UCONN
SCHOOL OF ENGINEERING

Fall 2014

materials science &ENGINEERING

mse.engr.uconn.edu

A WORD FROM THE DEPARTMENT HEAD

Dear students, faculty, alumni, and friends of UConn MSE,

The teaching distinctions, research accolades, and student achievements that our department has earned over the past few months have provided us with much to honor and celebrate. In May, we celebrated the graduation of the class of 2014 and culmination of their research projects on senior design day. Our department was proudly represented at the engineering commencement ceremony by 2014 MSE graduate Rose Cersonsky, who was selected for the prestigious honor of commencement speaker. In addition to their stellar undergraduate accomplishments, our most recent group of alumni have already advanced to positions in academia and industry for which UConn MSE has prepared them.

The spring semester marked other departmental milestones. A new scholarship was established to honor the legacy of Dr. Owen F. Devereux, whose three-decade long career at UConn contributed to the creation of the MSE major. Dr. Devereux's admirable vision helped to establish MSE among the top public programs in the nation and continues to influence our growth and innovation.

MSE faculty and alumni were honored for their distinguished contributions to the field. Professor Cato T. Laurencin was elected 2014 MRS Fellow and Professor C. Barry Carter was awarded the Ceramic Educational Council Outstanding Educator Award for 2014. MSE alumna and International Training Manager for Saint-Gobain Dr. Anne Silberstein was inducted to the UConn Academy of Distinguished Engineers, and The Connecticut Technology Council named 2014 doctoral graduate Dr. Zengmin Xia one of eight "Women of Innovation" for her research on biomaterials and tissue regeneration. Five of our graduate students were awarded GE Fellowships for Innovation, a program designed to support technological research, enrich the graduate community, and expand upon the valuable relationship between UConn and GE.

The department was as active as ever in the summer months, with faculty and students engaged in diverse research and internship experiences. In conjunction with his colleagues at Argonne National Laboratories, Dr. Serge Nakhmanson published "Dynamic Layer Rearrangement During Growth of Layered Oxide Films by Molecular Beam Epitaxy" in *Nature Materials*. The groundbreaking paper details findings that are highly valuable to the future design and discovery of functional oxides.

This fall, Dr. Seok-Woo Lee joins our teaching faculty as Pratt & Whitney Assistant Professor. Dr. Lee's research focuses on the study of the mechanical behavior of advanced materials at multiple length scales and an examination of the deformation mechanisms in advanced materials, investigations that are essential to the design of reliable devices. UTC Aerospace Systems Director of Materials Engineering Dr. Venkat Vedula will also serve as the eighth and newest member of the Industrial Advisory Board. Please join me in welcoming them to the UConn MSE community!

Here's to another productive year of learning, research, and innovation,

S. Pamir Alpay

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

Please direct any questions or comments to mseinfo@engr.uconn.edu.

STAFF WRITER:
Giorgina Paiella

CONTRIBUTOR:
William Weir

PHOTOGRAPHY:
Peter Morenus,
Christopher LaRosa,
Heike Brueckner, and others.

CONTENT EDITOR & DESIGN:
Heike Brueckner

KEEP IN TOUCH

To stay informed about ongoing news and events happening at UConn's Materials Science & Engineering Department, visit our website regularly: www.MSE.engr.uconn.edu

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UConn Materials Science & Engineering Alumni Group

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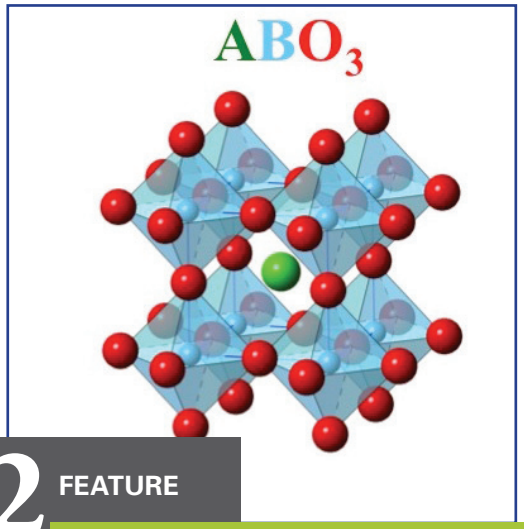
"It is up to you how far you go"
MSE celebrates 2014 Commencement



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The Future of Functional Oxides
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MSE establishes the Dr. Owen F. Devereux Scholarship
A new scholarship honors the legacy of MSE visionary Dr. Owen F. Devereux.

"It is up to you how far you go": Engineering Graduates Celebrate 2014 Commencement

On Saturday, May 10th, approximately 400 undergraduates in the School of Engineering celebrated the culmination of their four years at UConn. Over 5,000 graduates, family members, and friends gathered in Gampel Pavilion for a day that will remembered as one of great triumph for the graduates, supplemented by unique and unforgettable speeches.

NASA astronaut Rick Mastracchio (ENG '82) delivered a keynote address to the 2014 graduates from the International Space Station, orbiting 260 miles above the Earth. After graduating from UConn with a bachelor's degree in electrical engineering and computer engineering, Mastracchio first began a career with Hamilton Standard (now UTC Aerospace Systems). He then transferred to Houston, where he supported 17 NASA missions as a flight controller and was later accepted into the astronaut corps in 1996. "It is up to you how far you go," Mastracchio told the graduates, reflecting on the hard work and perseverance required to reach any goal.

Mastracchio was presented with an honorary doctorate degree by Kazem Kazerounian, Dean of the School of Engineering, and Provost Mun Choi, which Mastracchio's wife, Candace, accepted on his behalf.

Dr. Kazerounian delivered a speech to the graduates on engineering's important role in solving problems facing humankind: "In many ways, the future of humanity is entrusted to you. That gives me comfort," Dean Kazerounian stated.

2014 MSE graduate and student commencement speaker Rose Cersonsky reflected on her rich experiences as a UConn engineering student:

> At UConn, I have learned that camaraderie is at the heart of personal growth and success. "No man is an island, entire of itself"; I did not get to where I am alone… I have learned much about patience, empathy, and most importantly, loyalty from the amazing people that have surrounded me these four years. And you can often find these lessons in the most unlikely of partnerships.

Rose finished her speech emphasizing the human element vital to the graduates' future aspirations, a message unifying each of the Commencement speeches:

> The brains of this audience may be home to the greatest innovations of the future, but I have no doubt in what I say next. The greatest mark that we leave on this world is the impact that we have on those around us. Thank you and congratulations to everyone in this room—together we have done something great.

Congratulations and best of luck to the class of 2014!

Bachelor of Science Graduates

- Timothy Batt
- Daniel Violette (University Scholar)
- Derek Baxter
- Brian Ely Becerra
- Patrick J. Brueckner
- Nicholas Cerchia
- Rose Cersonsky* (Commencement Speaker)
- Marc Chale
- Stephen Consoles
- Daniel J. Cunningham*
- Cody Seymour Donecker
- Shannon Gagne
- Blake Robert Knox
- Joshua Leveillee*
- Alejandro Lluberes*
- Nathan Lussier*
- Nathan Martin*
- Mackenzie Merrick
- Brandon James Moffitt
- Connor Pierce O'Neill
- Steven Onorato
- Alexander Reardon
- Nicholas Santoro
- Scott Suvall
- Cody Thomas Unger

* Denotes *Honors Scholar*

Master of Science Graduates

- Andrew Gutierrez
- Christie Barbera
- Brittany Estes
- Shawn Couceiro Fonseca
- Kan Fu
- Michael James Harris
- Francis Moon
- Tulsi Ashok Patel

Ph.D. Graduates

Mario Pasquale Bochiechio
Major Advisor: Eric H. Jordan
Doctoral Dissertation: Thermal Barrier Coatings for Aggressive Thermal Environments

James L. Bosse
Major Advisor: Bryan Huey
Doctoral Dissertation: Investigation of Crystallization Kinetics of Chalcogenide Based Phase Change Memory Films by Atomic Force Microscopy

Ching-Chang Chung
Major Advisor: George A. Rossetti Jr.
Doctoral Dissertation: Microstructural Evolution in Lead Zirconate Titanate (PZT) Piezoelectric Ceramics

Le Ge
Major Advisor: Prabhakar Singh
Doctoral Dissertation: Chromium Evaporation of Metallic Component Materials in Solid Oxide Fuel Cells (SOFCs)

Mauricio Andres Gordillo
Major Advisor: Mark Aindow
Doctoral Dissertation: Structure/Property Relationships in Two Novel Powder-Processed Al-Transition Metal-Rare Earth Alloys

Erica Rose Kramer
Major Advisor: Mei Wei
Doctoral Dissertation: Magnetic Apatites for Biomedical Applications

Na Li
Major Advisor: Prabhakar Singh
Doctoral Dissertation: The Interaction of LSM-YSZ Composite and Improvement of the Solid Oxide Cell Durability by Mn-modified YSZ

Kuo-Ting Liao
Major Advisor: Puxian Gao
Doctoral Dissertation: Green Synthesis, Processing and Characterization of Nanostructured Metal- and Bimetal (Hydroxy-)Stannates

Justin Roller
Major Advisor: Radenka Maric
Doctoral Dissertation: Flame Synthesis of Nanomaterials for Alternative Energy Applications

Han Wang
Major Advisor: Brian G. Willis
Doctoral Dissertation: Atomic Layer Deposition of Alkaline Earth Oxides: Process Optimization, Characterization, and Application

Zengmin Xia
Major Advisor: Mei Wei
Doctoral Dissertation: Biomimetic Collagen-Apatite Composites for Bone Tissue Engineering

Satyesh Kumar Yadav
Major Advisor: Ramamurthy Ramprasad
Doctoral Dissertation: Electronic and Mechanical Properties of Nano-heterostructures from First Principles

Jialan Zhang
Major Advisor: Pamir Alpay
Doctoral Dissertation: Electrothermal Properties of Perovskite Ferroelectric Films

Keling Zhang
Major Advisor: Prabhakar Singh
Doctoral Dissertation: Development of Molten Salt Promoted Absorbent for CO2 Separation

Left to right: Dean Kazem Kazerounian, Rose Cersonsky, Nancy Cersonsky, MSE Department Head S. Pamir Alpay

Left to right:Professor Avinash Dongare, Karoon MacKenchery, Rafael Patel, Nicholas Cerchia, Parker Wells, Steven Onorato, Brandon Moffitt, Scott Suvall, Alexander Reardon, Alejandro Lluberes, Professor Radenka Maric, Mackenzie Merrick, Shannon Gagne, Nathan Martin, Rosy Cersonsky, Nathan Lussier, Daniel Cunningham

2014 MSE graduate and student commencement speaker Rose Cersonsky

Dr. Zengmin Xia Named Woman of Innovation by the Connecticut Technology Council

(Left to right) Professor Mei Wei and 2014 MSE Ph.D. graduate Zengmin Xia

The Connecticut Technology Council (CTC) has selected Dr. Zengmin Xia as one of eight "Women of Innovation." The council honors Connecticut women who are leaders in the science, math, technology, and engineering disciplines, granting awards in eight innovation and leadership categories: academic, entrepreneurial, large business, small business, youth, collegian, reseach, and community. Xia is the 2014 top category winner for collegian innovation and leadership.

