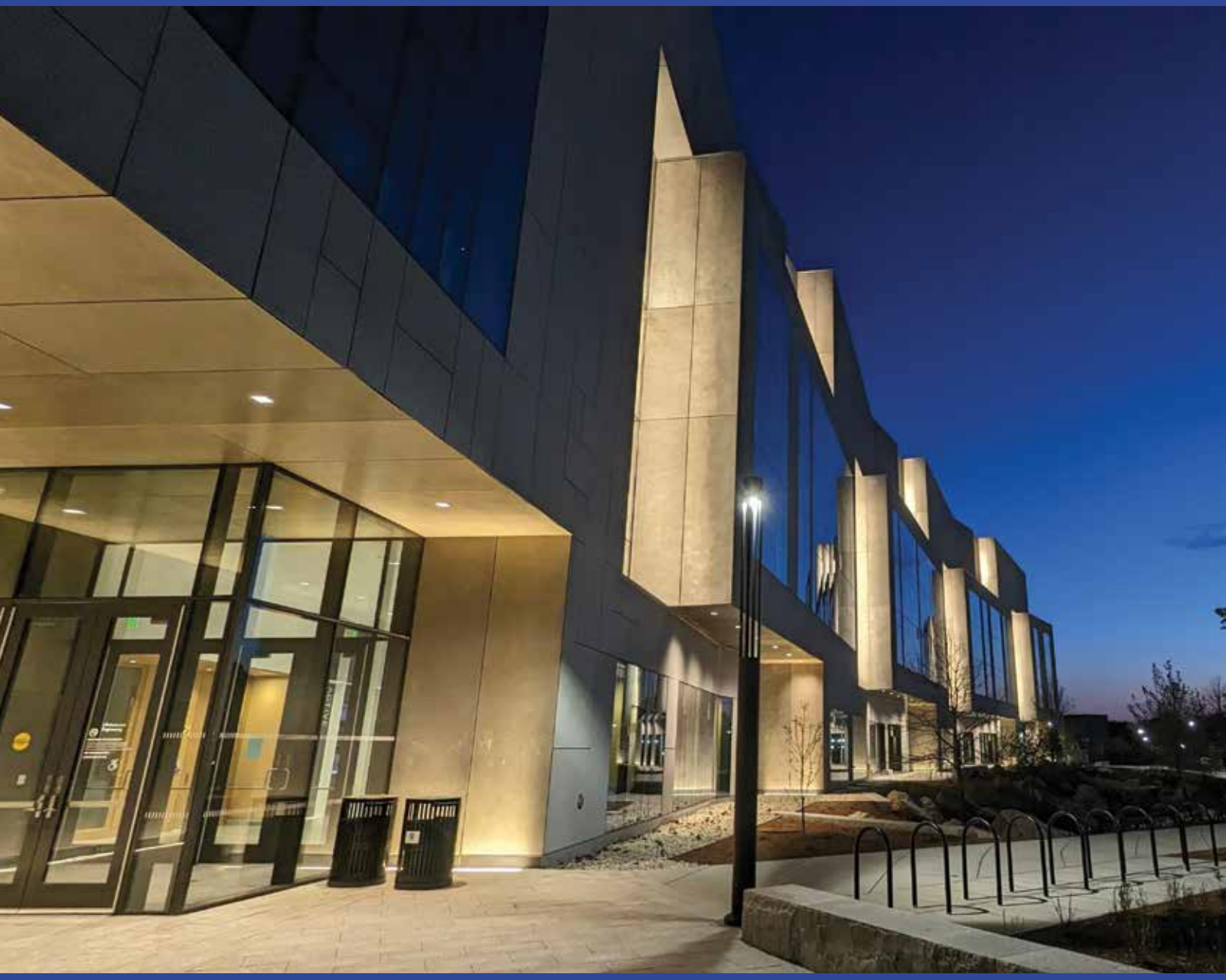
materials science &ENGINEERING 2023



MATERIALIZE YOUR FUTURE.

UCONN

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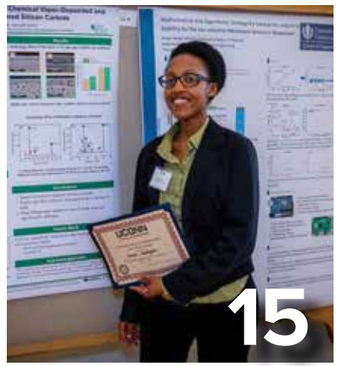

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This outreach bulletin is produced for the students, alumni, faculty, corporate supporters, and friends of the Department of Materials Science and Engineering at the University of Connecticut.

Please direct any questions or comments to mse@uconn.edu.

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Department Highlights

There's never been a bigger year for UConn MSE.

We moved into the new Science 1 building, providing 200,000 ft^2 devoted to materials research and education. We celebrated our very own Professor Radenka Maric rising to University President, and added 2 new faculty to the department as well. Collectively, our 20 professors are overseeing $60M in active research awards. We welcomed 18 new Ph.D. students this fall, our biggest cohort ever. We continue to be recognized as leaders by the broader materials community through new fellowships and major leadership in TMS, ASM, MRS, UMC, and others. And our students and alumni are evermore successful.

At the same time, MSE's rankings are mimicking the impressive trajectory of our university overall. The Wall Street Journal just identified UConn as #9 among all public universities in the country. We score highly in affordability and the value a degree adds to graduates' salaries. We are most proud to be tied for 1st for the average time it takes our undergraduates to earn their degrees –just 4.1 years. It's a great time to root for UConn too, with our 2023 national championship basketball team.

Read further to learn about so many achievements by our faculty and researchers. Get a peak inside our new labs. Hear more about what motivates our diverse students and alumni. Discover the breadth of industries and agencies with which we work.

Most of all, we hope this newsletter inspires you to engage with us further. We know you'll be amazed when you visit. Help us to uphold our message and commitment to our students: 'Materialize Your Future.'

Bryan D. Huey
Department Head

MSE Welcomes New Faculty

ALEXANDER DUPUY
Assistant Professor

Having received his Ph.D. in mechanical engineering from the University of California, Riverside in 2016, Dupuy went on to work for the University of California, Irvine, as a post-doctoral scholar and then as assistant project scientist before joining us here at UConn.

With 16 years of research experience in ceramic processing and synthesis, particularly using Spark Plasma Sintering (SPS), Dupuy makes for an exciting addition to the department. His research interests include materials related to electrifications (such as energy generation, storage/batteries, delivery, and conversion), materials for high temperature and extreme environments, and the processing, properties, and behavior of high entropy ceramics.

XIAO-DONG ZHOU
Professor and Director of Center for Clean Energy Engineering, Sustainable Energy Technologies

As the incoming director of the Center for Clean Energy Engineering (C2E2) at the University of Connecticut, Zhou aspires to catalyze the widespread adoption of clean energy sources, reduce greenhouse gas emissions, and promote environmental stewardship by focusing on the development of advanced materials, efficient processes, and innovative solutions.

"My goals as director of C2E2 revolve around achieving elevated research outcomes, empowering students through education, fostering effective partnerships, making a positive environmental impact, and expanding outreach efforts," he said. "I also plan to create enriching experiences for undergraduate and graduate students by involving them in cutting-edge research and providing opportunities for skill development in the field of sustainable energy."

Brand-New Science 1 Facility Hailed as Game-Changer for UConn

The state-of-the-art facility offers 198,000 square feet for research, teaching, and innovation.

State leaders and industry partners joined the UConn community to formally celebrate the opening of the state-of-the-art Science 1 facility in Storrs on Thursday, June 15.

“Science 1 is transforming the way we educate,” UConn President Radenka Maric said at a ribbon-cutting ceremony held at the brand-new facility on King Hill Road. “This new building will support our efforts for federal funding and support our industry in the state. We want to be at the top of innovation in Connecticut. I always tell people Connecticut is a state of innovation, we are just too humble to tell people how innovative we are.”

Science 1 , the new home of the Institute of Materials Science, is one of the largest projects in the Next Generation Connecticut initiative, which was announced in 2013 to significantly expand UConn’s educational and research work in STEM (science, technology, engineering, and mathematics) fields.

The building is one of UConn’s largest and most technologically advanced facilities, with some 198,000 square feet dedicated to 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, administrative support offices, and informal gathering places.

It also includes a “clean room,” which is a space designed to support specialized scientific research in a tightly controlled environment where contamination is minimized to protect the work by filtering airborne particles from within the room.

“We know that if children have the opportunity to become familiar with STEM fields that are growing, expanding, and evolving, it is great for Connecticut,” Lieutenant Gov. Susan Bysiewicz said at the ceremony. “It’s equally important that we have state-of-the-art facilities to get our higher education students excited about studying STEM, and I know they are going to have the opportunity to do that in this beautiful building. The governor and I are very passionate about STEM education and STEM careers, because many of the thousands of jobs that are open right now in the state are in STEM fields, and are among the highest paying jobs.”

