

2019 **Materials Science** And Engineering

J. Shi, Expitaxil Growth of VO2 Nanopillars



Pawel Keblinski

Professor and Department Head, Department of Materials Science and Engineering (MSE)

WELCOME

GREETINGS TO OUR MSE ALUMNI AND FRIENDS,

I AM EXCITED TO REPORT THAT AFTER ONE YEAR OF SABBATICAL LEAVE, I HAVE RESUMED DUTIES AS CHAIRMAN OF THE DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING. THIS MARKS THE START OF MY SECOND TERM IN THIS CAPACITY.

Over the past year, I greatly enjoyed research and other activities I conducted in my native Poland at the Institute of High Pressure Physics of the Polish Academy of Sciences. During that time Prof. Dave Duquette skillfully guided the department through my leave, for which I am grateful. Most rewardingly, while I was away, Prof. Duquette with other faculty did the legwork that led

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WELCOME [CONT.]

to the hire of **Prof. Edwin Fohtung**, a scattering-based structure characterization expert, who started here this fall. In this bulletin, you will find more information on Prof. Fohtung's quite unique career path that started in his native Cameroon, continued in Russia and Germany, and finally led to a successful faculty career in the United States.

In this installment of MSE News, you will find highlights of our recent achievements and new developments within MSE community at RPI, as always, covering all groups within the department, including undergraduate and graduate students, staff, faculty and alumni. One of the highlights focuses on Prof. Tomozawa, who recently received multiple recognitions and awards form the ceramic community. Remarkably, after Prof. Tomozawa's past fifty years of service at RPI, he continues to learn more and more about glasses and shed light on centuries-old questions, such as nature of stress relaxation processes in these materials. He is an inspiration to us all! In this issue of the MSE News, you will also find many other compelling stories. Prof. Ramanath continues to make magic with his Nanoglue, this time to make tougher composites. We reflect on the legacy of Prof. Linda Schadler, which still has a huge imprint on our department associated with her research prominence in the area of polymer nanocomposites, and numerous leadership roles in education, administration and outreach. We wish Prof. Schadler all the very best at her new post as the Dean of the College of Engineering and Mathematical Sciences at University of Vermont.

Please enjoy the stories we report to you and share any thoughts, ideas and your own successes with us.

Thank you,

Pawel Keblinski Professor and Department Head Materials Science and Engineering Department Rensselaer Polytechnic Institute



On the Cover: Professor Jian Shi's group has recently studied the epitaxial growth of obliquely aligned correlated oxide crystals used for dynamic strain engineering in perovskite crystals. The beautiful image on our cover this year was published by Yiping Wang and Jian Shi in Science Advances (2018).

DOCTORATES AWARDED IN 2019

Congratulations and best of luck!

Congratulations to our newly minted Ph.D.s in Materials Science & Engineering! Our graduates are moving on to start their careers across the country and the world. Drs. Cansu Ergene, Aditya Prasad, and Varun Sarbada will all move to Intel as a trio of new Process Engineers. Yiping Wang has started his career at Micron Technologies while Emily Aaldenberg will start at Corning. Tianji Zhou has joined IBM. Minjie Li is now a postdoc at Southern University of Science and Technology in Shenzhen, China with Prof. Xing Cheng. Michael Deagen is a postdoc with Prof. Linda Schadler, who is now Dean of Engineering at the University of Vermont. Harikrishnan Vijayamohanan is starting his new postdoc at MIT with Prof. Tim Swager.



Pictured here are (L-R): Drs. Michael Deagen, Emily Aaldenberg, Cansu Ergene and Aditya Prasad. Not pictured: Drs. Zhanyang Chen, Mingjie Li, Harikrishnan Vijayamohanan, Varun Sarbada, Tianji Zhou, Yiping Wang.

GRADUATING CLASS OF 2019



Congratulations and best of luck!

We are enormously proud of our newest graduates, who are bound for professional positions (LotusWorks, Norsk Titanium, Boeing Company, Global Foundries, Newport News Shipbuilding, Samsung Austin Semiconductor, MIT Lincoln Labs) and graduate school (UIUC, RPI).

Undergraduate Awards: Paul Miller (Matthew Albert Hunter Prize), Anahit Hovhannisyan (Scott Mackay Prize), Sabrina Chasen (Materials Design Award), Jackson Wong (Istvan S. Moritz Award, given to a co-term student for academic excellence and service contribution), Naomi Williams (Doreen Ball-DiFazio Award, given to a female senior for academic excellence and outstanding service).



