Institute of Materials Science Newsletter 2020

INSTITUTE OF MATERIALS SCIENCE

Institute of Materials Science
97 North Eagleville Road, Unit 3136
Storrs, CT 06269-3136
Phone: (860) 486-4623
Fax: (860) 486-4745

On the Cover: The Future Home of IMS

The University of Connecticut will soon break ground on **Science One**, **the future home of the Institute of Materials Science**. The new building will be a part of the Northwest Science Quadrant, a cornerstone of the Next Generation Connecticut program and critical piece of UConn's plans to significantly boost STEM research and education. Our cover images this year feature artist renderings of the new facility.

The building will be one of UConn's largest and most technologically advanced facilities when it opens. Its 198,000 square feet will house research, teaching and core laboratories; a new 240-seat active-learning room designed to engage students more dynamically than traditional lecture halls; and faculty offices, public spaces including a new cafe, administrative support offices and informal gathering spaces.

The Northwest Science Quadrant will also include a new outdoor space – a woodland corridor that will provide an attractive, landscaped area to help UConn meet environmental goals for storm water management and natural habitats for plants and wildlife.

IN THIS ISSUE

MESSAGE FROM THE DIRECTOR

Hello again from 97 North Eagleville Road! This has been an outstanding year for the Institute of Materials Science. As you can see from this year's front cover, we are all very excited to prepare for the start of construction later this year on the future home of IMS, Science One. We will continue to provide updates as construction begins, progresses, and we move closer to occupancy.

This issue of the Annual IMS Newsletter highlights new faculty and staff members as well as new accomplishments from IMS personnel. We continue our spotlight on centers of excellence concentrating on materials research.

The newest additions to the IMS staff include Kaitlyn Cullen our new Administrative Assistant who you may interact with if you call the main office. Dr. Capri Price now manages our Gas Chromatography Mass Spectrometry and Spectroscopy laboratories. Dr. Nate Hohman is our newest Assistant Professor. Nate joined us after leading a strong research group at the Molecular Foundry at Lawrence Berkeley National Laboratory. We are fortunate to be currently looking to fill two additional faculty positions in 2020.

The Industrial Affiliates Program continues to flourish and you can read in this issue about the outstanding annual meeting held this past year. Along the administrative avenue, we will miss but congratulate Dr. Mei Wei who is now Dean of Engineering at Ohio University. We also are happy for Dr. Pamir Alpay as a new Associate Dean for Research and Industrial Partnerships.

You will read about entirely new research, teaching, mentoring, and outreach efforts by a number of outstanding faculty members, both those newer to our ranks and those who are already established researchers. We are very proud of these colleagues for their diverse and excellent accomplishments. The exciting entrepreneurial activities of numerous faculty members are featured in this issue. We recognize several faculty members who have won local, state, national and international awards. Finally, the awards, fellowships, and recognition of a number of our truly talented graduate students are detailed within these pages. The future is clearly bright for this next generation of materials researchers.

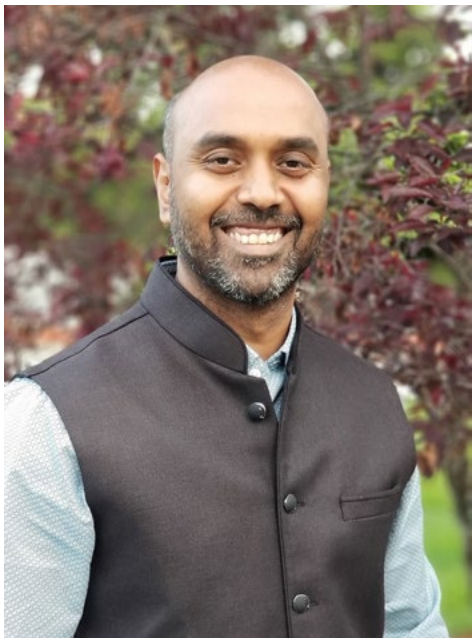
As always, we would love to hear about your recent news and will welcome you anytime to 97 North Eagleville Road...until that new building pops up!

Steven L. Suib

Steven L. Suib, Director
Institute of Materials Science

IMS Faculty Member Partners with DOE/NNSA to Strengthen U.S. Nuclear Weapons Maintenance

by Kaitlyn Cullen and Brianna Demers - Institute of Materials Science



Dr. Avinash Dongare

The Center for Research Excellence on Dynamically Deformed Solids (CREDDS) is one of four new Centers of Excellence designated by the U.S. Department of Energy's National Nuclear Security Administration (DOE/NNSA). The NNSA is the agency behind the nation's Stockpile Stewardship Mission (SSM), which works to maintain the safety, security, and effectiveness of our nuclear weapons. In an effort to strengthen U.S. nuclear weapons maintenance, CREDDS will "aim to discover, understand, and predict the influence of microstructural heterogeneities, such as interfaces, inclusions, and porosity, on the high strain rates mechanical response of additively manufactured, multiphase metallic materials," according to the University of Connecticut (UConn) Principal Investigator, Dr. Avinash M. Dongare. This center carries the goal of training the next generation on nuclear conservation.

At UConn, Dr. Dongare, an Associate Professor in Materials Science and Engineering and a United Technologies Corporation (UTC) Professor in Engineering Innovation, directs the Computational Materials and Mechanics Group (CMMG), which holds a crucial role within CREDDS. Including graduate student Marco Echeverria and postdoctoral researcher Dr. Avanish Mishra, the UConn team is using atomic scale modeling methods to investigate the role of variations in the microstructure on the predicted deformation and failure response under shock loading conditions. Dr. Dongare explains that, "the aim will be to understand the role of interface microstructure (structure, spacing, distributions, etc.) on the mechanisms of nucleation and evolution of defects (dislocations, twins) during shock compression as well as the evolution of damage (voids) at the atomic scales and discover the physical mechanisms by which, multiphase metallic materials respond to high strain-rate deformation."

Using state-of-the-art computational methods (the use of computers to simulate and study complex or dangerous situations using mathematics and computer science), CMMG can expedite the testing and performance of materials in extreme environments by completing experimental approaches. "A challenge in the use of advanced manufacturing methods to design structural materials is the ability to test these materials and understand how they will respond, and more importantly, identify the mechanisms by which they may fail under the extreme conditions," notes Dr. Dongare. CMMG will develop the computational framework that allows us to investigate atomic scale mechanisms by which the structural materials will perform in such extreme environments.

As a result of UConn's involvement in the project, undergraduate and graduate students, as well as postdoctoral researchers working on the project will have the opportunity to interface with national laboratories involved in the SSM. UConn CMMG graduate student Marco Echeverria has already taken advantage of this opportunity by interning during summer 2019 at Lawrence Livermore National Laboratory in Livermore, California. Other laboratories that may involve student-centered research

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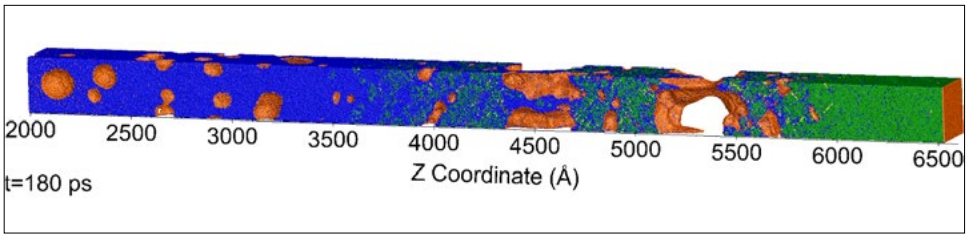
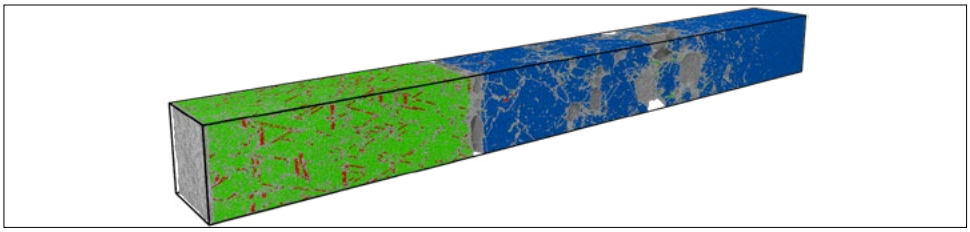
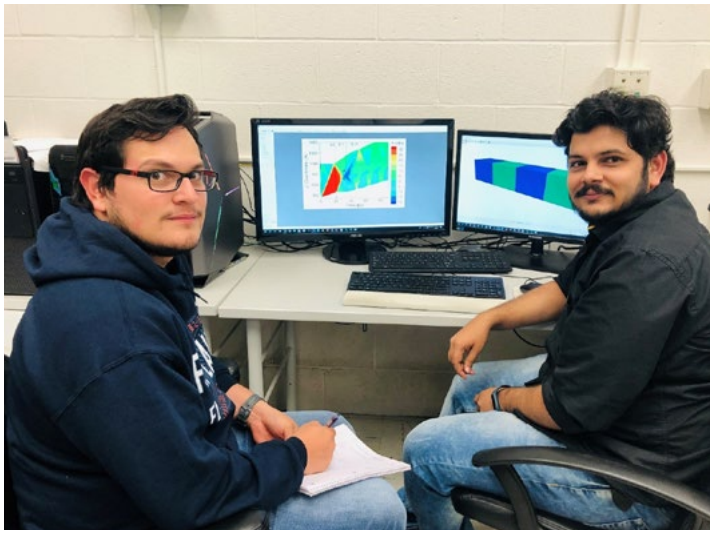


A Cu sample undergoing spall failure under laser shock loading conditions as predicted using molecular dynamics simulations. [Image Courtesy: Marco Echeverria]



A Cu/Fe bilayer sample undergoing spall failure under shock loading conditions as predicted using molecular dynamics simulations. [Image Courtesy: Avanish Mishra]



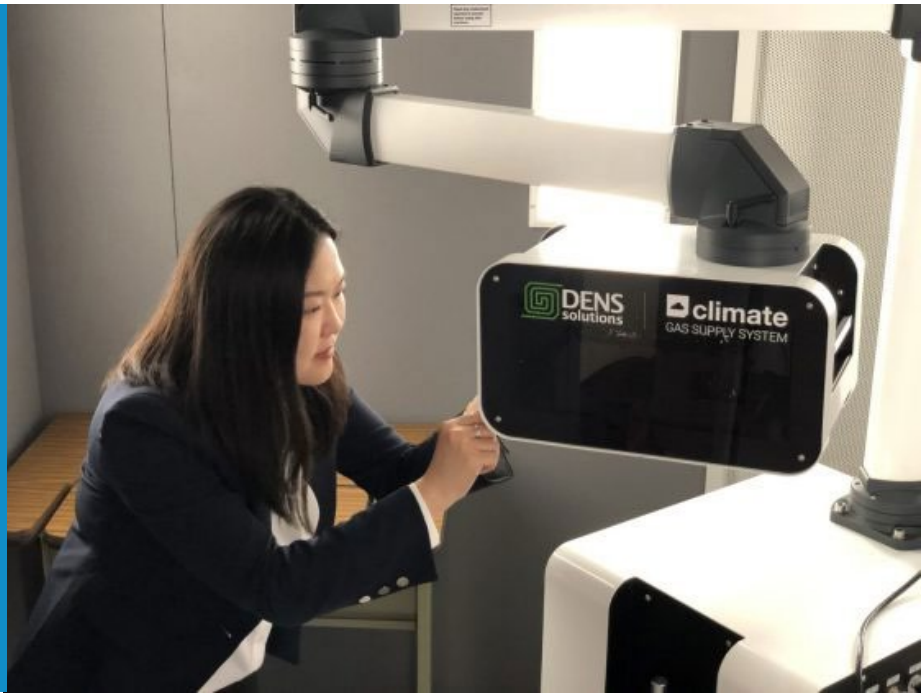
Graduate student Marco Echeverria (left) and postdoctoral researcher Avanish Mishra (right) analyzing the data generated for shock loading of a Cu/Ta multilayered microstructure using molecular dynamics simulations.

include Sandia National Laboratory and Los Alamos National Laboratory, along with the NNSA who is spearheading the center. This is an incredible opportunity to not only explore the scientific understanding of materials design related to nuclear weapons maintenance, but also for UConn students to gain exposure to national laboratories, work with other leading universities, and build future collaborations for the University.

CREDDS was awarded $12.5 million over a five year period from NNSA and is led by Dr. Michael Demkowicz, Associate Professor with the Department of Materials Science and Engineering at Texas A&M University. The project will also involve collaborations with Principal Investigators Dr. Amit Misra, Department Chair and Professor with the Department of Materials Science and Engineering at the University of Michigan Ann Arbor; Dr. Irene J. Beyerlein, Professor with the Department of Mechanical Engineering at the University of California Santa Barbara; and Dr. Avinash M. Dongare, Associate Professor with the Department of Materials Science at the University of Connecticut.

Advanced Electron Microscopy Center Tackles Real-World Challenges in Materials Science

by Jessica McBride - Office of the Vice President for Research



Yuanyuan Zhu, director of the InToEM center, works with the DENSsolutions Climate system at UConn Tech Park. (UConn Photo)

With in-situ and/or operando transmission electron microscopy (TEM), scientists can study material reactions in the here and now. A new center at the UConn Tech Park aims to use this specialized technology to find innovative solutions for some of the most complex challenges facing society today.

The IN-siTu/Operando Electron Microscopy (InToEM) Center represents a partnership between the UConn Tech Park and DENSsolutions, a firm based in the Netherlands that develops in-situ TEM technologies. InToEM will be the home of scientists and engineers with complementary expertise working at the frontier of materials dynamics.

At the heart of the research center is the highly specialized Climate MEMS-based Nano-Reactor from DENSsolutions. The system is able to probe high-temperature gas-solid reactions with high spatial resolution under ambient pressure, in gaseous environments controlled by sophisticated dynamic gas mixing. The UConn scientists working in the center can monitor dynamic changes in local site-specific structural information of nanomaterials in real-time under realistic reaction conditions. This means they are able to gather more applicable information about what exactly is happening to the materials being tested, and can also conduct concurrent mass-spectrometry, calorimetry and chemical analysis while the material is in operation.

"Being able to study the behavior of materials in their native environment has been microscopists' dream since the birth of TEM," says Director of the InToEM center, Dr. Yuanyuan Zhu. "I'm very excited about this collaboration, which will provide an optimal scientific 'sandbox' to explore microscopy as it should be." Dr. Zhu is also an assistant professor in the Department of Materials Science and Engineering and the Institute of Materials Science.

These new capabilities will provide unprecedented insight into the correlation between materials dynamics and temporal performance at the fundamental atomic-scale. The research team and partners at DENSsolutions have high hopes that the new center will open up a world of research opportunities in heterogeneous catalysis, fuel cells, corrosion, and materials growth and transformation.

"These new techniques connect microscopy more meaningfully with chemistry, materials research and nanotechnology," says Ben Bormans, CEO of DENSsolutions. "We are all very, very excited about being a partner in the InToEM center and with the world-class researchers at UConn."

DENSsolutions in-situ Transmission Electron Microscope

Dr. Rainer Hebert is Solving Problems in 3D

by Anna Zarra Aldrich - Office of the Vice President for Research

Rainer Hebert, Director of the Pratt & Whitney Additive Manufacturing Center at the Innovation Partnership Building. (Carson Stifel/UConn Photo)

Under the leadership of Castleman Term Associate Professor in Engineering Innovation and IMS Associate Director Dr. Rainer Hebert, the Pratt & Whitney Additive Manufacturing Center (PW AMC) at the UConn Tech Park is addressing the biggest problems currently faced by the aerospace industry in additive manufacturing.

In 2012, when the University launched the first stage of its partnership with Pratt & Whitney to develop an additive manufacturing center, Hebert was at the helm. The center began with three machines in the Longley Building.

"The initial idea was really to support Pratt & Whitney, and at the same time train students here at UConn in the field of additive manufacturing," says Hebert who is astonished by the level of growth the field and the center have experienced in that short time.

The center does not typically create 3D printed parts; rather, the research team works on understanding the science behind the printers and how to make them perform better. The center provides its industry partners with answers to fundamental scientific questions about the process, allowing them to invest wisely in these cutting-edge technologies.

"The pace of industry and academia is different. At the PW AMC, we focus on the fundamental questions that help industry stay ahead right now and innovate for the future," says Hebert.

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World-Class Facilities

As UConn's hub for collaborative research between industry and academic researchers, the IPB is designed to house sensitive machines and minimize interference from external or environmental variables that can affect the accuracy of their results.

"The most exciting part is really the equipment," Hebert says. "It's not just that we have one or two specialized instruments. What sets us apart for this type of work is that we have a suite of equipment to find solutions for these unique challenges. I can say there is simply no other place nationally or internationally with our capabilities in this area of research."

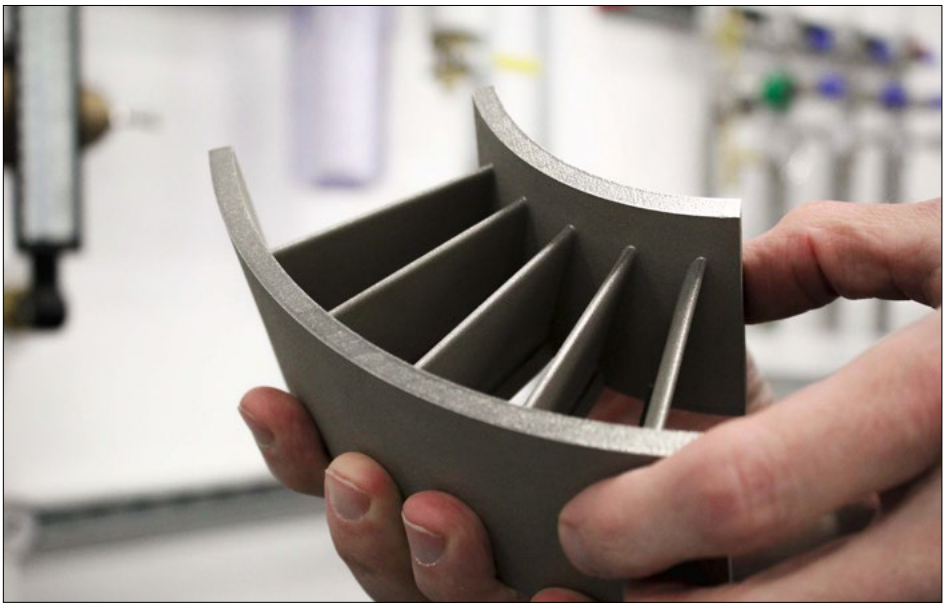
All of the center's projects try to respond directly to industry needs, often in new areas of R&D for the companies and the UConn engineers. From customized alloys specifically designed for additive manufacturing, strategies to prevent cracking and damage during the additive manufacturing process, or better understanding of how powders behave in additive manufacturing machines – research at the PW AMC does not exist in a bubble and always seeks real-world solutions for its industry partners.

