

Nuclear

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

# RESEARCH IMPACT



THE OHIO STATE UNIVERSITY  
COLLEGE OF ENGINEERING

2020



# Message from the Chair

## Jim Gregory



The Department of Mechanical and Aerospace Engineering at The Ohio State University builds on its diversity of people and ideas to cultivate a range of advancements in mechanical, aerospace and nuclear engineering.

From gears to cancer research, our mechanical engineers are experts in an array of specialty areas. Our strengths in both aeronautical and astronautical engineering boost the impact of our aerospace engineers. And, with an on-site nuclear reactor—and high-achieving graduates throughout industry and government—our nuclear engineers value collaboration.

To best showcase the unique achievements of each of our programs, we have created separate research publications. In this Research Impact: Nuclear, you will see samples of our advancements in nuclear engineering over the past year.

We are co-coordinated a research project on non-classical particle transfer between students and researchs from Ohio State and Rio de Janiero State University (page 7), launched a nuclear propulsion research collaboration focused on space flight (page 9), and organized a workshop on big data for nuclear power plants that brought international participation (page 11).

All of this was accomplished with our talented students, who continue to be our primary focus. They are involved in every facet of our research.

I invite you to read on to learn about our recent cutting-edge innovations.

**Jim Gregory**  
*Chair, Mechanical and Aerospace Engineering*  
*Professor, Mechanical and Aerospace Engineering*

Cover: Buckeye nut images. Left: X-ray CT, Right: Neutron tomography of a buckeye nut. SEE MORE: page 5

### DEPARTMENT AT A GLANCE

## DEGREES CONFERRED

*Academic Year 2019- 2020*

<b>BS</b>	<b>248</b> MECHANICAL	<b>69</b> AEROSPACE	
<b>MS</b>	<b>73</b> MECHANICAL	<b>20</b> AEROSPACE	<b>3</b> NUCLEAR
<b>PHD</b>	<b>26</b> MECHANICAL	<b>7</b> AEROSPACE	<b>3</b> NUCLEAR

## STUDENT ENROLLMENT

*Autumn Semester 2019*

<b>BS</b>	<b>608</b> ME MAJOR	<b>561</b> ME PRE-MAJOR	<b>164</b> AE MAJOR	<b>286</b> AE PRE-MAJOR
<b>MS</b>	<b>107</b> MECHANICAL	<b>21</b> AEROSPACE	<b>3</b> NUCLEAR	
<b>PHD</b>	<b>147</b> MECHANICAL	<b>38</b> AEROSPACE	<b>22</b> NUCLEAR	



# Statement from the Chair: We must change.

The Ohio State University's Department of Mechanical and Aerospace Engineering stands with all black people – faculty, staff, students, colleagues, friends, and members of our community. The injustice that we see has been painfully brought to light by the long chain of lives needlessly and shockingly lost due to unjust and flagrant abuses of power – George Floyd, Ahmaud Arbery, Breonna Taylor, Botham Jean, and many others stretching over decades and centuries of our history. Many of us are experiencing deep pain - we share that pain, and together we long for justice and a better future.

We stand with all black people in vocally exclaiming that things must change. We will labor together to pursue ever greater justice, to advance towards an equitable society, to warmly embrace diversity, and to thoughtfully create a respectful and inclusive environment.

But this isn't just about what's happening in the world around us: the problem is here with us. In fact, my eyes are being opened to the ways that many of us contribute to and are complicit with systemic injustice. Just a few days ago in an engineering community dialogue, I listened to the voices of young African American Engineering students who shared their experiences of racism – injustices that they have experienced in our presence and from us. Excluded from groups. Seen as a threat. Isolated. Othered.

I am confronted by this stark reality. This is not who we want to be! It is not a reflection of the values of compassion, community, respect, justice, equity, diversity, and inclusion to which we aspire.