Lisa McCormick

The department is pleased to welcome Lisa, Administrative Specialist, as our newest addition to the main office staff. Lisa is a native Vermonter and joined the department this past spring 2019. In addition to coordinating the procurement processes, she is also the seminar coordinator for the department seminar series. She will support the operation and activities of the materials student chapters, particularly the Material Advantage. She has previously worked at Saint Michael's College and the University of Vermont. Lisa enjoys spending time with family, travel, and working with faculty and students.



We are enormously pleased to introduce our newest faculty member, Dr. Edwin Fohtung, Associate Professor of Materials Science and Engineering!



Dr. Edwin Fohtung

The MSE department welcomes Prof. Edwin **Fohtung** to the faculty, starting in Fall 2019. Prof. Fohtung is an expert in scattering and imaging techniques for nanoscale device materials. with a focus on ferroic nanostructures where charge, spin, lattice and orbital degree of freedom compete to create novel topological configurations of electric and magnetic polarization. The advanced characterization tools that Edwin brings to bear will nicely complement existing departmental and institutewide strengths in experimental and computational materials science at the nanoscale.

Dr. Fohtung earned his B.Sc. ('05) and M.Sc. ('07) degrees in Physics from St. Petersburg State Polytechnic University, Russia. After completing a Ph.D. in materials science and physics from the University of Freiburg, Germany (2010) and a postdoctoral fellowship in UC San Diego, he was a LANSCE Associate Professor of physics and materials at New Mexico State University and Los Alamos National Laboratory prior to joining Rensselaer. Prof. Fohtung is a recipient of numerous awards including the Rosen Fellow at LANL and the LINX (Lund Institute of Advanced Neutron and X-ray Science) fellowship in Sweden.

Dr. Fohtung's pioneering research is financially supported by industry and federal government grants (totaling ~\$4M thus far), particularly by the US Department of Defense, Air Force Office of Science and Research (AFOSR) and Los Alamos National Laboratory. Druing his 5 years at New Mexico State, he supervised a total of 9 graduate students and 7 undergraduates. Recently, the Fohtung group published their work on "Nanoscale topological defects and improper ferroelectric domains in multiferroic barium hexaferrite nanocrystals" in the journal Physical Review B.



Students win National Science Foundation (NSF) Graduate Research Fellowships



Alexander Yepikhin

Alexander Yepikhin is a first-year graduate student in the materials science and engineering department at Rensselaer Polytechnic Institute, being co-advised by Professors Chaitanya Ullal and Ed Palermo. Alex will use his fellowship to create and study new polymers that will allow him to achieve both high throughput and nanoscale resolutions in maskless 3D nanolithography. State of the art tools to achieve 3D lithography with

nanoscale fidelity and resolutions are either prohibitively slow or require tools that costs millions of dollars. Alex envisages leveraging recent groundbreaking advances from the Ullal and Palermo groups that combine photoswitchable molecules with state of the art optics inspired by the Nobel Prize winning technique of STED microscopy to achieve his goals.



Parth Bide

Parth Bide was an undergraduate student at Rensselaer Polytechnic Institute, majoring in Chemical Engineering with a minor in in Materials Science and Engineering. His research adviser was Professor Chaitanya Ullal in MSE. Parth is currently pursuing his Ph.D. in Materials Science at the University of Minnesota. He credits the research and courses that he did in the Materials Department as playing a crucial role in driving his ambition to

pursue a career in academics in the field of Polymer Science. The introductory polymer science course, taught by Prof. Ed Palermo, was reportedly his favorite course at RPI, and his research experience has already led to a co-authored peer reviewed publication in the journal Langmuir on a collaborative project between the Ullal and Palermo groups.



BROADER IMPACTS

The three-year NSF fellowship recognizes and supports outstanding graduate students in NSF-supported STEM disciplines. An important component of the NSF GFRP is weighted towards broader societal impacts. Both Alex and Parth are very strongly motivated to inspire the next generation of materials scientists and engineers. Parth has been deeply involved in outreach through the Engineering Ambassadors program at RPI, and the hands on learning workshops he developed have been used across NY State, from the Bronx to cities across the Hudson Valley. Alex intends to expand on his existing contributions, which include having helped start a Science Olympiad program at Rensselaer Middle School, by participating in RPI's extensive outreach efforts and running hands on learning workshops at two high needs schools in Troy and Watervliet.