Hebert's center has worked closely with companies that include Pratt & Whitney, Collins Aerospace, aerospace supply chain companies, and other firms. The Thermo Fisher Scientific Center for Advanced Microscopy and Materials Analysis (CAMMA) has helped with analyses of these systems.

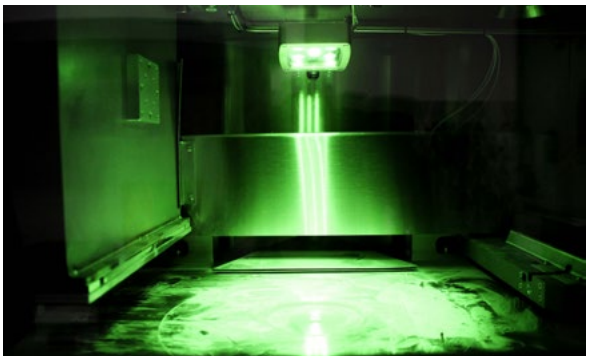
"By training undergraduate and graduate students to use this technology and showing them the industry-specific applications, we're helping create a talent pipeline that benefits the students, the companies, and the state. It's a win-win situation," Hebert says.

Moving forward, Hebert says he envisions the center maintaining its focus on solving fundamental challenges related to the additive manufacturing process and maximizing the new, highly specialized equipment at the IPB. He also expects a growing emphasis on improving manufacturing simulations.

Hebert works with equipment to determine melting points and other thermodynamic properties at temperatures up to about 3,000 degrees Fahrenheit.(Carson Stifel/UConn Photo)



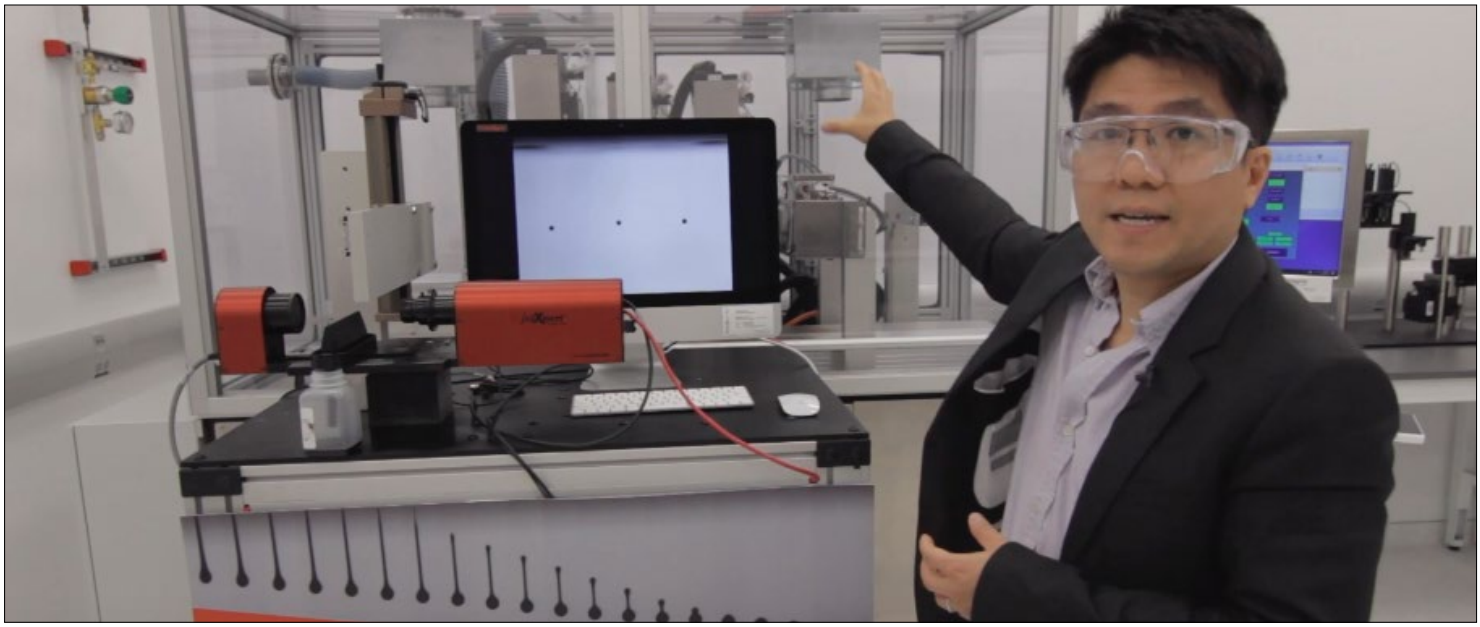
Hebert holds additively manufactured samples for R&D that emulate real-world component designs. (Carson Stifel/UConn Photo)



Interior of an additive manufacturing machine build chamber. (Carson Stifel/UConn Photo)

UConn's New HuskyJet Brings 3D Printing to the Next Level

by Eli Freund - School of Engineering



Chemical Engineering Professor Anson Ma explains the "drop watcher system" on HuskyJet, which gives the user the ability to test and measure the droplet volume, velocity, and trajectory of any new ink or substance to achieve optimal printing performance.

Adding on to the myriad of equipment and capabilities of the University of Connecticut's Tech Park, the UConn National Science Foundation (NSF) SHAP3D site, and its site director, Associate Professor of Chemical Engineering Anson Ma, have acquired a state-of-the-art Pilot Scale industrial inkjet 3D-printer, appropriately named HuskyJet.

The versatile printer has a number of applications, which range from regular 2D graphics on paper, to creating flexible electronics, medicinal tablets, and green parts for ceramics and metals. The printer was funded by UConn's Academic Plan and has already been leveraged for a number of projects, including a federally funded project from NextFlex – America's Flexible Hybrid Electronics Manufacturing Innovation Institute – of which UConn is a founding academic member.

HuskyJet can print 2D graphics and a number of 3D applications.

In July 2018, UConn, the University of Massachusetts Lowell, and the Georgia Institute of Technology launched a new collaboration named SHAP3D, an NSF-funded Industry-University Cooperative Research Center (IUCRC), in order to address the emerging challenges in the additive manufacturing (also known as 3D printing) process. The SHAP3D center aims to develop critical insight into the fundamental structure-processing-property relationships for the lucrative additive manufacturing industry.

The site, run by Ma and Materials Science and Engineering Professor Rainer Hebert, is primarily focused on 3D printing applications for the aerospace, shipbuilding, and biomedical applications—all major industries in the state of Connecticut.

How HuskyJet works is multi-faceted, and can be adjusted for many different parameters, including different inks, substrates and powders, and the strength of the ink stream, using three piezoelectric print heads.

The print job, whether for a 2D graphic or a medicinal tablet, is brought along the printer from left to right using a controlled, linear sled system. Near the end of the printing task, the object passes to a section of the printer that uses infrared and ultra-violet rays to perform both high-temperature processing and high-speed drying of the ink and addi-

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tional solvents. At the very end of the process, the object is placed under a camera in order to review if there has been any printing error during the process.

The HuskyJet printer is also equipped with a drop watcher system, which gives the user the ability to test and measure the droplet volume, velocity, and trajectory of any new ink or substance to achieve optimal printing performance.

IMS and MSE Researchers Land $4.5M Air Force Contract

by Jessica McBride - Office of the Vice President for Research

Pamir Alpay, left, and Rainer Hebert, stand next to a 3D metal printer at the Innovation Partnership Building on Dec. 20, 2017. (Peter Morenus/UConn Photo)

A research team led by Drs. S. Pamir Alpay and Rainer Hebert landed a $4.5M contract to aid the U.S. Air Force Research Laboratory (AFRL) in developing processes to increase efficiencies in the production of original equipment manufacturer (OEM) parts. The project involves a team of seven faculty members, 10 doctoral students, and two postdoctoral researchers. The award was announced in March 2019 by U.S. Senators Chris Murphy and Richard Blumenthal and U.S. Representative Joe Courtney.

In the manufacture of aircraft parts, relatively inexpensive raw materials go through several steps to be transformed into expensive components for use in the aerospace sector. At each step in the manufacturing process, the potential exists for flaws, which could lead to the failure of a part to function as designed and the scrapping of the part. The research being funded through this contract seeks to understand every step in the manufacturing process in order to improve the quality of the system and parts, reduce costs, and enhance industrial capability.

Dr. Alpay is the General Electric Professor in Advanced Manufacturing and executive director of the Innovation Partnership Building (IPB) at the UConn Tech Park. Dr. Hebert is Director of the Pratt & Whitney Additive Manufacturing Center and Associate Director of the Institute of Materials Science (IMS). Both are professors in the Materials Science and Engineering Department (MSE) and faculty members in IMS. They have gathered an extensive team of experts from UConn and collaborated with industry leaders including Pratt & Whitney, Aero Gear, and GKN Aerospace. The research and development activities will be conducted at the IPB.

"Through UConn's expertise in specialized manufacturing simulation, extensive materials analysis, and process modeling, we will provide transformative capabilities for AFRL, OEMs and their supply chains to reduce scrap rates, increase yield and performance, and cut down on failures," says Dr. Alpay.

Other UConn researchers involved in the program include Distinguished Professor of Materials Science and Engineering Dr. Harold Brody; Associate Professor of Civil and Environmental Engineering and Director of the Connecticut Manufacturing Simulation

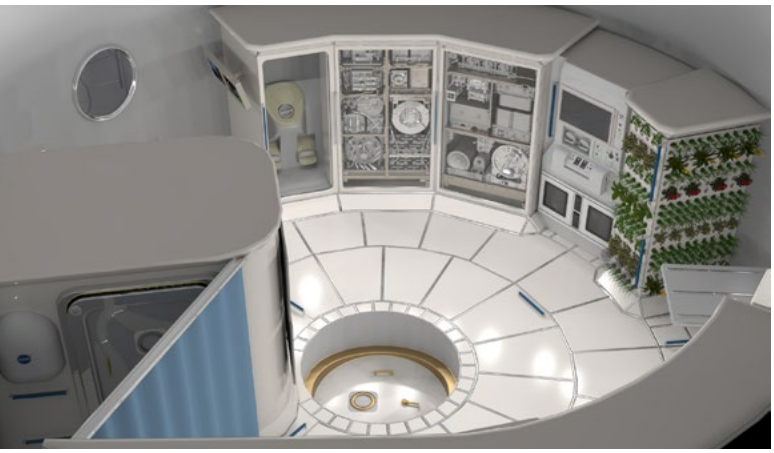
The UConn-AFRL research group at the Innovation Partnership Building at UConn Tech Park. From left, Dr. Jeongho Kim, Rui Li, Ryan Enos, Dr. Jiong Tang, Uche Anene, Dr. Dianyun Zhang, Dr. Hal Brody, Lakshmi Ravi Narayan, Dr. Serge Nakhmanson, Dr. Rainer Hebert, Lillia Miller, Dr. Howard Sizek (AFRL, Program Manager), Lukasz Kuna, Mohamad Daeipour, and Dr. Pamir Alpay. (Uche Anene/UConn Photo)

Center Dr. Jeongho Kim; Professor of Mechanical Engineering and Director of Graduate Studies Dr. Jiong Tang; Associate Professor of Materials Science and Engineering Dr. Serge Nakhmanson; and Assistant Professor of Mechanical Engineering Dr. Dianyun Zhang.

"The intellectual depth, capabilities, and capacity, combined with state-of-the-art research facilities at UConn, will provide the tools necessary so that our federal and industry partners can integrate them into U.S. defense strategies and strengthen the nation's global dominance in materials development for the aerospace sector," said Vice President for Research Radenka Maric.

UConn Researchers to Help Design Resilient Deep-Space Habitats

by Jaclyn Severance - UConn Today



NASA concept image of the interior of a deep space habitat. (NASA photo)

Fifteen days and nights of continuous sunlight, followed by 15 days and nights of continuous darkness. Passing meteorites that frequently strike the ground and kick up debris. Radiation unfiltered by any sort of atmosphere. One-sixth of the Earth's gravity, no air pressure to speak of, and persistently occurring moonquakes.

Logo of the Resilient ExtraTerrestrial Habitats institute (RETHi).

The environmental conditions on the surface of the moon are harsh, to say the least, making NASA's goal of returning and staying on the moon by 2024 a challenge for scientists and engineers.

UConn researchers, though, will be on the front line of the effort, through a new NASA-funded project aimed at advancing the design of resilient, deep-space habitats.

"On the moon, the environment is extremely harsh. There's no atmosphere and it's a hard vacuum. The temperature fluctuates in the extreme and it is under continuous exposure to a deadly level of radiation," says Ramesh Malla, a professor of structural engineering and applied mechanics in the Department of Civil and Environmental Engineering at UConn's School of Engineering and IMS faculty member, who is leading UConn's team on the NASA project.

"Our purpose is to come up with habitats to survive in this kind of situation, this kind of extreme environment. We'll be looking to build resilient habitats, where if there is some disruption, it can maintain critical functions and quickly come back to its original operational condition."

A disruption could be internal – such as an instrumentation or life support malfunction – or external, like a meteorite strike that punctures the structure of the habitat, Malla says.

The UConn team will take part in the Resilient ExtraTerrestrial Habitats institute (RETHi), which will seek to design and operate resilient deep-space habitats that can adapt and recover from expected and unexpected disruptions. The new institute will receive as much as $15 million over a five-year period to fund its work of designing and ultimately creating a prototype of an autonomous, resilient, deep-space habitat that is capable of functioning with and without the presence of a human crew.

"As NASA works toward its goal of returning to the moon," says Radenka Maric, vice president for research at UConn and UConn Health, "UConn re-

Dr. Ramesh Malla

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searchers are at the forefront – developing the resilient technology to allow greater space exploration and human habitation beyond our planet."

Led by Dr. Malla, UConn's team of faculty researchers includes Ashwin Dani, assistant professor of electrical and computer engineering; Song Han, assistant professor of computer science and engineering; Krishna Pattipati, Board of Trustees Distinguished Professor and UTC Chair Professor of Systems Engineering in the Department of Electrical and Computer Engineering; and Jiong Tang, professor and director of graduate studies in the Department of Mechanical Engineering.

Kazem Kazerounian, dean of UConn's School of Engineering adds, "This project is one in a long line of strategic research projects we have embarked on. Our inclusion in this project speaks to the strength of our faculty, and the track record of our research in this field."

The project is funded by NASA's Space Technology Mission Directorate, which is responsible for developing crosscutting, pioneering new technologies, and capabilities needed by the agency to achieve its current and future missions.

Waste Not Want Not: Dr. Richard Parnas Patents Membrane to Monetize Biodiesel Waste Products

by Anna Zarra Aldrich - Office of the Vice President for Research

Dr. Richard Parnas from UConn's Department of Chemical and Biomolecular Engineering and the Institute of Materials Science has received a patent for a novel membrane that can be used to make biodiesel production more profitable by aiding the conversion of glycerol to 1,3 propanediol, a valuable platform chemical.

Richard Parnas, professor of Chemical & Biomolecular Engineering in his lab. (Carson Stifel/UConn Photo)

Biodiesel is an environmentally friendly alternative to traditional petroleum and diesel fuels that is gaining international traction. Biodiesel is produced from virgin or used animal or vegetable fats. The fats are converted into biodiesel and waste products including glycerol and water.

The waste products need to be removed before the biodiesel can be used. Currently, manufacturers use various methods to remove waste products, but do little to monetize the waste products. The biodiesel industry is therefore only marginally profitable.

A number of investigators have developed fermentation methods to convert the glycerol to 1,3 propanediol, but efficiently separating the 1,3 propanediol from the fermentation broth has proven very difficult.

Parnas has created a membrane which is capable of filtering out 1,3 propanediol from the fermentation broth. This chemical has applications in personal care and cleaning products, textile materials, products like antifreeze, and medical anesthetics.

The membrane is able to selectively filter out 1,3 propanediol from the fermentation broth and leaves behind water, extracellular matrix, and other fermentation residues that are produced.

While the membrane was designed particularly for 1,3 propanediol, it may have applications for other polar organic chemicals which have applications in many other industries.

Parnas received his Ph.D. from the University of California, Los Angeles. His research focuses on biofuel production and separations, renewable polymers and composites, and interface engineering.

Crystallizing Knowledge with a Learning Machine

by Kim Krieger - UConn Communications

Dr. Serge Nakhmanson

Transforming a new drug from a set of liquid ingredients in a lab to a pill in a box can be an exercise in complex chemistry. For a better understanding of how drug ingredients crystallize, UConn researchers mined a vast collection of experimental data provided by Pfizer. They reported their findings in the February 28 cover story of the journal CrystEngComm.

Many medicines are taken in solid crystalline form as pills, but figuring out the best way to coax a drug into a solid form is a tricky problem. A number of solvents could be used to dissolve drug ingredients, and a number of procedures might be used to crystallize a drug. Processing conditions, such as temperature and pressure, can also have a profound effect. With so many different variables that could change the outcome, machine learning may be the best way to attack such a complicated problem.

Pfizer formed a collaboration with UConn materials scientist Serge Nakhmanson and his colleagues in the Department of Materials Science and Engineering to evaluate machine learning approaches for their usefulness. Data mining, they hoped, could help figure out the best way to get a pharmaceutical compound to crystallize. Using Pfizer's data and relevant expertise, the UConn materials team tested three different computer algorithms. The algorithms are referred to as machine learning because the computer uses them to build mathematical models of the data, find patterns, and then 'learn' from those patterns to make accurate predictions.