So, we must change. Please join me in boldly confronting these failures to live up to our values – this is what we have the most direct agency to change. I invite you to process with me in

assessing our own role. We'll need to humbly and unflinchingly confront the ways that we contribute to injustice. Yes, there is racism among us. Yes, the injustice is systemic. And yes, we can do better.

I freely admit that I am not fully aware of the injustice and the problems, and that I need to learn. The effects of systemic injustice run deep and may be difficult to bring to light. But we must – for the good of all of us.

While I don't have any answers today, I am committing our department to listening, to learning, and to change. These are a few initial steps that we will take:

- We will reflect on the history of our department and learn from it. Let's examine the origins of our department and our role in society over the years - we'll need clarity as we bring the systemic injustices to light.
- We will proactively listen to our own students, staff, and faculty – to hear their experiences; to ask careful questions; and to compassionately commit to change. We will respond with care and committed action when we learn of reports of racist or unjust behavior or attitudes.
- We will partner with the College of Engineering and the University on broader change where we can play a role.

We are deeply grieved by the injustice that we see in the world, injustice that has been with us for a long time. And, we acknowledge that there are many ways that each of us is a part of the systemic injustice in our world. Together, we will courageously move forward on a pathway of listening, learning, advocacy, and change. Thanks for your partnership with us as we pursue an equitable and just learning environment and broader society.

**Jim Gregory**  
*Chair, Mechanical and Aerospace Engineering*  
*Professor, Mechanical and Aerospace Engineering*



## DIGITAL NEUTRON IMAGING PROVES BUCKEYES ARE ONE TOUGH NUT

When you want to know if you have a broken bone, an X-ray is the best way to get an image. When researchers want to know about the interior of large or dense objects, neutron radiography can be the answer. Neutron radiography is a nondestructive method for imaging the internal form of samples by measuring the neutrons that are not absorbed when passing through the sample. It provides contrast between certain sample materials in a complementary manner to other imaging techniques, such as X-ray radiography. Neutron radiography and tomography (3D imaging) have been used for a wide variety of applications, such as studying cultural heritage objects, fuel cells, nuclear fuels, and for quality control of industrial products. Specialty applications, such as imaging highly radioactive fuels or using fast neutrons to image large or dense objects, are emerging in the field of digital neutron imaging.

**Bill Chuirazzi**, a PhD Candidate in Nuclear Engineering at The Ohio State University, has worked to optimize neutron detection for imaging through a combinatorial study as part of his recent dissertation. Part of Chuirazzi's work on optimizing fast neutron scintillators utilized The Ohio State University Nuclear Reactor Laboratory (NRL) beam facility for neutron imaging. Bill was then awarded a 2-year Idaho National Lab (INL) fellowship and has been working there since August 2018. As part of his research, he imaged buckeye nuts, the eponymous nut to The Ohio State University, to demonstrate the difference

in X-ray and neutron imaging. These images of buckeye nuts give the State of Ohio and the university the evidence of something suspected long ago – buckeyes are one tough nut.

“X-rays and neutrons give us different information about samples because they interact with atoms differently. The difference in resolution between the images comes from the fundamental physics of the two imaging techniques. However, this fundamental difference is why examining an object with both techniques helps us develop a better understanding of what is inside”, said Chuirazzi, who successfully defended his PhD dissertation on March 20th in a virtual format, due to the impact of the coronavirus epidemic crisis.

Using the same principles that produced the neutron image of the buckeye nut, Chuirazzi performed neutron radiography and tomography on nuclear fuel while a Graduate Fellow at INL.



Bill Chuirazzi, PhD Candidate in Nuclear Engineering



Buckeye nut images (Left: X-ray CT, Right: Neutron tomography of a buckeye nut). Dr. Nikolaus Cordes (INL) and Dr. Josh Kane (INL) provided assistance and advice in image processing.