RESEARCH MILESTONES

Ramanth's Nanoglue Makes Composites Tougher Under Dynamic Loading



Ganpati Ramanath

In a discovery that could pave the way for new materials and applications, materials scientists at Rensselaer Polytechnic Institute have found that oscillating loads at certain frequencies can lead to several-fold increases in the strength of composites with an interface that is modified by a molecular layer of "nanoglue." A newly published article in Nature Communications reports the unexpected discovery of the effects of loading frequency on the fracture energy of a multilayer composite involving nanoglue.

"Unearthing, understanding, and manipulating nanoscale phenomena at interfaces during dynamic stimuli is a key to designing new materials with novel responses for applications," said **Ganpati Ramanath**, the John Tod Horton Professor of Materials Science and Engineering at Rensselaer and the lead author on the study. "Our work demonstrates that introducing a nanoglue layer at an interface of a layered composite can lead to large mechanical toughening at certain loading frequencies."

Ramanath and his team of collaborators found that, at certain loading frequencies, the energy required to fracture a nanoglue-modified polymermetal-ceramic composite tripled, and exceeded the static loading fracture energy. This behavior is unexpected and significant because fracture energy is typically lower during cyclic loading than it is during static loading. Such frequencydependent toughening was observed only when a nanoglue layer was used to bond the metal and the ceramic.

The results also show that while the nanolayer is necessary for toughening to occur, the frequency range and the extent of toughening are primarily determined by the mechanical properties of the polymer in the composite. Specifically, the nanoglue facilitates load transfer across the metal-ceramic interface and dissipates energy in the polymer through plastic deformation, leading to an increase in fracture energy.

"Our discovery opens up an entirely new set of possibilities to design composites with novel responses using different combinations of polymers and interfacial nanolayers. For example, we could realize a completely new class of smart composites that can significantly toughen, or perhaps even self-destruct, at certain frequencies," Ramanath said.



STUDENT AWARDS & HONORS



Dr. Michael Deagen

Dr. Michael Deagen (MSE Ph.D. 2018) is the winner of the 2019 U.S. Department of Energy (DOE) Manufacturing Innovator Challenge competition for crowd-sourced solidstate lighting (SSL) manufacturing concepts. Deagen is the first recipient of this new award, for his submission entitled, "Layer-by-Layer Stamping for Developing Next-Generation Optical Waveguides."The award includes a \$3,000 prize and recognition during the 2019 DOE SSL R&D Workshop.



Dr. Emily Aaldenberg

Dr. Emily Aaldenberg (MSE Ph.D. 2018) has been selected by the Glass and Optical Materials Division (GOMD) of the American Ceramic Society (ACerS) to receive the 2019 Norbert J. Kreidl Award for her contribution to understanding the origins of fast surface stress relaxation in glass. This award is the highest honor GOMD bestows upon a graduate student. Emily presented her award lecture at the 25th International Congress on Glass in Boston, MA.



Sushant Kumar, a third year graduate student, was selected by American Physical Society (APS) for a travel award to attend the 2019 GERA Energy Research Workshop held in Boston, MA during APS March Meeting. The meeting was organized by the APS Topical Group on Energy Research and Applications (GERA) to promote communication on relevant physics between graduate students and wellknown senior scientists and science policy experts through a series of talks and panel discussions.



Yanming Zhang, a fourth year graduate student at RPI, has been awarded the Corning Glass Age Scholarship, which will support his research for the 2019-2010 academic year. He is the fifth recipient of this award since its inception in 2015. This award will support Yanming's work with Prof. Yungeng Shi at the Rensselaer Materials Science and Engineering department on investigating the crystallization of glass melts using the hot thermocouple technique.



Allison Martin, a rising junior in MSE, received a 2019 AIST Foundation Premier Steel Intern Scholarship. This award is meant to encourage engineering students to pursue careers in the iron and steel industry upon graduation. The one-year scholarship of \$12,000 includes a paid internship with a North American steel company.



Erik Milosevic has won the S.C. Sun Best Student Paper Award, presented at the IEEE International Interconnect Technology Conference in Brussels, Belgium in 2019. Erik worked with Prof. Gall and graduated in 2019 and is currently at Global Foundries. This award adds to his impressive list of twelve previous poster and paper presentation awards.