Xia received her doctorate from the UConn Materials Science and Engineering Department in May 2014. She completed her research on biomaterials and tissue regeneration, specifically the preparation of novel tissue engineered scaffolds for bone repair and regeneration, in Dr. Mei Wei's lab. The Wei Laboratory focuses on the development of novel biomaterials for tissue repair and regeneration. Biomaterials research is highly interdisciplinary, combining elements of materials science, engineering, biology, chemistry, and medicine. Through her lab experiences, Xia benefitted from this multidisciplinary and team-oriented environment, where she learned the fundamentals of materials science and engineering and the principles and applications of tissue engineering.

Bone loss due to trauma, disease, and aging creates a pressing need for bone grafts, an issue central to the focus of tissue regeneration research.

"Many currently existing bone grafting materials still suffer from poor osteoconductivity and poor mechanical properties," Xia states. "Thus, there is a pressing need to produce a bone tissue engineered scaffold that can have good mechanical properties and excellent biocompatibility. We designed tissue engineered scaffolds for improved bone repair and regeneration. The fabrication process for the scaffold is simple, which makes the scale-up manufacturing step easy to achieve. The scaffolds have been found to have bone-like morphology, improved mechanical strength, and their pore size can be easily tailored to meet the needs in different applications. The scaffolds had been tested in vivo for both calvarial and long-bone defect repair and demonstrated promising outcomes."

A patent was published in 2013 based on Xia's research. Her invention helped the Wei Laboratory secure an NSF I-Corp grant to commercialize the tissue engineered scaffolds, with Xia serving as entrepreneur lead. The team's novel scaffold was able to induce faster bone formation in vivo, suggesting that patient rehabilitation time may be reduced in the future.

On receiving the CTC distinction, Xia notes, "I really didn't think I would win. The award is a great honor to me. My greatest appreciation goes to my advisor, Professor Mei Wei, who received the same award in 2007. With the help of Professor Wei, I developed a lasting intellectual curiosity and a desire to be a researcher in biomaterials. She is a knowledgeable and enthusiastic professor, a caring person, and a great mentor who empowers students. She is a role model to young women, particularly those in her lab group and female students in the School of Engineering. With her inspiration and guidance, I started to think highly and dream big; I learned to become a better me."

Prior to joining UConn, Xia received her B.S in chemical engineering and minor in English from Zhejiang University and her M.S. in chemical engineering from the Beijing University of Chemical Technology. Over the span of her Ph.D study, Xia produced an impressive 14 referred journal publications, one patent, one book chapter, and 17 conference presentations. Now that she has graduated, she will take on a research assistant professor position in New York State.

Reflecting on her time in UConn MSE, Xia states:

> I want to especially thank Professor Harold Brody, Professor Yu Lei, Professor MT Shaw and Professor Anson Ma for their helpful suggestions on my research. I have improved my understanding of material properties through fruitful discussions with professors of the School of Engineering. I have also gained knowledge of cell culture and the interactions of materials with the biological environment from our collaborators at the UConn Health Center. In addition, I love working with other graduate students and mentoring undergraduate students in Professor Wei's group. I have mentored 12 undergraduate students, one high school student, and one technician during my Ph.D. study. I discovered that learning how to supervise is just as important for my career in the long-term as independent research. ■

KX Technologies Taps into MSE Student Talent

The Senior Capstone Program is the culminating experience of a UConn School of Engineering student's education. Over two semesters, senior students take the Senior Design Project course, where they learn about the principles of design, engineering ethics, professional communication, and other real-life engineering lessons. UConn MSE students are educated in materials engineering innovations, learn key leadership skills, and are immersed in the real-life challenges that engineers face.

Throughout their final year, students plan, design, and research a project addressing a problem or unsolved issue facing local companies. They identify a problem facing engineers and propose solutions, developing faculty and industry mentor relationships along the way.

Marmon Water Technology Council Meeting
Left to right: Andrew Lombardo, Frank Brigano, Fiona Leek, William Li, Nicholas Cerchia, and Bruce Taylor

MSE students frequently produce exemplary Senior Design Projects in response to challenging materials problems. 2014 MSE graduates William Li and Nicholas Cerchia's project, "Select Sealant and Design Quality Control Process for Manufacturing Filter Cartridges," was sponsored by KX Technologies of West Haven. Initially established in 1989 and later incorporated into the Marmon group, KXT provides innovative technologies and custom-designed filtration systems. The company has served as a sponsor for UConn MSE senior design projects for the past two years and a sponsor for a project in the UConn Chemical Engineering department this year.

"We wanted to create an opportunity where the students not only can present the work they did but also have the opportunity to interface with potential employers."

KXT makes water filter cartridges that are tested for defects using "bubble-point testing." Li and Cerchia's objective was to explore faster, more accurate testing methods as alternatives to the bubble-point process. The team's first approach used thermal imaging to capture hot air being blown through the filter, with defects appearing as "hot spots" on the thermal image. They also tested MRI and X-Ray CT technology to produce high-resolution, three-dimensional images of the sample, producing favorable results for these tested methods. Thermography proved to be the most promising solution for defect detection in water filters, capable of detecting micron-sized defects with the lowest initial and running costs. X-Ray CT produced exciting images, but was deemed cost-ineffective for in-situ quality control testing.

Li and Cerchia were invited by KXT to speak at the Marmon Water Technology Council meeting in February. The Marmon Group consists of Graver Technologies, EcoWater Systems, and KX Technologies. "We wanted to create an opportunity where the students not only can present the work they did but also have the opportunity to interface with potential employers," states industry advisor Dr. Frank Brigano.

The professional relationships established throughout the project and the opportunity to speak at the Marmon Water meeting proved especially valuable when Will was offered employment at KXT.

"The MSE senior projects are an excellent way to interview a person," notes Dr. Brigano. "We had a school year to see how the student interfaced with us and the faculty advisor, how they follow up on project activities, their thought processes, etc. Not only did we get valuable results from their project, but we also got a way to trial a person. It is extremely expensive to hire an individual. The process of using the senior programs at MSE reduces the hiring risk."

Capstone design projects not only provide employers with the opportunity to hire skilled, engaged MSE students, but also create an essential collaboration between academia and industry.

As Dr. Brigano reflects:

> Our hiring Will Li signifies the importance we value on our relationship with the University of Connecticut. We are very proud to be able to sponsor senior projects and associate with the University of Connecticut. All of the students that we have worked with at UConn have been extraordinary. We have been extremely pleased with the quality of the students, their work, and with the faculty advisors. We are committed to being a long term "investor" in the UConn MSE program, its students, and the university. ■

MSE Students Exhibit Capstone Projects on Senior Design Day

MSE seniors had the chance to present their senior design projects on Friday, May 2nd in IMS 20. With a total of 16 projects and 29 students participating, the event showcased the department's exceptional student talent.

Congratulations to our graduating seniors and the MSE Senior Design Project final presentation winners!

First prize was awarded to Steven Onorato for his project, "Tribology of S-Monel Influence of Alloy Processing," sponsored by UTC-Aerospace under the guidance of faculty advisor Professor George Rossetti and industry advisors Kevin Rankin and David Grulke.

Nathan Martin and Anthony Manni received second prize for "Laser Based Additive Processing of Ultrahard Coatings on Stainless Steels," sponsored by RBC Bearings and under the guidance of faculty advisor Professor Rainer Hebert and industry advisor Wayne Samuelson.

Third prize was awarded to Jacob Wrubel and Steve Consoles for UTC-Aerospace-sponsored "Design Characteristics of Alternate Anaerobic Adhesives." Professor Bryan Huey served as academic advisor and Michael Folsom and David Grulke as industry advisors.