In addition to its cutting-edge research and teaching applications, Science 1 was also designed to incorporate best practices in sustainability and energy efficiency, as part of UConn’s effort to achieve carbon neutrality by 2030.

The sustainability features of the facility will reduce energy usage, improve thermal comfort, optimize energy performance, and incorporate on-site renewable energy systems.

“Science 1 is designed for best practices in sustainability, and I am very passionate about incorporating climate change into how we act and think,” Maric said.

The facility is also intended as a crucial step forward in Connecticut’s investment in UConn as an engine for innovation and economic development. It further enhances a key priority of the University’s, which is to boost entrepreneurship and research funding.

“This building expresses our mission in every dimension as a public, flagship, land grant institution,” UConn Provost Anne D’Alleva said. “This building is for everyone in the state, and we couldn’t be prouder to create it and share it with everyone in our state. It truly represents the dedication of our state leaders, our industry partners, and our entire Connecticut community in advancing learning, research, and economic development.”

UConn Today, Mike Enright

(l-r) Rep. Kathy Kennedy; Rep. Tim Ackert and his grandson, Jameson; Mansfield Town Manager Ryan Aylesworth; Mansfield Mayor Toni Moran; President Radenka Maric; Sen. MD Rahman; Rep. Gregg Haddad; Sen. Cathy Osten; Rep. Holly Cheeseman; Lt. Gov. Susan Bysiewicz; Sen. Mae Flexer; Provost Anne D’Alleva; Trustee Philip Rubin; Student Trustee Aanya Mehta; and Institute for Materials Science Director Steven Suib join together at the dedication of the Science 1 Research Center on June 15, 2023. (Peter Morenus/UConn Photo)

Dr. Cato T. Laurencin of UConn accepting the 2023 Priestley Medal (Photo credit: EPNAC.com).

Dr. Cato T. Laurencin Awarded the 2023 Priestley Medal by the American Chemical Society

The Priestley Medal is the highest honor of the American Chemical Society.

On March 28 Dr. Cato T. Laurencin, the University Professor and Albert and Wilda Van Dusen Distinguished Endowed Professor at the University of Connecticut, received the 2023 Priestley Medal. This is the highest honor of the American Chemical Society. He was honored “for pioneering, breakthrough work on polymeric materials and polymer composites for biologic use, and for leadership in inclusion, diversity, equity, anti-racism, and learning (IDEAL).”

In chemistry and materials science, Laurencin is a pioneer in polymeric materials chemistry, and polymeric materials science engineering for musculoskeletal systems. He produced seminal research work and discoveries in patents and papers on polymeric nanofiber technology, ushering in the field of polymeric nanomaterials for tissue regeneration. His work in published papers and patents focusing on polymer-ceramic systems inspired the development of biocomposite materials, including interference screws for which he was named “One of the 100 Engineers of the Modern Era” by the American Institute of Chemical Engineers at their centennial celebration. Fundamental research on polymeric fiber system for soft tissue regeneration has led to a number of soft tissue regenerative systems including the Laurencin-Copper (LC) bioengineered anterior cruciate ligament, now in humans. His work on engineered materials for soft tissue regeneration was highlighted by National Geographic Magazine in its “100 Scientific Discoveries that Changed the World” edition. He has worked with industry on the development and understanding of systems combining polymeric materials and allograft human tissue, creating technologies helping patients throughout the world.

The Priestley Medal (Image Credit: American Chemical Society).

Laurencin is the pioneer of the field of Regenerative Engineering. His work encompasses fundamental science, applied research, and research translation to clinical applications.

Laurencin is also the editor-in-chief of the Journal Regenerative Engineering and Translational Medicine. Regenerative Engineering and Translational Medicine is an international journal covering convergence (the deep integration) of the disciplines of advanced materials science, stem cell research, the physical sciences, developmental biology, and clinical translation. Convergence brings exciting opportunities to translate bench-top research into bedside methods, allowing the possibility of moving beyond maintaining or repairing tissues to regenerating them.

Laurencin is an elected member of the National Academy of Sciences, the National Academy of Engineering, the National Academy of Medicine, and the National Academy of Inventors.

He is the first individual to receive the highest distinctions across science, engineering, medicine, and technology for this work. In science, he received the Philip Hauge Abelson Prize from the American Association for the Advancement of Science awarded “for signal contributions to the advancement of science in the United States.” He was awarded both the highest/oldest honor of the National Academy of Engineering (the Simon Ramo Founders Award) and one of highest/oldest honors of the National Academy of Medicine (the Walsh McDermott Prize). And he received the National Medal of Technology and Innovation, our nation’s highest for technological achievement in ceremonies at the White House.

Laurencin has also profoundly contributed to mentoring and fostering diversity. He was honored by President Barack Obama with the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring. He received the 2021 Hoover Medal given jointly by the American Institute of Chemical Engineers, the American Society of Mechanical Engineers (ASME), the American Society of Civil Engineers (ASCE), the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) and the Institute of Electrical and Electronics Engineers (IEEE). The purpose of the medal is “to recognize great, unselfish, non-technical services by engineers to humanity.” Laurencin’s exceptional dedication to inclusion, equity, and fairness along with his impactful work in mentoring led to his selection.

UConn Today, Jini Davis

MAJOR NEW AND ONGOING AWARDS

>14M

MARK AINDOW
PAMIR ALPAY
HAROLD BRODY
LESLEY FRAME
RAINER HEBERT
BRYAN HUEY
SERGE NAKHMANSON
VOLKAN ORTALAN

DOD-AFRL:
Advanced Manufacturing

>3M

MARK AINDOW
PAMIR ALPAY
AVINASH DONGARE
LESLEY FRAME
RAINER HEBERT
SERGE NAKHMANSON

DOD-Navy:
National Institute for Undersea Vehicle Technology

2.1M

LESLEY FRAME

DOD-ARL: Data for Materials Assessment and Processing

750K

BRYAN HUEY

Dept. Ed: Materials Engineering Grad Student Training Grant

750K

YUANYUAN ZHU

DOE: Tungsten under Fusion Extremes

650K

XUEJU (SOPHIE) WANG

NIH: Multifunctional 3D Bioelectronic and Microfluidic Hybrid Systems

550K

PRABHAKAR SINGH

DOE: Scalable SOFC Power System

400K

AVINASH DONGARE

DOE: Reverse Phase Transformations and Detwinning

VOLKAN ORTALAN received the AFOSR's Defense University Research Instrumentation Program (DURIP) award for his project on "Multimodal Ultrafast Electron Microscopy and Femtosecond Spectroscopy in Extreme Environments."

Image: Researchers test a laser in Professor Ortalan's lab (Gideon Silfe/UConn).

MSE's Involvement in the University Materials Council

Department Head Bryan Huey's thoughts on being elected UMC chair and the bright future of materials science and engineering at UConn.

For the 2022-2023 academic year, Department Head Bryan Huey was elected as the chair for the nationwide association of MSE department heads. This 'University Materials Council' (UMC) meets twice a year to share statistics about our programs, lists of students interested in graduate school, and other helpful information. "We also host academic job announcements—it's been an amazing year for MSE programs across the country, with more than 45 faculty searches over the past 9 months. Most of all though, we are there to share best practices with each other."

For instance, in 2020 the UMC had several virtual meetings as they realized the magnitude of the looming Covid pandemic. Member programs shared valuable advice on effective lab instruction during Covid, supporting our department communities from afar, approaches to health and safety, and more.

"It really helped us all to collectively figure out ways to best deal with Covid as educators," Huey remembers. "For example, I believe several programs have now duplicated how we modified our weekly seminars here at UConn. As we shifted to talks online, we encouraged much shorter presentations, and balanced that with substantially more discussion driven by panels of students with overlapping interests. Even after pivoting back to being in person, we're still benefitting. I don't think seminar visits have ever been so engaging."

Professor Huey and the other five UMC officers are responsible for organizing the biannual meetings. This past fall, the UMC assembled in Boston coincident with the Materials Research Society Conference. The 65 attendees enjoyed panel discussions focused on undergraduate student recruiting, budgeting, and advice for new department heads. This Spring, 45 heads met in San Diego alongside The Minerals, Metals & Materials Society (TMS) conference. There was an update on student recruiting, discussions on how to leverage artificial intelligence in materials education, and conversations about department culture and inclusivity.

MSE Department Head Bryan Huey, who was elected as chair of the 'University Materials Council' (UMC) for the 2022-2023 academic year.

"I'm especially pleased that broad support emerged across the UMC membership for a few nationwide efforts that should benefit materials professionals," Huey notes. "For one, we're going to kick off communities of practice for those supporting our teaching labs. This will make it easier for us to share popular lab modules, or to identify the most suitable equipment for an undergraduate lab."