Dr. Nakhmanson's research is the cover feature for the February 28, 2019 edition of CrystEngComm.

Nakhmanson's graduate student, Ayana Ghosh, found that the Random Forest Regression (RFR) algorithm provided the most accurate crystallization predictions. In addition, RFR was the only one able to identify traits that would make pharmaceutical molecules easier to crystallize; for example, if a molecule weighs less than X amount and has a certain number of hydrogen bonds, the probability it can be successfully crystallized is increased.

"This is precisely the sort of information that a synthetic chemist would need in order to decide how to make a new drug in the form of a pill," says Nakhmanson. "The RFR machine learning technique is really helpful in addressing which parameters are important for crystallization and which ones are not."

IMS Welcomes Dr. J. Nathan Hohman

Dr. J. Nathan Hohman (Nate) joined the Institute of Materials Science as a resident faculty member from the Chemistry Department in August 2019. Dr. Hohman began his graduate work at Penn State University and received his Ph.D. from the University of California, Los Angeles advised by Dr. Paul Weiss. He completed his postdoctoral research with Dr. Nicholas Melosh at Stanford University. Most recently, Dr. Hohman was employed at the Molecular Foundry at Lawrence Berkeley National Laboratory. Dr. Hohman's research interests include surface science, nanomaterials, chemical patterning, and many other areas.

IMS Director Dr. Steven Suib, expressed his thanks to the hiring committee which included Drs. Rainer Hebert (Chair), Andrei Alexandrescu, Baki Cetegen, Martin Han, Jie He, Linnaea Ostroff, and Luyi Sun. He also expressed gratitude for the support of Provost John Elliott, Vice President for Research Radenka Maric, former Dean Davita Glasberg of CLAS, and Chemistry Department Head Christian Bruckner.

Dr. J. Nathan Hohman

New UConn Research Center Provides Reliable Data, Realistic Simulations for Manufacturing Industry

by Anna Zarra Aldrich - Office of the Vice President for Research

Rainer Hebert and Lesley Frame from UConn's Department of Materials Science and Engineering in the Innovation Partnership Building at UConn Tech Park. (Carson Stifel/UConn Photo)

The University of Connecticut recently launched the Center for Materials Processing Data (CMPD) with their university and industry collaborators.

The center will provide the manufacturing industry with valuable data about how their materials will perform, eliminating much of the time and cost-intensive trial and error upon which the industry has relied for years.

UConn is working with the Worcester Polytechnic Institute and the University at Buffalo, each bringing unique expertise and workforce to the center projects. Another key player is ASM International, one of the world's largest associations of materials engineers and scientists. ASM International serves as the materials data archive, enabling easy access to data by industry members and non-members.

CMPD works with businesses in the manufacturing industry, like UTC Pratt and Whitney, to provide reliable transient material property data representing how materials respond under dynamic and realistic processing conditions. Currently, industries rely on material data gathered under static conditions that may not accurately reflect the variations in load, temperature, and atmosphere that materials undergo during manufacturing.

> **There's an industry-wide shift to be able to model and predict the behaviors of materials rather than doing trial and error for process development.**
>
> *~Dr. Lesley Frame*
> *Assistant Professor*

"The center provides an opportunity for the materials engineering community to take a deep dive into the specific challenges of gathering transient material property data," says Lesley Frame, CMPD director and assistant professor in UConn's Department of Materials Science and Engineering. "There are three equally important pieces to this goal: the first is generating accurate materials property data; second, we need to curate these data and qualify and compare against published materials data; and third, we need to demonstrate modeling applications of how we can reliably use these data. This is where the center comes in."

One of UConn's greatest contributions to the center is the state-of-the-art equipment in its Innovation Partnership Building (IPB) at UConn Tech Park.

"UConn has an arsenal of equipment at IPB that is perfect for gathering dynamic material property data," Frame says. "We're able to leverage these resources to answer questions about materials behavior that are very difficult to answer with basic equipment."

One industry application of the type of data produced through CMPD projects is with digital twins, which are digital replicas of real world entities. Researchers and industry professionals are beginning to use digital twins of a given material during manufacturing to characterize what is happening to it on a microscopic level as it is processed. The digital twin allows researchers to understand and document changes in structure and properties for materials through a computer model in a way that is just not possible with the physical material itself. However, these digital twins are only as accurate as the data fed into the models. When material data is collected under static conditions, but then fed into a model that is meant to characterize a dynamic material response, there will inevitably be some error in the result. Better data means more reliable models and better predictions of material behavior during processing.

When industry members join CMPD, they have access to every step of the projects. Industry members help to govern the center, they recommend and choose projects, and they continue to advise and participate in projects as they evolve. Industry members also have access to the resulting data.

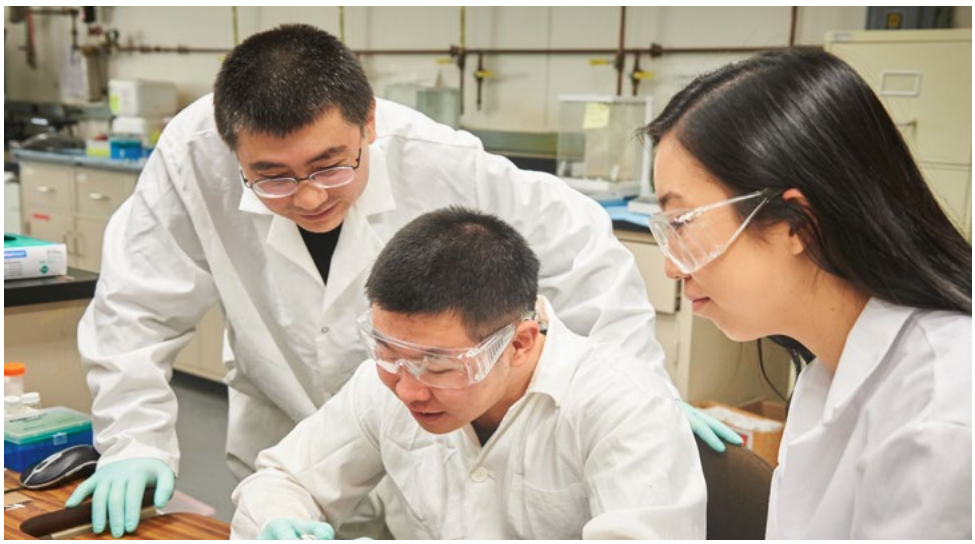
"The entire field is interested in generating and using more materials data," Frame says. "There's an industry-wide shift to be able to model and predict the behaviors of materials rather than doing trial and error for process development."

UConn's leadership in CMPD will help further cement the University as a hub for innovation in the fields of manufacturing research and materials engineering, says Pamir Alpay, executive director of the Innovation Partnership Building.

"CMPD is huge in terms of everything we're doing at IPB on manufacturing technologies. It's a massive effort that will serve a large community and it will make a big impact. It will become a point of priority for UConn."

A Glass Sensor That Can Take the Heat

by Anna Zarra Aldrich - Office of the Vice President for Research



Dr. Yu Lei with students.

Automotive and other energy-intensive industries have an interest in monitoring emissions and combustion efficiencies of their vehicles and plants. Incomplete combustion of fossil fuels, the primary source of energy for these processes, emit carbon monoxide and hydrocarbon gas, which can affect the environment and human health.

In order to provide real-time feedback and measurements to monitor combustion processes and related emissions, gas sensors are used. These sensors work by allowing gases to interact with sensing materials to generate a measurable signal. If a measured signal is above a set level, it will trigger an alarm. However, monitoring can be challenging due to the high temperatures inherent in these settings.

Currently, high-temperature gas sensors have some drawbacks. They exhibit poor thermal stability, have low sensitivity at high temperature, and readings can be impacted by interference from other gases that manufacturers are not interested in measuring. There are few sensors on the market able to meet performance requirements within these harsh operating conditions.

Centennial Professor in UConn's Department of Chemical and Biomolecular Engineering and IMS faculty member, Dr. Yu Lei, has patented an improved gas sensing technology for use in industrial applications. His technology uses a highly porous nanomaterial that is stable at high temperatures (e.g. 800 degrees Celsius), and is highly sensitive to gases such as carbon monoxide and hydrocarbons, making it suitable for monitoring combustion efficiency and emissions for a wide range of applications.

Dr. Lei's device also uses a new impedance metric technique that operates at a fixed high frequency, which minimizes the interference from other gases in a combustion mixture. This allows for highly selective readings.

Moreover, Dr. Lei's process to produce this nanomaterial is much easier and more affordable than existing methods, with many potential uses once commercialized.

"This sensor is operated in a simple configuration and will bring a potential leap in various combustion monitoring and control device developments," Lei says. "It will also impact other sectors areas, such as energy harvesting and storage, petroleum and coal refineries, and pollution control."

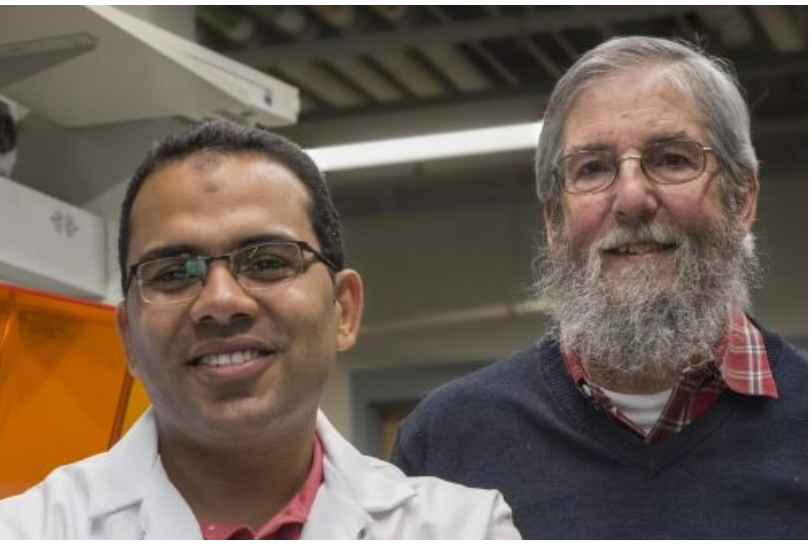
This sensor is operated in a simple configuration and will bring a potential leap in various combustion monitoring and control device developments.

~Dr. Yu Lei
Castleman Professor, CBE

Dr. Lei received his Ph.D. from the University of California Riverside in 2004 before joining the UConn Chemical and Biomolecular Engineering faculty the same year. He is now one of five named Castleman Distinguished Professors. His research focuses on the development of a diverse array of sensor technologies that are novel, simple, ultrasensitive and universal.

New 3D-Printed Technology Lowers Cost of Common Medical Test

Excerpted from a story by Anna Zarra Aldrich - Office of the Vice President for Research



UConn graduate student Mohamed Sharafeldin, and his advisor, chemistry professor James Rusling, developed a way to 3D print a pipette tip. (Sean Flynn/UConn Photo)

A desire for a simpler, cheaper way to do common laboratory tests for medical diagnoses and to avoid "washing the dishes" led University of Connecticut researchers to develop a new technology that reduces cost and time.

Their pipette-based technology could also help make certain medical testing available in rural or remote areas where traditional methods might otherwise be prohibitively expensive and complicated to conduct.

Traditional ELISA tests are performed on plates featuring 96 micro-wells; each well works as a separate testing chamber where samples can be combined with various agents that will then react with the sample, typically by changing color. Technicians can then analyze whether a sample contains indicators of a particular disease or condition depending on the intensity of the color produced during the reaction.

A standard pipette. (iStock photo)

Like many research laboratories, Dr. James Rusling's chemistry lab, where research assistant Mohamed Sharafeldin and his primary collaborator, Karteek Kadimisetty ('18 Ph.D.), conducted their work, doesn't have an automated ELISA washing machine, so plates being used for tests must be manually washed – a time consuming and difficult process.

One day while running ELISA, Kadimisetty mused that he wished "doing ELISA was as simple as pipetting." That offhand comment was the impetus for the design of a 3D-printed adapter for commonly used pipettes that could run an ELISA test right in the pipette tip, without the need for a traditional ELISA plate and the expensive equipment that goes with it.

Each single-use pipette tip represents one micro-well on an ELISA plate; the researchers also designed a multi-tipped version that allows eight tips to be pipetted at the same time. The tips fit snugly onto most pipettes used in laboratory settings, making fluid handling much easier than with the standard ELISA plate.

Mohamed Sharafeldin, holds a unique pipette tip created with a 3D printer. (Sean Flynn/UConn Photo)

The researchers tested the pipette tips on samples from prostate cancer patients and found not only were the test results from the tips as accurate as ELISA tests, they were able to conduct the tests with one-tenth of the amount of testing agent – significantly reducing the overall cost of the test – and at a fraction of the time. Tests conducted by different users with different levels of skill ultimately demonstrated the same results.

The pipette tips also do not require an expensive or sophisticated plate reader to determine test results, as ELISA tests do. In the trials with the prostate cancer samples, the pipette tip results were accurately read by taking a cell phone photo and using a free app that measures color intensities in the image.

While additional sample testing is needed, Rusling's group is optimistic about the potential for the pipette tip design to reduce costs. He is also engaging with engineers to design an automated, vacuum-assisted pipette that would further ease the use of the pipette tips and the need for ELISA tests, and would be available for significantly less cost than traditional ELISA equipment.

In addition to Kadimisetty and Rusling, collaborators include Mohamed Sharafeldin, Ketki R. Bhalerao, Itti Bist, Abby Jones, Tianqi Chen; and Norman H. Lee, professor of pharmacology and physiology at George Washington University.

Five Questions for Dr. Mei Wei

Dr. Mei Wei

After a 17-year career at UConn, Dr. Mei Wei has begun a new journey as Dean of the Russ College of Engineering and Technology at Ohio University in Athens, OH. Dr. Wei's trajectory from assistant professor to School of Engineering Centennial Term Professor, and Associate Dean for Research and Graduate Education speaks to her success as an educator, researcher, and administrator.

Prior to her departure, Dr. Wei found time in her extremely busy schedule for this five-question interview for IMS News:

Since first coming to UConn, how has your research and your perspective been influenced by advances in materials science?

Materials science research has advanced substantially in the past two decades. The emergence of many new technologies has enabled us to pursue research we could never do in the past.

How do you feel your work and experiences at UConn have prepared you for your new position as Dean of the Russ College of Engineering and Technology at Ohio University?

UConn has prepared me well for the new position. I entered UConn as an assistant professor, was promoted to associate professor, and then full professor. Here, I learned how to be an educator. I established my research laboratory; I graduated my first doctoral student, and mentored numerous graduate and undergraduate students. In recent years, I became involved in administration. Besides serving as the Associate Dean for Research and Graduate Education at the School of Engineering, I also serve as the Director for the General Electric Center of Excellence in Advanced Materials and Modeling, Director for Masters of Engineering in Global Entrepreneurship, and, from 2015 to 2016, I served as interim department head. All these experiences have prepared me well for the new position as Dean of the Russ College.

As a woman who has found great success in a male-dominated field, how do you view the future of women in STEM professions?

Traditionally, Engineering is regarded as a field for males only. More and more women are entering the field and being successful. These women are excellent testimonies that the field is suitable for both genders. This will in turn encourage more females to enter STEM. I hope that we can close the gender gap in the near future.

Over the years, you have taught undergraduates and advised M.S. and Ph.D. students. How important is interaction with students and will you continue to mentor students in your new position?

As a professor, I really enjoy interacting with students. Good mentorship is extremely important for students' academic and career development. In my new role, I will continue to mentor students, learn their needs, and work with my colleagues to create a welcoming and uplifting study environment for the students.

On both a personal and professional level, how will you remember your tenure at UConn?

UConn was my first stop in the U.S. when I came from overseas, and the only place I can call home. I have been here for 17 years. At UConn, I was promoted from Assistant Professor to Associate Professor, Full Professor, and then Associate Dean, Interim Department Head and center directorships. I purchased my first house here and both of my children were born in CT. It was a rather difficult decision to leave UConn. I will miss all my friends and colleagues here.

Dr. Jessica Rouge is Recipient of NSF CAREER Award

by Rhonda Ward – Institute of Materials Science

Dr. Jessica Rouge

Assistant Professor Jessica Rouge (CHEM/IMS), is the recipient of a Faculty Early Career Development Program (CAREER) Award from National Science Foundation's (NSF) Macromolecular Supramolecular and Nanochemistry program.

The funding from the NSF CAREER Award will enable the Rouge group to develop novel chemical crosslinking strategies that can be incorporated into DNA nanomaterials. Their group had developed a DNA-surfactant assembly strategy that generates DNA nanoshells compatible with cells and enzymes. A major goal of the grant is to synthesize new crosslinkages that can control the nanomaterials assembly and disassembly in complex biological environments, similar to the way a virus does in nature. Such strategies are important for developing more sensitive biological sensors and more accurate drug delivery systems.

"Receiving this grant is a huge step for our research program and will enable our group to explore a variety of bio-inspired material designs. Our group is a blend of chemistry, materials science and biochemistry. Our strategies will help us answer fundamental questions necessary for achieving more potent gene silencing responses in cells, brighter bioimaging responses using DNA aptamers, and more sensitive platforms for identifying disease biomarkers," Rouge says.

The group is currently developing DNA programmable materials, which can use various stimuli including light and temperature to initiate chemical reactions. This funding will enable the group to test a variety of different stimuli and reaction schemes; identify more deeply selective responses; and initiate more targeted cellular responses.

"The funding will also support a number of the group's science outreach initiatives here at UConn which we are excited to expand in the coming months," says Rouge.

Dr. Rouge received her undergraduate degree in Biochemistry from Boston College where she worked with Dr. Shana Kelley on the design and synthesis of DNA functionalized nanomaterials. She then went to the University of Colorado where she received her Ph.D. in Chemistry studying RNA mediated nanoparticle synthesis using aptamers under the guidance of Dr. Bruce Eaton. During her postdoctoral studies, Jessica worked with Dr. Chad Mirkin at Northwestern University designing a variety of DNA nanomaterials geared at therapeutic applications.