Other Capstone Design Projects:

Select Sealant and Design Quality Control Process for Manufacturing Filter Cartridges
by Nicholas Cerchia and William Li
Industry Sponsor: KX -Technologies, Inc.
Industry Advisor: Bruce Belcher, Blake Savoy
Faculty Advisor: Prof. Pamir Alpay, Dr. Fiona Leek

Process and Chemistry to Produce UV Stable Colored Cable Insulation by Rafael Patel
Industry Sponsor: Rockbestos-Suprenant Cable Corporation, Inc.
Industry Advisor: Daniel Masakowski
Faculty Advisor: Prof. Harris Marcus, Dr. Fiona Leek

Design of Carbon Fiber Resin Composites for Improved Fatigue Behavior by Shannon Gagne
Industry Sponsor: MSH1 Bicycle Works
Industry Advisor: M.P. Klucha
Faculty Advisor: Prof. Rainer Hebert

Modify Design and Manufacturing for ESP Cable Systems in Extreme Environments
by Alejandro Lluberes and Parker Wells
Industry Sponsor: Marmon Utility-Kerite Pump Cable
Industry Advisor: Michael Norton
Faculty Advisor: Prof. Prabhakar Singh

A Predictive Model for Specification and Control of Advanced Electron Beam Welding by Daniel Cunningham
Industry Sponsor: PTR-Precision Technologies, Inc.
Industry Advisor: John Rugh
Faculty Advisor: Prof. Pamir Alpay

Design Rules for Composites from RTM Polyimides
by Rose Cersonsky
Industry Sponsor: Pratt & Whitney Aircraft
Industry Advisor: Hillary Huttenhower, John Riehl
Faculty Advisor: Prof. Serge Nakhmanson, Dr. Fiona Leek

Develop Design Rules for Diffusion Brazing in Superalloy Joints by Alexander Reardon
Industry Sponsor: Pratt & Whitney Aircraft
Industry Advisor: Edward R. Szela
Faculty Advisor: Prof. Mark Aindow

Additive Metal Processing for Production of Surgical Device Components by Daniel Violette and Scott Suvall
Industry Sponsor: Covidien
Industry Advisor: William Powers
Faculty Advisor: Prof. Rainer Hebert

Tooling and Processing Optimization for Complex Geometry, Nonferrous Castings
by Nathan Lussier and Sean Reynolds
Industry Sponsor: Sikorsky Aircraft Corporation and Sikorsky Innovations, Inc.
Industry Advisor: Paul Inguanti
Faculty Advisor: Prof. Harold Brody

Additive Manufacturing of Tooling to Repair Complex Shape Fiber Composites by Marc Chale and Luke Wiles
Industry Sponsor: Sikorsky Aircraft Corporation and Sikorsky Innovations, Inc.
Industry Advisor: Michael Urban
Faculty Advisor: Prof. Harold Brody (MSE), Prof. Leila Ladani (ME)

Laser Assisted Manufacturing of Inserts for Honeycomb Shelves by Giovann Giarratana and Mackenzie Merrick
Industry Sponsor: Sikorsky Aircraft Corporation and Sikorsky Innovations, Inc.
Industry Advisor: Michael Urban and Alexander Weintraub
Faculty Advisor: Prof. Harris Marcus (MSE), Prof. Leila Ladani (ME)

Improved Design, Performance, and Repair of Firewalls by Laser Assisted Processes by Joshua Leveillee and Derek Baxter
Industry Sponsor: Sikorsky Aircraft Corporation and Sikorsky Innovations, Inc.
Industry Advisor: Michael Urban, Stephen Hakenjos
Faculty Advisor: Prof. Avinash Dongare (MSE), Prof. Stephen Stagon (ME)

Computational Design of Predictive Models for Dislocation Evolution in Metallic Materials by Karoon Mackenchery
Sponsor: UConn MSE Department
Faculty Advisor: Prof. Avinash Dongare

MSE Undergraduate Student Spotlight: Aliya Carter

MSE undergraduate Aliya Carter does not shy away from rigor. The rising junior has displayed academic excellence and ambition throughout her first two years at UConn, with many scholarships, awards, and research opportunities to her name that far exceed her class standing.

Aliya Carter

This fall, Aliya will be entering her third year in the MSE program as a new member of the UConn Honors program. She has accelerated her materials science studies by jumping into sophomore introductory courses during her freshman year and two junior-level MSE courses during her sophomore year, providing her with the valuable opportunity to network with professors and upperclassmen early in her college career.

"Being an engineering student is this amazing experience in which you get to learn, not only from books and lectures, but from a large variety of people who have each had their own respective experiences," Aliya notes. "As you meet these people, you can develop additional ideas, form a new appreciation of that particular field, and improve your own mindset overall. It is a perpetual learning journey."

Aliya is the recipient of numerous scholarships and awards on both the university and national level. She was most recently awarded the George A. Roberts Scholarship from the ASM Materials Education Foundation this summer, a national scholarship for undergraduate materials science and engineering members of Material Advantage. She also received the Charles W. Finkl Scholarship, an engineering scholarship from the Forging Industry Educational and Research Foundation (FIERF). At UConn, Aliya is the recipient of the School of Engineering Art McEvily Scholarship and GE Advanced Materials Endowed Scholarship.

Aliya received a Summer Undergraduate Research Fund award (SURF) this summer for her project, "Nanoscale Property Mapping of VO2 Thin Films for Energy Efficient *Smart Windows*." She carried out this research with MSE Associate Professor Bryan Huey in the IMS NanoMeasurement Labs. The previous summer, she was a participant in the Naval Research Enterprise Internship Program (NREIP) at the Naval Undersea Warfare Center in Newport, RI, a program funded by the American Society for Engineering Education (ASEE). Aliya worked on her project, "Flow Noise Analysis of a Vector Sensor Towed Array," under the advisement of Dr. Andrew Hull in the Department of Autonomous Underwater Vehicles and Unmanned Underwater Vehicles. She also completed research at the Naval Undersea Warfare Center as a high school intern in the Science and Engineering Apprenticeship Program (SEAP) during the summer of 2011.

Aliya hopes to complete a concentration in nanomaterials, having discovered an interest in the field fostered by her summer research in the NanoMeasurement Lab and favorite MSE course, Special Topics in Engineering, Advanced Nanoscience and Society (MSE 4095) with Professor Huey. She counts Professor Huey and Professor Harold Brody among her favorite professors in the department.

Reflecting the same passion evident in her studies and research, Aliya's extracurricular involvement is also rooted in engineering activities. She is a member of Material Advantage, which additionally provides membership to The American Ceramic Society (ACerS), the Association for Iron & Steel Technology (AIST), The Minerals, Metals, and Materials Society (TMS), and the American Society for Metals (ASM). She will be attending the MS&T conference with the UConn Material Advantage chapter in the fall. Aliya was also a member of the Engineering House Learning Community during her freshman and sophomore years.

She reflects, "The past two years as an undergrad have truly taught me to take advantage of every opportunity—whether you believe it is within your reach or not—because even if you don't accomplish your goal, you have obtained the experience to later succeed."■

MSE Graduate Students Awarded GE Fellowships for Innovation

First row – left to right: Sadid Muneer, Reed Williams, Lingyu Ren, Jian Ren, Yan Xia. Second row – left to right: Ayhan Kammer, Yu Sun, Huseini Patanwala, Zheng Ren. Third row – left to right: Mehmet Kesim, Haibo Yu, Arun Mannadi Kankkithodi, Shilei Ma, Kan Fu

2014 GE Fellows

Kan Fu
"Integrating Biomolecules and Nanoscale Electronics in Chemical Sensing Technologies: Enhanced Functionality and Performance"
(Advisor: Prof. Brian Willis)

M. Tumerkan Kesim
"Metals and Alloys for Electrical Circuit: Electrical Characterization and Oxidation/Aging Studies"
(Advisor: Prof. S. Pamir Alpay)

Haibo Yu
"Metals and Alloys for Electrical Circuit Breakers Contacts: Microstructural Characterization"
(Advisor: Prof. Mark Aindow)

Arun Kumar Mannodi Kanakkithodi
"Rational Computational Design of New Polymer Dielectrics"
(Advisor: Prof. Rampi Ramprasad)

Zheng Ren
"Monolithic Nanowire Array Catalysts for Vehicle Emission Control and Clean Energy Combustion"
(Advisor: Prof. Puxian Gao)

Congratulations to the five MSE graduate students who have been named 2014 GE Fellows!

The GE Fellowship for Innovation program was established to provide fellowships to outstanding graduate students in UConn's School of Engineering (SoE) who plan to pursue terminal degrees in the areas of advanced materials, magnetic materials, polymeric materials, and energy and modeling. The fellowship is part of a five-year $7.5 million advanced technology initiative meant to expand the longstanding relationship between GE and the University of Connecticut. Established in 2012, the program was created to transform the state's technology sector and spark breakthrough innovations in electrical distribution products.

In order to receive the fellowship, a student must receive a 50% research assistantship from his or her advisor. Recipients must also maintain excellent standing in research and academics, attend SoE graduate professional workshops, deliver a presentation on the annual GE night, and participate in at least 50 hours of SoE activities designed to enrich the graduate community. ■

MSE Graduate Student Spotlight: Arun Kumar Mannodi Kanakkithodi

The MSE department is home to students who demonstrate excellence early on in their undergraduate and graduate careers, receiving prestigious accolades and opportunities that set them apart as high achievers among their peers.

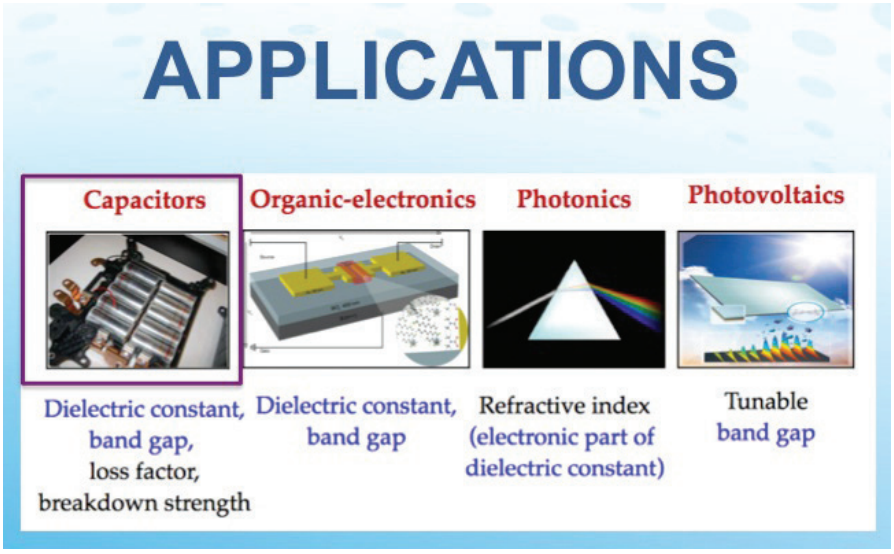
Arun Kumar Mannodi Kanakkithodi will be entering his third year as an MSE Ph.D. student completing doctoral research work on dielectrics. He is one of five MSE graduate students selected as 2014 GE Fellows, a distinguished program that provides fellowships to outstanding graduate students in the UConn School of Engineering who are pursuing terminal degrees in the areas of advanced materials, magnetic materials, polymeric materials, and energy and modeling.