RESEARCH FOCUS

Continuing a Tradition of Outstanding Glass Science



Professor Minoru Tomozawa, who first arrived on the RPI campus as a postdoc in 1969, has won two prestigious glass science awards in 2019. For the past half a century, Tomozawa has stood out as one of the world's most impactful glass scientists.

Professor Minoru Tomozawa,

one of our most venerable senior faculty, shows no signs of ever slowing down! Since he first set foot on campus in 1969, Tomozawa's research has focused on mechanical properties of glass materials, understanding their fictive temperatures, and especially understanding the role of water at the glass-air interfaces. This year, Tomozawa received two prestigious awards from the American Ceramic Society (ACerS) and a new research grant from Corning Glass Incorporated. First, Tomozawa was selected to deliver the ACerS 2019 Edward Orton Ir. Memorial Lecture at the Materials Science & Technology Conference and Exposition (MS&T) in Portland, Oregon. In addition, Tomozawa was elected to be a **Distinguished Life** Member of the ACerS. The prestigious Orton Lecture is named in honor of General Edward Orton, Jr., founder of the American Ceramic Society. The Distinguished Life Member grade of Society membership is the Society's most prestigious level of membership and is awarded

in recognition of a member's contribution to the ceramics profession.

The Tomozawa research group recently won a new four-year grant from Corning for their proposal entitled "Development of High Strength Glasses and Glass Composites through Slower Water Diffusion", in the amount of \$800k. Currently, the Tomozawa group is also funded by the National Science Foundation (NSF) for their work on "Surface Stress Relaxation: Science and Effects on Glass Properties", which is a four-year grant of \$478k.

These honors are just two of the most recent recognitions of Prof. Tomozawa's longterm leadership in glass science. Recently, two of his graduate students - Emily M. Aaldenberg (2019) and Peter Lezzi (2014) received the Norbert J. Kreidl Award for Young Scholars. This award is the highest honor that the Glass and Optical Materials Division of ACerS bestows upon a graduate student, recognizing research excellence in glass science.

FOUNDER'S AWARD OF EXCELLENCE

Michael Deagen (MSE PhD, 2018) and Sebastian Garcia (co-terminal MS student) recently received the Rensselaer Founders Award of Excellence at the Honors Convocation ceremony on October 20, 2018. Established in 1994, the Founders Award "honors students who embody qualities of creativity, discovery, leadership, and the values of pride and responsibility at Rensselaer."

Michael Deagen completed his Ph.D. in the Department of Materials Science and Engineering at Rensselaer under the guidance of Prof. Chaitanya Ullal and co-adviser Prof. Linda Schadler. During his work at Rensselaer within the Center for Lighting Enabled Systems and Applications (LESA), he worked on low-cost fabrication of micro- and nano-scale structures of optical materials through layerby-layer stamping with a focus on nanoscale wetting and adhesion phenomena. Prior to joining Rensselaer, Michael received his B.S. in Materials Engineering from California Polytechnic State University in San Luis Obispo, where he developed a solar-recharged light and mobile phone charger for developing countries. As an intern in the Interior Lighting Development department at BMW in Munich, Germany and as a consultant for NEXT Lighting in San Francisco, CA, Michael worked on applications for colortunable LED lighting. He hopes that his Ph.D. research at Rensselaer on low-cost stamping at the nanoscale will someday translate into efficient color-mixing optical waveguide technology for color-tunable lighting systems.

Sebastian Garcia is a co-terminal student working under Professor Dan Lewis, where he is analyzing the melting behavior of Inconel 718 for the purposes of selective laser melting. Prior to that, he completed a dual Bachelor's degree in Mechanical Engineering and Design, Innovation & Society.



Michael Deagen



SEBASTIAN GARCIA

Linda Schadler's Polymer Nanocomposite Legacy Lives on at RPI



Professor Linda S. Schadler has been appointed **Dean** of the **College of Engineering and Mathematical Sciences** at the **University of Vermont**.