After speaking about past improvements, Huey went on to talk about the future. "I'm personally most excited about another effort, focused on more effectively broadcasting what materials engineers really do, and the impact we have on society. The roughly 130 Materials programs across North America all work so hard on outreach about materials for our own institutions. Now, we aim to collectively create and share such content. Initially there will be two main approaches. One will target high school students, featuring short video clips from recent alumni about the interesting problems they solve as materials engineers. The other will assemble video segments, audio clips, and other news items, from major leaders in industry about the impact of advanced materials for their various technologies – and more broadly, for society."

The UMC meetings also historically feature a carefully structured 'brag session'. Every professor is allowed 1 slide, and 60 seconds, to share highlights about their own program. "As the UMC chair, that's one of the hardest jobs – holding professors to just 1 minute. It's been especially hard for me representing UConn, as there's so much to be proud about. Student successes, faculty innovations, major awards, and of course Science One. We are envied by many right now, not just on campus but across the country. UConn Materials is just such a great place to be." ■

Introducing the New Faces of our External Advisory Board

The MSE department is thrilled to introduce three distinguished individuals who have joined our MSE External Advisory Board (EAB). With their inclusion, the EAB now boasts a total of nine esteemed industry leaders and alumni. This group is dedicated to shaping our curriculum, championing our endeavors, and ultimately elevating the stature of the Materials Science and Engineering Department on local, state, and national fronts.

Steve Mayott currently works at General Dynamics Electric Boat as Manager of Materials Engineering & Laboratory Services. He oversees several technical groups, including metallic materials engineering, metallic additive manufacturing, the metallurgy laboratory, and the chemistry laboratories. One of his responsibilities is assuring that correct metallic materials, materials processes, and material specifications are used in the design and construction of submarines. He is also responsible for the evaluation of material non-conformances, mechanical property testing of metallic materials, and the adoption, implementation, and oversight of metallic additive manufacturing at the company.

Victoria Reichelderfer graduated from UConn with her bachelor's in 2020 and from the University of Colorado Boulder with her master's in 2022, both in materials science and engineering. After moving back to the east coast, she began working as a materials and process engineer at Kaman Air Vehicles in Bloomfield, CT. There, she supports materials selection and process development, working mainly with metals and composites. Outside of work, Victoria is involved with the Society of Women Engineers and ASM's Heat Treat Society and is an active member of the Heat Treat Society's R&D committee.

Dr. Su is a University of Connecticut alumnus who earned his Ph.D. from the Materials Science and Engineering department in 1997. Paul has participated in materials R&D for over 30 years, especially in corrosion mitigation, materials degradation and monitoring, failure analysis, and chemical product development in the property insurance, chemical, and aerospace industries. He is a Fellow of the National Association of Corrosion Engineers and member of IEEE, ASM International, and ASME societies. In addition, Paul has received a patent and seven industry awards.

With this infusion of fresh perspectives, we also bid farewell to three esteemed members who have served their tenure on the MSE External Advisory Board: Peter Chomowicz, Peter Jarrett, and Howard Orr. Expressing his gratitude, Department Head Bryan Huey remarks, "We are so grateful to all our board members for their advice and support, and will miss Peter, Peter, and Howard for their 30 years of collective insights. The EAB in general is always so helpful in advocating for our program, keeping the university attuned to industry priorities and concerns, and steering resources our way like equipment donations, internships, and jobs for our students and alumni."

Yuanyuan Zhu Receives NSF CAREER Award

Overcoming Emission Hurdles with Innovative Catalyst Regeneration

MSE Assistant Professor Yuanyuan Zhu has been awarded a 600K NSF Faculty Early Development Program CAREER award for her proposal entitled *Mechanistic Understanding and Strategies to Improve the Regeneration of Supported Nickel Catalysts for Methane Conversion.*

In the race to combat global warming, balancing surging energy needs with reduced emissions is paramount. US reliance on natural gas as a primary power source adds complexity, given its emissions impact. Enter Gas-to-Liquids (GTL) and Catalytic Methane Pyrolysis (CMP) technologies – they hold the promise of generating hydrogen for fuel while curbing emissions. Yet, catalyst deactivation challenges loom large, hindered by carbon buildup and metal sintering.

This project stands as a catalyst for change. By delving deep into nickel catalyst regeneration, we aim to unlock longer catalyst lifespans. Bridging the gap between existing knowledge and practical solutions, this endeavor enhances carbon management and slashes greenhouse emissions, propelling the shift to sustainable fuels and chemicals.

UConn, Yale Push Connecticut to Quantum Reality

Connecticut is making progress to become the nation's leading accelerator of quantum technologies, with UConn and Yale leading the way.

The state's two premiere research universities are heading a massive coalition seeking funds to help establish the state as a quantum leader. The project entitled "Quantum-CT" took an important step towards its goal with a $1 million National Science Foundation (NSF) Engines Development award.

The UConn-Yale partnership recruited an expansive coalition of public, private, and state officials that aims to establish Connecticut as an innovation engine powered by quantum technologies. The award funds a two-year development effort that will help position Connecticut to become the nation's accelerator for quantum technologies and compete for an NSF Engines award of up to $160 million over 10 years.

"Quantum science and technologies hold so many keys to the future of Connecticut and the nation," said Pamir Alpay, UConn's vice president for research, innovation, and entrepreneurship. "Bringing together the expertise and research excellence of UConn, Yale, and many partners, Quantum-CT has the potential to be transformative for science, our economy, and workforce. This program extends opportunities to communities and sectors left behind by recent economic downturn and promotes equitability across the state."

Alpay is one of the lead investigators on the project. Quantum-CT seeks to make Connecticut the nation's accelerator for quantum technologies, which is tech developed through quantum mechanical principles that govern the atomic and subatomic world. Quantum technologies are poised to influence hundreds of applications, including smartphones, navigation systems, advanced computers, and hundreds of other applications impacting many of Connecticut's key manufacturing, energy, and infrastructure industries.

"Connecticut is a microcosm of the challenges and opportunities facing our nation," said UConn President Radenka Maric. "Our proud industrial base has stayed strong in the face of international competition, offshore manufacturing, and the mass retirement of skilled workers. Likewise, our cities and towns have persevered through tremendous adversity. UConn is honored to join Yale as leaders in the effort to make Connecticut America's accelerator by transforming a diverse, compact region into an economic development powerhouse using quantum tech."

With its versatility and potential to change lives for the better, quantum technology research and development has generated dozens of partners for the Quantum-CT initiative. Collaborators on the grant include the Governor's office, the cities of Hartford, New Haven, Stamford, and Waterbury, the Connecticut State Colleges and Universities (CSCU), the Connecticut Conference of Independent Colleges, and the CT Business and Industry Association, among others. Innovation and venture partners, including Connecticut Innovations, CT Next, Advance CT, Yale Ventures, and UConn's Technology Innovation Program, will work together to ensure that emerging quantum technologies are quickly transferred to real-world applications.

The NSF designed the awards to benefit states and regions that have not fully benefited from the technology boom of the last few decades. Quantum-CT is officially award number 2302908.

The Quantum-CT planning initiative is complex, incorporating all sectors that stand to be impacted by the economic revitalization spurred through quantum technology translation. In addition to state offices and the network of universities, technology adopters in the pharmaceutical, defense, financial services, and computing sectors all stand to benefit.

UConn's involvement includes more than a dozen researchers spanning several schools, colleges, and services, including the School of Engineering, College of Liberal Arts and Sciences, and the Technology Commercialization Services wing of the University's research enterprise. Quantum technology is applicable to many of UConn's research priorities, including sensing, cryptography, artificial intelligence, infrastructure optimization, drug and therapy development, software, and cybersecurity.

"The complexity and vastness of Quantum-CT will draw out the best of UConn and utilize our full physical infrastructure and intellectual capital," Alpay said. "Together with Yale and the support of our partners, we have the resources and expertise necessary to make Connecticut the nation's quantum technology accelerator."

More information about Quantum-CT is available at quantumct.org. To learn more about the NSF Regional Innovation Engines, visit new.nsf.gov/funding/initiatives/regional-innovation-engines.

Based on UConn Today, Matt Engelhardt

Xueju (Sophie) Wang is an EML Young Investigator Award Winner

Assistant Professor Xueju (Sophie) Wang

MSE Assistant Professor Xueju (Sophie) Wang won the Extreme Mechanics Letters (EML) Young Investigator Award (YIA). The YIA is sponsored by Elsevier to honor the best paper by a young scientist, which has been published by the journal EML. The YIA honor is bestowed annually to the corresponding author(s) of the paper who received their Ph.D. within ten years of the award. EML is a journal that focuses on the role of mechanics in various fields such as materials science, physics, chemistry, biology, medicine, and engineering, with a particular emphasis on the originality, depth, and impact of new concepts and observations in applied sciences. Wang is one of just four 2022 winners.