The GE Fellowship program is part of a five-year $7.5 million advanced technology initiative meant to expand the longstanding relationship between GE and the University of Connecticut. Established in 2012, the program was created to transform the state's technology sector and spark breakthrough innovations in electrical distribution products. In order to receive the fellowship, a student must receive a 50% research assistantship from his or her advisor. Recipients must also maintain excellent standing in research and academics, attend SoE graduate professional workshops, deliver a presentation on the annual GE night, and participate in at least 50 hours of SoE activities designed to enrich the graduate community.

After receiving his bachelor's of technology degree in 2012 from the Department of Metallurgical and Materials Engineering at the Indian Institute of Technology (IIT) in Roorkee, India, Arun joined the UConn MSE department in 2012 as a graduate assistant in the Ramprasad Research Group.

Arun received a GE Fellowship for his thesis, Rational Discovery and Design of New and Improved Dielectric Polymers. He explores the chemical space of organic and organometallic polymers using first principles calculations and advanced data mining methods based on machine learning techniques, research that is expected to lead to the production of new, promising polymer dielectrics. This interdisciplinary research also allows for active collaborations with experimental polymer chemists, particularly Dr. Greg Sotzing's Polymer Science group in the chemistry department. Arun's 50% research assistantship supporting his doctoral research work is provided by Professor Ramprasad's Multidisciplinary University Research Initiative (MURI) grant, which he received from the Office of Naval Research in July 2010 to guide the design and synthesis of polymeric films for capacitive energy storage. In addition to his research, Arun served as Dr. Theodolus Kattamis' teaching assistant this past year. The position provided him the opportunity to deliver several lectures on Strengthening Mechanisms in Metals to a class of sophomores, which allowed him to explore and enhance his teaching skills.

Arun Kumar Mannodi Kanakkithodi

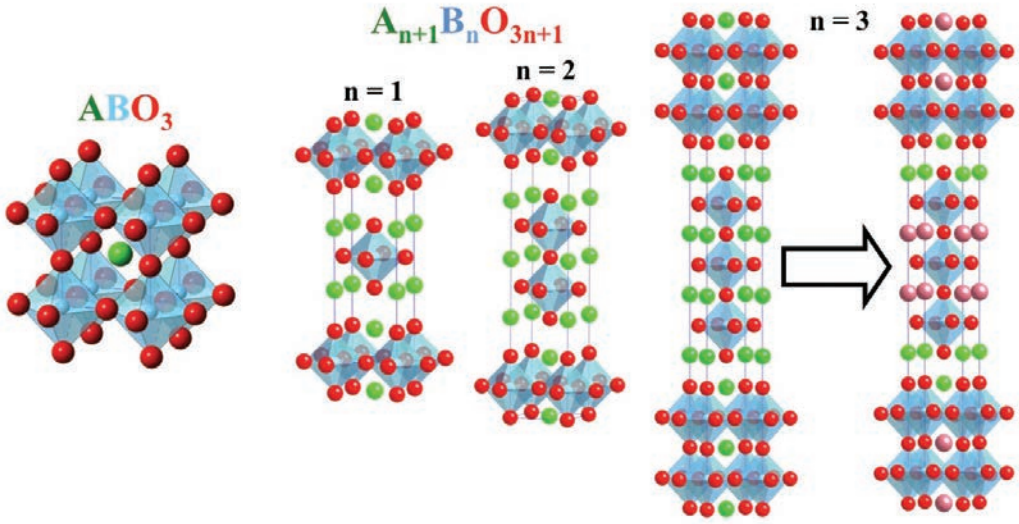


"Arun is an intelligent, independent, creative and motivated student who is highly deserving of the honor of the GE Graduate Fellowship," advisor Professor Ramprasad states. "Moreover, his research topic overlaps strongly with several of GE's interests, including dielectrics, polymers, and modeling, as well as application areas such as electrical energy storage and high-field phenomena." ■

"Dynamic Layer Rearrangement During Growth of Layered Oxide Films by Molecular Beam Epitaxy" Published in *Nature Materials*

MSE Associate Professor Dr. Serge Nakhmanson, in conjunction with colleagues from Argonne National Laboratory, has published a paper in *Nature Materials*, the premier journal for innovative materials science research.

The article, "Dynamic Layer Rearrangement During Growth of Layered Oxide Films by Molecular Beam Epitaxy," has been selected for advanced online publication on *Nature Materials*' website and is also featured in the "News and Views" section of the *Nature Materials* September 2014 issue. The paper marks the culmination of a three-year project that was seeded in 2010 under the Argonne Strategic Initiative in Materials Design. The project, "Synthesis Science of Functional Layered Complex Oxides," was dedicated to the development of the first in situ ternary-oxide molecular beam epitaxy (MBE) system for the synthesis of novel layered-oxide materials.



Sketches of the Ruddlesden-Popper series of layered oxides for n = 1 (e.g., Sr_2TiO_4), 2 (e.g., $La_3Ni_2O_7$) and 3.
Parent, n = ∞, ABO_3 structure is also shown on the left.
A layered superlattice, similar to $PbSr_2Ti_2O_7$, is shown on the right for n = 3.

One of the candidate compounds proposed for this cutting-edge MBE system is Goldstone ferroelectric $PbSr_2Ti_2O_7$, a layered perovskite oxide Serge Nakhmanson and Ivan Naumov predicted with the help of density functional theory simulations. While material properties have to strictly conform to structural symmetry, this particular compound appears to violate this principle, exhibiting no preference for the orientation of its unit cell polarization. Although $PbSr_2Ti_2O_7$ still awaits synthesis, the team's attempts to grow similar layered structures have led to several contributions highly valuable to future efforts aimed at the design and discovery of functional oxides, one of which is reported in the paper.

Complex oxide materials, such as ABO_3 perovskite structures, are highly versatile and possess a variety of useful functionalities that are critical for a wide range of promising technological applications. A large number of these materials have already been extensively studied and their functional properties well characterized. Improving on these functionalities or designing new and advanced ones, however, remains a great challenge because proposed advances can only be achieved in more complex structures (e.g. perovskite superlattices or layered compounds) that are more difficult to synthesize. In order to construct these intricate new materials, researchers need to know precisely where individual atoms go during the growth process and how growth conditions can be altered to produce intended geometry.

Modern solid-state synthesis techniques already utilize state-of-the-art technology. MBE is simultaneously the most difficult and flexible of these methods, allowing researchers to grow oxide films by spraying atomically

Meet our faculty

Mark Aindow
Professor
Associate Director of IMS

Defects and Interfaces, Microstructural Development in Alloys and Thin Films & Electron Microscopy

S. Pamir Alpay
Professor and Department Head

Smart Materials, Material Modeling, Conducting Oxides & Thin Film Deposits

Harold D. Brody
Distinguished Professor
Alpha Sigma Mu Chapter Advisor

Materials Processing, Alloy Casting and Solidification, and Process Models

thin layers one at a time with great precision. However, addressing the challenge of "knowing exactly where the atoms are going" in order to construct new materials that are usually reluctant to come together requires the development of in situ (watch-as-you-grow) capabilities. The team accomplished this feat with the design of a unique MBE system utilizing the power of Argonne's Advanced Photon Source (APS), a synchrotron that produces the brightest X-ray beams in the Western hemisphere. The results of the synchrotron experiments were combined with intensive density functional theory and classical molecular dynamics simulation studies to reveal subtle layer rearrangement phenomena occurring during film growth.

Professor Nakhmanson comments on the details of the growth process described in the paper:

> If you draw out the structure of the desired layered oxide on a piece of paper – or build it on a computer, which is now more common – and then try to grow it by spraying atomic monolayers on top of one another the way they are drawn, you will not get what you want. That is because, as they are being sprayed on, individual monolayers will interact with each other, which may sometimes result in large structural changes. Some layers may "sink down," while others may "float on top" of your film, and the specific details of these interactions depend upon the chemical identities of the layers we are trying to put together. However, the layers that sink do not go all the way to the bottom, but after a few of such "layer flips," they get caught within the growing structure and stop moving. Therefore, in order to grow the material that you want, you have to take this dynamic layer rearrangement into account and spray layers out of trivial sequence.