During this work, a new method for digitally imaging highly radioactive nuclear fuel was developed. In addition, his dissertation work advances the state-of-the-art of digital neutron imaging by developing new neutron detectors that have the potential to drastically increase detection efficiency and image resolution, producing better quality images. “Bill is tackling challenging problems in neutron imaging by enhancing the detection efficiency, but he has also extended the application of digital neutron imaging technologies”, said Dr. Raymond Cao, the director of NRL and also the advisor for Chuirazzi.

As the only operating research reactor currently in the State of Ohio, the NRL is a unique teaching and research laboratory that delivers high quality service to its customers and excellent instruction

and research opportunities to nuclear engineering students. In 2017, the United State Department of Energy (DOE) designated the NRL as a partner facility of the Nuclear Science User Facilities program, allowing awarded researchers, often in collaboration with other laboratories and industry, to perform DOE mission-supporting research at the NRL. Two neutron beam facilities, one thermal neutron beam and one 1-MeV fast neutron beam, are available at NRL to provide capabilities for conducting neutron imaging research and applications.

by Maria McGraw, Nuclear Analysis and Radiation Sensor Laboratory



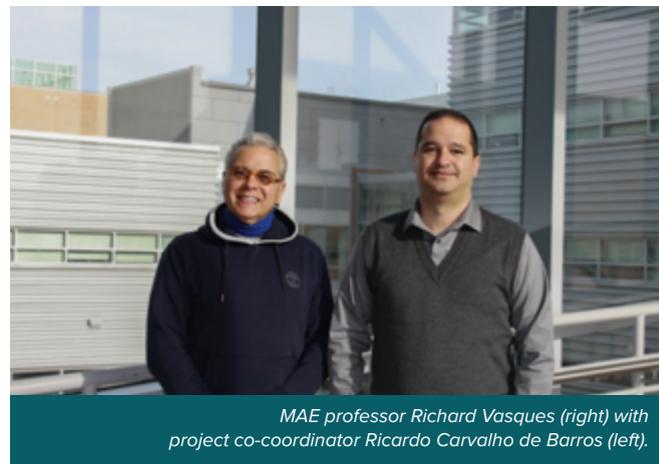
## OHIO STATE PROFESSOR TO CO-COORDINATE NEW NON-CLASSICAL PARTICLE TRANSPORT RESEARCH

Richard Vasques, an Ohio State professor of the Nuclear Engineering Graduate Program, is co-coordinating a research collaboration with Rio de Janeiro State University's professor Ricardo Carvalho de Barros to study non-classical particle transport.

This research collaboration is funded by the Brazilian Ministry of Education through the CAPES-Print program, aiming to stimulate the international cooperation with Brazilian Universities.

The goal of the study is to create accurate and efficient computer simulations of non-classical transport using Vasques' non-classical generalized linear Boltzmann equation as the mathematical model.

This research will have a significant impact in several applications in the areas of nuclear engineering, atmospheric sciences, and computer-generated imagery (CGI), to name a few.



MAE professor Richard Vasques (right) with project co-coordinator Ricardo Carvalho de Barros (left).

The Rio de Janeiro State team is already recognized for its significant contributions towards research on computational models of classical transport, and is now looking to make important contributions in the area of non-classical transport.

The Ohio state faculty and students contributing are:

**Richard Vasques** (coordinator)

**Japan Patel** (Postdoc, participant)

**John Kuczek** (PhD student, participant)

**Robert Palmer** (PhD student, participant)

*by the department of mechanical and aerospace engineering*



Assistant Professor Marat Khafizov and Professor Carol Smidts leading a breakout session at the 2019 Big Data for Nuclear Power Plants Workshop, which drew international participation (page 11)



## OHIO STATE LAUNCHES NUCLEAR PROPULSION RESEARCH COLLABORATION FOCUSED ON SPACE FLIGHT

At the American Astronautical Society's John H. Glenn Memorial Symposium in Cleveland, The Ohio State University College of Engineering and a subsidiary of BWX Technologies, Inc. (BWXT) announced a joint interdisciplinary research effort to advance nuclear thermal propulsion for space flight missions.