Wang's paper titled "Reconfiguration of multistable 3D ferromagnetic mesostructures guided by energy landscape surveys" fits perfectly in the scope of this emerging journal focused on the mechanics of functional materials and structures. The paper was recognized for presenting a comprehensive experimental and theoretical study on highly nonlinear, multistable three-dimensional magnetic structures. It explored ways to control their multistable states and least energy reconfiguration paths. The findings are an important step towards the development of reconfigurable structures for a variety of applications, such as soft robotics and multifunctional deployable devices.

Wang joined MSE in 2020. Her research interests include stimuli-responsive materials and multifunctional structures for applications ranging from soft robotics to bio-integrated electronics, which combines elements of mechanics and multiple scientific fields. In addition to the EML Young Investigator Award, Wang has also received the NSF CAREER Award, NIH Trailblazer Award, ASME Orr Early CAREER Award and PMSE Young Investigator Award for her contributions to the field of research.

SCIENCE 1 FACTS

UNDERGRADUATE LABORATORIES

The Teaching Labs in Science 1 are home to the Materials Science and Engineering Undergraduate Laboratories. This ~4600sf area contains eight rooms.

Its entry is a large breakout area that serves as both lecture space and an informal meeting room for students to meet for club activities, group work, homework, and socializing. It is also home base for the Materials Advantage student chapter and the 3D Printing Club.

This is flanked by four primary laboratories:

- **Thermal Processing and Synthesis**
- **Materials Characterization**
- **Mechanical Testing and Cold Work**
- **Metallography**

Behind the breakout area is the Lab Director's office, a project room occupied by the 3D Printing Club, a large closet space for lab coats and a wall of storage cupboards for lab, project, and club materials.

MSE Students Are Incredibly Well-Rounded

Emma Lucas was successful in both her academics and on the UConn's women's rowing team. Emma said that balancing the two "gets hard sometimes, but having a rigorous schedule helps me prioritize what's important and gives me the structure I need in my day."

Emma had even won the Scholar Student-Athlete Award from the Collegiate Rowing Coaches Association (CRCA). This award requires that student-athletes row in at least 70 percent of the regular season and/or at championships, all while maintaining a minimum 3.5 GPA.

Department Head Bryan Huey, who is a recent convert to rowing, knows just how committed one has to be to get on the water at sunrise and then work through the rest of the day, "Emma is a wonderful example of how our students can be so successful in the classroom, while also advancing their other passions or obligations like collegiate sports, band, jobs, volunteering, clubs, campus research, and so many other interesting activities."

Emma chose to study materials science and engineering (mse) after taking ENGR 1000: Orientation to Engineering with Professor Kevin McLaughlin. "We were able to hear from professors what we'd study and eventually do when we graduated, and I found mse to be the most exciting."

Emma Lucas (MSE '23)

Emma had also had the opportunity to work in the undergraduate lab. "My time in the lab has been such an awesome experience. I love working hands-on, and being able to use that to supplement my learning from sophomore to senior year has been so beneficial."

As part of this experience Emma worked with Undergraduate Lab Director Fiona Leek. "Professor Leek has been such a crucial part of my learning in MSE, and I really appreciate all the hard work and late nights she puts in to help get things done."

When asked her thoughts on the Science 1 building, Emma said that "The new labs are so cool and are making the undergraduate lab experience even more amazing than it already was. They have the potential to really expand interest in the mse major."

On top of being both a student and rower, Emma also participated in an internship with Electric Boat (EB), a company that has been the primary builder of submarines for the United States Navy for more than 100 years.

Emma said during some days at EB she would do work on a computer with the help of her coworkers. "On other days I'd head over to the weld lab."

Welding seems to have been Emma's favorite part of the internship. "I struggled for a while in the beginning, but I ended up picking up on shielded metal arc welding. I was able to get a few of my welded plates bend-tested and they passed! I also attempted gas metal arc welding and gas tungsten arc welding, but I found those more challenging."

As another part of the internship, Emma gained experience in the Non-Destructive Testing (NDT) lab. "I was able to try my hand at magnetic particle testing for indentations in welds on a practice plate. I was then also able to see the NDT inspectors investigate some welds that eventually would be used on one of the submarines."

When asked for a fun fact about herself, Emma revealed that she's a triplet. "My two sisters, Sophie and Abby, play college soccer at Salve Regina University and Southern Connecticut State University." Emma graduated from UConn in May 2023. ■

UNDER-GRADUATE AWARDS

STUDENT OF THE YEAR
Jackson Kaszas

OUTSTANDING RESEARCH
Yunjiang Ding
Kelley Huebscher
Yinyu Wang

OUTSTANDING TEACHING
Jaclyn Grace

OUTSTANDING LEADERSHIP
Matthew Carragher

STUDENT OF THE YEAR (Freshman/Sophomore)
Adin Jennings

MSE Undergraduate Research Opportunities is What Drew Matthew Carragher to UConn

Matthew Carragher already knew when he applied to college that he wanted to pursue materials science and engineering. But he chose UConn because of the MSE Department's undergraduate research opportunities. "I think what made the decision obvious was the amount of interesting materials research going on at UConn," Carragher says. "The amount of faculty doing research is massive, making it really easy to find opportunities here."

He chose to study MSE because it is a mixture of different type of sciences. "MSE is an amazing blend of both the hard sciences, concepts you would learn in a chemistry or physics curriculum, and the practical applications of those concepts you get from other engineering majors," he says. "I think I wouldn't have been satisfied in my education if I only learned one side of that spectrum, and so MSE was the obvious choice."

Carragher's favorite area of MSE is metallurgy. "I don't think I realized just how much there is to learn about metals until I got to UConn. In class, we often talked about the relationship between structure, properties, processing, and performance, and there are few areas of materials science where that relationship is so strong," he said.

Carragher was a teaching assistant in Professor Fiona Leek's lab. He helped set up and run the experiments for the junior class, made sure all the experiments run as smoothly as possible, and imparted practical knowledge of MSE that students might otherwise miss. "Professor Leek has been amazing to work with," said Carragher. "She is more than willing to listen to the opinions of her teaching assistants and values the ideas we come up with. She gives me the autonomy to run many parts of the lab classes myself, while providing help when I need it. All of these things have taught me a lot about how to be a good teacher and leader."

Carragher also worked in the Foundry with recently retired Emeritus Professor Harold Brody. Carragher described this as the highlight of his time at UConn. "Professor Brody is an amazing resource, and has an unbelievable body of knowledge to draw from. I don't think I've ever walked away from him and not learned something new," stated Carragher. He also praised Emeritus Professor Brody's ability to challenge him to think critically and apply every concept he's learned. "He has made me a far better engineer and academic than I could have possibly imagined."

Carragher was the president of the Metal Working Club, the chief technology officer of the 3D Printing Club, and

Matthew Carragher (MSE '23)

a member of UCMA. The Metal Working Club aims to teach students about different metal processing principles, like casting and blacksmithing. The club uses the Foundry and its resources for many of the projects. "The club has given me the chance to apply many MSE concepts to solve problems and help other members with the projects they want to work on," claimed Carragher. "Our faculty advisor, Professor Frame, has been a pleasure to work with and has been extremely supportive of everything the club wants to do."

Department Head Bryan Huey noted that the Metal Working and 3D Printing clubs are incredible opportunities for students, not just to expand their knowledge, but also their organizational and leadership skills. The clubs are so successful because of devoted students like Matt, devoted faculty mentors like Professors Frame, Brody, and Leek, and a continued commitment from the department to support and indeed grow the clubs. As Matt has demonstrated, MSE students have wonderful chances to be engineers and practice what they learn while they're still students. And starting this term, they get to do so in our incredible new Science 1 building.

After graduation Carragher will pursue a master's degree and then Ph.D. degree. After graduate school he wants to spend some time in industry, and then go back into academia with his practical knowledge. "Research and industry are so deeply intertwined, and I think spending some time in both areas would do everyone good," he claims.

For students questioning whether to study materials science and engineering, Carragher said to go for it. "Studying MSE is such a good way to broaden your future opportunities," he said. "Someone with a degree in MSE can go into just about any STEM related job they want, while still getting to learn a specialized field that makes them stand out from other potential candidates."