Dr. Rouge joined the faculty of UConn's Chemistry Department in June of 2015 with an appointment in the Institute of Materials Science. At UConn, Jessica's lab is focused on designing new nucleic acid-based nanomaterials for a variety of applications, ranging from nucleic acid delivery for gene regulation to DNA/RNA catalyzed reactions for biosensing and energy applications. Her lab also focuses on studying the fundamental mechanisms by which DNA functionalized nanomaterials can traverse cell membranes to make more stable and effective DNA delivery platforms. To understand the many challenges facing the materials they are designing, Dr. Rouge collaborates with researchers across many departments at UConn, including the health center.

Dr. Rouge was also recently selected for the inaugural Program in Accelerated Therapeutics for Healthcare (PATH) Award from the Office of the Vice President for Research here at UConn. That award will fund further development of Dr. Rouge's investigation into "Determining the Pharmacology of a Novel DNAzyme-therapeutic Formulation for the Treatment of Allergic Airway Disease."

Dr. S. Pamir Alpay Named Associate Dean for Research and Industrial Partnerships in School of Engineering

excerpted from a story by UConn Today

Dr. S. Pamir Alpay, Associate Dean for Research and Industrial Partnerships and Executive Director of the Innovation Partnership Building at UConn Tech Park.

IMS faculty member, Dr. S. Pamir Alpay, has been appointed to the newly created position of Associate Dean for Research and Industrial Partnerships within the School of Engineering.

Dr. Alpay is the Executive Director of UConn Tech Park, leading the University's efforts to increase strategic partnerships with businesses in a state-of-the-art research and development facility. He is also the General Electric Professor in Advanced Manufacturing in the Department of Materials Science and Engineering. Alpay joined UConn's Materials Science and Engineering Department in 2001 and served as its program director and subsequently as its department head from 2011 to 2017. He received his Ph.D. in 1999 from the University of Maryland.

> Dr. Alpay's new leadership role within the School of Engineering allows him to continue leading efforts to establish new industry partnerships and leverage the unparalleled capabilities available at Tech Park.
>
> *~Dr. Radenka Maric*
> *Vice President for Research*
> *UConn/UConn Health*

"Dr. Alpay's new leadership role within the School of Engineering allows him to continue leading efforts to establish new industry partnerships and leverage the unparalleled capabilities available at Tech Park," Dr. Radenka Maric, Vice President for Research at UConn and UConn Health said. "Having worked closely with industry partners throughout his career, I am confident that Dr. Alpay will continue to contribute to the University's mission to support research, education, and economic development in the state."

2019-2020 Scholarship Facilitation Fund Winners from IMS

This award provides financial support up to $2,000 to faculty across all disciplines, on a competitive basis, to promote, support, and enhance the research, scholarship and creative endeavors of faculty at UConn.

Elena Dormidontova, Physics
Computer Modeling of Molecular Self-Assembly: Exploring Chemical Nature Effect

Tomoyasu Mani, Chemistry
Triplet-Triplet Annihilation Up-conversion Without Heavy Atoms Under Aerobic Conditions

Victoria Robinson, Molecular and Cell Biology
Structure-Function Relationships Involved in NS-Dependent Nucleolar Localization Pathways

Stefan Schafföner, Materials Science and Engineering
Characterization of Pyrrhotite-Containing Concrete by Automatic Electron Backscatter Diffraction

Anna Tarakanova, Mechanical Engineering
Manuscript in Scientific Reports

Carolyn Teschke, Molecular and Cell Biology
A View of the Salmonella Phageome in Wastewater

Jasna Jankovic, Materials Science and Engineering
International Workshop on Advanced Manufacturing and Characterization for Electrolyzers and Fuel Cells

Dr. Seok-Woo Lee Honored with Mentorship Excellence Award

by Marlese Lessing - Materials Science and Engineering Department

Dr. Lee and his student, Hetal Patel, accepting the Mentorship Excellence Award at the Frontiers in Undergraduate Research Reception on Friday, April 12, 2019.

In honor of his outstanding excellence in mentoring and supporting undergraduates in the MSE Department, Assistant Professor Seok-Woo Lee has been awarded the UConn Mentorship Excellence Award from the Office of Undergraduate Research.

The award recognizes professors who help develop their mentees' education and goals through continued guidance; push and support student research and growth; help their students develop a broader understanding of the field in which they are working; connect students with resources for research, educational, and career-related endeavors; and, overall, aid students in becoming well-rounded, educated, and driven scholars within the University of Connecticut.

One of his undergraduate students, MSE senior Hetal Patel, nominated Assistant Professor Lee for the award because of his continued and outstanding support of her and her research throughout her time in MSE.

"Having Dr. Lee as my research advisors is the best thing that happened to me at UConn. He is the highlight of my day and a hallmark of my UConn career," Hetal says. "Overall, Dr. Lee had changed the trajectory of my career through his kindness, his passion for science, and his dedication towards a student's success. Coming into UConn, I knew nothing about research, and if I hadn't met Dr. Lee, I would have never thought of applying to be a University Scholar, have decided to pursue a Ph.D. or would be going to a top graduate school."

"This is a great honor for me. This award gives me a lot of meaning much more than any other awards related to research and funding," Dr. Lee said. "I have worked with UConn undergraduate students for the last four years, and I was always amazed by their positive mind, enthusiasm, and creativeness. I will keep working hard to provide the best MSE education with our precious MSE undergraduate students."

Dr. Lee was honored at the Frontiers in Undergraduate Research Poster Exhibition reception on April 12, 2019. Frontiers in Undergraduate Research is an annual poster exhibition of student research, scholarship, and creative projects. Frontiers is a chance for students to share their work with the UConn community and with visitors to campus. This is one of the largest events for UConn undergraduate research, in which several hundred undergraduate students from the entire campus participate.

2019-2020 SPARK Technology Commercialization Fund Award Winners

SPARK Technology Commercialization Fund aims to support innovative proof-of-concept studies seeking to translate research discoveries into products, processes, and other commercial applications.

Baikun Li, Department of Civil and Environmental Engineering: *"Enhancing Durability and Accuracy of Solid-state Ion Selective Membrane (S-ISM) Nitrogen Sensors for Long-term Monitoring of Wastewater Systems: with Septic Tanks as the Initial Demonstration Site"*

Paul Nahass (PI), Institute of Materials Science, **Dr. Rajeswari Kasi (Co-PI),** Department of Chemistry: *"Medical Devices for Real-time Radiation Dosimetry at Sub-millimeter Spatial Resolution"*

James Rusling, Department of Chemistry: *"BioCap-harvest for Self-powered Cardiac Pacemakers"*

Dr. Jessica Rouge Selected for Inaugural PATH Award

by Rhonda Ward - Institute of Materials Science

Jessica Rouge, left, assistant professor of chemistry, speaks with graduate student Josh Santiana in her research lab in the Chemistry Building. (Sean Flynn/UConn Photo)

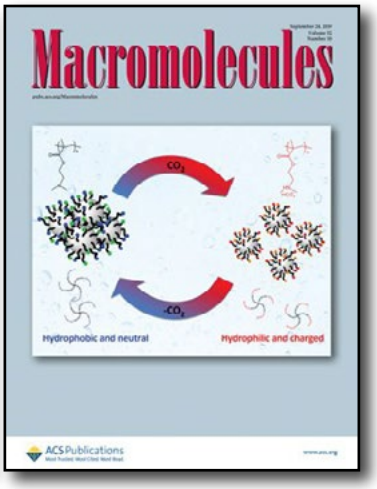
Dr. Jessica Rouge, IMS faculty member from the Chemistry Department, has been awarded the inaugural Program in Accelerated Therapeutics for Healthcare (PATH) Award from the Office of the Vice President for Research.

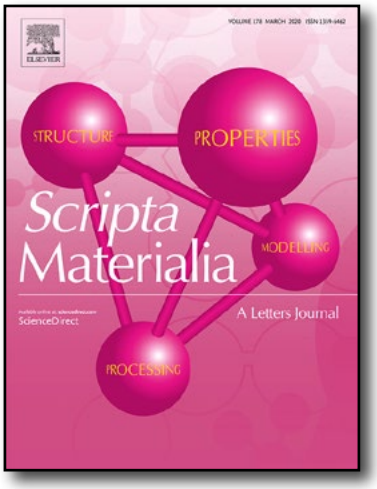
"I'm feeling very lucky to have this opportunity," Rouge says of the $75,000 PATH Trailblazer award, one of only two at this level of funding. The award will fund further development of Dr. Rouge's investigation into "Determining the Pharmacology of a Novel DNAzyme-therapeutic Formulation for the Treatment of Allergic Airway Disease."

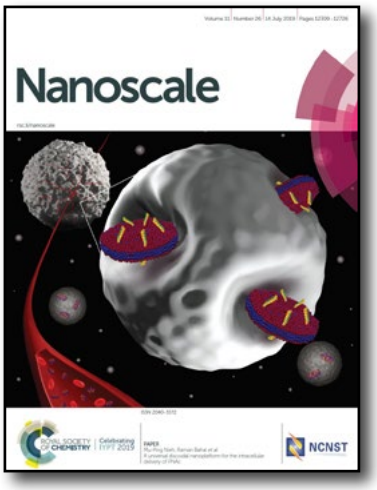
PATH is a partnership that includes the OVPR, the School of Pharmacy, and the School of Medicine to accelerate the translational pathway for researchers to convert their discoveries to new medical therapeutics. Funding is provided to academic research programs designed speed up the development of novel therapeutic approaches. It focuses on well-validated molecular targets for a specific disease area with an unmet treatment need in the current commercial marketplace.

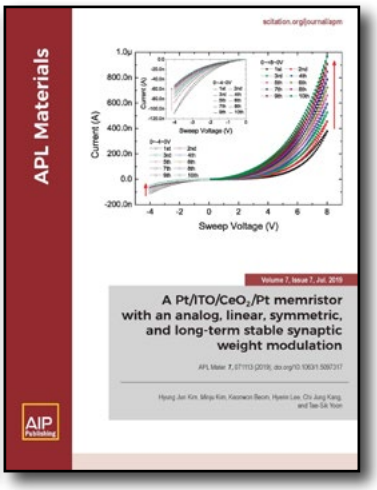
"We are really excited about it. It will help to accelerate our work, so it's a huge step!" Rouge says.

IMS Faculty and Student Publishing Credits









Program in Accelerated Therapeutics for Healthcare (PATH) Awardees

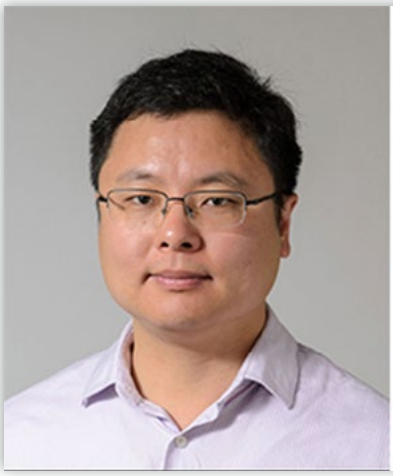
PATH is a partnership that includes the Office of the Vice President for Research (OVPR), the School of Pharmacy, and the School of Medicine to accelerate the translational pathway for researchers to convert their discoveries to new medical therapeutics.

Xiuling Lu, Department of Pharmaceutical Science - $75,000
Co-PIs: Rajeswari Kasi, Chemistry; Theodore Rasmussen, Pharmaceutical Sciences; Andrew Wiemer, Pharmaceutical Sciences; Raman Bahal, Pharmaceutical Sciences
"Cutting Cancer at Its Root: Inhibition of Acute Leukemic Stem Cells Using Doxorubicin-Loaded Nanoparticles"

Jessica Rouge, Department of Chemistry - $75,000
Co-PIs: Steven Szczepanek, Pathobiology
"Determining the Pharmacology of a Novel DNAzyme-Therapeutic Formulation for the Treatment of Allergic Airway Disease"

IMS Members Jie He and Jing Zhao Receive NSF EAGER Awards

by Rhonda Ward - Institute of Materials Science



Dr. Jie (Jay) He

Dr. Jing Zhao

Dr. Jie (Jay) He and Dr. Jing Zhao, both faculty members of the Chemistry Department with appointments in IMS, were recently awarded the NSF EArly-concept Grant for Exploratory Research (EAGER). The grant supports exploratory work in its early stages on untested, but potentially transformative, research ideas or approaches.

Dr. He was awarded $149,991 for his collaborative research entitled *Hybrid Quantum Dot-Metal Nanocrystals for Photoreduction of CO2: Synthesis, Spectroscopy and Catalysis*. The grant is effective August 15, 2019 to July 31, 2021.

Dr. Zhao was awarded $204,082 for her collaborative research entitled *A Low-Cost, "Digital" Biosensing Platform with Single Protein Biomarker Sensitivity*. The grant is effective September 1, 2019 to August 31, 2022.

2019-2020 START Preliminary Proof Of Concept Award Winners from IMS

This award aims to support the preliminary validation of innovative early stage technologies that have possible commercial potential and is designed to bring those technologies to a stage that may be more attractive for additional later stage translational funding support.

Yusuf Khan, UConn Health, Department of Orthopaedic Surgery - *Polymer-coated Allograft for Large Scale Bone Defect Repair* ($10,000)

Eugene Pinkhassik, College of Liberal Arts and Sciences, Department of Chemistry; Co-PIs/Team: Sergey Dergunov, Department of Chemistry - *Integration of Homogeneous Catalysts Entrapped in Nanocapsules in Flow Processes* ($10,000)

Liisa Kuhn, University of Connecticut, Department of Biomedical Engineering - *Esophageal Regeneration Device* ($10,000)

James Rusling, University of Connecticut, Department of Chemistry - *BioSuperCap-Harvest for Self-Powered Deep Brain Stimulators* ($10,000)

Luyi Sun, University of Connecticut, Department of Chemical and Biomolecular Engineering - *Polyvinyl Alcohol (PVA)/Polydopamine (PDA) Composite Wet Adhesive for High Performance Underwater, Biomedical, and Wearable Electronics Applications* ($10,000)

Dr. Challa V. Kumar

Dr. Challa V. Kumar is Recipient of Fulbright US-Australia Research Excellence Award

by Rhonda Ward - Institute of Materials Science

Dr. Challa V. Kumar, an IMS faculty member from the Chemistry Department, has been selected for the Fulbright US-Australia Research Excellence Award for 2019.

Dr. Kumar will travel to Australia in 2020 to carry out research on 3D printing of enzymes to make progress toward the realization of biobatteries. The research intends use sugar as a source to produce the batteries, which are intended for use in personal electronics.

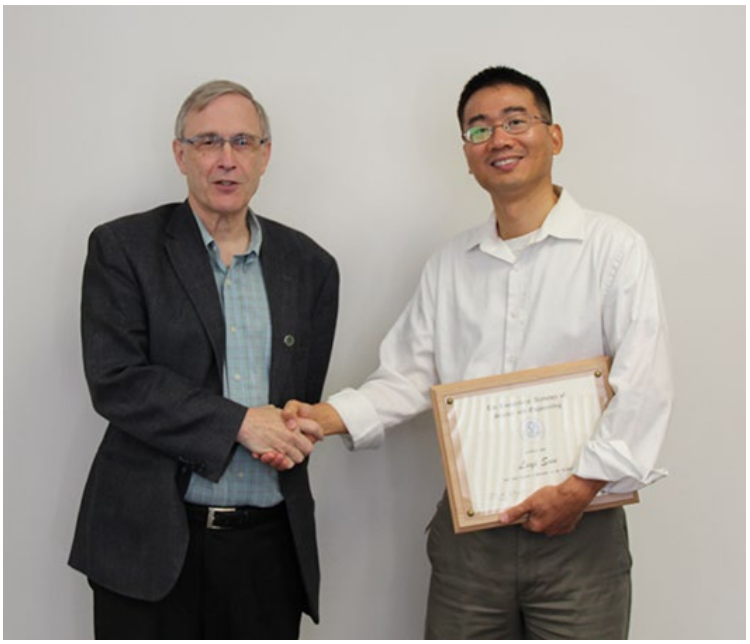
Dr. Kumar is among six representatives from the United States who were selected the award.

The Australian-American Fulbright Commission is a non-profit organization sponsored by the U.S. and Australian governments and other institutional and business partners, private bequests and endowments.

IMS Celebrates the Election of Dr. Bryan Huey and Dr. Luyi Sun to CASE

by Rhonda Ward - Institute of Materials Science

IMS Director Steven Suib congratulates Dr. Bryan Huey on his election to CASE.



IMS Director Steven Suib congratulates Dr. Luyi Sun on his election to CASE.

IMS celebrated the election of two of its faculty members to membership in the Connecticut Academy of Science & Engineering (CASE). Dr. Bryan D. Huey, Department Head and Professor of Materials Science and Engineering (MSE), and Dr. Luyi Sun, Director of the IMS Polymer Program and Professor of Chemical and Biomolecular Engineering, were inducted into the academy at its 44th Annual Meeting in May 2019.

Election to CASE is made on the basis of scientific and engineering distinction achieved through significant contributions in theory or applications, as demonstrated by original published books and papers, patents, the pioneering of new and developing fields and innovative products, outstanding leadership of nationally recognized technical teams, and external professional awards in recognition of scientific and engineering excellence.

Dr. Huey has published extensively in such journals as *Nature*, *Science*, and *Nanoletters*. He is responsible for major advances in nanoscale materials property measurements, including High Speed Atomic Force Microscopy (AFM) and Tomographic AFM. He has made substantial contributions to the Materials Research Society including as lead organizer of the 7000+ attendee 2019 Fall Meeting. He served as past chair of the American Ceramic Society's Basic Science Division, which has over 1300 members. Dr. Huey also serves as advisor to the Materials Research Society (MRS) Student Chapter at UConn.

Dr. Sun's publication credits include such distinguished journals as *Scientific Reports*, *Nature Communications*, *Science*, and *Science Advances*, as well as holding several patents related to his research. His work has been featured in articles at Smithsonian.com, *R&D Magazine*, and *Plastics Technology* among other publications. Dr. Sun also serves as advisor to the UConn student chapter of the Society of Plastics Engineers (SPE).

IMS Director Dr. Steven L. Suib, also a CASE member elected in 2012, congratulated both researchers on their membership and accomplishments.