Nuclear thermal propulsion (NTP) offers the potential to significantly reduce travel time for spacecraft, especially for deep-space destinations in the solar system at distances of Mars and beyond. Additionally, the significant power and specific impulse improvements will enable new and innovative flight trajectories, and eventually reduce the time astronauts are exposed to harmful cosmic radiation while transiting in deep space.

BWXT is a leading supplier of nuclear components and fuel to the U.S. government, and is currently working for NASA under contract to reduce risk for NTP development as well as conduct a mission study for a potential flight demonstration.

Ohio State's world-class materials science capabilities, robust data analytics expertise and its own nuclear



Dean Williams (left) and BWXT President of Advanced Technology Programs Jonathan Cirtain

reactor laboratory complement BWXT's applied science leadership in nuclear propulsion to help meet the nation's future space flight needs.

"The Ohio State University is a leader in research partnerships with industry and performing critical research in the national interest," said College of Engineering Dean **David B. Williams**. "We work closely with NASA's two primary centers focused on nuclear applications

for space, NASA's Marshall Space Flight Center in Huntsville, Alabama, and NASA's Glenn Research Center in Cleveland. We are excited to build this collaboration to help further space exploration and greatly reduce travel times to a range of key destinations in deep space."

The College of Engineering's Center for Design and Manufacturing Excellence soon will embark upon the construction of a working NTP scale-model rocket engine using non-nuclear power sources and significant advances in additive manufacturing.

"We are extremely pleased to work with The Ohio State

University to advance nuclear thermal propulsion technology," said BWXT President and Chief Executive Officer Rex Geveden. "Projects like this create an interesting intersection between student development and our business ambitions in this promising technology for the space market."

Student involvement will be emphasized in Ohio State's support of BWXT's NTP program, and will be enriched further through the university's role as one of six members of the Department of Energy's Idaho National Laboratory National University Consortium. This summer, Ohio State engineering graduate students are already interning at BWXT's Lynchburg offices and

**"Projects like this create an interesting intersection between student development and our business ambitions in this promising technology for the space market."**

at Marshall's nuclear propulsion research laboratories, respectively. Several mechanical and aerospace engineering capstone projects focused on NTP in the past academic year, and more are planned for the future.

Later this year, Ohio State and BWXT also will host a dedicated research conference focused on the interdisciplinary aspects of nuclear thermal propulsion. Coordinated by the university's Battelle Center for Science, Engineering, and Public Policy in the John Glenn College of Public Affairs, the conference will convene global technical, policy, and administrative leaders and help focus specific areas of research.

*by the College of Engineering*

## MAE STUDENT TO RECEIVE DOE NEUP FELLOWSHIP

Ohio State mechanical engineering student **Matt Bisbee** has been selected to receive a 2020 Department of Energy Nuclear Energy University Program (DOE NEUP) Fellowship Award.

Bisbee's research was advised by Dr. **Richard Cao** and focused on neutron imaging. He has been working on automating neutron imaging processes.



The DOE NEUP selects 33 students to receive a graduate fellowship to students pursuing nuclear energy-related disciplines at universities across the country. The graduate fellowship includes \$50,000 annually over the next three years, as well as \$5,000 to go towards a summer internship.

Bisbee is from Hudson, Ohio, and has one semester left before completing his undergraduate degree in Mechanical Engineering. He will start graduate school in Jan. 2021, where he will continue to work on neutron imaging. One he graduates he has an interest in working with advanced reactor designs.

"It means a lot to be recognized for this Fellowship," he said. "I appreciate Dr. Cao for giving me the insight and push to apply to the DOE NEUP Fellowship which has awarded me for the hard work I have put into my undergraduate studies."

*by the department of mechanical and aerospace engineering*



## INTERNATIONAL PARTICIPATION AT BIG DATA WORKSHOP

On December 10 and 11, the Department of Mechanical and Aerospace Engineering hosted the Big Data for Nuclear Power Plants Workshop in Columbus, Ohio.