MSE Senior Design 2023

TEAM 1

Goalie Glove Construction and Materials Re-Design

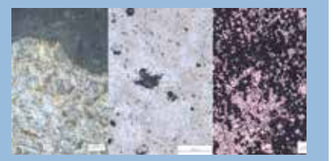
Team Members
Emma Lucas
Gina Parlato

Industry Sponsor: **Keeperstop**
Industry Advisor: **Christian Benjamin**
Faculty Advisors: **Fiona Leek**

TEAM 2

Materials for a High-Security, Drill Resistant Lock Cylinder Redesign

Team Members
Jonathan Bane
Matthew Carragher
Charles Schwarz



Industry Sponsor: **Assa Abloy-Medeco**
Industry Advisor: **Clyde Roberson, Doug Trent**
Faculty Advisor: **Lesley Frame**

TEAM 3

Carbon Negative Insulating Cores for Steel Doors

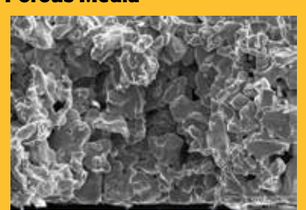
Team Members
Isabela Kay
Aidan Lee
Pablo Zarama

Industry Sponsor: **Assa Abloy**
Industry Advisor: **Dan Glover, Dan Picard**
Faculty Advisor: **Fiona Leek**

TEAM 4

Fatigue Testing of Porous Media

Team Members
Yunjiang Ding
Wyatt Dzilinski



Industry Sponsor: **Mott**
Industry Advisor: **Vincent Palumbo**
Faculty Advisor: **Seok-Woo Lee**

TEAM 5

Corrosion Analysis of Agriculture Valve System

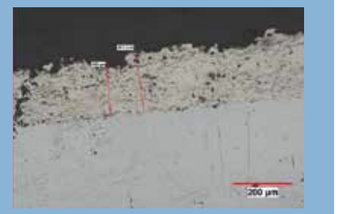
Team Members
Thi Le
Emily Rondeau
Yinyu Wang

Industry Sponsor: **Company name cannot be disclosed**
Faculty Advisor: **Jasna Jankovic**

TEAM 6

Research and Implementation for Real-Time Measurement of Plasma Spray Coating

Team Members
Samuel Katz
Noah Ossolinski
Milly Ullaha

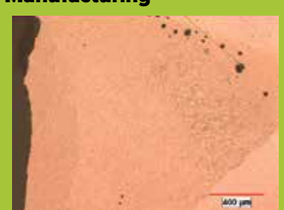


Industry Sponsor: **Barnes**
Industry Advisor: **Greg Bies, Eric Cutiongco**
Faculty Advisor: **Bryan Huey**

TEAM 7

Copper Bonding Mesh Manufacturing

Team Members
Benjamin Labkovsky
Tianyi Lyu

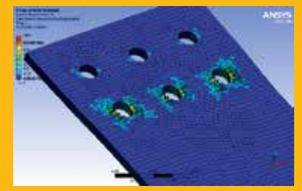


Industry Sponsor: **Greaves**
Industry Advisor: **Matt Strand**
Faculty Advisor: **Yuanyuan Zhu**

TEAM 8

Jet Engine Composite-Metal Interface

Team Members
Elliott Trester
Seth Utter



Industry Sponsor: **Pratt & Whitney**
Industry Advisor: **Connor Perry, Darin Lussier**
Faculty Advisor: **Xueju (Sophie) Wang**

TEAM 9

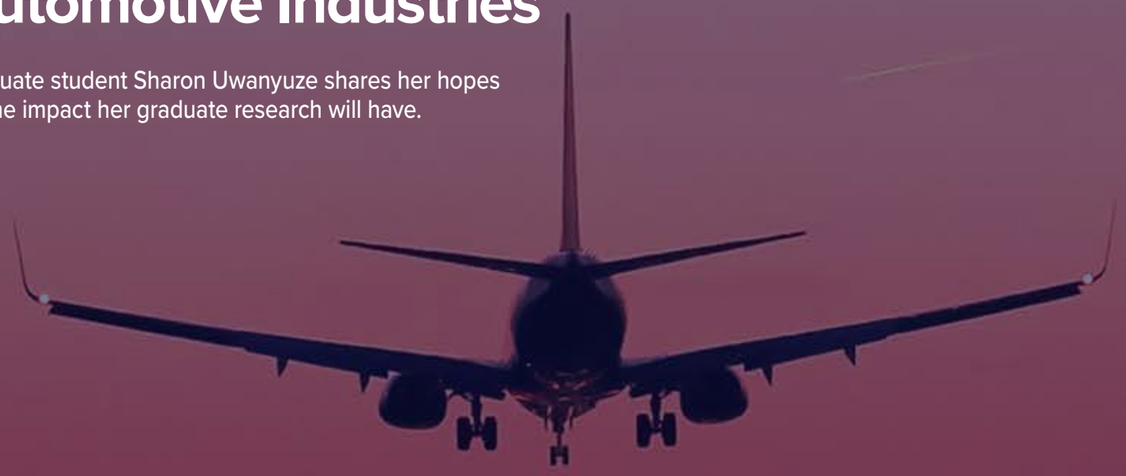
Extracting Iron from Lunar Regolith

Team Members
Evron Foster
Jackson Kaszas
Priyamvada Kishore

Industry Sponsor: **2022 NASA BIG Idea Team/NASA**
Faculty Advisor: **Rainer Hebert**

Sharon Uwanyuze Works to Lessen Pollution in the Aerospace and Automotive Industries

Graduate student Sharon Uwanyuze shares her hopes for the impact her graduate research will have.



When asked to describe her overall experience as an MSE graduate student, Sharon Uwanyuze says it was one that "pushed me out of my comfort zone to explore more of what I can be."

Uwanyuze first got connected with UConn's Department of Materials Science and Engineering when she went to a conference back in 2018. "I was an undergraduate research assistant at the University of Alabama in Birmingham, and when I went to present my work I met MSE faculty member Professor Cato Laurencin. When he came over to my poster we talked for some time, and I told him I was applying to grad schools and also some industry positions. He told me about the great opportunities at UConn, and I later looked up the school. It definitely seemed very competitive and in a new area which would make it more of an adventure for me. I then got in contact with some other professors who were very interested in some of the work that I'd been doing. These interactions made coming to UConn a smooth transition."

When Uwanyuze first became interested in research as an undergraduate, she worked in an advanced ceramics lab. Her current research involves understanding and mitigating interfacial reactions that form during investment casting of titanium alloy parts in ceramic oxide molds. In simpler terms: "When we want to make a part out of titanium or titanium alloys (with additives), the raw materials have to be melted and then put in a mold of the shape that you want. That mold is made out of ceramic materials. What we then want is to carefully choose the material we're making the ceramic mold out of so that we prevent reactions when the metal touches the ceramic surface. My work deals with innovating new materials that can show even higher chemical resistance than the current materials that are used."

What interests Uwanyuze most about this research is the application of the parts that she makes. Titanium is lightweight, corrosion resistant, and has excellent biocompatibility. "More than half of titanium alloy parts (around 60%) go to aerospace applications and allow us to have lighter planes that consume less fuel – that's less pollution, and faster planes as well. The other relatively large percentage goes into making biomedical implants, like knee implants or hip implants, which are very useful for a person who has a disability."

When asked what she hopes the impact of this research will be, Uwanyuze says, "I'm really hoping that we can implement more of the material that I'm studying – which is called strontium zirconate – as an improved mold material in casting titanium alloys. If we use advanced materials like these as mold materials, then we can make more titanium alloy parts – without the need of extra processing to remove reaction layers. The manufacturing would take less time and gradually become cheaper, meaning that we can produce more of these parts and we can have them in other applications – not just the high-end applications like aerospace and biomedicine. We can have them even in automotive parts. If our cars have lighter materials – I think they are trying to implement aluminum, but titanium can get to an even higher temperature – we can have lighter cars, less fuel consumption, less pollution. That is what I hope will be the general impact."

Already, Uwanyuze has had the opportunity to publish several research papers. "Publishing a paper can be almost a whole year worth of data collection, writing, revising, review. We first have to understand what is not known currently and how can I bridge that gap, and then collect good data. Sometimes you go to the lab and things just don't want to work out, so you come back and try again. It's been a journey and it has taught me perseverance."

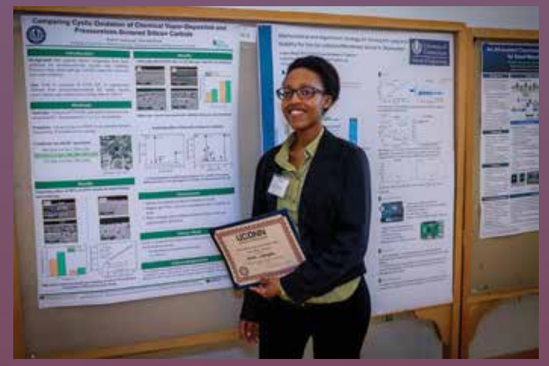
Additionally, Uwanyuze has a lot of interest in mentoring and teaching. "In the MSE department we serve as teaching assistants for a couple of semesters, but I went ahead and did an extra semester. I also took the Graduate Certificate of College Instruction, which is a program that is available to grad students who are interested in improving their teaching and considering a possible career in academia. It's offered through the School of Education, and I finished that last December. During that process I was able to apply what I learned and the MSE department awarded me the MSE Teaching Excellence Award in 2020 so I was grateful for that."

Uwanyuze is a member of several organizations, including Grad Black STEM where she helps to mentor undergraduate students seeking to pursue higher education in a STEM field. Previously, she served as Intellectual Merit Chair, but was recently elected President of the organization. "The role of Intellectual Merit Chair is to plan events and activities that enhance the academic excellence of the members. Some of the things we do are effective presentation styles, research seminars, and good ways to present your research to a wide audience."