The team developed these insights for the layered-oxide materials that belong to the Ruddlesden-Popper perovskite homologous series, which also includes ferroelectric $PbSr_2Ti_2O_7$. Dynamic layer rearrangements were first studied for Sr_2TiO_4, a simple and well-studied layered material. In order to demonstrate the broad efficacy of the new growth strategy, the researchers then used the same techniques to grow the first thin film of single-crystalline $La_3Ni_2O_7$. ■

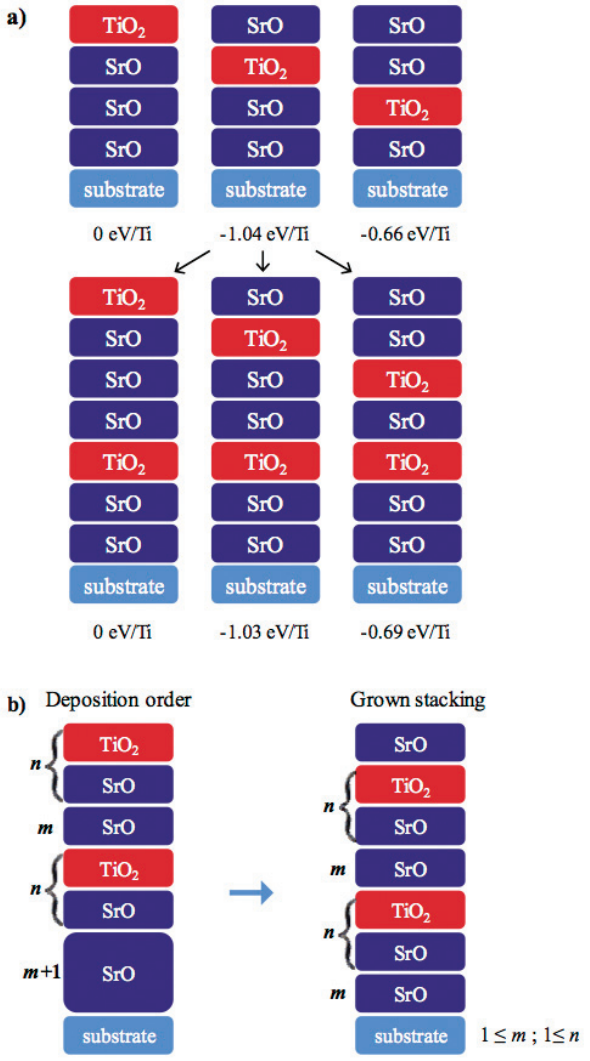


Figure S2: Strategy to grow Sr_2TiO_4 and $(SrO)_m(SrTiO_3)_n$ films. a.) Energy differences among different stackings in the growth of Sr_2TiO_4 films. (upper) Different possible stackings after the deposition of SrO -> SrO -> SrO ->TiO_2; (lower) Different possible stackings after the subsequent deposition of SrO -> SrO -> TiO_2. The relative energy of each stacking is labeled at the bottom. b.) Illustration of the relationship between deposition order and the actual grown stacking for the first two unit cells of $(SrO)_m(SrTiO_3)_n$ film.

C. Barry Carter
Professor

Interfaces & Defects; Metals, Ceramics, Materials, Semiconducters; Nanomaterials; TEM, SEM, AFM

Avinash M. Dongare
Assistant Professor, Material Advantage Chapter Advisor

Atomistic, Meso-Scale, Multi-Scale Modeling, Multiphase Bulk Material, Interfaces

Puxian Gao
Associate Professor

Nanomaterials Synthesis, Characterization and Manipulation, Nanotechnology

Dr. Radenka Maric and Dr. Mark Aindow Get Fuel Cell Funding

By Bill Weir

Dr. Radenka Maric and Dr. Mark Aindow (Christopher LaRosa/UConn Photo)

Dr. Radenka Maric of CBE and MSE and Dr. Mark Aindow of MSE have key roles in two projects that have received a total of $6.7 million from Advanced Research Projects Agency-Energy (ARPA-E) designed to reduce the overall operating costs of solid oxide fuel cells (SOFCs).

The two projects are headed by United Technologies Research Center (UTRC) and FuelCell Energy (FCE). Dr. Maric is the principal investigator for UConn on both the UTRC and FCE awards and Dr. Aindow is the UConn co-principal investigator on the FCE grant.

The ARPA-E grants are extremely competitive, with only 13 new awards being made by the agency in this cycle, corresponding to less than 5 percent of the full proposals submitted. As such, it is particularly noteworthy that two of these awards involve UConn researchers. ARPA-E is an organization that advances high-potential, high-impact energy technologies that are too early for private-sector investments by funding researchers who develop new ways to generate, store, and use energy.

Working with UTRC, Dr. Maric will develop an intermediate-temperature SOFC for residential applications that will combine a building's heating and power systems into one unit. The aim of the three-year project is to develop a fuel cell that works at a lower cost with less degradation. With FCE, Drs. Maric and Aindow will develop an intermediate-temperature fuel cell that directly converts methane to methanol and other liquid fuels. Advanced metal catalysts will be optimized to improve the yield and selectivity of the methane-to-methanol reaction. Both projects make use of a reactive spray deposition technique (RSDT) developed by Dr. Maric to lower manufacturing costs.

One of the UConn researchers' tasks is to develop an electrochemical cell capable of producing liquid fuel such as methanol directly from the methane-containing feedstock, and to be able to do it at a temperature of about 500 degrees Celsius. What is commonly used now are high-SOFCs operating in the range between 800 and 1,000 degrees Celsius. Lowering the temperature lessens the level of degradation. Because lower temperatures allow for the use of cheaper materials than the ceramics currently used, that lowers the costs of operation.

SOFCs have been used for decades, but they are still very expensive and there is still significant degradation.

"It's still an energy-intensive process," Maric said. "So in order for fuel cells to penetrate the market, they have to be cost-effective." Targets for cost-efficiency have been increasingly ambitious. Maric said the target for low-temperature fuel cells is now at $30 per kilowatt hour.

"You have to hit these cost targets to be able to reach the mass market," she says. "The more we have these materials and processes that can lower the costs, the closer we are to getting them to market."

By the end of the three-year period, they expect to have a short stack of five to ten cells that will go from the phases of concept to prototype to demonstration. Maric and Aindow are confident that they'll complete all three phases successfully.

"This is technology driven," Aindow says. "It's not like some of the blue skies research that we do – 'Well, it sounds like a good idea, let's try it out.' It really has to have some sound feasibility behind it." ■

Rainer Hebert
Associate Professor, Director of Additive Manufacturing Innovation Center, Director of Undergraduate Studies

Phase Transformations, Alloys, Metalic Glasses & Plastic Deformation Processing

Bryan Huey
Associate Professor
Director of Graduate Studies, MRS Student Chapter Advisor

Scanning Probe Microscopy, Nanoscience, Electronic Materials, Textures & Ceramics

Theodoulos Z. Kattamis
Professor

Solidification and Metals Joining, Materials Processing, Thin Coatings and Tribology

Dr. Pamir Alpay Elected Fellow of the American Physical Society

Dr. S. Pamir Alpay

MSE Professor and Department Head Dr. S. Pamir Alpay was recently elected a Fellow of the American Physical Society (APS) for his work on functional/smart materials.

Representing over 50,000 members, APS is a nonprofit membership organization that works to advance and diffuse the knowledge of physics by way of education, outreach, research journals, advocacy, and international presence. Election to fellowship in the APS is selective and prestigious; it is limited to no more than one half of one percent of total membership. Fellows are nominated by their professional peers for outstanding contributions to physics, and the APS Council evaluates and elects successful candidates.

Dr. Alpay received his Ph.D. in Materials Science and Engineering from the University of Maryland in 1999. He joined the UConn MSE Program in 2001 as an Assistant Professor. Dr. Alpay received the National Science Foundation CAREER Award in 2001 and the UConn School of Engineering Outstanding Junior Faculty Award in 2004. He was also named the United Technologies Corporation (UTC) Associate Professor in Engineering Innovation, a position that he held from 2008 to 2010.

Dr. Alpay was nominated for APS Fellowship through the APS Forum on Industrial and Applied Physics. He has worked extensively with industry in guiding the development of new materials and devices; examples include his work related to focal plane arrays for night vision, gas leak imaging, and fire detection applications (General Motors and United Technologies Corp. – UTC), dielectrically tunable phase shifters devices (Delphi, SMI Inc. and Army Research Labs), solid-state heating/cooling (UTC), and a new generation of electrical contacts (GE Energy – Industrial Solutions). Dr. Alpay and his collaborators have developed quantitative models that act as the guiding set of principles for experimentalists in determining the role of domain phenomena in piezoelectric sensors/actuators, misfit and thermal strains on the properties of pyroelectric detectors, defect structures (dislocations and space charges) in ferroic materials, and electrostatic and electromechanical interactions in multilayered ferroelectric heterostructures.

Dr. Alpay is the author of 130 publications in peer-reviewed journals and is currently an editor of the Journal of Materials Science. Most recently, he was the recipient of the *Materials Science and Engineering Department's Award for Teaching Excellence* as well as the *School of Engineering Outstanding Faculty Advisor Award*. ■

MSE Professor Dr. Cato T. Laurencin Elected 2014 MRS Fellow

Dr. Cato Laurencin was recently selected as a Fellow of the Materials Research Society (MRS). He was recognized for his "seminal contributions to the use of advanced polymer materials in the medical field and in regenerative medicine."

Dr. Laurencin is a University Professor at the University of Connecticut (the 7th in the institution's history). He serves as Chief Executive Officer of the Connecticut Institute for Clinical and Translational Science at UConn. In addition to his position as Professor of Materials Science and Engineering, he is the Albert and Wilda Van Dusen Distinguished Endowed Professor of Orthopaedic Surgery, Professor of Chemical, and Biomolecular Engineering, and Professor of Biomedical Engineering. He is also a member of the Institute of Materials Science at UConn.

Dr. Laurencin is the founder and director of both the Institute for Regenerative Engineering and the Raymond and Beverly Sackler Center for Biomedical, Biological, Physical and Engineering Sciences at the University of Connecticut. Dr. Laurencin previously served as the Vice President for Health Affairs and Dean of the School of Medicine at UConn. During his tenure, he was an instrumental leader in the transformative $864 million "Bioscience Connecticut" initiative designed to assure the long-term future of the UCHC as a top academic medical center. ■

Cato Laurencin
University Professor, A. &. W. Van Dusen Distinguished Chair in Orthopedic Surgery

Advanced Biomaterials, Tissue Engineering, Nanotechnology

Seok-Woo Lee
Pratt & Whitney Assistant Professor

Metallic Materials, Mechanical Properties, Amorphous Alloys

Radenka Maric
CT Clean Energy Fund Professor of Sustainable Energy

Novel Materials for Fuel Cells & Batteries, Processing Materials, Aerosole and Flame Synthesis

Dr. Venkat Vedula Joins MSE Industrial Advisory Board

Dr. Venkat Vedula

The department is pleased to welcome Dr. Venkat Vedula as its newest MSE industrial advisory board member. Comprised of eight highly reputable industry partners, the board works to augment the visibility of the UConn Materials Science and Engineering department at the university, state, and national level.