The workshop was organized with help from Ohio State nuclear engineering faculty and staff. Professor **Carol Smidts** and assistant professor **Marat Khafizov** served on the Technical Organizing Committee. Postdoctoral researcher **Xiaoxu Diao** and research associate engineer **Yunfei Zhao** led the local organizing committee.

The two-day event focused on big data, a term describing large volumes of high velocity, complex and variable data, and its applications to the nuclear industry. The main goal of the workshop was to identify research issues and needs, as well as opportunities for applications of big data and



The local organizing committee was led by (left to right) Marat Khafizov, Carol Smidts, Xiaoxu Diao and Yunfei Zhao



Dr. Ed Herderick, principal engineer CDME, presenting on advanced manufacturing

artificial intelligence. “We are trying to focus on operation, maintenance and advancement,” said MAE professor and workshop organizer Carol Smidts.

The annual workshop brings in nuclear energy researchers and industry experts from across the country, but this year also brought international participants for the first time. Japan and Norway were represented by participants including Emil Wingstedt, a research scientist from the Institute for Energy Technology in Halden, Norway who presented during a section on diagnostics and prognostics.

The workshop kicked off with two panel discussions. The first panel on industry needs and challenges was delivered by industry professionals from Utilities Service Alliance, the Electric Power



Sherri Buchanan (Oak Ridge National Laboratory)

Research Institute, Rolls-Royce and Framatome. This was followed by presentations on advanced manufacturing and nuclear materials from a panel that included speakers from Oak Ridge National Laboratory, Idaho National Laboratory, and Edward Herderick from the Ohio State Center for Design and Manufacturing Excellence (CDME).

The afternoon presentations were divided into two tracks. Participants in track A heard presentations on diagnostics and prognostics. This included a presentation from Yunfei Zhao, a mechanical and aerospace engineering research associate, who spoke about component degradation modeling and maintenance optimization in the nuclear industry. Track A also included speakers from the University of Pittsburgh, North Carolina State University, Idaho National Laboratory and Argonne National Laboratory.

Track B held session that heard presentations on cyber and physical security as well as information science. **Pavan Kumar Vaddi**, a graduate research associate in the Department of Mechanical and Aerospace Engineering, spoke about increasing threats of cyber-attacks on nuclear power plants.

Vaddi also shared his experimental results in classifying cyber security threats. The final presentation of the evening was given by MAE PhD student, Wei Gao. Gao shared his research in using neural network models to automatically derive

information on components and their identifications from piping and instrumentation diagrams.

The second day of the Big Data for Nuclear Power Plants Workshop began with two breakout sessions. One breakout moderated by MAE assistant professor Marat Khafizov discussed advanced manufacturing and nuclear materials. The second breakout covered nuclear operation and maintenance.

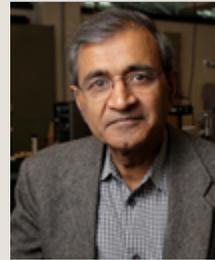
Final presentations were given in morning sessions with Track A covering integration with physics-based modeling. Track B’s focus was on sensors and included a presentation from MAE graduate fellow **Anthony Birri** on using an optical fiber-based gamma thermometer array to infer reactor core power distribution.

This was the third year of the Big Data Workshop. Next year’s workshop will be held December 9 and 10, 2020 in Columbus, Ohio. The 2020 workshop will focus on furthering the investigation of big data and how it can be applied to various segments of nuclear science and engineering.

by Sam Cejda, department of mechanical and aerospace engineering

# FACULTY RECOGNITION

## Professor Bharat Bhushan announces retirement



Since 1991, professor **Bharat Bhushan** has been an Ohio Eminent Scholar and the Howard D. Winbigler Professor in the department of mechanical

and aerospace engineering. His research interests include fundamental studies with a focus on scanning probe techniques in the interdisciplinary areas of bio/nanotribology, bio/nanomechanics and bio/nanomaterials characterization and applications to bio/nanotechnology, and biomimetics.