Convergence Award for Research in Interdisciplinary Centers Winner from IMS

This award supports the development of collaborative interdisciplinary teams to bid for major (>$5M) federally funded initiatives, such as research centers.

Yu Lei, Department of Chemical and Biomolecular Engineering
Exposure, Health Effects, Sensing, and Remediation of Emerging Contaminants Superfund Research Program (SRP) Center

Dr. Leslie Shor Named Associate Dean for Graduate Education and Research in School of Engineering

excerpted from a story by UConn Today

Dr. Leslie Shor works in her lab.

IMS faculty member from the Chemical and Biomolecular Engineering Department, Dr. Leslie Shor, has been appointed Dean of Graduate Education and Research in the School of Engineering.

Since joining the UConn faculty in 2009, Dr. Shor has served as a leader and an accomplished researcher. In addition to her appointment in the Institute of Materials Science (IMS), she also has a joint appointment as a graduate faculty member in the Environmental Engineering program. Prior to her tenure at UConn, she held various appointments at Vanderbilt University and received her Ph.D. from Rutgers University in 2002.

Since arriving at UConn, Shor has secured over $5 million in research funding from the National Science Foundation, the Department of Defense, the Bill & Melinda Gates Foundation, and several others. She has advised over 50 undergraduate and graduate students at UConn. Her research is in the development of engineered microbial habitats and the fate and transport of hydrophobic organic contaminants. Because of her leadership and academic strength, Shor was named a DuPont Young Professor. She has been a finalist for a Connecticut Women of Innovation award, and has been an invited speaker for the National Academy of Engineering, Frontiers of Engineering Education Symposium. She has nearly 100 peer-reviewed journal publications and conference proceedings.

"We are thrilled to have someone with Dr. Shor's experience taking the lead on our research development. With her passion, strong background, and innovative thinking, I am excited for the future of our School," Dean Kazem Kazerounian said.

2019-2020 Research Excellence Program Award Recipients from IMS

This award is designed to assist faculty in the initiation, completion, or advancement of research projects, scholarly activities, creative works, or interdisciplinary initiatives that are critical to advancing the faculty member's scholarship and/or creative works.

Necmi Biyikli, Department of Electrical and Computer Engineering - $25,000

Ultrawide Bandgap Semiconductors for Flexible Electronics

Challa Kumar, Department of Chemistry - $45,000

Protein-Based NanoMaterials: Highly Efficient Supercapacitors for Next Generation Energy Systems for Space (NASA) Applications

Co-PIs: Rajeswari Kasi, Chemistry; James Rusling, Chemistry

Thanh Nguyen, Department of Mechanical Engineering - $50,000

Biodegradable Piezoelectric Scaffold for Bone Regeneration

Co-PIs: Kevin Lo, Institute for Regenerative Engineering

Jessica Rouge, Department of Chemistry - $50,000

Visualizing the Synthesis and Assembly of RNA and DNA Nanostructures Using In Situ Liquid Cell TEM

Co-PIs: Lucas Parent, Center for Advanced Microscopy and Materials Analysis

UConn Researcher Radenka Maric Named AAAS Fellow

by Jessica McBride - Office of the Vice President for Research

Radenka Maric, vice president for research, innovation, and entrepreneurship, right, looks over membrane samples with graduate students Thomas Ebaugh, and Ryan Ouimet '14 (ENG) at the Center for Clean Energy Engineering (C2E2) on Nov. 22, 2019. (Peter Morenus/UConn Photo)

Vice President for Research, Innovation and Entrepreneurship Radenka Maric has been named a 2019 Fellow of the American Association for the Advancement of Science (AAAS). Maric is also CT Clean Energy Fund Professor of Sustainable Energy in the Department of Chemical and Biomolecular Engineering and the Department of Materials Science and Engineering.

AAAS, publisher of the journal Science, is the world's largest general scientific society, founded in 1848.

"I am truly honored to represent UConn as an AAAS Fellow," says Maric. "It is a privilege to serve the UConn community, as I feel this institution is my home. I am energized everyday by my colleagues, gifted faculty, and talented students who make UConn a special place for education, creative work and research, sustainability, and global perspectives of inclusion and the exchange of ideas."

> It is a privilege to serve the UConn community, as I feel this institution is my home.
>
> *~Dr. Radenka Maric*
> *Vice President for Research*
> *UConn/UConn Health*

Maric came to UConn in 2010 after an international career working in industry and national labs. She is the recipient of many awards and honors from the national and international research community for both preeminence in her field and dedication to educating future generations of scientists. Some of these honors include election into the Connecticut Academy of Science and Engineering in 2012, being named the 2015 Woman of Innovation in the Research category by the Connecticut Technology Council, and selection as a Fulbright chair professor in Italy in 2016-2017.

While Maric is currently serving as a member of UConn's senior leadership, she maintains an active lab and continues to mentor students from UConn and beyond. In collaboration with a team from Technion University in Israel, Maric is developing new transition metal oxide catalysts using Reactive Spray Deposition Technology (RSDT) that could signal major improvements in alkaline exchange membrane fuel cell (AEMFC) performance.

As a Fulbright chair professor at Politecnico di Milano in Italy, which is ranked in the top 20 technical universities in the world, Maric taught, conducted research, and supervised two students who are now pursuing doctorates in the U.S.

Maric is also dedicated to leveling the playing field in education and encouraging diversity. As the first woman to earn a doctoral degree from the School of Engineering at Kyoto University – Japan's most prestigious university – Maric overcame gender stereotypes and language barriers in order to succeed. In 2019, she founded the Maric Graduate Fellowship to support graduate students in need across all UConn's schools and colleges.

"As educators and scientists, it's our duty and privilege to produce creative problem solvers, able to integrate passion and curiosity, seek out and create new knowledge, and engage as ethical world citizens," says Maric. "I have no doubt that many of them will join me one day as future AAAS Fellows."

IMS Member Elected to American Academy of Arts and Sciences

excerpted from a story by UConn Today

IMS faculty member, Dr. Cato Laurencin (l) and Physics Professor, Dr. Nora Berrah (r).

Two UConn professors, IMS faculty member Dr. Cato Laurencin and physics professor Dr. Nora Berrah, have been elected as members to the historic and prestigious American Academy of Arts and Sciences. This year, more than 200 individuals were elected to the academy with compelling achievements in academia, business, government, and public affairs.

"One of the reasons to honor extraordinary achievement is because the pursuit of excellence is so often accompanied by disappointment and self-doubt," said David Oxtoby, president of the academy. "We are pleased to recognize the excellence of our new members, celebrate their compelling accomplishments, and invite them to join the Academy and contribute to its work."

Founded in 1780 by John Adams and James Bowdoin, the academy honors exceptionally accomplished individuals who are engaged in advancing the public good.

Laurencin is a world-renowned surgeon-scientist in orthopedic surgery, engineering, and materials science. He is known as a pioneer in the field of regenerative engineering. His work over a span of more than 25 years has had an extraordinary range of depth and breadth. He has made fundamental and seminal contributions in polymeric materials science and engineering, and nanotechnology. At the same time, his research successes have included the growth and regeneration of bone, ligaments, and other musculoskeletal tissues.

Laurencin serves as the eighth University Professor in UConn's history. He is professor of chemical and biomolecular engineering; professor of materials science and engineering; and professor of biomedical engineering.

"I am very honored and humbled to be elected to the American Academy of Arts and Sciences. I thank my mentors especially Professor Robert Langer, and my students who continually inspire me," said Laurencin, the first UConn Health faculty member to be elected.

Berrah, who was head of the physics department from 2014 to 2018, has been recognized for her distinguished contributions to the field of molecular dynamics, particularly for pioneering non-linear science using X-ray lasers, and spectroscopy using synchrotron light sources.

Using big lasers – like the Linac Coherent Light Source at SLAC National Laboratory on the campus of Stanford University, the most powerful X-ray laser in the world – Berrah's research explores transformational changes occurring inside molecules when exposed to ultra-intense beams of light. In particular, she investigates physical molecular processes that occur at the femtosecond time scale: one quadrillionth, or one millionth of one billionth, of a second.

> One of the reasons to honor extraordinary achievement is because the pursuit of excellence is so often accompanied by disappointment and self-doubt.
>
> *~David Oxtoby*
> *AAAS President*

"The American Academy for Arts and Science honors excellence and convenes leaders to examine new ideas, and that it is a high honor bestowed on me," Berrah said.

IMS Faculty Members

Biomedical Engineering

Dr. Ki Chon
Dr. Alix Deymier
Dr. Bin Feng
Dr. Martin Han
Dr. Kazunori Hoshino
Dr. Cato T. Laurencin
Dr. Tannin Schmidt
Dr. Sina Shahbazmohamadi
Dr. Wendy Vanden Berg-Foels

Chemical & Biomolecular Engineering

Dr. George M. Bollas
Dr. Kelly A. Burke
Dr. Cato T. Laurencin
Dr. Yu Lei
Dr. W. K. Anson Ma
Dr. Jeffrey R. McCutcheon
Dr. Mu-Ping Nieh
Dr. Richard S. Parnas
Dr. Leslie Shor
Dr. Luyi M. Sun
Dr. Julia A. Valla

Chemistry

Dr. Douglas H. Adamson
Dr. Alfredo Angeles-Boza
Dr. Alexandru D. Asandei
Dr. William F. Bailey
Dr. José Gascón
Dr. Jie He
Dr. J. Nathan Hohman
Dr. Rajeswari Kasi
Dr. Challa V. Kumar
Dr. Yao Lin
Dr. Tomoyasu Mani
Dr. Fotios Papadimitrakopoulos
Dr. Eugene Pinkhassik
Dr. Rebecca Quardokus
Dr. Jessica Rouge
Dr. James F. Rusling
Dr. Thomas A. P. Seery
Dr. Gregory Sotzing
Dr. Steven L. Suib
Dr. Jing Zhao

Civil & Environmental Engineering

Dr. Maria Chrysochoou
Dr. Shinae Jang
Dr. Jeong-Ho Kim
Dr. Baikun Li
Dr. Ramesh Malla
Dr. Kay Wille
Dr. Arash E. Zaghi
Dr. Wei Zhang

Electrical & Computer Engineering

Dr. Rajeev Bansal
Dr. Necmi Biyikli
Dr. Yang Cao
Dr. Ali Gokirmak
Dr. Faquir C. Jain
Dr. Helena Silva

Marine Sciences

Dr. Heidi M. Dierssen
Dr. J. Evan Ward

Materials Science & Engineering

Dr. Mark Aindow
Dr. S. Pamir Alpay
Dr. Harold D. Brody
Dr. Avinash M. Dongare
Dr. Lesley Frame
Dr. Pu-Xian Gao
Dr. Rainer J. Hebert
Dr. Bryan D. Huey
Dr. Jasna Jankovic
Dr. Theodoulos Z. Kattamis
Dr. Cato T. Laurencin
Dr. Seok-Woo Lee
Dr. Radenka Maric
Dr. Serge M. Nakhmanson
Dr. Volkan Ortalan
Dr. George A. Rossetti Jr.
Dr. Stefan Schafföner
Dr. Yuanyuan Zhu

Mechanical Engineering

Dr. Baki Cetegen
Dr. Xu Chen
Dr. Wilson K. S. Chiu
Dr. Kazem Kazerounian
Dr. Ying Li
Dr. George Lykotrafitis
Dr. Thanh D. Nguyen
Dr. Julian A. Norato
Dr. Ugur Pasaogullari
Dr. David M. Pierce
Dr. Anna Tarakanova
Dr. Savas Tasoglu
Dr. Dianyun Zhang

Molecular & Cell Biology

Dr. James L. Cole
Dr. Kenneth M. Noll
Dr. Victoria L. Robinson
Dr. Carolyn M. Teschke

Nutritional Sciences

Dr. Yangchao Luo

Pathobiology

Dr. Mazhar I. Khan

Pharmaceutical Sciences

Dr. Robin H. Bogner
Dr. Diane J. Burgess
Dr. Bodhisattwa Chaudhuri
Dr. Debra A. Kendall
Dr. Na Li
Dr. Xiuling Lu

Physics

Dr. Elena E. Dormidontova
Dr. Niloy Dutta
Dr. Gayanath W. Fernando
Dr. George Nicholas Gibson
Dr. Phillip L. Gould
Dr. Jason Hancock
Dr. Menka Jain
Dr. Richard T. Jones
Dr. Jeffrey S. Schweitzer
Dr. Boris Sinkovic
Dr. Ilya Sochnikov
Dr. Barrett O. Wells

Physiology and Neurobiology

Dr. Linnaea Ostroff

Plant Science & Landscape Architecture

Dr. Cristian P. Schulthess

UConn Health

Dr. Douglas J. Adams
Dr. A. Jon Goldberg
Dr. J. Robert Kelly
Dr. Yusuf Khan
Dr. Insoo Kim
Dr. Liisa Tiina Kuhn
Dr. Sangamesh Kumbar
Dr. Cato T. Laurencin
Dr. Wai Hong (Kevin) Lo
Dr. Lakshmi S. Nair
Dr. Syam Nukavarapu

Emeritus/Retired Faculty

Dr. Thomas Anderson
Dr. Robert R. Birge
Dr. Joseph I. Budnick
Dr. C. Barry Carter
Dr. Anthony DiBenedetto
Dr. Harry Frank
Dr. James Galligan
Dr. Norman Garrick
Dr. Maurice Gell
Dr. Douglas S. Hamilton
Dr. William Hines
Dr. Eric H. Jordan
Dr. Devendra Kalonia
Dr. Lawrence A. Kappers
Dr. Quentin Kessel
Dr. James Knox
Dr. Harris L. Marcus
Dr. Matthew Mashikian
Dr. Douglas Pease
Dr. Donald Potter
Dr. Wolf-Dieter Reiter
Dr. Daniel A. Scola
Dr. Montgomery T. Shaw
Dr. Winthrop W. Smith
Dr. William C. Stwalley
Dr. Chong Sook P. Sung
Dr. Geoff Taylor

IMS resident faculty are indicated in bold

Graduate Student Ayana Ghosh Wins Prestigious Fellowship Award

by Marlese Lessing - Materials Science and Engineering Department

Ph.D. student Ayana Ghosh

MSE graduate student Ayana Ghosh has been named the recipient of the prestigious John Tanaka Graduate Student Fellowship award, which is given annually to a UConn graduate student in the United States' oldest honor society, Phi Kappa Phi.

The award was established in 1993 and is named after chemistry professor emeritus and former Director of the Honors Programs, Dr. John Tanaka. Professor Tanaka led Phi Kappa Phi at UConn for many years during his 45-year career at UConn. He also taught inorganic chemistry, and advised many undergraduate and graduate students. Although he passed away seven years ago in April 2012, his name lives on in this prestigious award.

> This type of recognition always acts as a catalyst for me to continue my daily efforts in research, learn more, and perform better.
>
> *~Ayana Ghosh*
> *Ph.D. Student*

Ayana said she is "very pleased" to have won the award.

"This type of recognition always acts as a catalyst for me to continue my daily efforts in research, learn more, and perform better," she said. "I am extremely grateful to receive exceptional mentorship from my advisors at UConn, Pfizer Inc. and Los Alamos National Laboratory as well as my previous institutions that have shaped my academic career to date. I wish to continue performing cutting-edge research on a wide-range of materials with present-day and prospective technological and medical applications while being engaged in events to encourage younger individuals to pursue careers of their choices, especially in STEM fields."

Candidates for this award are judged based on their research, career goals, academic success, achievement, and rigor, and service and leadership skills and activities.

Ayana has achieved many of these markers, winning Best Design for her poster in the third annual School of Engineering Poster Session in 2017, and departmental first place in the 2019 competition. She came to UConn in 2016, starting work in Professor Serge Nakhmanson's lab working to evaluate Machine Learning methods to predict accurately the crystallization of pharmaceutical compounds, a project funded by Pfizer Inc. and UConn MSE.

She is currently studying Computational Materials Design using Density Functional Theory (DFT), Machine Learning and Data Mining in Professor Nakhmanson's lab. Ayana has previously been a graduate student at New Mexico University. She earned her Bachelor of Science in physics and abstract mathematics from the University of Michigan-Flint in 2015.

"Obviously, I am extremely happy about Ayana receiving this well-deserved award," Professor Nakhmanson said.

> The Tanaka Fellowship emphasizes excellence in research and academics, and therefore is a great match for Ayana's numerous accomplishments.
>
> *~Dr. Serge Nakhmanson*
> *Associate Professor*

"The Tanaka Fellowship emphasizes excellence in research and academics, and therefore is a great match for Ayana's numerous accomplishments. She managed to complete not only a bunch of projects with me, but also collaborated with Pfizer researchers and did multiple internships at the Los Alamos National Laboratory working on something else entirely. She published extensively on all of these efforts and will surely publish more before she graduates."

New Technology Designed to Reduce Mortality Rates in Cancer Patients

excerpted from a story by Anna Zarra Aldrich - UConn Today

Ph.D. students Leila Daneshmandi and Armin Tahmasbi Rad, both from the Department of Biomedical Engineering, have developed a technology that takes a patient's tumor cells and grows them outside of the body to test different cancer treatments. (Evan Olsen Photography)

Armin Tahmasbi Rad, Ph.D. candidate in Dr. Mu-Ping Nieh's group, along with Leila Daneshmandi, Ph.D. candidate in Biomedical Engineering have developed a system to grow and test tumor cells outside the body with a goal of more efficient patient treatment.

UConn Today reports that the technology could potentially greatly reduce the trial-and-error aspect of cancer treatment that is exhausting, expensive, and potentially fatal for the patient.

The researchers were aided by support from Accelerate UConn, the National Science Foundation (NSF) I-Corps site at UConn.

"There are many FDA-approved drugs for each type of cancer. The difficulty is in choosing the most efficient one. It might take multiple rounds of chemotherapy to figure out which drug is working best," Daneshmandi says. "This process of determining which drug a patient responds to best, is lengthy and is one of the major reasons why many lives are lost. This is where we are trying to come in. We want to ensure each cancer patient gets the most efficient treatment from the very beginning."