Dr. Vedula is the director of materials engineering at UTC Aerospace Systems. The department is responsible for developing advanced materials technologies and supporting materials and processes requirements for aerospace programs, including compliance with materials of concern.

Dr. Vedula started his career at United Technologies Corporation (UTC) in 2000 as a senior engineer at the United Technologies Research Center (UTRC) in East Hartford, CT and has held positions of increasing responsibility throughout his tenure. He joined Hamilton Sundstrand in 2011 as chief engineer of materials engineering.

Dr. Vedula earned a master's degree in engineering from SUNY Buffalo, a doctorate in materials science and engineering from Pennsylvania State University, and a master's degree in business from Rensselaer Polytechnic Institute. He is the author of fourteen peer-reviewed technical publications and has seven patents issued and pending.

Upon joining the board, Dr. Vedula notes, "I am very excited about the opportunity to work with the MSE faculty and the industrial advisory board to advance the academic research program and align with industry needs." ■

Dr. Seok-Woo Lee Joins MSE

Dr. Seok-Woo Lee

The department proudly welcomes Dr. Seok-Woo Lee to its teaching faculty. In the fall, Dr. Lee will join MSE as Pratt & Whitney Assistant Professor.

Dr. Lee received both his bachelor's in materials science and engineering and master's of science in advanced materials engineering from Korea University in Seoul. He went on to earn his Ph.D. in materials science and engineering from Stanford University, completing his dissertation on *The Plasticity of Metals at the Sub-micron Scale and Dislocation Dynamics in a Thin Film*, research that focused on the mechanics of materials at the sub-micron scale. Since 2011, he has served as Kavli Nanoscience Institute Fellowship Postdoctoral Scholar in the Department of Applied Physics and Materials Science at the California Institute of Technology.

Dr. Lee's research focuses on the study of mechanical behavior of advanced materials at multiple length scales. Fundamental understanding of deformation mechanisms is necessary to design robust and reliable devices ranging from small to large length scales. Reduction of internal (microstructural) and external (sample dimensional) length scales brings out unusual phenomena that cannot be observed in bulk scale. Dr. Lee's laboratory uses a state-of-the art in-situ nanomechanical tester, advanced electron microscopy, and computer simulation of dislocations to understand deformation mechanisms in various types of advanced materials, including micro-/nano-pillars, nanoparticles, thin films, metallic glass, nano-lattices, and other materials.

Dr. Lee is the author of 28 publications and a patent for the production methodology of Cu-based nanostructured alloys and their thin plates. He is the recipient of many awards and fellowships, including an NSF Summer Institute Fellowship, Advisory Board Fellowship from Stanford, Frontier Top Fellowship from Ko-

Serge M. Nakhmanson
Associate Professor

Multiscale Modeling of Materials, Multifunctional Ferroics, Soft Materials

Ramamurthy Ramprasad
Professor

Materials Modeling & Computation, Nanomaterials, Thin Films & Interfaces, Photonic Crystals & Meta-materials

George A. Rossetti Jr.
Associate Professor

Electroceramic Materials, Crystal Chemistry and Physics & Ceramic Processing Science

rea University, and several research awards, including an outstanding symposium talk distinction from the MRS.

"I am very excited about joining the Department of Materials Science and Engineering at the University of Connecticut," Dr. Lee states. "UConn has excellent research environments for the materials researcher, including the Institute of Materials Science. I strongly believe that my expertise will not only provide students with exciting materials science topics but also create synergetic research with other departments. I just can't wait to work with my graduate students and teach my classes here at UConn!" ■

Academic Advisor Joins MSE

Mariel Notar-Francesco

The department proudly welcomes academic advisor Mariel Notar-Francesco to its staff! A Connecticut native, Ms. Notar-Francesco was appointed to the MSE and CBE departments and the Management and Engineering for Manufacturing (MEM) program. She is one of five new professional advisors who will assist School of Engineering students throughout their academic careers. ■

Professor C. Barry Carter Awarded Ceramic Educational Council Outstanding Educator Award for 2014

Dr. C. Barry Carter

MSE Professor Dr. C Barry Carter has been awarded the Ceramic Educational Council Outstanding Educator Award for 2014.

The CEC Outstanding Educator Award recognizes the exceptional work and creativity of ceramic educators in the areas of instruction, direction of student research, or in the general education process through lectures, publications, and other similar contributions. Professor Carter, the first recipient of the accolade from the University of Connecticut, will receive his award in October at The American Ceramic Society banquet at the Materials Science and Technology meeting in Pittsburgh, Pennsylvania.

Professor Carter was named a Fellow of the American Ceramic Society back in 1996 and has received the Roland B. Snow Award six times, including three times in succession (2000-2002). The Snow award is presented to the Best of Show winner of the Ceramographic Exhibit and Competition, an annual poster exhibit promoting the use of microscopy and microanalysis in the scientific exploration of ceramic materials.

Professor Carter's research focuses on interfaces in ceramic materials, phase transformations and solid- state reactions, transmission electron microscopy, atomic force microscopy, dislocations in metals, semiconductors, and ceramics, mechanisms of thin-film growth of ceramics by pulsed-laser deposition and chemical vapor deposition, organization and modification of nanoparticles and nanowires, and processing oxides for energy production and storage.

Among Professor Carter's outstanding contributions to ceramic education is his book, *Ceramic Materials: Science and Engineering*, which he co-authored with Professor Grant Norton, current Dean of the Honors School at Washington State University. The popular textbook is one of the most downloaded books in the disciplines of chemistry and materials science, has been cited more than 278 times, and offers a unique, comprehensive approach to ceramic materials. Professor Carter is also the author of a second textbook, *Transmission Electron Microscopy: A Textbook for Materials Science*. Co-authored with Professor Dave Williams, current Dean of Engineering at Ohio State University, the book is also frequently used by individuals working on ceramic materials.

On receiving this distinction, Professor Carter states:

> I am immensely honored by this award, especially when I see so many of my heroes as previous winners. I have emphasized teaching in my university career so it is particularly pleasing to be honored for my teaching. Being recognized by my peers in the American Ceramics Society is also greatly appreciated because much of my research throughout the past 40 years has been concerned with metals, semiconductors, and other materials. ■

Prabhakar Singh
Professor, Director C2E2

High Temperature Materials,
Oxidation and Corrosion,
Electrochemistry, Fuel Cells

Mei Wei
Professor and Associate Dean for
Research and Education

Biomaterials, Ceramics,
Coatings & Composites

MSE Alumna Dr. Anne Silberstein Named to Academy of Distinguished Engineers

Left to right: Mei Wei, Associate Dean for Research & Graduate Education and Professor of MSE; Michael Accorsi, Senior Associate Dean of SoE; Mun Choi, Provost; Phil Clapp, Anne Silberstein, Kazem Kazerounian, Dean of SoE; Daniel D. Burkey, Associate Dean for Undergraduate Education & Diversity; Janet Callahan, Associate Dean and Professor of MSE, Boise State University.

Dr. Anne Silberstein was named a 2014 inductee to the UConn School of Engineering Academy of Distinguished Engineers.

Founded in 2003, the Academy of Distinguished Engineers honors UConn School of Engineering alumni whose careers are shaped by outstanding, sustained contributions to the engineering discipline through education, research, policy, or service.

Dr. Silberstein received her Ph.D. in materials sience and engineering in 1988. Prior to joining UConn, she graduated in 1984 with a master's degree in materials science from the Institut National des Sciences Appliquées (INSA) in Lyon, France.

Dr. Silberstein currently works for Saint-Gobain, a French company founded in 1665 under Louis XIV to produce the mirrors comprising the Hall of Mirrors at the Palace of Versailles. The large, multi-national company now produces a variety of construction and high-performance materials, operates in 64 countries, and is home to over 190,000 employees.

Dr. Silberstein is the International Training Manager for one of the four sectors of the company, presiding over 47,000 people and 25 percent of Saint-Gobain turnover. She collaborates with HR directors of the 55 countries included in the sector to ensure that employees acquire vital technical and managerial skills through local and central organizations. Dr. Silberstein's multicultural experiences, including her fluency in French, English, and German, contribute to her success in serving international markets.

On receiving this distinction, Dr. Silberstein states, "To be identified and selected to receive this award has come as a huge surprise, and is a great honor for me." ■

Yusuf Khan
Joint Assistant Professor, Dept. of Orthopedic Surgery, UCHC

Tissue Engineering & Biocompatible & Biodegradable Scaffolds

Sangamesh Kumbar
Joint Assistant Professor, Dept. of Orthopedic Surgery, UCHC

Synthesis and Characterization of Novel Biomaterials for Tissue Engineering and Drug Delivery Applications

Lakshmi Nair
Joint Assistant Professor, Dept. of Orthopedic Surgery, UCHC

Injectable Hydrogels, Nanomaterials, Bioactive Biomaterials, Surface Modification, Tissue Engineering

Dr. James Bosse Named 2014 MSE Outstanding Graduate Student

Nothing demonstrates the worth of a UConn MSE education more than passionate, high-performing alumni who thrive in their post-graduation endeavors.