As President of the organization, Uwanyuze now oversees activities in other areas as well, such as Broader Impact and Professional Presence, which consist of mentoring undergraduates and learning how to make yourself marketable.

Another organization Uwanyuze is part of is His Branches Adventurer Club, a local church-based program for children in grades 1-4 to play, learn, and improve their social skills. Previously she was the Director of this program, and now serves in an advisory role. "I love to see the imagination, creativity, and innovation that the children have, and being able to work with a child through their process of discovering themselves and discovering a new topic. We learn about different things like fire safety and hygiene, and just being able to read. These are simple things, but the same concept applies to general teaching skills, like teaching an undergrad course. I still have to understand that they're people, they're not just there to consume information. Just caring about the whole person. I really enjoyed that role."

Uwanyuze says that the MSE department at UConn is really interconnected. "It's not an overwhelming size, so we are able to get to know each other, both among students and between students and faculty. We have a lot of resources at our disposal; the labs are great. I have the opportunity to work in both the new Science 1 complex and the Innovation Partnership Building, both of which are world-class facilities. It's been really nice having those buildings at my disposal. The move was a bit challenging but it was worth it in the end."



MSE graduate student Sharon Uwanyuze after being awarded the "Best in MSE Program" certificate by the School of Engineering during the 2020 Annual Poster Competition.

There are many people in the MSE department that Uwanyuze admires. "I have great role models in the department, whether it's other students or faculty that I can look up to and that push me to aim even higher. The support system has been great, both in classes and in research as well. I've had really supportive advisors."

Currently Uwanyuze's advisor is Professor Pamir Alpay. "Even though he is now the Vice President for Research, he makes time for us as his students through weekly meetings and checking in with us both about our academic research and professional goals. I appreciate that."

Uwanyuze also speaks fondly of her former advisor, Professor Stefan Schaffoener, who transferred from UConn to the University of Bayreuth in 2021. "Even though he moved to a different school, he still stays in touch with the students he advised almost on a weekly basis to check in on how we are doing in terms of research, academics, and even job applications."

When asked how UConn has helped her work towards her career goals, Uwanyuze says, "When I was a younger student at UConn, I felt like I had opportunities to grow in either industry or academia. I mentioned resources such as the Graduate Certificate of College Instruction, which was a great stepping stone toward exploring the world of academia. Regarding industry, different career fairs and internship opportunities were extremely helpful. So I've been able to explore both industry and academia, and gladly I have job offers and opportunities in both. So that in itself is a great indication of how well the department and the school have prepared me to have several doors open in my future." ■

SCIENCE 1 FACTS

THE CLEAN ROOM

The Cleanroom at Science 1 is 2,000 ft^2 under filter with a 3,900 ft^2 service and support area.

It is organized into four distinct research bays, each associated with a different clean room process, and all arranged in a linear sequence of increasing cleanliness,starting at ISO 6 and progressing to ISO 5.

The four bays include:

- Chemical Vapor Deposition bay
- Etching bay
- Characterization bay
- EBeam/Lithography bay

Each space is provided with services and infrastructure to support the associated tooling as equipment becomes available.

Andres Godoy Wins Chateaubriand Fellowship

Graduate student Andres Godoy recently won the prestigious Chateaubriand Fellowship to study at the Université Grenoble Alpes in France. The fellowship is a merit-based grant offered by the Embassy of France in the United States that supports Ph.D. students from American universities who wish to conduct research in France. He first learned about the fellowship from Assistant Director of Enrichment Programs for Research and Fellowship Programs, Rowena Grainger. “This opportunity has been a very fruitful and rewarding experience, at the personal and professional level,” describes Godoy.

Godoy received his bachelor’s degree in materials science and engineering from Universidad del Valle-Cali (Colombia) in 2011. He decided to join the field of MSE because he was interested in the idea of working in an interdisciplinary field of science that brings together physics, chemistry, and engineering with the goal of designing or discovering new materials. After working at the University of Texas as a research assistant from 2011 to 2017 he joined the MSE Department at UConn as a graduate student.

At UConn, Godoy is a part of Associate Professor Jasna Jankovic’s research group. “At the time, Professor Jankovic was a new professor in the department, but she had a lot of experience in fuel cells and was eager to build something great,” claims Godoy. “I wanted to be part of that process, and so far we have grown significantly together; I am very proud of that and our team. Professor Jankovic always keeps pushing us to go beyond our limits, but also encourages us to get some time for ourselves to have a balanced life.”

“I am very proud of Andres” says Professor Jankovic. “He has advanced so much during his Ph.D., and gained invaluable expertise in microscopy and fuel cells. His energy and passion are indispensable, and his desire to learn more is admirable. Congratulations to Andres for receiving the Chateaubriand Fellowship! I am sure you will represent our team and UConn in the best light. Also, make sure to wave to us from the top of the Eiffel Tower!”

Currently, Godoy is interested in clean energies. “I am especially interested in using fuel cells as a practical solution to tackle the existential climate and environmental crises triggered by the use of fossil fuel-based energy generators,” he says. His goal is to create a new and efficient catalyst materials for proton exchange membrane fuel cells (PEMFC) which use clean fuels instead. This solution would give zero-emissions,

Andres Godoy in the Center for Clean Energy Engineering (C2E2) laboratory

be highly efficient, have low maintenance costs, and contain a high energy density.

Godoy built on this area of interest to conduct research while in France. By using advanced electron microscopy techniques, he proposed an investigation into the structure and properties of state-of-the-art and novel catalyst materials used for fuel cells. This will help to fundamentally understand the dominant degradation mechanisms at a nanometric level which these catalyst systems can experience under certain operating conditions.

Post-graduation, Godoy hopes to be a Fullbright Scholar to teach in France, Germany, England, or Japan. Then he plans to continue his research in academia and wishes to be a professor.

For undergraduate students considering graduate school in materials science and engineering, Godoy suggests talking to professors and completing an internship. “If you talk to a professor doing research on topics you are interested in or passionate about, most of them are very responsive and willing to help,” he says. “If possible, do an internship and build up a strong resume tailored to the area you feel strongly about. But in general, get out of your comfort zone and do the things that may intimidate you.”

GRADUATE AWARDS

DOCTORAL DISSERTATION RESEARCH AWARD
Sharon Uwanyuze

OUTSTANDING TEACHING
Matthew Caruso
Ching Chen

OUTSTANDING LEADERSHIP
Sara Pedram

GRADUATE STUDENT SPEAKING COMPETITION "PEOPLE'S CHOICE AWARD"
Rajat Sainju

ELEVATOR PITCH COMPETITION
1st place: Zizheng Wang
2nd place: Mason Freund
3rd place: Michael Fazzino

Science 1, Clean Room

The Husky Inside Intel: How UConn Alumnus Chigozie Muoto is Driving Innovation

Despite the overwhelming number of options Muoto was facing after attaining his Ph.D., he found his niche by combining his background in processing engineering with an MBA to excel as a business strategist.

The number of opportunities for UConn materials science and engineering graduates is endless. Chigozie Muoto combines his Materials Science and Engineering Ph.D. with an MBA as a business strategy manager for Intel Corp.

Muoto graduated from UConn with his Ph.D. in 2011, at which point he was hired by Intel Corp. as a process engineer in Hillsboro, Oregon. Over the nearly four and a half years he spent in this role, Muoto researched the "best and most efficient technologies that would be used in our latest products."

Muoto worked with a team to analyze and redesign lithography processes for Intel's microprocessor products. His day-to-day responsibilities required him to be in one of Intel's advanced fabrication factories, working hands-on with semiconductor lithography equipment and utilizing the skills he had acquired and developed in the labs at UConn.

After receiving his Undergraduate degree at the University of Lagos in Nigeria, Muoto knew he wanted to advance his academics in the United States. But why UConn?

"It wasn't like anyone told me about UConn," he said. "I was researching many schools on the Internet."

What stood out to Muoto about UConn was the technology available in the research labs. He recalled researching several options to pursue his masters and was amazed by "how easy it is for students to gain access to instruments I never got the opportunity to use." Muoto was also drawn by the "diversity in research projects the professors had," he said.

"I really wanted to go to UConn," Muoto remembered, "I thought about it for many months."

Once accepted, Muoto was exposed to far more than he initially expected. "Not only did I get access to that lab equipment, but I was also trained on how to service the equipment." This proved very valuable in his first interview with Intel. "That was part of the reason I got the job," he said, "the experiences and skills they were looking for were very similar to what I did in the lab at UConn."

MSE Alumnus Chigozie Muoto (Ph.D. '11), Business Strategy Manager at Intel Corp.

Muoto also fondly reminisced about Professor Mark Aindow, his advisor. Aindow encouraged Muoto to write scientific papers, which led to an impressive six publications for Muoto over the course of his UConn degree. "At first I wasn't thinking of it as something I could do," Muoto said. "The way he advised me was just exceptional."