While Rad and Daneshmandi came to UConn to pursue scholarly goals, they say participating in one of UConn's entrepreneurial programs, Accelerate UConn, is helping fulfill entrepreneurial aspirations too.

"Accelerate UConn can serve as a starting point for anyone who thinks they have a technology that has commercial potential," says Daneshmandi. "The mentors and the program itself have provided us with invaluable advice and guidance for developing our technology into a marketable product."

Accelerate UConn was launched in May 2015. It is jointly operated by UConn's Office of the Vice President for Research and the Connecticut Center for Entrepreneurship and Innovation (CCEI).

The only site of its kind in Connecticut, Accelerate UConn provides a framework for entrepreneurial faculty, staff, and students to assess the market potential of early-stage technologies developed in their labs. Along with early customer contact, the program also provides rigorous NSF-endorsed entrepreneurial training; $3,000 in seed funding to assess market potential; and connections with knowledgeable busi-

continued on next page

Encapsulate LLC was also awarded a 2019 MassChallenge "Technology in Space Prize" from the ISS National Lab and Boeing. Encapsulate Co-founder and CEO Armin Rad (second from right), Co-founder and COO Leila Daneshmandi (third from right), and Co-founder and CTO Reza Amin (fourth from right) are pictured here.

ness mentors to help researchers navigate the specific industry they hope to enter.

"UConn students and faculty develop innovative technologies every day, but to help patients and our economy, we need to support their commercialization so they can one day reach beyond the lab," says Radenka Maric, vice president for research at UConn and UConn Health. "The Accelerate UConn program provides our world-class student and faculty researchers with entrepreneurial skills and a support system to transform ideas into products and services that solve real-world problems."

Ph.D. Student and Encapsulate LLC Co-founder Armin Rad

Rad credits Accelerate UConn as the springboard for Encapsulate's development, which is currently headed toward starting initial clinical trials with UConn Health patients.

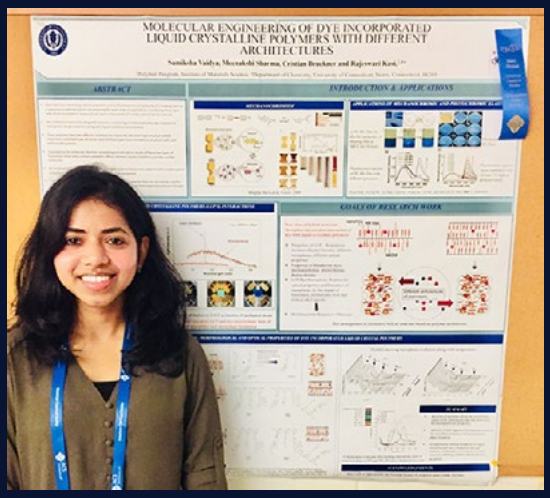
The developers also participated in the CCEI Summer Fellowship during the summer of 2019. The program helped them define their initial business plan and develop step-by-step goals to expand the company.

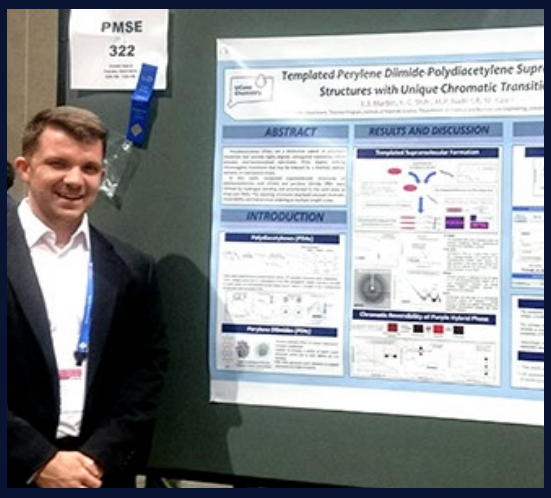
Rad and Daneshmandi continue to gain momentum for their potentially game-changing technology. Their project was recently awarded the Third Bridge grant, and they were recipients of the CTNext EIA Award in addition to being selected for the CTNext Mentor Network Program. They are currently in the process of joining UConn's Technology Incubation Program at UConn Health to begin their clinical trials.

"Accelerate UConn is a springboard into the entrepreneurial ecosystem within the University and in the state," says CCEI's Jen Murphy, manager for CCEI programs, including Accelerate UConn. "The Encapsulate team highlights how UConn's varied entrepreneurship and innovation programs work together to support companies like Encapsulate that have the potential to impact so many lives."

Kasi Group Members Nominated for ACS Best Poster

Ian J. Martin and Samiksha Vaidya of Dr. Rajeswari Kasi's research group recently attended the American Chemical Society (ACS) Fall 2019 National Meeting & Exposition in San Diego, CA and presented posters entitled "*Templated perylene diimide-polydiacetylene supramolecular structures with unique chromatic transitions*" and "*Molecular engineering of dye incorporated liquid-crystalline polymers with different architectures*", respectively. Each of their presentations were highlighted as distinguished poster nominees in the Polymeric Materials: Science and Engineering (PMSE) division.





Thermo Fisher Scientific Awards Five 2019 Fellowships


Megan Puglia


Patrick Song


Reuben Bosire


Ritopa Das

Five graduate students were awarded Thermo Fisher Scientific (TFS) Fellowships for work in the UCONN Thermo Fisher Scientific Center for Advanced Microscopy and Materials Analysis (CAMMA). These $10,000 fellowships are provided by TFS to encourage development of researchers in the area of electron microscopy.

The Thermo Fisher Scientific Fellowship is awarded annually as part of the microscope manufacturer's partnership with UConn through the CAMMA laboratory.

The fellowship recipients for 2019 were awarded to: Megan Puglia/Chemistry (Advisor: Dr. Challa V. Kumar); Patrick Song/Electrical Engineering (Advisor: Dr. Guoan Zheng); Heejeong Ryu (photo unavailable)/Chemical and Biomolecular Engineering (Advisor: Dr. Yu Lei); Reuben Bosire/Chemistry (Advisor: Dr. Rajeswari Kasi); Ritopa Das/Biomedical Engineering (Advisor: Dr. Thanh Nguyen).

MSE Students Win at MS&T 2019

Materials Science and Engineering undergraduates won awards totaling $1,750 for dome design and research presentations at the annual Materials Science & Technology conference in Portland, Oregon September 29 to October 4, 2019.

UConn Chapter Material Advantage (UCMA) undergraduates Amanda Agui, Samuel Bedard, Lucas Enright, and Justin Hewitt competed in the Geodesic Dome Design Competition against eight teams from universities across the U.S. with a 3D-printed ABS plastic dome.

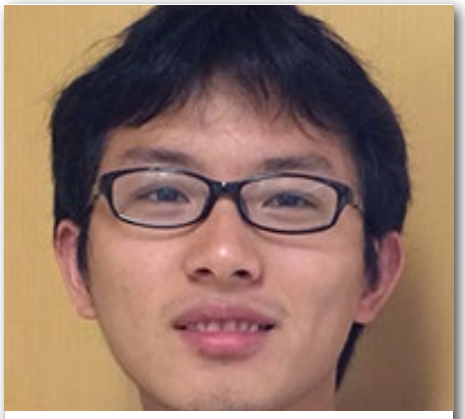
Congratulations Graduates!

IMS congratulates our 2019 graduates. These M.S. and Ph.D. candidates have worked hard over several years preparing to contribute to the future of materials science in industry, academia, and government. We wish all of them all the best as they begin their careers.

Dr. Garvit Agarwal, Ph.D., Materials Science and Engineering. Garvit is currently a Postdoctoral Researcher at Argonne National Laboratory.

During his graduate studies, Garvit received the 2018 Doctoral Dissertation fellowship and was also the winner of the 2018 Graduate Student of the Year Award in MSE.

Advisor: Dr. Avinash Dongare



Dr. Jie Chen, Ph.D., Materials Science and Engineering. Jie's Ph.D. research focused on the use of atomic scale modeling methods to understand the role of nanoscale interfaces on the deformation and failure behavior of metallic materials.

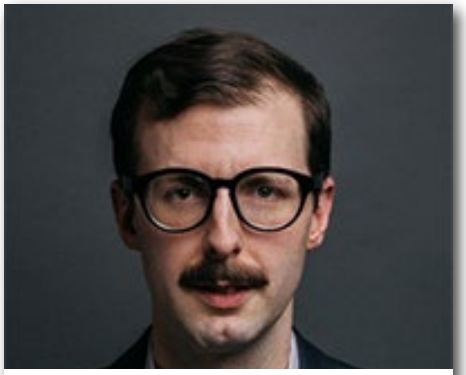
During his graduate studies, Jie was the recipient of the APS travel award to present his work at the Shock Compression of Condensed Matter meeting in 2017.

Advisor: Dr. Avinash Dongare

Dr. Udaya Dahal, Ph.D., Physics. Udaya is currently a Postdoctoral Researcher at Boston University.

During his graduate studies Udaya was first author or co-author for several publications including a Physical Review Letters publication which was chosen as "Editor's Suggestion"; *Physical Chemistry Chemical Physics and Macromolecules*. Udaya received a Doctoral Student Travel Award (2016) and a UConn Graduate School Doctoral Dissertation Award (2017).

Advisor: Dr. Elena Dormidontova



Dr. Keith J. Dusoe, Ph.D., Materials Science and Engineering. Keith is currently a Postdocoral Associate at the University of Massachusetts at Amherst.

During his graduate studies, Keith was awarded the Gold Prize at the TMS (the Minerals, Metals and Materials Society) 2017 national meeting in San Diego, CA; he was the winner of the 2016 UConn School of Engineering Graduate Student Poster Competition.

Advisor: Dr. Seok-Woo Lee

Dr. Yomery Espinal, Ph.D., Materials Science and Engineering. Yomery is now a Science & Engineering Technical Advisor to Defense Advanced Research Projects Agency (DARPA).

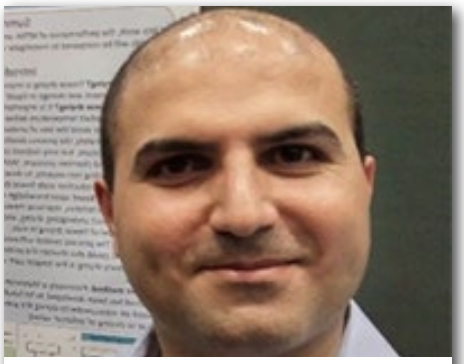
During her graduate studies Yomery received the ORAU Journeyman Fellowship, U.S. Army Research Laboratory, Adelphi, MD (2016-2018); the Multicultural Scholars Fellowship, UConn, Storrs, CT (2013-2018); and the NSF LSAMP-Bridge to the Doctorate Fellow, UConn, Storrs, CT (2013-2015).

Advisor: Dr. S. Pamir Alpay

Dr. Hailin Fu, Ph.D., Chemistry. Hailin is currently a Postdoctoral Researcher at the University of California, Berkeley.

During her graduate studies, Hailin received the UConn Chemistry Research Award (2018); a Doctoral Student Travel Award (2016); and a UConn Graduate School Doctoral Dissertation Award (2015).

Advisor: Dr. Yao Lin



Dr. Nasser Khakpash, Ph.D., Materials Science and Engineering. Nasser is now employed as a Yield Engineer at Intel Corporation.

During his graduate studies, Nasser served as CFO for the UConn Chapter of Keramos, the National Professional Ceramic Engineering Fraternity. He has authored or co-authored research published in journals which include the *Journal of Materials Science*, *Physical Review*, *Applied Physics Letters*, and *Acta Materialia*.

Advisor: Dr. George Rossetti, Jr.

Dr. Harish Kumar, Ph.D., Polymer Science.

During his graduate studies, Harish received the 2018 Graduate Award from the Society of Plastics Engineers UConn Chapter; a 2018 UConn Doctoral Dissertation Fellowship; was awarded first place by the Institute of Research and Journals for his 2016 presentation in ICSTEM; and received a 2016 Graduate Student Travel Award to attend the American Chemical Society's 2016 Conference.

Advisor: Dr. Douglas H. Adamson

Dr. Andrew G. Meguerdichian, Ph.D., Materials Science.

During his graduate studies, Andrew authored and co-authored several publications in the American Chemical Society (ACS) journal, *Inorganic Chemistry*, and Elsevier's journal *Applied Catalysis A: General.*

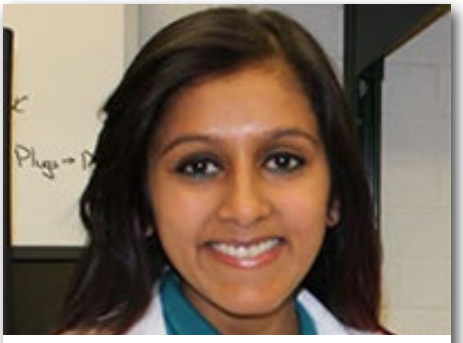
Andrew's research focused on the application of metabolites, small molecules from the human body, for the synthesis, and/or application of transition metal catalysts for energy applications.

Advisor: Dr. Steven L. Suib

Ms. Alexandra Merkouriou, M.S., Materials Science and Engineering. Alexandra is now a Development Engineer at M-Cubed Technologies. She has also returned to UConn to pursue her Ph.D.

During her graduate studies Alexandra received the Outstanding Women Scholars Award (2013); the Material Advantage Chapter of Excellence Award (2014); and the GE Early Career Award (2015).

Advisor: Dr. S. Pamir Alpay



Dr. Tulsi Patel, Ph.D., Materials Science and Engineering. Tulsi is now an NRC Research Associate at the Air Force Research Laboratory in Dayton, OH.

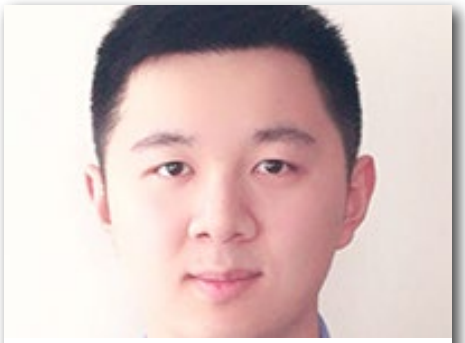
Tulsi's honors include DoED FIPSE-ATLANTIS fellowship (2012-2013); NSF GK-12 fellowship (2014-2016); NSF EAPSI fellowship in Korea (2016); Invited Participant for AAAS Catalyzing Advocacy in Science and Engineering (CASE) Workshop (2018); Best Oral Paper Award at 27th Annual Symposium of Connecticut Microelectronics and Optoelectronics Consortium

Advisors: Dr. Rainer Hebert/Dr. S. Pamir Alpay

Mr. Thomas Reid, M.S., Materials Science and Engineering. Thomas is now pursuing his Ph.D. in Materials Science and Engineering at UConn.

Thomas is a member of the UConn Chapter of the Materials Research Society.

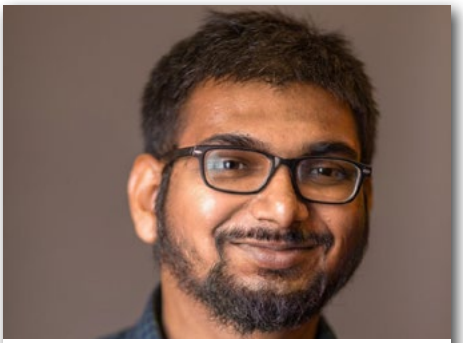
Advisor: Dr. S. Pamir Alpay



Dr. Alan Shen, Ph.D., Chemical Engineering. Alan is now employed at Intel Corporation as a Test R&D Engineer.

During his graduate studies, Alan was the recipient of the 2016 Anton-Paar Research Fellowship as well as the 2015 NASA CT Space Grant fellowship. Alan has also authored or co-authored several research papers published in journals including *IEEE Sensors Journal*, *Journal of Magnetism and Magnetic Materials*, and *Additive Manufacturing*.

Advisor: Dr. Anson Ma



Dr. Sneh Sinha, Ph.D., Polymer Science. Sneh is currently employed with Electroninks in Austin, TX.

Sinha was selected to give a presentation as part of the Excellence in Graduate Polymer Research Symposium at the American Chemical Society national meeting during the spring of 2019.

Advisor: Dr. Gregory Sotzing

Dr. James Steffes, Ph.D., Materials Science and Engineering. James is now employed as a Principal Engineer at GlobalFoundries, a semiconductor foundry headquartered in Santa Clara, CA.

James' work has featured in the *Proceedings of the National Academy of Sciences*, *Science*, *Science Advances*, the *Journal of the American Ceramic Society*, and *Nano Letters*.

Advisor: Dr. Bryan Huey

Congratulations Graduates

Dr. John T. Sypek, Ph.D., Materials Science and Engineering. John is currently employed at Collins Aerospace as a Staff Research Scientist.

During his graduate studies John's honors included Best Poster Award - 18th International Conference on the Strength of Materials (ICSMA) 2018, Materials Science and Engineering Department Graduate Student Speaking Contest Award; Graduate Student Award (Gold) at Materials Research Society's (MRS) 2018 national meeting; and 1st Place for the 2017 School of Engineering Graduate Student Poster Competition.

Advisor: Dr. Seok-Woo Lee

Dr. Mattewos Tefferi, Ph.D., Electrical and Computer Engineering. He is now a research engineer with G&W Electric.

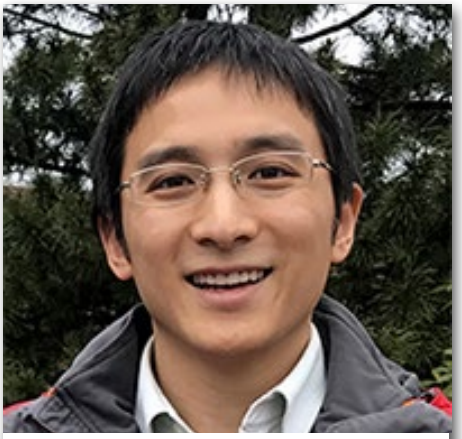
During his graduate studies Mattewos received the 2018 Doctoral Dissertation Fellowship from UConn Graduate School; best poster recognition at the NSF High Voltage and Temperature (HVT) 2017 Spring Annual Conference and 2017 Fall Annual Conference. He was the recipient of a 2016 Pre-Doctoral fellowship from the UConn School of Engineering. Mattewos has also been lead author or co-author for numerous publications.