Dr. James Bosse

Alumnus Dr. James ("Jim") Bosse, recipient of the 2014 MSE Outstanding Graduate Student Award, turned his MSE experiences into a dream job at Intel. After receiving his MSE undergraduate degree from UConn and working in the industry for two-and-a-half years, Jim returned to UConn to earn his doctorate under the advisement of Professor Bryan Huey. He completed his dissertation on "Nanoscale Performance Mapping of Semiconducting Materials with Multiparametric SPM," research that focused on providing tools to the AFM community that allow for the characterization of topographical, electrical, mechanical, and thermal properties with higher temporal and spatial resolution in a shorter time frame.

As early as his freshman year of college, Jim dreamed of working at Intel. Although he once thought that these prestigious companies were reserved for Ivy League students and would require a fair share of luck to join, UConn MSE provided him with the tools necessary to succeed in an environment filled with intelligent, creative, and driven individuals. "As a student going through the program, faculty and advisors always said things like 'you could work for Intel when you finish your degree,' Jim reflects. "It's really exhilarating to turn that dream into a reality years later."

"The faculty are very enthusiastic and relate MSE concepts to real world applications."

In his current position as Process Technology Development Engineer at Intel, Jim works in the Defect Metrology and Yield department within D1C. His focus is on determining the root causes of process issues, and increasing quality and yield for the new 14nm and 22nm node technologies.

Thinking back on his time at UConn, Jim states:

> I believe that the research areas represented by our faculty are well rounded. We are constantly improving the department with faculty hires in biomaterials, computational materials, nanostructure fabrication, etc. The quality of the teaching is fantastic; the faculty are very enthusiastic and relate MSE concepts to real world applications. Our facilities are improving, in terms of equipment and resources available to us, and I believe we will continue to improve our ranks in the coming years.

In addition to the academic resources that made his goals possible, Jim dedicates his Ph.D. work and other accomplishments to his father, from whom he inherited an appreciation for hard work and meticulousness.

The department wishes Dr. Bosse the best at Intel and with his future pursuits! ■

Syam Nukavarapu
Joint Assistant Professor, Dept. of Orthopedic Surgery, UCHC

Biomaterials, Tissue Engineering & Biomedical Nanotechnology

Daniel Goberman
Adjunct Faculty

Materials Characterization, Materials for Thermal Barrier Coatings, Plasma Spray Coating

Greg Ojard
Adjunct Faculty

Materials Characterization, Materials Selection & Design

Lorri Lafontaine, Administrative Services Specialist

Lorri Lafontaine was born and raised in Windham, Connecticut. Lorri started her career at UConn in 1984, working various support staff positions in different campus departments and programs, including the Cooperative Extension Animal Science Office, the Cooperative Extension Associate Dean's Office, the Department of Dramatic Arts, and the Center for Judaic Studies. Lorri works in the Department of Materials Science and Engineering as administrative services specialist, where she administers the graduate program. She is responsible for payroll, travel, and admissions, among other tasks. Outside of MSE, Lorri volunteers at the St. Mary-St. Joseph school in Willimantic and is a bell ringer for the Salvation Army during the holidays to raise money for those in need. In her free time, Lorri enjoys spending time with family, working on projects around the house, and simple pleasures like walking the dog and swimming. ■

Adam Wentworth, Laboratory Manager

Adam Wentworth is a technical associate and laboratory instructor in the UConn Department of Materials Science and Engineering. His technical duties include the maintenance and calibration of laboratory equipment, lab safety oversight, management of outreach initiatives, and conducting consultations for student research. Adam has played a key role in recent undergraduate lab renovations and has developed lab exercises that utilize the new equipment. His unique experience as an alumnus, having earned his B.S. in 2009 and M.S. in 2011 in the same MSE program, enhances his ability to serve as a mentor to students. Outside of MSE, Adam is the advisor of the UConn 3D Printing Club and stays active by biking and participating in soccer and summer softball. ■

Heike Brueckner, Webmaster and Publicist

Heike Brueckner was born and raised in Germany. After working for several years as a training instructor for word processing and desktop publishing software, Heike went on to earn an MBA with a focus on Information Technology and Human Resources, graduating the best of her class. Nine years prior to coming to the United States, she worked as an Assistant to the Managing Director and Manager for Human Resources at an international company that provides engineered industrial products for the industry. In the years following her MBA, Heike has pursued freelance work in web design, including an ongoing executive editor position of an international trophology internet project. Heike started working at UConn in 2009 as webmaster and publicist for the CMBE department before joining MSE and the Institute of Materials Science (IMS) in 2013. She constructs and maintains websites, designs print media, and creates presentations, among other similar tasks. Outside of MSE and IMS, Heike is involved with several community outreach and charity organizations. She is the co-founder of the UConn Area Newcomers Network (UCANN), an organization that fosters community in the UConn area. She also serves as webmaster and print media designer for the Windham Area Habitat for Humanity and health records coordinator for the Echo Dogs White Shepherd Rescue. Creativity plays an important role in Heike's professional life as well as her hobbies and interests. Adding to her diverse experiences, Heike was a student of a German American artist focusing in sculpture and painting for two years. ■

Cathy McCrackan, Administrative Coordinator

Cathy McCrackan was born and raised in Connecticut. After graduating from high school, she spent nearly four years as a Telecommunications Operations Specialist in the Air Force during the Vietnam conflict. After working an additional year as switchboard operator at Elmendorf (Anchorage, AK), Cathy returned to Connecticut, where she earned a B.S. in biology with a double minor in chemistry and communications from Eastern Connecticut State University. Cathy later continued her education at ECSU, earning a B.A. in computer science and, later, a 5th year certification in junior high science education. Cathy's diverse workforce experiences include positions as science lab supervisor at Middlesex Community College, systems programmer/analyst at ECSU, science department lab manager at Belmont Abbey College, NC, and a variety of teaching positions in Connecticut and North Carolina. She has also served as programmer for the Submarine On-Board Training Department at the New London Submarine Naval Base and applications trainer for Dictaphone Corporation. Cathy joined the MSE department in 2003 as administrative coordinator and jack-of-all-trades. She is responsible for processing payroll, managing purchases and reimbursements, setting up course schedules, maintaining ABET files, and overseeing budget adjustments, among other tasks. Outside of MSE, Cathy enjoys gardening, reading, and spending time with her furry daughter, Irish Setter Molly. When she is not cutting, splitting, and stacking her own firewood in preparation for long New England winters, Cathy's newest hobby is baking healthy, homemade dog treats for Molly. ■

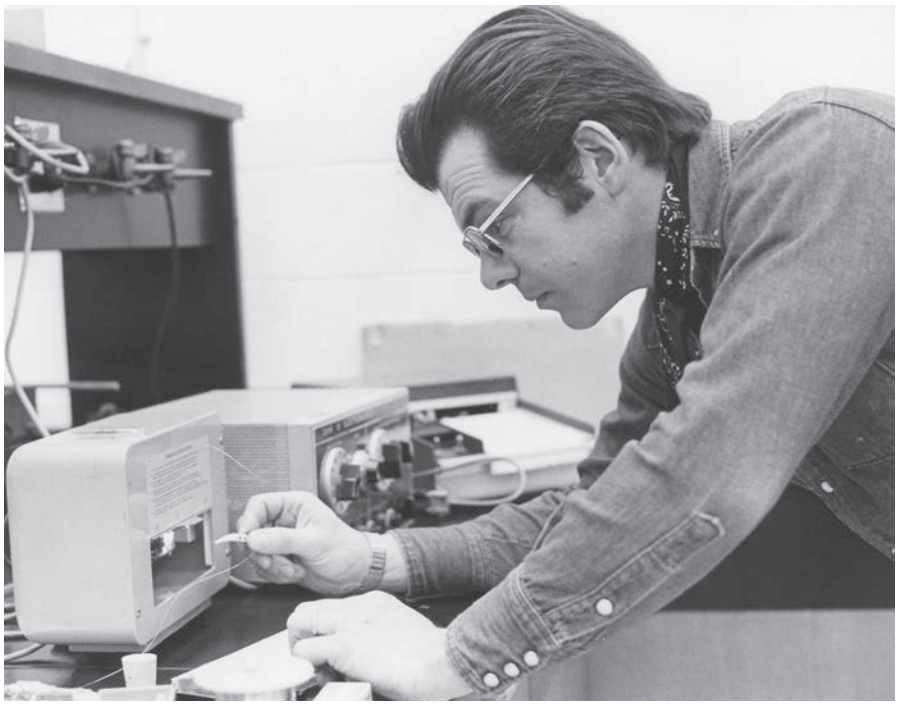
Mariel Notar-Francesco, Academic Advisor

Mariel Notar-Francesco is a Connecticut native. She earned her bachelor's degree in psychology and sociology and master's degree in counseling for student development in higher education from Central Connecticut State University. Mariel joined UConn in March after three years at Brown University, where she advised undergraduates aspiring to careers in medicine and law and assisted students on all aspects of the medical, dental, osteopathic, veterinary, and law school application process. She is the academic advisor for all first year and sophomore students in Materials Science and Engineering (MSE), Chemical and Biomolecular Engineering (CBE), and the Management and Engineering for Manufacturing (MEM) program. In conjunction with the other engineering advisors, Mariel conducted freshmen orientation and is currently teaching the Engineering House sections of UNIV 1810, an engineering first-year experience course. Mariel enjoys kayaking, hiking, and vacationing in her free time in addition to her two most recent and time consuming activities, house hunting and wedding planning. ■

Giorgina Paiella, Student Written Communications Assistant

Giorgina Paiella was raised in Avon, Connecticut. She is a junior at the University of Connecticut majoring in English with a minor in Women's, Gender, and Sexuality Studies as a member of the honors program. Her main academic interests include literary analysis, feminist theory, environmental literature, and philosophy. Giorgina joined the MSE department as student written communications assistant last fall, where she conducts interviews and writes articles for the MSE website and newsletter. Outside of MSE, Giorgina also works as a student assistant in the WGSS department, designing newsletters, slideshows, and other event materials. She is the chief organizational officer of the UConn National Organization for Women (NOW), a chapter of the largest group of feminist activists in the nation, and a member of Real Slow Food UConn, the National Society of Collegiate Scholars, and Alpha Lambda Delta. Giorgina has served as a UNIV facilitator, a peer mentorship program that assists first-year honors students in the transition to campus life at UConn. She is a Babbidge scholar and recipient of the 100 Years of Women Scholarship, Kristie Ann Wood Endowment Scholarship, Jacqueline Brown-Dickstein Scholarship, and a Summer Undergraduate Research Fund (SURF) award for a self-designed literary research project. In her free time, Giorgina enjoys reading, writing, vegan cooking, playing guitar and percussion, and spending time outdoors biking, running, and hiking. ■

MSE Scholarship Established in Honor of Dr. Owen F. Devereux



Dr. Owen F. Devereux

A new scholarship fund has been established in honor of the late Dr. Owen F. Devereux. Dr. Devereux, who passed away in June of 2012, joined the University of Connecticut in 1968 as an associate professor in the newly established Metallurgy Department and charter member of the Institute of Materials Science (IMS).