Dr. Schadler joined Rensselaer Polytechnic Institute as an Assistant Professor in 1996 and steadily rose thorough the ranks to the level of Russell Sage Professor in Materials Science and Engineering and was the Vice Provost and Dean of Undergraduate Education before her recent move to UVM as Dean. Active in materials research for over 25 years, Schadler has focused on the behavior of two-phase systems, primarily polymer nanocomposites. Her interests currently include the mechanical, optical, and electrical behavior of nanofilled polymer composites. Schadler has co-authored more than 175 journal publications, several book chapters, and one book. She has an h-index of 73. Dr. Schadler received a National Science Foundation National Young Investigator award in 1994 and the ASM International Bradley Stoughton Award for Teaching in 1997. She received a Dow Outstanding New Faculty member award from the American Society of Engineering Education in 1998 and is a Fellow of the Materials Research Society and ASM International. Dr. Schadler was named as one of the **Top 100 Materials Scientists** worldwide in the last decade by Times Higher Education, 2011.

Linda's stellar RPI legacy lives on in the lasting impacts she made to research and pedagogical innovation during her two decades here in Troy, NY. Her pioneering work on polymer nanocomposites was apparently quite contagious, seeing as many current faculty and students continue to pursue cutting-edge research in this and related areas. For example, Assistant Professor Chaitanya Ullal continues to co-advise doctoral candidates with Prof. Schadler. They recently co-authored an article in J Colloid Interf Sci (2019) entitled "Dye Doped Concentric Shell Nanoparticles for Enhanced Photophysical Performance of Downconverting Light Emitting Diodes". According to Ullal, the legacy of excellence in polymer nanocomposites was a major factor that attracted him to Rensselaer.

Linda is an associate editor for the Journal of Materials Research and recently joined the Materials Research Society Board of Directors. She is a former member of ASM International's Board of Trustees and the National Materials Advisory Board. She was the education and outreach coordinator for the National Science Foundation's Center "Directed Assembly of Nanostructures" headquartered at Rensselaer. As part of that position she was one of the executive producers for the Molecularium – a new style of planetarium show that takes the audience (primarily students in K-5) on a magical musical adventure into the world of atoms and molecules with the help of oxy, hydro and hydra (www.molecularium.com). Children learn that "everything is made of atoms and molecules" and about the three states of matter "solids slow, liquids flow, gas is fast."

For all these reasons and more, Linda will be greatly missed here at RPI, but her lasting impacts will continue to shape the research and teaching efforts on our campus for many years to come!

STUDENT ORGANIZATIONS

Material Advantage

RPI Material Advantage Student Chapter, a professional society housed by the MSE department, holds events focusing on professional development, educational outreach, and the student community. These events take place within the RPI community and surrounding communities, such as Troy, Niskayuna, and Albany. Listed below are some of the many events Material Advantage held this past year.

As the sole professional society specifically for materials engineering majors on campus, Material Advantage provides invaluable development opportunities to its members. These events give





2019-2020 Board. Pictured L-R: Emilee Fortier (Vice President), Ky Lamarca (President), Amelia Schopp (Secretary), Sumati Rangaraj (Treasurer), Gia Trzaska (Publicity Director).

students the opportunity to connect with professionals in industry and academia, by learning about the decisions that developed their career paths and meeting new people to develop career networks. As they do each year, students attended the Materials Science & Technology (MS&T) conference in 2018, where they took part in a design challenge competition, Speaking and Poster competitions and professional development panels. Students also visited the materials testing lab in the Stratton Air National Guard Base and learned about failure analysis in materials exposed to extreme conditions

"MatChat" is a recurring series held over the course

of the academic year, where several professors in the MSE department are asked to hold career-oriented dialogues with students. During these hour-long talks, professors begin by sharing a brief summary of their previous experiences and open the floor to questions. This provides an informal environment to learn about the professors and pick-up guidance.

Club members participated in Exploring Engineering Day where they taught K-6 students about recycling materials using their material properties. The demonstration featured a brief lesson to highlight concepts such as density, magnetism, and size, and incorporated an interactive activity that put these concepts to the test. Students were asked to separate a single plastic bead from a bag full of sand, nuts, and wooden popsicle sticks using water, filters, and magnets.

This past Spring, club members working in conjunction with Prof. Chaitanya Ullal held a series of events at Troy Prep Middle School as part of an afterschool science club. Sessions included a brief lesson and an activity. Students learned about tensile testing, stress vs strain, strength, and microscopy. The last event featured a field trip to RPI where Troy Prep students witnessed mechanical testing and microscopy in person.