Advisor: Dr. Yang Cao

Dr. Sriram Vijayan, Ph.D., Materials Science and Engineering. Sriram is now a Postdoctoral Researcher at The Ohio State University.

During his graduate studies, Sriram authored and co-authored numerous research papers which have been published in journals including *Nature: Scientific Reports, Journal of the Minerals, Metals & Materials Society* (TMS), the *Journal of Materials Science*, *Ultramicroscopy*, and *Microscopy and Microanalysis*.

Advisor: Dr. Mark Aindow



Dr. Wei Wu, Ph.D., Mechanical Engineering with a concentration in Energy and Thermal Sciences. Wei is currently employed as a Process Engineer in the Etching Business Unit at Applied Materials in Sunnyvale, CA.

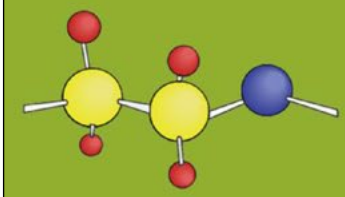
Wei's honors during his graduate studies included 2018 UConn Mechanical Engineering 1st Place Graduate Pre-Doctoral Research Award, 2018 Spring Materials Research Society (MRS) Meeting Symposium NM11 Silver Award, and 2015 FEI Company Graduate Fellow.

Advisor: Dr. Michael Pettes

Dr. Sajad Yazdani, Ph.D., in Mechanical Engineering, with a concentration in Energy and Thermal Sciences. He is currently a Mechanical Engineering & Materials Science Postdoctoral Associate at Yale University advised by Dr. Judy J. Cha.

During his graduate studies, Sajad received the 2015 General Electric Graduate Fellow for Innovation.

Advisor: Dr. Michael Pettes



POLYMER PROGRAM SEMINARS

Fall 2019 - Spring 2020 Seminars

"Plastic or Planet – Everyone's Responsibility"
Dr. Jaime Gomez, Society of Plastics Engineers

"Directed Self-assembly and Crystallization of Polymeric Colloids"
Prof. Marcus Weck, New York University

"Synthetic Strategies by Which to Afford Natural Product-based Polymer Materials: Impacts on Sustainability, Life, Health and the Environment"
Prof. Karen Wooley, Texas A&M University

"Microfluidic Development and Applications of Functional Polymeric Micro-materials"
Prof. Jing Fan, City College of New York

"Manipulation of Product Distributions in Biomass Fast Pyrolysis Using Molten Polymers"
Prof. Hsi-Wu Wong, UMass, Lowell

"Designing TPU/Carbon Nanofiller Nanocomposites with Targeted Properties: A Roadmap for Filler Selection"
Prof. Ica Manas-Zloczower, Case Western University

"Nature-derived Multifunctional Materials and High-Performance Energy Storage"
Prof. Hongli Zhu, Northeastern University

"Bioinspired Design of Dynamic Soft Materials"
Prof. Zhibin Guan, University of California, Irvine

"Perfluoroalkylated Aromatics: From Crystal Engineering to Redox Active Fluoropolymers"
Prof. Haoran Sun, University of South Dakota

"Strategies for Successful Proposals"
Dr. Nora Savage, National Science Foundation

IMS INSTITUTE OF MATERIALS SCIENCE

polymer.ims.uconn.edu/seminars/

UCONN

Distinguished MSE Alumna Leads the Next Generation of Engineers

by Marlese Lessing - Materials Science and Engineering Department

MSE Alumna Dr. Jacquelynn Garofano

A highly accomplished and distinguished MSE alumna, Dr. Jacquelynn Garofano (M.S. '09, Ph.D. '11), has been named Program Manager of the prestigious Margaret Ingels Engineering Development Program at United Technologies (UTC). The program is named after Margaret Ingels, the first American woman to receive a professional degree in mechanical engineering (B.S. 1916; M.S. 1920, University of Kentucky) and the first female engineer at Carrier where she spent a distinguished technical career and was a close associate of Willis Carrier.

Jackie began her career at UTC as a senior research scientist at the Research Center (UTRC) in 2011. For more than seven years, she worked to solve technical challenges, provide failure investigation and develop innovative technologies for UTC's aerospace and building industries, leveraging her materials engineering expertise. Now, she draws on her solid technical foundation, leadership competencies and social impact to lead UTC's newest leadership program.

"In my new role, I have the privilege of cultivating and leading the next generation of engineers who will shape our future. I can't wait to welcome our first cohort into UTC this June!" Jackie said.

The Ingels program is a two-year, entry-level engineering development program designed to build engineering, leadership, and business acumen through a challenging, fast-paced rotation experience. Program associates will receive a holistic view of United Technologies through four six-month rotations at Pratt & Whitney, Collins Aerospace and UTRC across engineering disciplines that exposes them to the product lifecycle: design, manufacturing, testing & validation, operations, delivery, and so on.

Jackie is responsible for recruiting top engineering talent for UTC. She is actively seeking engineers for the second cohort, which starts in 2020. In addition to the Ingels program management, she says, "I also have an opportunity to support UTC's strategic initiatives in STEM education and workforce development to ensure that we are fostering a diverse and competitive technical engineering workforce and pipeline."

In my new role, I have the privilege of cultivating and leading the next generation of engineers who will shape our future.

~Dr. Jacquelynn Garofano (M.S. '09; Ph.D. '11)

Dr. Garofano was named a 2011 Women of Innovation by the Connecticut Technology Council, as a recipient of the Collegian Innovation and Leadership Award, capping off an exceptional career at UConn. Early in her professional career, she earned the unique distinction of landing on the Forty Under 40 outstanding young professional list for Connecticut Magazine (2013) and Hartford Business Journal (2015). Most recently, she was recognized as a 2018 Future is NOW awardee by the CT Women's Education and Legal Fund for her work to advance women and girls in the STEM field.

Breaking CO2 Faster, Cheaper, and More Efficiently

by Kim Krieger - UConn Communications

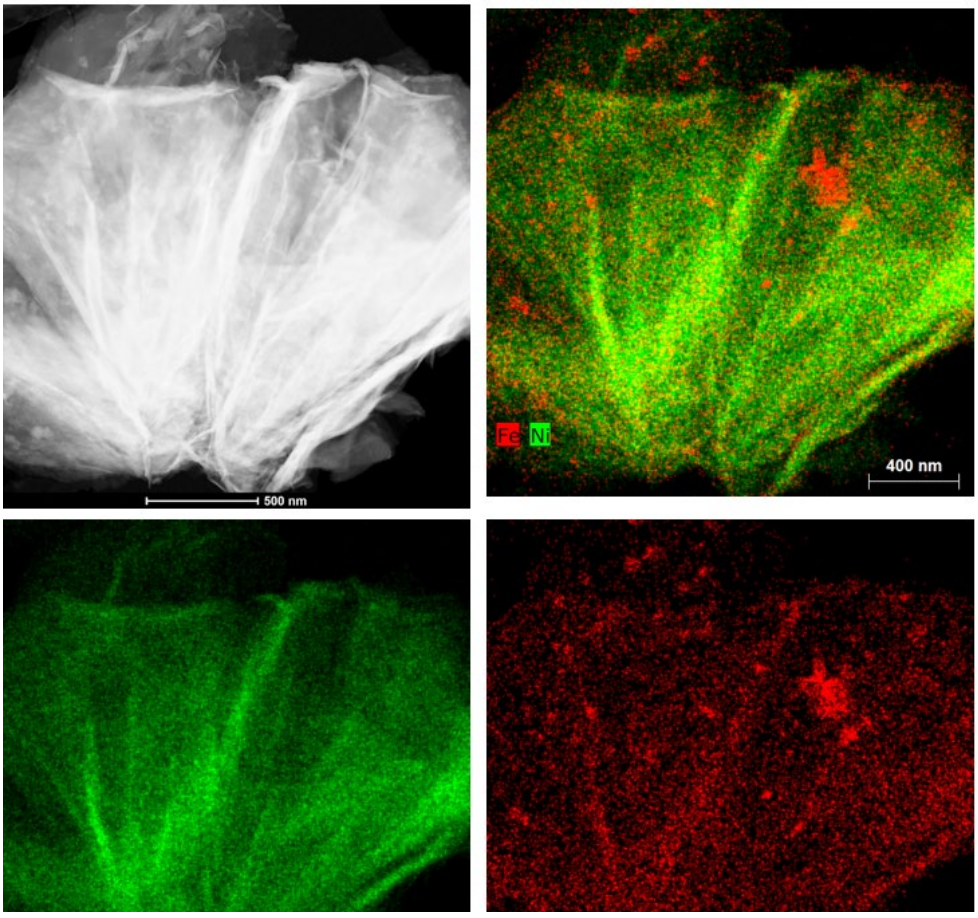
A new catalyst breaks carbon dioxide into useful chemicals faster, cheaper, and more efficiently than the standard method, reports a team of researchers in this week's issue of PNAS. The discovery could make it possible to economically turn carbon dioxide into fuels.

Carbon dioxide is a stable, abundant gas. In fact it's a little too abundant, and the extra carbon dioxide in the atmosphere is changing the planet's climate. Knowing this, many chemists are working on efficient ways to turn carbon dioxide into other useful products. But carbon dioxide's stability makes this tough. It's hard to get the molecule, happy on its own, to react with anything else.

The best existing technique to electrochemically break carbon dioxide into pieces that will chemically react uses a catalyst made of platinum. But platinum is a rare, expensive metal.

Now, a team of researchers led by Yongtao Meng, a former UConn graduate student in the lab of Institute for Materials Science Director Steve Suib and now a researcher at Stanford University, has come up with a better way. They created

Dr. Yongtao Meng



These photos provide color coding of the elements within the catalyst. Where different colors appear in the same area, there is likely a chemical association.

an electrochemical cell filled with a porous, foamy catalyst made of nickel and iron. Both metals are cheap and abundant. When carbon dioxide gas enters the electrochemical cell, and a voltage is applied, the catalyst helps the carbon dioxide (a carbon atom with two oxygens) break off oxygen to form carbon monoxide (a carbon atom with one oxygen.) The carbon monoxide is very reactive and a useful precursor for making many kinds of chemicals, including plastics and fuels such as gasoline.

Not only does the new nickel-iron catalyst work well; it's actually more efficient than the expensive platinum process it could replace. The electrochemical cell using the nickel-iron catalyst gets almost 100% efficiency.

"It's almost unheard of. Typically in a good system you'll get 90 to 95% efficiency, but it might not be stable, might not work at the same low voltage or might not be cheap," says Suib. This process has all of that.

Suib's lab used scanning transmission electron microscopy to map cross-sections of the new nickel-iron catalyst, revealing its internal structure. Technically it's a nickel iron hydroxide carbonate, with a porous structure that allows the carbon dioxide gas to flow through it. Suib's microscopy work showed the catalyst stayed intact and did not degrade from use.

The next step in the process is to see if it can be scaled up, made in bulk, and tested in industrial situations such as power plants that produce large amounts of carbon dioxide as a waste product.

Under Katsouleas, 2020 Will Mark Beginning of Innovation, Research Ramp-Up at UConn

excerpted from a story by Sean Teehan – Hartford Business Journal

If all goes according to University of Connecticut President Thomas Katsouleas' plan, the next decade at UConn will be defined largely by innovation, research and working with industry and state actors on workforce-development issues.

UConn Chemistry Building (l) and Engineering and Science Building (r)

At his first board of trustees meeting after replacing outgoing UConn President Susan Herbst last August, Katsouleas said he wanted to bolster UConn's position as a research university, and put it on track to becoming a destination for entrepreneurs and researchers intent on creating and commercializing new products.

In an interview about plans for his first full year leading UConn, Katsouleas said he'll focus in 2020 on laying the foundation for his long-term goal of doubling annual research funding at the university from its current level of about $265 million to $500 million within the next 10 years.

UConn President Thomas Katsouleas

That will include spending time talking to various constituencies, including students, faculty and legislators about what a built-up research and entrepreneurship institution should look like, and what metrics the administration should use to measure success.

One of the biggest obstacles standing between Katsouleas and his plan to reinvent UConn as a rival to innovation powerhouses like Stanford University and MIT is the school's multibillion-dollar unfunded pension liability.

That liability, which cost UConn and UConn Health $52 million in 2019 alone, makes the school a more expensive place for entrepreneurs to base their operations compared to other research universities, putting it at a disadvantage in attracting grant-funded researchers.

"We cannot achieve our goal of doubling research and scholarship if we don't remove that disadvantage," he said.

Katsouleas said a long-term plan needs to be developed to deal with the liability, but he's putting a temporary solution in place for this year.

Beginning this month, the school is using about $4 million from its academic budget to offset the fringe costs researchers incur when working out of UConn facilities, he said.

"That's the plan, to mitigate the effect of the pension liability on those researchers submitting grants," said Katsouleas, who noted that the plan is a Band-Aid, not a permanent fix, since it involves reprioritizing funds meant for other things. "It's not something we think we can do year after year. You can defer some investment in a laboratory repair, but you can only defer it for so long."

That temporary measure would be in addition to a $20-million plan the school recently aired to recruit and hire 10 experienced entrepreneurial faculty over the next five years.

The so-called Academic Entrepreneurship initiative aims to hire proven life-sciences scholars, innovators and entrepreneurs who can help the school ramp up commercialization of discoveries made by faculty and students.

Part of the investment includes seeding each new hire with a $1-million startup

fund that could be used for new equipment, lab space, supplies and other resources.

To help underwrite the plan, UConn is looking for a $10-million investment from the Connecticut Bioscience Innovation Fund (CBIF), which provides financial assistance to push bioscience breakthroughs to market and is overseen by the state's quasi-public venture investor, Connecticut Innovations.

The rest of the money would come from philanthropic giving.

A $22.5 million gift from Peter J. Werth, a philanthropist and founder of generic drug company ChemWerth Inc., will also bolster Katsouleas' plans to expand innovation, he said.

In addition to its pension liability, UConn also faces the threat of future funding cuts from the state legislature, as lawmakers still face the possibility of budget deficits, especially if a recession hits.

Boosting Workforce

Helping the state's workforce-development efforts is also on Katsouleas' 2020 agenda.

The idea of higher education and industry working together to develop Connecticut's workforce has been a key focus for Gov. Ned Lamont, and in his first few months as president, Katsouleas said he has made an effort to engage with the business community, meeting with the heads of major Connecticut companies like Pratt & Whitney, Stanley Black & Decker and Synchrony Financial.

He's also an ex-officio member of the Governor's Workforce Council, which will be presenting a new comprehensive workforce-development strategy for the state by the end of the year.

"I've been getting a message from all of the CEOs I've met with about how important UConn is to their workforce development, and to their research," Katsouleas said. "Working together, we can do workforce development that meets the needs for the entire state, but also leaves no demographic of our workforce behind in that process."

IMS Industrial Affiliates Program Welcomes Industry Partners for 2019 Annual Meeting

by Rhonda Ward - Institute of Materials Science

IMS Industrial Affiliates Program Director, Dr. Paul Nahass, opens the 2019 Annual Meeting.

The IMS Industrial Affiliates Program (IAP) held its 2019 Annual Meeting on June 11, welcoming nearly 100 representatives from over 40 industry partners. Dr. John A. Elliott, Interim Provost and Executive Vice President for Academic Affairs offered the keynote address.

The morning session was hosted by Dr. Paul Nahass, Director, and Dr. Hatice Bodugoz-Senturk, Associate Director of the program, which is the industry outreach arm of the Institute of Materials Science (IMS). The session featured research presentations from Dr. Yang Cao, Director of

continued on next page

Interim Provost, Dr. John A. Elliott, offered the keynote address at the 2019 Annual Meeting.

Dr. Lesley Fame, Assistant Professor of Chemical & Biomolecular Engineering presents her research at the 2019 Annual Meeting.

the Electrical Insulation Resource Center (EIRC); Dr. Luyi Sun, Director of the IMS Polymer Program; Dr. Lesley Frame, Assistant Professor of Materials Science and Engineering; and Dr. Bryan Huey, Department Head of the Materials Science and Engineering Department.

Dr. Steven Suib, Director of IMS, presented a bright future for IMS, noting the strides in research, growth of membership in the IAP, and the addition of faculty members. His presentation included artist renderings of Science One, the future home of IMS.

In his address, Dr. Elliott held IMS up as a template for many institutes within the university that were established following the creation of IMS. He also hailed the industry partnerships IMS has been able to forge through the IAP, which performs characterization and microscopy services that help our partners bring safe and reliable products to market. Dr. Elliott also spoke about the need to educate and train technical and operations workers for jobs in the manufacturing industry critical to creating and maintaining business in the state.

For the first time, IAP offered workshops as part of the day. 2019 workshops included *Surface Analysis Techniques, Electron Microscopy Techniques*, and *X-Ray Spectroscopy Techniques*. The IMS Polymer Program presented its joint poster session with the Materials Science and Engineering Department (MSE) and the Electrical Insulation Resource Center (EIRC) at the Innovation Partnership Building (IPB) providing an opportunity for industry representatives to interact with students and discuss students' research interests. For the second year the IPB coordinated with IAP to offer laboratory tours of facilities in the flagship building of UConn's Tech Park.

Dr. Luyi Sun makes presentation at 2019 Annual Meeting.

X-ray Spectroscopy for Materials Characterization

An IMS Industrial Affiliates Program Short Course

About the Course

This one-day course is composed of three modules to provide theoretical background and operational demonstrations for numerous x-ray analytical techniques for various materials such as composites, metals, polymers, and biomolecules.

Course Highlights

Module 1: X-ray Micro CT Scanning (Dr. Sina Shahbazmohamadi)
Module 2: X-ray Fluorescence and X-ray Diffraction (Dr. Daniela Morales)
Module 3: Small- and Wide-angle X-ray Scattering (Dr. Mu-Ping Nieh)

Who Should Attend

The course will cover the capabilities of the techniques, the types of samples that can be analyzed, and the quality and accuracy of results for participants with expert, little, or no theoretical or practical knowledge. Attendees will leave with a good understanding of x-ray analytical techniques and their applicability for various materials systems.