Although he thoroughly enjoyed his engineering position, Muoto found himself interested in the business side of Intel. He went on to get his MBA at the University of California, Los Angeles Anderson School of Management. In 2017, he returned to Intel as a product manager.

In three years, Muoto rose to his current position of business strategy manager. "I have contributed immensely because of my engineering background," he said. While most people involved in the business side focus on the status of the industry, Muoto's deep understanding of both business and engineering allows him to lead Intel to more efficient and plausible business solutions.

Muoto's career path serves as an example of the unique professional options that come with a degree in materials science and engineering. Muoto advises current students to begin exploring their options early. "Start researching the companies you want to go to, and start networking," he said.

Muoto struggled himself with deciding on a career that fit his interests. "Sometimes it's not very clear because you don't have a lot of information about them," he said. "At the end of the day it's not just about the money or the accolades...follow your passion. Everything else will follow." ■

High School to Advanced Manufacturing Development: Vincent Palumbo's Journey to Mott Corporation

UConn MSE Alumnus Vincent Palumbo (Ph.D. 2013) was inspired to enter the field of materials science and engineering after attending the Engineering 2000 (E2K) high school engineering program at UConn.

"It was a way to explore all the engineering disciplines at the university. You spent a week there in the summer, and we got to see all the engineering disciplines, from civil to environmental, mechanical, materials science, chemical, etc. Materials science was the one that stood out to me the most," Palumbo said. "They had really interesting, hands-on demonstrations and discussed applications of various materials, how they are processed, and how some properties can be tuned to fit specific end uses."

That E2K program was just the first step along an impressive career path for Palumbo, who is now Program Manager for Advanced Manufacturing Development at Mott Corporation.

Mott Corporation develops and sells filtration and flow control components across a wide variety of different industries. From orange juice shelf-life stabilization, to the treatment of wet macular degeneration, to electrolysis for green energy, to National Oceanic and Atmospheric Administration satellite longevity, Mott has a worldwide reach (and beyond...).

Palumbo is specifically responsible for vetting new equipment, collaborating with other companies in additive manufacturing, and working on root-cause failure investigations. "It's a lot of responsibility pushing new, state-of-the-art technology acquisitions for our company. The company is growing very fast, which is great. I hope to be instrumental in getting our new capabilities up to speed, supporting production and research at the same time," he said.

Palumbo next to the Renishaw AM 500S Flex after its installation in the Mott Customer Innovation Center.

Palumbo's ability to excel in this position has been 15 years in the making.

After sparking his initial interest in the E2K program, Palumbo decided to attend UConn for his undergraduate degree in 2004. The University had one of the top public programs for materials science, and Palumbo had access to state-of-the-art equipment and facilities. Palumbo recalled, "UConn had a lot of characterization equipment available to the students that were working at the time, and that was somewhat unique."

After his first four years, Palumbo decided he wasn't finished at UConn. His decision to pursue his Ph.D. at UConn came easily, he said. "I liked the people there, the professors, and the program

Examples of the unique geometries and consolidation of parts made possible by the metal additive manufacturing process. These components all incorporate precisely controlled porosities for various filtration and flow control applications.

overall, so I honestly didn't have much motivation to look elsewhere."

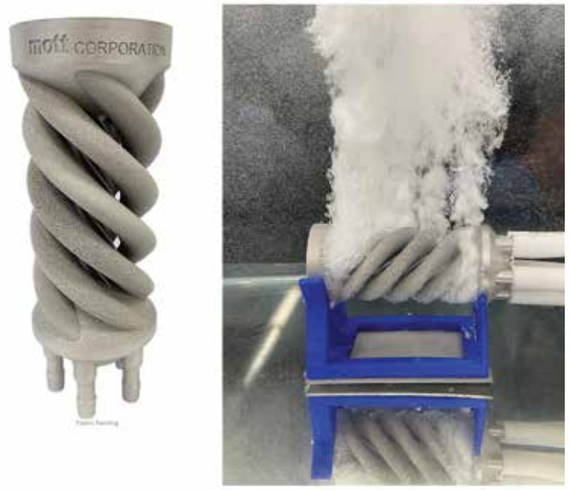
Working with Professor Bryan Huey in the undergraduate labs also played a role in his continued education at UConn. "I really liked the work we were doing, I liked working for him in general, and I got to see a lot more of the university than I would have if just staying in course work. That really helped foster my interest in pursuing advanced degrees and staying in the UConn MSE program."

After graduating with his Ph.D. in 2013, Palumbo stayed at UConn for about a year as a postdoctoral fellow before moving on into the workforce. When a recruiter from Mott reached out to him, Palumbo found what he was looking for in a career. "I went for a tour and the interview, and I was impressed with what I saw. The capabilities in their lab, and the types of products they were making, were very interesting. So, I just took it from there, and here I am eight years later," he explained.

Originally hired as a Metallurgist, Palumbo first focused on lab requests that would help solve production floor issues, quality issues, doing failure analysis, and root cause investigations. "You know, utilizing the materials science techniques that I had learned from my undergraduate and graduate careers at UConn," he laughed.

"I was able to come in having familiarity with most of the lab equipment in Mott's R&D group. Tools like the scanning electron microscope, X-ray fluorescence system, and mechanical testing machines. I had experience with those techniques because of the curriculum at UConn and some of the research efforts that I did for my masters and Ph.D. work, so I was able to hit the ground running. Many graduates from other universities are familiar with those same tools, but they didn't get to run such equipment themselves. They had to give the samples to a grad student who would run it and give them the data. I think that's a big benefit which UConn offers—access to all of the modern tools materials engineers use, gaining real research experience, and being hands-on. It really does pay off."

From there, Palumbo moved into a Research Scientist role examining new capabilities development, where he worked with a team to "leverage new techniques and technologies, which we had not yet integrated into Mott, to make new or improved products for our company and clients," he said, "One of those concepts was metal additive manufacturing. Through collaboration with service providers, equipment vendors, and the additive manufacturing center at UConn, I was able to narrow down what specific additive manufacturing technique and equipment manufacturer was the right fit for us. We then acquired the equipment, spent some time refining the processes, developed a range of



An example of a printed component being used for gas-to-liquid mass transfer aka "sparging". This part, created in a single build, features five independent elements with different porosities.

media suitable for filtration and flow control applications, and started making prototypes for customers and small run production parts. The program is really taking off."

Examples of the unique geometries and consolidation of parts made possible by the metal additive manufacturing process. These components all incorporate precisely controlled porosities for various filtration and flow control applications.

At the beginning of this year, Palumbo became the Program Manager for Advanced Manufacturing Development, where he identifies and proves out manufacturing and characterization equipment that supports Mott's strategic growth and enables new fabrication capabilities. "There are ten different vendors that are going to make the same machine. It is important to consider how we compare those and know which is the right fit for us in terms of everything from the capabilities of the machine, its footprint, the resources required to operate it, and the level of technical support that the equipment manufacturer offers. Then, work on the logistics of how to bring those pieces in and implement them into the workflow of our facility."

It's his favorite part about the job. "It's a longer process, it has its ebbs and flows of whether it's going to pan out or not, but when you finally do get the approvals, and you can justify the expenses, you can make a case for why we need a particular piece of equipment. Once you have that thing working out on the floor and people can see its benefits, that's very fulfilling," he said.

Palumbo also collaborates with other companies that are doing additive manufacturing. "We can leverage our strengths, and theirs, to come together to advance what we're trying to do in the world of additive manufacturing, supporting our ultimate efforts of filtration and flow control," he said. To do this efficiently, Palumbo said he often draws from different interdisciplinary and collaborative work he did in the UConn labs.

Although in a more managerial role, Palumbo still appreciates root-cause investigations around the lab as one of the most rewarding parts of his position at Mott. "That means finding why something failed and how we can prevent it in the future: Is it back to the raw materials stock, is it a part of the processing parameters, or was it simply just a mistake that somebody made? Going through all those possibilities, putting together the timeline of how and why something happened, and identifying how we can grow and be better in the future to avoid similar issues, that's really rewarding," he said.

Palumbo offered some advice to students looking to find a company and career path where they will be consistently excited to go to work.

"Do the internships as early as you can. Don't be afraid. Just put yourself out there, talk to people, go to the career fairs, do undergraduate student research if it's available, work with a professor for a couple of semesters, get that experience because that really does stand out," he said. "It doesn't have to be the exact thing you are learning about in a course. If there is something that interests you and you can relate it somehow, go after that, because that's just going to make you better at your future jobs. If you truly have an interest in what you are doing, it's a lot more rewarding."