FACULTY NEWS

FACULTY AWARDS & HONORS



Jian Shi

Professor Jian Shi was promoted to the rank of Associate Professor, with tenure, joined the

in July of 2019. Dr. Shi joined the MSE Department at RPI as an assistant professor in 2014. He was a postdoctoral research fellow at Harvard University from 2013 to 2014. Shi received his Ph.D. in Materials Science at the University of Wisconsin at Madison in 2012 and his M.S. degree in Mechanical Engineering at the University of Missouri at Columbia in 2008. He obtained his B.S. degree in Materials Science and Engineering at Xi'an Jiaotong University in China in 2006.

Prof. Jian Shi Promoted to Associate Professor with Tenure!

Research in the Shi group includes materials for electronics and photonics, adaptive devices, and materials for energy transformation. This work has been supported by multiple grants from the National Science Foundation, as well as an Air Force Office of Science and Research (AFOSR) Young Investigator Award and industry support from IBM.

Prof. Shi is also the 2019 winner of the Alfred H. Geisler Memorial Award.

This award recognizes an outstanding young materials scientist/engineer from the Eastern NY ASM chapter who has made significant contributions in the fields of education, research. or manufacturing before the age of 40.Shi has co-authored a total of 76 peer-reviewed publications in worldrenowned journals such as Nature, Science, Advanced Materials, Science Advances, Nature Communications, and many more. Having been cited more than 3300 times with an h-index of 32, his body of scholarship is extremely impressive. More information can be found at Professor Shi's website: http://homepages.rpi. edu/~shij4/index.html



Daniel Gall

Prof. Daniel Gall Receives IBM Award

Gall's research on "Post-Cu metallization" was awarded a research gift of \$40,000. This award further recognizes exciting work from Prof. Gall's group that seeks new metals

that could outperform copper as nano-scale wires in future silicon chips. In Fall 2018, LAM Research awarded him with the Unlock Ideas Faculty Award, a \$25,000 research gift.



Liping Huang

Science (ELATES) at Drexel program. The fellowship is aimed at advancing senior female faculty in academic engineering, computer science, and other STEM fields across the country.

Prof. Liping Huang, ELATES Fellow

MSE Prof. Liping Huang has been accepted as a member of the 2019-2020 cohort of fellows for the Executive Leadership in Academic Technology, Engineering and



Anahit Hovhannisyan

Anahit Hovhannisyan graduated in 2019 with a dual degree in Materials Engineering and Mathematics, and a minor in Management. She has pursued research in glass science with Professor Liping Huang since her freshman year at Rensselaer Polytechnic Institute, working to understand the behavior of gold nanoparticles in sodium silicate glass. Anahit has also been involved in the Materials Science & Engineering Department by participating in the professional society, Material Advantage. Leading the club as president in her sophomore year, Anahit has contributed to the MSE department early in her college career. In the meantime, she has also contributed to The Polytechnic, campus newspaper, as Features Editor and Editorial/Opinion Editor and developed her leadership skills through the Professional Leadership Program at RPI. Winner of the Corning Undergraduate Scholar Award and the Founders Award of Excellence, Anahit is passionate about materials science and leading fellow materials colleagues. Upon graduation, Anahit will continue her pursuit of materials science as a single wafer diffusion process engineer at Global Foundries.



2019 NORMAN S. STOLOFF RESEARCH EXCELLENCE AWARD

The MSE Department is delighted to announce that Dr. Harikrishnan Vijayamohanan ('19 supervised by Prof. Ullal) and Dr. Emily Aaldenberg (19', supervised by Prof. Tomozawa), are the winners of the **2019 Norman S**. **Stoloff Research Excellence Award**. The award recognizes MSE graduate students for their outstanding research accomplishments, as evidenced by a submitted or published journal article in the past 12 months. This award is presented annually to two current MSE graduate students. The winners will each receive a cash prize, a certificate of the achievement and will each deliver an oral presentation on their work as part of the Department's seminar series.



Pictured L-R: Ravishankar Sundararaman, Dr. Emily Aaldenberg, Dr. Harikrishnan Vijayamohanan, David Duquette

COMPUTATIONAL MATERIALS GRADUATES JUMP START CAREERS



Dr. Jihui Nie completed her PhD in MSE at RPI in 2019. She worked with Prof. Keblinski on the computational materials especially with molecular dynamics simulations. Her dissertation was about the thermal conduction in the disordered materials including the semiconductor alloy and oxide glasses. Besides the thesis project, she also conducted some side projects, e.g. the mass

accommodation at a high-velocity water liquid-vapor interface. In 2018, she participated in a half-year internship project in the High Pressure Physics Institute of Polish Academy of Sciences