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Ms. Kaitlyn Cullen

Kaitlyn Cullen Joins IMS Staff as Administrative Assistant to Director

Ms. Kaitlyn Cullen (Kate), formerly an administrative assistant for the Materials Science and Engineering Department (MSE), joined the IMS in the position of Administrative Assistant to IMS Director Dr. Steven Suib.

An alumna of UConn, Kate graduated with a dual B.A. in Psychology and Human Development, bringing a diverse skillset to IMS. In addition to her work in MSE, Ms. Cullen has worked for insurance giant Cigna and MassMutual Financial in an administrative capacity.

Five Questions for Capri Price

Capri Price joined the IMS technical staff in July 2019 as manager of the Gas Chromatography Mass Spectrometry (GCMS) and Spectroscopy laboratories. She received her Ph.D. in 2018 from Portland State University where her research focused on detecting the earliest signs of metallic corrosion via electrochemistry and spectroscopy. She also taught and instituted new curricula for instrumental analysis, quantitative analysis, and general chemistry laboratories.

You have been with IMS less than six months, how are you finding your time here?

I have found IMS to be a welcoming atmosphere of people who are eager to see the pursuit of science succeed. Everyone I have worked with clearly takes pride in doing their job well. I have already had the opportunity to work on many industry and student projects, spanning a wide range of topics, each offering an opportunity to demonstrate and expand our understanding of the lab's capabilities.

One of the missions of IMS is outreach, with the IAP serving as the industry outreach vehicle for the institute. How does the work you perform in the GCMS/Spectroscopy labs assist our industry partners?

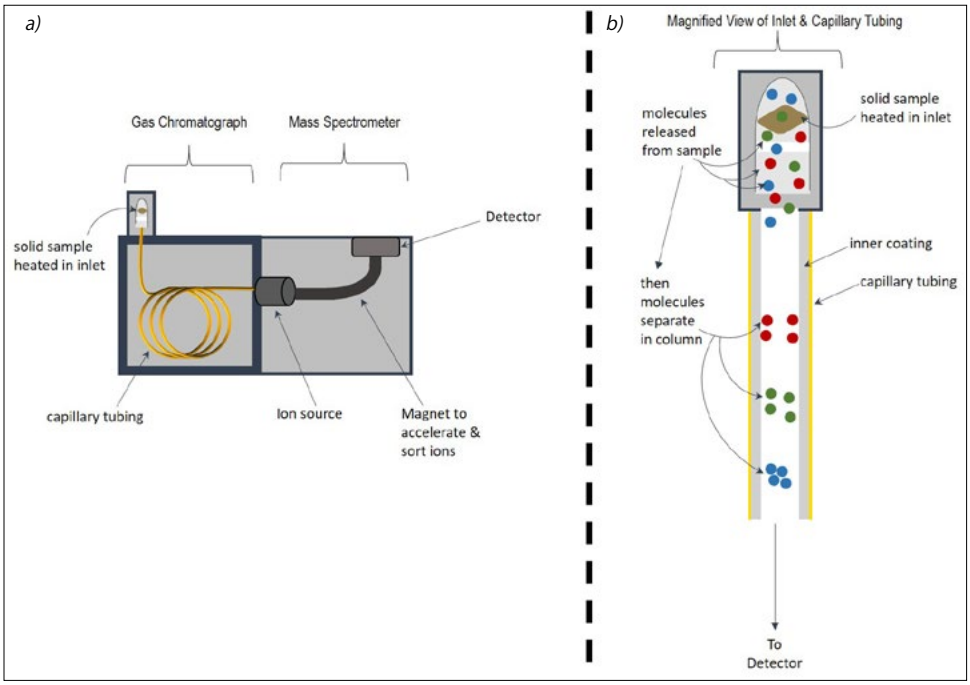
My labs are often the first line of defense in answering the question "what is this material made of?".

Identifying the chemical composition of an original material can be the starting point for answering further questions. These questions might be: is this new raw material similar enough to our original material? Has the material's structure changed after it has been used? What is the chemical composition of this visible degradation? This information can enable a company to take steps to prevent future problems.

How would you explain the instrumentation in your lab to a layperson?

Dr. Capri Price

The infrared instruments shine an infrared light onto samples, which causes the molecules in the sample to vibrate. This information is recorded in what we call a spectrum (an example is shown in Figure 1)- I sometimes refer to this as a record of the sample's dance moves. Each molecule has unique move(s) that separate that particular molecule from others. These move(s) present with specific frequencies and intensities. These different vibrations allow us to distinguish the various types of molecular arrangements present in the sample- ex. "this sample has an alcohol" or, "this sample has a phosphate". This can be valuable information for a com-



Depiction of gas chromatography-mass spectrometry, where part a) is an overview of the instrument, while b) is a detailed view of the sample introduction into the capillary column.

pany looking to understand the overall structure of a material.

With the gas chromatograph-mass spectrometers, the goal is to separate a mixture of chemicals (this is the gas chromatograph's job) and then send them one by one to the mass spectrometer, where the chemicals are then identified.

In my lab, we most often use a technique called "thermal desorption", where we heat a solid sample in order to release volatile molecules from the sample. These molecules are injected into a long piece of capillary tubing with a chemical coating inside. This coating interacts with the molecules to varying degrees, largely based on the boiling point of the molecule and whether a molecule is more polar, like water, or more nonpolar, like oil. More interaction will slow that particular chemical down and it will reach the detector later than a chemical that does not interact as much, thereby separating out a sample's mixture of molecules.

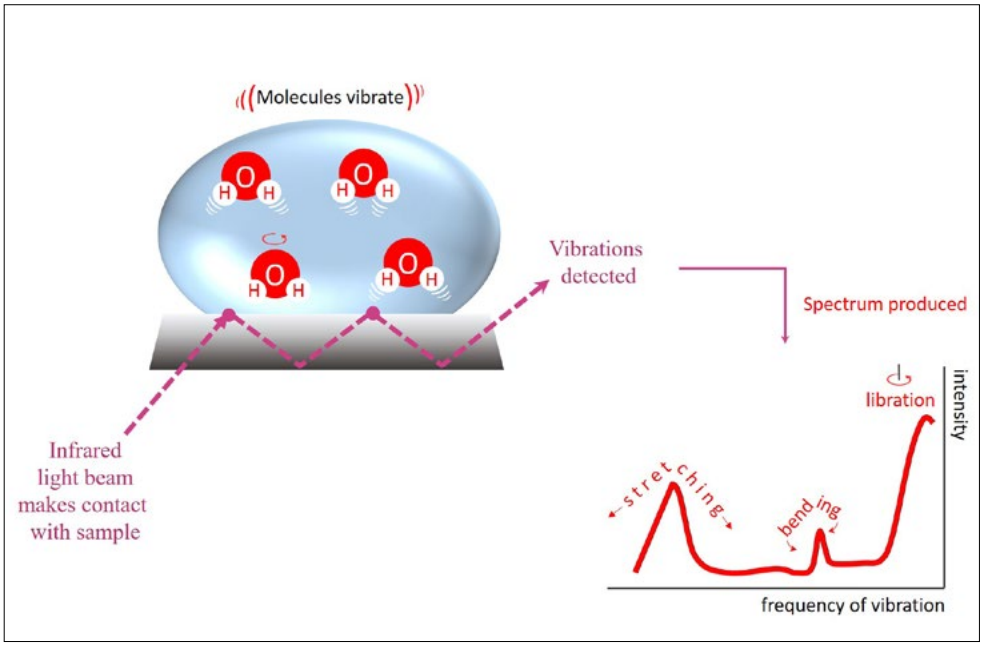
From the gas chromatograph the chemicals exit the end of the capillary tubing and go into the mass spectrometer (MS). In the MS the molecules are first ionized, as being charged allows them to be moved about by the magnetic fields in the spectrometer. These magnetic fields are used to sort the ions based on their weight and charge. This information is recorded, and, based on the ratio of the weight and the charge, we can determine what molecules are present. This technique is particularly valuable for its low detection limit- meaning that it can see very small amounts of contaminants or additives.

You are new to Connecticut. Have you had an opportunity to explore the state, the region, the campus? What are your impressions so far?

Experiencing my first New England fall has been an excellent introduction to Connecticut. I have been impressed by the number of state parks in Connecticut- one for every 40 sq mi – and exploring these areas has been a great weekend activity. Having never lived on the East Coast, I am also enjoying exploring other states and historical sites that I've only read about.

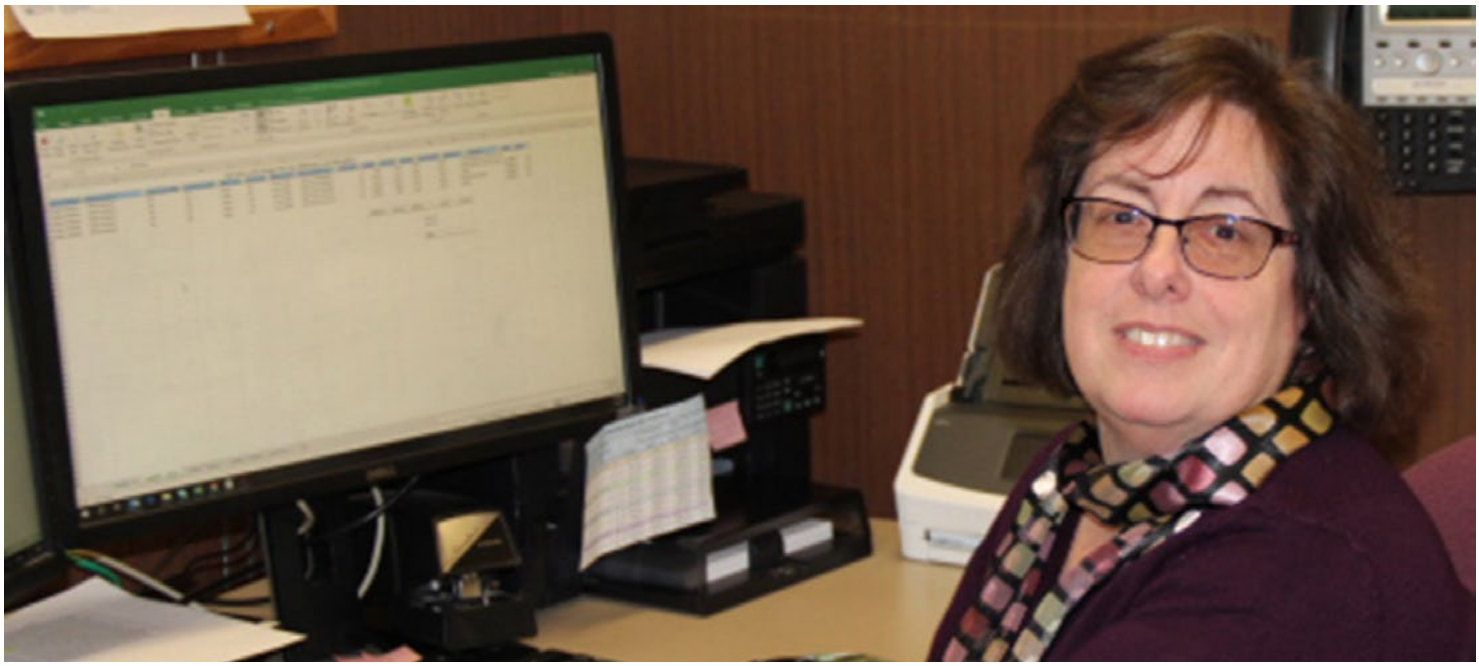
You have an impressive history of volunteerism and outreach to youth. What inspires you to pursuits such as this?

There were a few moments in my career where my continued success was greatly influenced by a new idea or perspective provided by a mentor. Without those mentors, I would not have dared to pursue my interest in chemistry as far as I have. Mentoring others, and hopefully having a similar impact, helps me stay motivated to continue learning and pursuing my own personal growth. Additionally, it has been uplifting to watch young people, particularly women, begin to understand their worth and potential as human beings.



Depiction of infrared spectroscopy and readout.

For Shari Masinda It is All in the Numbers



Shari Masinda pauses from her work in the IMS accounting office.

Shari Masinda has worked in the Institute of Materials Science (IMS) for 12 years and at UConn 16 years. She began working for the University's Small Business Development Centers, then transitioning to IMS as an administrative assistant for the Industrial Affiliates Program (IAP). Currently, she is a financial assistant in IMS administrative offices. Shari is the mother of two grown sons, and has recently celebrated her 32nd wedding anniversary.

You have had a wide variety of experiences in IMS operations from processing travel and providing administrative support to the IAP to a big responsibility with financial operations. How do you think you have grown due to your working experiences in IMS?

I like being able to see the "big picture" in work tasks. For me, financial transactions are a big puzzle that are linked to one another. Just doing one task without being able to see how everything else is impacted is very limiting. I'm happy to be in a position to see how things work in the background.

What would you say is the best part of your job, and why?

The best part is interacting with people; staff, students and faculty. I feel that the students are our future and it is incredibly important to be supportive while they're here. I like finding out where they are from and where they hope to go after graduating. I've found that the faculty are so interesting and devoted to their research. I am truly impressed by the dedication to research—trying to improve our lives through science and innovation, so cool.

Having been in IMS for several years, what are some of the big changes that have happened over the years that stand out for you?

One of my favorite quotes is, "The only thing that is constant is change." The biggest change that I've noticed is a change in attitude. That comes from bringing in positive, team-oriented people. I also feel that there has been a necessary shift to integrate business and industry with academics. Having started at UConn in Small Business Development Centers, I've always valued business. The change in attitude and direction is a real advantage to students, faculty, and the department.

These days, you are considering retirement. Are there activities you look forward to starting or diving deeper into after retirement?

I think about it all the time. I try to recall the things I loved doing before. My husband and I will be traveling more; we just renewed our passports. I would like to do more photography and volunteer work. I would like to de-clutter my house, but all the stuff is tied to memories, so that will be tough. Most of all, I am looking for the gift of time — time to look at the color in an autumn leaf and feel sun on my face. I think I will have more appreciation for everything when I have the luxury of time.

How will you remember your time in IMS?

I've learned to mostly say "polymers" instead of "plastics." And in the news, every time I hear "chemicals" with a negative connotation, I remember that everything is made of chemicals (mostly words I can't pronounce). I have a far greater appreciation for the materials and design that go into every single thing. I'll remember the great positives, the surprising silver linings, and the humor in situations. I am always impressed by the science, even if I don't understand it. I'll remember the people most of all.

Nancy Kellerann 'Gets' It

Nancy Kellerann handles all purchasing, shipping and receiving for IMS.

Anyone who needs anything in IMS will eventually meet Nancy Kellerann. Nancy is the administrative specialist responsible for purchasing, shipping, and receiving for all of IMS. Whether it is a ream of hole-punched paper, a desktop or laptop computer, or a tank of helium gas, Nancy plays a vital role in ensuring every person in IMS has what they need to meet the institute's mission of education, research, and outreach.

You have 30 plus years of experience working in various UConn departments. What departments have you supported and how do you feel have you grown through your years of experience?

I worked in both the purchasing and the accounts payable department for several years. But it was my good fortune to take a position at the UConn School of Continuing Education to support a group of artists in the marketing department. They were an eclectic group of artists who worked together to design award-winning TV, print and radio advertising campaigns for UConn continuing education and many other UConn colleges. They are the people who opened up the world of art for me.

You coordinate the purchasing, receiving, and shipment of a wide range of resources for IMS including chemicals that can be harmful if proper precautions are not taken. What would you say is the most important part of your job?

An important part of my job is…buy, buy, buy. And there is so much shopping to be done that I have to keep reminding myself: Don't panic and keep spending. It's no wonder that in my personal life I loathe shopping!

You have worked for IMS for 18 years. What are some of the systems and procedural changes you have witnessed over the years that have had a positive effect on your ability to carry out your responsibilities?

Well, the advent of personal computers has changed the way I do my job. When I started working at UConn, staff members had electric typewriters and mountains of paperwork. Now we have computers (and mountains of paperwork). Email has giving me the ability to communicate easily with staff, faculty and students.

What would you say is the best part of your job and why?

The people are the best part! I've met a wonderful and diverse group of people in IMS. There are moments here and there when people share a little about themselves. I really appreciate that.

You have a keen interest in the arts and culture. What are some things you do to nourish your interests outside of work?

I support local artists by attending local art shows and openings. And for the past two years before sunrise on Saturday morning you can find me climbing Horsebarn Hill with my camera. Every sunrise is an original work of art.

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Support the Institute of Materials Science

For over fifty years, the UConn Institute of Materials Science (IMS) has invested in scientific development within the state, across the nation, and around the globe. Our students, faculty, staff, and alumni continue to make countless contributions made possible by the educational, outreach, and research efforts of IMS. We are home to more than 150 graduate students performing research in our materials science, materials science and engineering, and polymer science programs.

Please consider donating to the institute as we make strides toward a richer future. Your donation to the fund(s) of your choice will directly contribute to our efforts to keep our research infrastructure and graduate education strong.

The Owen F. Devereux MSE Undergraduate Excellence Scholarship (31384)
Funds will be used to provide undergraduate merit based scholarships in honor of Professor Owen F. Devereux to students in the Materials Science and Engineering Program.

IMS Equipment and Maintenance (21753)
This account provides cutting-edge equipment and maintains IMS facilities. IMS houses a wide range of advanced research instruments and facilities.

IMS Polymer Mixture Thermodynamics (20334)
This account supports graduate students and faculty studying polymer mixtures.

An Unrestricted IMS General Fund Account (20312)
This account supports all IMS activities, from maintenance of supplies to industrial collaborations.

Julian F. Johnson Alumni Fellowships Fund (22177)
This account provides fellowships to graduate students in the IMS polymer program. The polymer program is the only center in Connecticut dedicated to research and education in polymer science and engineering and is nationally and internationally recognized for its excellence.

Materials Science and Engineering (MSE) General Fund Account (22165)
This account supports the materials science and engineering program offered by the Department of Materials Science and Engineering. MSE focuses on the production, processing, characterization, selection, design, and modeling of materials.

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Alumni, we would love to hear from you!

Send us your highlights, news stories, updates, research information, and photos. We would like to feature you in our next publication.

Please send email to: IMSnews@uconn.edu

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