, 2018

Prof. Dvora Perahia
Clemson University

FEBRUARY 14, 2018

Prof. Zhiting Tian
Virginia Tech

APRIL 11, 2018

Prof. Craig Hawker
UC-Santa Barbara

APRIL 18, 2018

Prof. Sam Stupp
Northwestern University

APRIL 25, 2018

Dr. Adam Rawlett
U.S. Army Research Lab

JUSTIN BARONE: BIOLOGICAL SYSTEMS ENGINEERING
Compounding amyloid reinforcement into rubber, 2016-2019, USDA-NIFA

ROMESH BATRA: BIOMEDICAL ENGINEERING AND MECHANICS
Progressive Damage and Failure of Marine Sandwich Structures with Fiber-reinforced Face Sheets Due to Extreme Thermo-mechanical Loads, 2016-2018, Office of Naval Research, DOD

SCOTT CASE: BIOMEDICAL ENGINEERING AND MECHANICS
Models for Mechanical Performance of Composites Made Using Fused Filament Fabrication, 2016-2017, Oak Ridge National Laboratory, DOE

RICHEY DAVIS: CHEMICAL ENGINEERING
NM: Scalable Hybrid Material for Nano-scale Device Applications, 2017-2020, NSF

COY IRVING: BIOMEDICAL SCIENCES & PATHOBIOLOGY
Evaluating NLR Modulation of Canonical and Non-Canonical NF-kB Signaling in IBD, 2015-2017, National Institutes of Health – NIDDK

TIMOTHY LONG: POLYMER CHEMISTRY
Material Design for Additive Manufacturing of Orthodontics, 2016-2017, Align Technology, Inc.

Study of Polymers Using Itaconic Acid and Itaconic Acid Esters by Addition Polymerization, 2016-2017, Exxon Mobil Corporation

LOU MADSEN: PHYSICAL, POLYMER, MATERIALS CHEMISTRY
Correlating Transport with Ionomer Membrane Structure from Molecular to Micron Scales, 2015-2018, NSF

AMANDA MORRIS: INORGANIC AND ENERGY CHEMISTRY
CAREER: Electron Transfer Mechanisms in Metal Organic Framework Thin Films, 2016-2021, NSF

SCOTT VERBRIDGE: BIOMEDICAL ENGINEERING AND SCIENCE
High-frequency Irreversible Electroporation (H-FIRE) combinational GBM therapy, 2017-2021, NIH

FACULTY GRANTS

ADHESION SCIENCE SHORT COURSE

THE ADHESION SCIENCE Short Course was presented by MII faculty, Dr. Tim Long, Dr. Alan Esker, Dr. David Dillard, Dr. Michael Bortner, Dr. Richey Davis and Dr. Chip Frazier, on May 14-19, 2017, at the Inn at Virginia Tech. Topics presented included: Frontiers in Adhesion Science, Waterborne Rheology, and Durability & Design, as well as lab sessions. The course was attended by 21 participants from 13 companies, including Fitbit, Northrop Grumman, and Lord Corporation.

For additional information on this Course, please visit **https://mii.vt.edu/outreach/short-courses/adhesion-science.html**

The next session is scheduled for
May 14-18, 2018
with registration ongoing online.

COMMENTS FROM ATTENDEES

Very well done & excellent balance of topics.

In depth and nice to have such access to the instructors.

This course was excellent. Very comprehensive and opened my eyes to a lot of testing methods I wasn't aware of before. The presenters were extremely knowledgeable and I learned a ton from all of them. I was able to find relevance in every presentation.

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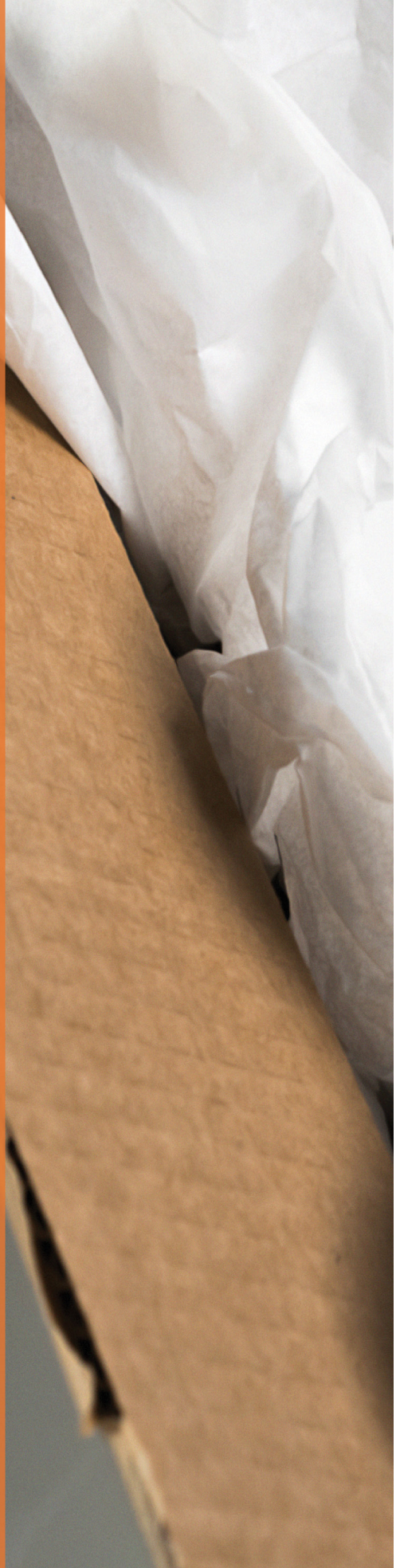

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