Dr. Wei Peng completed his PhD in MSE at RPI in 2018. He studied the dynamic and viscoelastic properties of polymer nanocomposite materials by molecular dynamic simulations in his thesis research. Due to the limitation of the efficiency and functionality of the open-source software package he used for his simulation research, he always desired to apply state-of-the-

art parallel computing algorithm to accelerating the simulation program and to implement customized models that were not

in Warsaw, Poland, during which she used pressure to probe thermodynamic anomalies in tetrahedrally-bonded materials with molecular dynamics simulations. Molecular dynamics simulations can be regarded as "numerical experiments" conducted in the virtual computational environments rather than a real laboratory. Accordingly, the precise control of the initial condition and external constraints during the simulation are achieved by the explicit programming. Therefore, to better conduct the research and also out of interest, Jihui took many courses in computer science and gained a dual master degree in computer science at RPI. With her passion in programming, she strived to develop a career path in a more general computational area, not only in the materials science field. After graduation, Jihui joins Google as a software engineer and she believes that she would forever benefit from the comprehensive and rigorous scientific training she received at RPI.

included in the software package. His enthusiasm of acquiring more sophisticated computational programming skills compelled him to take the Master of Science program in computer science, and he graduated from Rensselaer in May 2018 with both his Ph.D. in Materials Engineering and M.S. in Computer Science. His extensive experience in simulation research landed him a job as Computational Scientist at **X-ray Optical Systems, Inc.**, which manufactures of X-ray fluorescence (XRF) analyzers to improve public safety and customer efficiency in industries. His job is to research the properties of the XRF spectra and to offer robust and efficient solutions implemented by low level programming languages. He is now the chief architect of the physical models deployed in their High-Definition XRF devices for quantitative analysis.

CURRICULUM CORNER

The MSE undergraduate class of 2021 has embarked on the first implementation of the Summer Arch program at Rensselaer Polytechnic Institute. This new initiative involves a summer of on-campus learning for all Sophomores, followed by a semester of off-campus experience such as a co-op or internship, research project, or individual entrepreneurial venture. For the summer courses, **Prof. Dan Lewis** developed a new 1-credit "Materials Skills" course, which is a kind of training camp for practicing materials engineers. These MSE Skills will equip our students with the tools to thrive in industry settings. Students are now spending the semester away at Northrop Grumman, Special Metals, Fenner Precision Polymers, Advanced Testing, Solid State Cooling Systems, and Sierra Nevada Corp. We are confident that they will put their MSE Skills to work expertly in the coming months!

STUDENT NEWS



SCHOLAR-ATHLETE EXCELS ON AND OFF THE ICE

Meet Sabrina Repaci,

MSE class of 2020, a star student-athlete on the Division I Varsity Women's Hockey Team at RPI. She is the center on the starting line, and often one of the hardest-working players on the ice, who is instrumental in setting up plays and making things happen. Since 2016, Sabrina has played in nearly one hundred games, scoring a total of twenty goals and twenty-eight assists over three seasons. She is a three-time Eastern College Athletic Conference (ECAC) All-Academic awardee and was named Freshman of the Year in 2016.

Off the ice, Sabrina is no less impressive in her multifaceted pursuits of excellence. She has attained the scholastic achievement of Dean's Honor List, is Secretary for the Student-Athlete Advisory Committee (SAAC), and has performed **NASA**sponsored research on laser cutting and melting of metals, as well as completing two summer internships



For more information about Sabrina's athletic accomplishments visit, rpiathletics.com/roster.aspx?rp_id=13389

involving R&D at Integran Technologies Inc.

Sabrina is from Toronto, ON, and hails from a family of highly accomplished hockey players. Her sister played ice hockey at University of Vermont and for Team Canada U18 and U22 and her brother plays ice hockey at St. Mary's University in Canada. On attending Rensselaer, Sabrina says, "The combination of the excellent engineering program and the opportunity to play Division I hockey really attracted me to RPI. I visited the campus and fell in love with

the school. It just seemed like a perfect fit for me to continue my education and follow my dream of playing college hockey. RPI gives an unlimited amount of resources for undergraduate students to succeed. The semi-yearly career fairs are examples of students connecting with top companies and lining up possible job opportunities. Rensselaer has a great and respected reputation, which gives undergraduate students an advantage when looking ahead for an internship, job, research or master's program."



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