Department Head Bryan Huey notes "Dr. Palumbo's comments echo what so many of our alumni tell us... about the importance of hands-on experience, and in enjoying what you do. That's one reason why UConn MSE undergraduates earn more in-lab credits than in any other engineering major on campus. We recognize the value of these experiences, and how they help students be prepared for internships and future jobs. And there isn't a program in the country with newer or more impressive facilities. That includes 4744 square feet and >$500k of recent equipment investments exclusively for our undergraduate labs. And this is amplified 50-fold across the more research-focused rest of the new Science 1 building, along with the already-impressive resources at IPB and C2E2."

Huey says, "Most of all, it's exciting to see the contributions our alumni like Vincent are making as materials engineers."

"Work Hard and Never Give Up": An Alumna's Advice to Current MSE Students

Gabrielle Charno (MSE'17), Project Manager at Lockheed Martin

When asked what advice she'd give to current materials science and engineering (mse) students, Gabrielle Charno said to "work hard and never give up. MSE classes will test you and frustrate you. You'll have to stay up late studying and probably spend a lot of time worrying about exams and projects – but don't let it discourage you. Engineering courses are meant to be challenging and teach you critical thinking skills. It is worth it! Keep going!"

Ever since she was little, Charno knew she wanted to go into engineering just like her dad. "I was always interested in math and science growing up. When I attended UConn's engineering orientation, I was amazed by how many areas materials science and engineering touched. I felt it was the most diverse engineering discipline that had potential for excitement in everyday work."

"Professor Brody was the most impactful and inspirational professor in my time at UConn," Charno said. "He challenges you, pushes you to be a critical thinker, and helps you understand that there are many ways to solve a problem. He encourages you to work as a team and collectively brainstorm potential solutions. Profes-

sor Brody always supported my athletic commitment while on the soccer team at UConn as well."

Charno worked at several companies before finding her current position as Program Manager at Lockheed Martin. "I started my career at Electric Boat working in the Materials and Welding Department on shipyard support and laboratory assignments. I enjoyed the hands-on nature so much that I then altered my career to focus more on manufacturing. At Nucor Steel, I was on the shop floor every day ensuring we produced the highest quality product while meeting our commercial customers' needs and requirements. However, I did miss the defense industry, so I transitioned to my current position at Lockheed Martin working on Air Force programs within Strategic Missile Defense."

"As a project manager, I am responsible for the execution of our program," Charno explained. "My job consists of managing customer requirements, staying within the cost and schedule baseline, identifying risks and opportunities, and delivering our hardware on time to ensure we meet all program milestones. My favorite part of my job is the development of technology and working on products that are operated directly by our military for national defense."

Charno advises current mse students to utilize everything the program has to offer. "The MSE department has so many opportunities. Take an elective you think might be interesting, join a club, go after an internship, or become a researcher or TA for a professor you really admire. The network of UConn alumni in mse is extensive too. Always reach out, we like to help!"

KEEP IN TOUCH

To stay informed about ongoing news and events happening at UConn's Materials Science and Engineering Department, visit our website regularly:

mse.engr.uconn.edu

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Meet MSE Alumnus Vincent Ybanez Working at the Forefront of Jet Engine Technology

Vincent Ybanez has always been fascinated by the properties of different materials and how they can be used to solve complex problems. Now, as a key member of the Aftermarket and Sustainment Engineering team at Pratt & Whitney, he's putting that expertise to work on some of the most cutting-edge engine technologies around.

Alumnus Vincent Ybanez ('16), Senior Design Engineer at Pratt & Whitney

In his role of senior design engineer, Ybanez works on repairs for jet engine hardware by "initially developing repair concepts, establishing design and testing requirements for the repair, substantiating and obtaining approvals within the various engineering groups, and drafting the technical documents for the repair."
The specific processes he uses to repair engines utilize solid-state welding, fusion welding, additive manufacturing, machining, and plasma spray coating to optimize cost and repairability of hardware.

"UConn's MSE curriculum and instructors provided an excellent basis for understanding materials science and general engineering fundamentals, which help me make design engineering decisions with a materials engineering mindset," Ybanez said.

Ybanez recalled that his initial interest in engineering came at an early age, as he worked alongside his father on home-repair projects. Following that spark of interest, Ybanez attended a vocational technical high school, where his hands-on work with electromechanical technologies solidified his future career path.

"I chose UConn as their Engineering program is highly acclaimed, the university itself was known as one of the top public research universities nationwide, and I heard many good experiences of the university and engineering program from friends and relatives," Ybanez said.

Mechanic overhauling engine at an Aftermarket Repair Shop. Pratt & Whitney Aftermarket and Sustainment Engineering group provides innovative aftermarket repair strategies for various jet engine hardware.

At UConn, Ybanez discovered the materials science and engineering (mse) field through Professor Daniel Goberman's 'Foundations of Engineering' class. "I didn't realize mse was a field until that class, and how broad the mse field was, as well as the various job opportunities that materials engineers can pursue," Ybanez said. That helped him decide to declare mse as his major.

With Professor George Rossetti as his advisor, Ybanez was able to explore different career options during his undergraduate studies. "I remember having helpful discussions with him regarding pursuing graduate studies versus working directly in industry after graduation, which led me to pursuing an independent study opportunity to help me decide," he said.

Ybanez also fondly described his favorite class as being 'Failure Analysis' with Goberman. "The class content has been very useful in my Welding Engineer role when I am leading various investigations for welding process failures and improvements," he said.

"I remember all the MSE professors not only being very knowledgeable within their fields, but also being very engaging and enthusiastic when teaching as well. The enthusiasm of all the professors and staff, as well as the smaller size of the MSE department, helped MSE feel like a more close-knit and inclusive department in the UConn School of Engineering," Ybanez said.

After graduation, Ybanez decided to move directly into industry before pursuing his MS in welding engineering a few years later at The Ohio State University. There, Ybanez recalled drawing from his UConn education in materials science and engineering to excel in his academics. "Topics such as phase diagrams, microstructure, phase transformation in steels, and thermodynamics were being reintroduced in my grad school program, and I was able to easily understand them due to my strong undergraduate background."

He also drew from his experience in a favorite independent study class. Because of his work as an undergraduate research assistant in Professor Puxian Gao's Nanomaterials Science Lab, he gained insight into the research lab setting and what post-graduate research would be like. Ultimately "this helped me with the personal decision of pursuing industrial experience instead of post-graduate academic research right after graduation," he said.

Directly following his graduation with a BS in mse from UConn in 2016, Ybanez was hired as a materials engineer for Quest Global in East Hartford.

His involvement in both the Material Advantage club, as well as the Engineering Ambassador club at UConn, helped him stand out from other candidates when applying for his first job after graduation. Ybanez advises current students to do the same—"get involved."

"Particularly, leadership roles set potential new hires apart," Ybanez said. "Also, try to pursue and apply for any internships and/or independent research opportunities that are available. This will help you decide which specific field/industry you want to specialize in, as well as whether you want to pursue post-grad academic research or industrial work right after graduation."

GET INVOLVED with UConn MSE

SENIOR DESIGN

Educating the Next Generation of Engineers

Seize the opportunity to become a Senior Design industry partner and tap into the exceptional student talent, distinguished faculty, and state-of-the-art laboratory equipment that the UConn Department of Materials Science and Engineering has to offer.

Students who join the No. 1 public MSE program in the Northeast enjoy excellent employment, internship, and scholarship opportunities, first-rate faculty instruction with the best faculty-student ratio across the School of Engineering, and numerous hands-on research opportunities. The experience culminates with Senior Design, a two-semester project that exposes student teams to real-world engineering problems, design challenges, and collaboration with industry.

As an industry partner, you can expect expert interactions with UConn MSE, polished project updates and documentation, secure proprietary information, and a direct pipeline to our skilled students. Visit our Senior Design webpage at mse.engr.uconn.edu/seniordesign for more information.

YOUR CONTINUED SUPPORT HELPS POWER MATERIALS

Over 50 years after our first awarded Ph.D., and more than 15 since our first Bachelor of Science degrees, there's never been a better time to support the rapidly expanding UConn MSE community. We are now 19 core faculty members, and almost 250 dedicated students, postdocs, and staff members, all working to advance materials for tomorrow. As we settle into our new building, help us to enhance our teaching and research mission so that today's students can **Materialize their Future.**

Please consider donating to the MSE Department, where your contributions will directly enhance our efforts to promote research, education, and outreach.

For further information about personal and corporate opportunities for matching donations, establishing endowments, naming labs in our new building, equipment donations, sponsored lectures, hosted events, or other ways to give back to UConn MSE, including potential tax benefits, please reach out to Department Head Bryan Huey.

- **Materials Science and Engineering (MSE) General Fund Account (22156)**
  This account supports the overall efforts of the MSE Department, with a primary focus on opportunities for students, professional networking, investments in our teaching labs, and outreach. These funds also help students attend conferences, and support our active Materials Research, Student Advantage, 3D Printing, and Metalworking Clubs.

- **The Boland/Devereux MSE Undergraduate Excellence Scholarship (31727)**
  The funds will be used to provide undergraduate merit-based scholarships in honor of James Boland and Owen Devereux to students in the MSE Program.

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