Dr. Devereux made substantial contributions to the growth and prominence of the department during his three-decade long career as a distinguished faculty member, including a 13-year tenure as department head. Spanning his long career at UConn, Dr. Devereux authored a successful textbook, *Topics in Metallurgical Thermodynamics*, founded a TMS/ASM student chapter, and formed the first departmental Industrial Advisory Committee. Prior to his 1999 retirement, Dr. Devereux established a plan in the 1990s to revitalize and reinvigorate the department, contributing to his legacy.

The Dr. Owen Devereux Scholarship will be awarded to two exceptional MSE undergraduate students each year.

As the department and the institute reached a thirty-year milestone, many of the pioneering metallurgy faculty members were reaching retirement age. Dr. Devereux established a strategy to revitalize and reinvigorate the program. Through his surveys of Connecticut engineering employers, he discovered that despite a high demand for local entry-level engineering professionals, this demand was filled by MSE graduates from universities outside of New England. His plan led to the establishment of a Materials Science and Engineering (MSE) major, an innovative feat that set UConn apart among public universities in the Northeast.

"Owen envisioned the department rising to a top 10 nationally recognized program."

The UConn MSE department now ranks among the top 25 public programs in the nation. Graduates are highly sought-after to fill materials engineering jobs and graduate education positions. Dr. Harold Brody, Distinguished MSE Professor and former colleague of Dr. Devereux, reflects, "Owen envisioned the department rising to a top 10 nationally recognized program, and I believe his efforts put the department on a trajectory likely to fulfill that vision."

The Dr. Owen Devereux Scholarship will be awarded to two exceptional MSE undergraduate students each year. As Dr. Brody states:

> The purpose of the Owen F. Devereux scholarships is to honor the legacy of Professor Devereux and to support his vision that the University of Connecticut would educate materials engineering professionals to contribute to and lead the economic vitality of the region. The awarding of these merit based scholarships will be aimed to attract and retain high achieving students as majors in MSE and to continue the University of Connecticut as the premier source of materials engineering professionals for the region.

To contribute toward the scholarship fund, please see the donation gift designation form on page 21 or contact Rachel Marshall at rmarshall@foundation.uconn.edu or (860) 486-2983. ■

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UEXX14

☐ **The Owen F. Devereux MSE Undergraduate Excellence Scholarship (31384) Amount: _____**
Funds will be used to provide undergraduate merit based scholarships in honor of Professor Owen F. Devereux to students in the Materials Science & Engineering Program. I/We understand that if gifts and commitments to the fund total $10,000 or more on or before January 31, 2015, or such later date as determined by the Foundation in its discretion, the fund will be classified as a restricted *endowment* fund. If the endowment minimum is not met in this timeframe, all contributions will be fully expendable for such scholarships.

☐ This gift is being made in honor of: Owen F. Devereux ☐ Please send notification to: Livi Devereux

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Last Look:
MSE Graduate Student Sapna Gupta

In her years at UConn thus far, Sapna Gupta has achieved impressive feats that demonstrate academic excellence, leadership, and innovative thinking.

Sapna has worked as a research assistant in the UConn Center for Clean Energy Engineering since 2011, focusing on the development of electrically and ionically conducting high temperature ceramics for energy conversion systems and oxygen gas separation devices under advisor Professor Prabhakar Singh. Her research interests include ceramics, high temperature electrochemical systems, mixed electrically and ionically conducting high temperature materials, and the characterization and evaluation of chemical and structural stability of materials in an aggressive environment. In addition to her research, Sapna has served as a teaching assistant for Mechanical Behavior of Materials (MSE 3004) and Introduction to Structure, Properties, and Processing of Materials II (MSE 2001).

Prior to joining UConn in 2011, Sapna received her bachelor's of technology in Metallurgical and Materials Engineering from the National Institute of Technology, Trichy in India in 2010. She will be entering her fourth year in the MSE Ph.D program this coming fall.

"During the past three years of my graduate career," Sapna reflects, "I have been introduced to various facets of research: critical assessment of literature, long hours of comparative study, precise documentation, frustration over unanticipated results, requirement for continuous perseverance, and the joy of solving a problem or making a discovery. This experience fascinates me and continues to pique my interest in research and development."

Sapna's passion for learning is evident in the many fellowships, distinctions, and awards that she has received. Last summer, she pursued a research internship at Praxair Technology Center to work on materials development for oxygen transport membrane systems. At UConn, she is a member of the Golden Key International Honor Society and Phi Kappa Phi, the nation's oldest, most selective, and most prestigious honor society. Within the materials science and engineering discipline, she is a member of the Materials Research Society (MRS), The American Ceramic Society (ACerS), Association for Iron & Steel Technology (AIST), The American Society for Metals (ASM International), and The Minerals, Metals and Materials Society (TMS).

An extension of her extracurricular involvement and interest in ceramic education, Sapna formed a UConn chapter of Keramos last fall. One of twelve student chapters across the country, the national professional ceramic engineering fraternity aims to stimulate scholarship, character, and development in students while promoting interest in the professional aspects of ceramic engineering, technology, and science. As chapter president, Sapna helped to plan and organize two Keramos events this year. Early in the semester, the group welcomed the Litchfield County 4-H organization to the UConn Center for Clean Energy Engineering, where members ranging in age from seven to seventy learned about fossil fuels, renewable energy, and cutting-edge materials research. They had the opportunity to view scientific demonstrations, see how a hydrogen fuel cell worked, and take a tour of the center. To increase the visibility of Keramos within the MSE department, the chapter also hosted an egg drop challenge, where students were provided with a packet of office supplies and 45 minutes to build a device capable of protecting an egg from a two-story fall. Bridging her leadership and involvement in several materials societies, Sapna also serves as finance committee chair on The American Ceramic Society (ACerS) President's Council of Student Advisors (PCSA). The student-led committee of delegates aims to engage students in ACerS activities and facilitate the development of a ceramics community by increasing collaboration across various student organizations, universities, and academic departments.

Sapna Gupta

Sapna was most recently featured as a guest columnist in the May 2014 issue of the American Ceramic Society Bulletin, where she detailed her journey as an international graduate student and the unique experiences offered to her as a member of the UConn MSE community:

> My experiences as an international graduate student have been holistic because of the skills and knowledge they have endowed me and because they have shown me how people from various cultures approach the same problem from different angles. Through my experiences, I have learned that nothing is impossible to a willing heart and mind. ■

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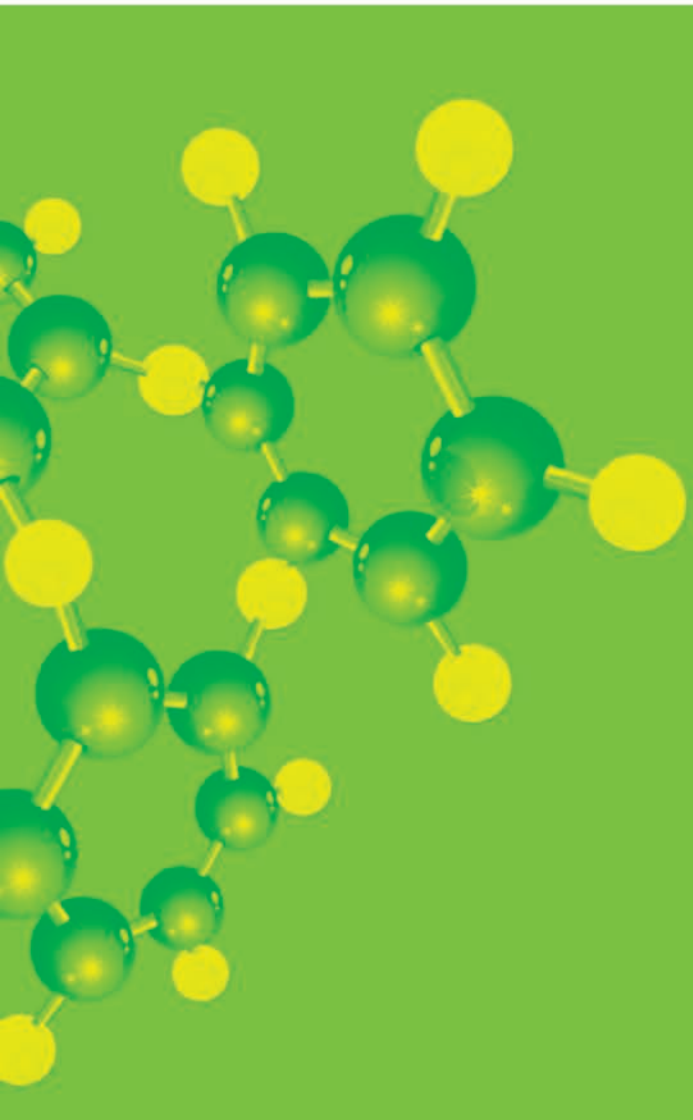

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