During his time at Ohio State, Bhushan has been prolific in his publishing. He has published 10 scientific books, over 100 book chapters, and over 900 scientific papers. He has edited over 50 books and holds more than 25 U.S. and foreign patents. Professor Bhushan has become an internationally recognized researcher and is one of the top 1500 highly cited researchers in the world.

Prof. Bhushan has been recognized with numerous awards, most

recently the ASME May Hershey Award, presented for lifetime contributions to the field of tribology.

In addition to his technical work, professor Bhushan advised 28 PhD students and 43 masters students.

## Professor Cheena Srinivasan announces retirement

**Cheena Srinivasan** has been a part of the Ohio State community for 40 years. For 12 years (2000-2012) he served as the Chair of the department of mechanical and aerospace engineering.



Professor Srinivasan's key contributions to the department include leading capital campaign efforts that led to the building of Scott Laboratory. He oversaw the merger of mechanical and nuclear engineering with aerospace engineering in 2010. And he was able to establish and sustain extensive relationships with department alumni networks.

Srinivasan also served as Associate Dean for Research in the College

of Engineering (1998-2000), and as Program Director for the Manufacturing Machines and Equipment Program at the National Science Foundation (1992-1994). He also helped advance MAE alumni relations as Faculty Director for Alumni Relations (2016-2018).

Many students and faculty in the department of mechanical and aerospace engineering have benefitted from professor Srinivasan's knowledge and experience. He will continue to engage in academic activities including teaching and researching as an Emeritus Faculty.

## Renee Zhao receives 2 NSF awards in Spring 2020



**Renee Zhao**, an assistant professor of Mechanical and Aerospace Engineering, has received two awards from the National Science Foundation (NSF)

in Spring 2020.

Earlier this year, Zhao received a five-year, \$562,511 NSF Faculty Early Career Development (CAREER) Award for her research in the mechanics of soft intelligent materials.

More recently, NSF announced she will be awarded \$398,773 over three years for the project "Micromechanics of Interactions Between Hard Magnetic Particles and Soft Matrix on Magneto-Mechanical Actuation."

"The two grants will facilitate the investigation of the mechanical behavior of the magnetic soft materials," Zhao said. "These materials are composites with hard-magnetic particles embedded in soft matrixes. Upon the application of an external magnetic field, the composite could provide untethered, fast and reversible deformation with large shape changes. The magnetic soft materials have already demonstrated potentials in designing morphing structures and actuators for various engineering applications.

Read more: [go.osu.edu/ReneeZhao](https://go.osu.edu/ReneeZhao)

## Canova and Serrani Recognized with Lumley Interdisciplinary Research Award



Canova

the Department of Electrical and Computer Engineering were awarded the College of Engineering's Lumley

**Marcello Canova**, associate professor in the Department of Mechanical and Aerospace Engineering, as well as **Andrea Serrani**, professor in

Interdisciplinary Research Award.

This award is presented annually to faculty and/or research scientists within the College of Engineering who have demonstrated significant research collaboration that cuts across departmental or discipline boundaries.

"This team is well recognized nationally and internationally, and has made a significant contribution to the advancement of feedback control technology and its applications to advanced powertrain systems," said Hesham El Gamal, professor and chair of the Department of Electrical and Computer Engineering.

Because of the interdisciplinary nature of their work and its balance between methodological depth and industrial relevance, Canova and Serrani have received significant research funding from the National Science Foundation (NSF) as well as Ford Motor Company.

## Ryan Harne awarded the ASME Gary Anderson Early Achievement Award

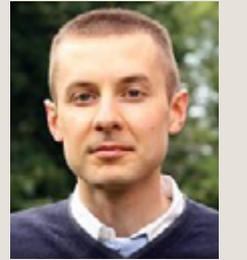
Ohio State mechanical engineering professor **Ryan Harne** was awarded the ASME (American Society of Mechanical Engineers) Gary Anderson Early Achievement Award for his contributions to the field of Adaptive Structures and



Serrani

Material Systems.

The outcomes of Dr. Harne's research efforts have included one patent, multiple patents pending, one book, over 50 journal publications, over 50 conference proceedings, and numerous students mentored and guided through their academic programs.



Harne

## Professor named International Society for Optics and Photonics fellow



**Marcelo Dapino**, professor of mechanical and aerospace engineering, the Honda R&D Americas Designated Chair in Engineering, and director

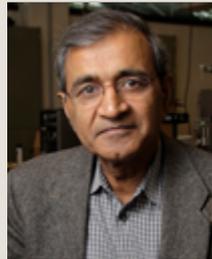
of the NSF IUCRC Smart Vehicle Concepts Center has been named a fellow of the International Society for Optics and Photonics (SPIE).

Dapino was selected for outstanding technical contributions in the field of smart materials and structures and for extensive service over the past 20 years to the SPIE Smart Structures and Nondestructive Evaluation conference.

Prof. Dapino is widely recognized in the field of smart materials for the development of transitional

research programs that approach foundational research with an industrial focus. Along with his students and collaborators, Dapino has authored 250 technical articles and book chapters while serving as primary advisor on over 50 dissertations and theses.

### **Professor Bharat Bhushan receives ASME Mayo D. Hersey Award for lifetime achievement in tribology Award**



Professor Bharat Bhushan, Ohio Eminent Scholar and Howard D. Winbigler Professor and Director of Nanoprobe Lab for Bio- & Nanotechnology

and Biomimetics has received the 2020 Mayo D. Hersey Award from the American Society of Mechanical Engineers (ASME).

The ASME Mayo D. Hersey Award was established in 1965. It is given in recognition of distinguished and continued contribution over a substantial period of time to the advancement of lubrication science and engineering, according to ASME. The award is regarded as the highest honor in the field given by ASME.

For more than four decades Dr. Bhushan has made outstanding contributions to the advancement of tribology as a prolific author and internationally recognized expert at the micro-to-nano scales. He

has authored 10 scientific books, over 100 handbook chapters, and over 900 scientific papers. He also edited more than 50 books and holds more than 25 U.S. and Foreign Patents. He is a Highly Cited Researcher in materials science, biology, biochemistry, and cross-field category. His research was listed as one of the Top Ten Science Stories of 2015 and he has received two semi-honorary and three honorary doctorates. Bhushan is also recognized as a pioneer of the tribology of magnetic storage devices, whose influence has extended to the interdisciplinary areas of biological and materials science.

### **Jim Gregory to become chair of Mechanical and Aerospace Engineering**

Professor James W. Gregory will become the new chair of the Department of Mechanical and Aerospace Engineering (MAE) at The Ohio State University, effective June 1, 2020. He will succeed Professor Vish Subramaniam, who has served as chair since 2016.



Currently an MAE professor and Director of the Aerospace Research Center (ARC), Gregory came to Ohio State in 2008. Under his leadership, ARC has expanded interdisciplinary collaborations to include colleagues from industrial engineering, electrical engineering, mechanical

engineering and medicine. The center's research output also has grown substantially, with a doubling of research expenditures over the past two years. In August 2017, Gregory led a team of researchers and students in setting official world records for speed and distance for an autonomous drone.

Gregory's innovative teaching methods helped him earn numerous awards throughout his career, including the McCarthy Engineering Teaching Award, the Department of Aerospace Engineering Outstanding Professor Award, and SAE's Ralph R. Teeter Educational Award. He has produced a video lecture series on the Science of Flight, in collaboration with the Great Courses and the Smithsonian Institution's Air & Space Museum.

## **NEW FACULTY APPOINTMENTS**



### **Chris Atkinson**

Professor Atkinson joined the department of mechanical and aerospace engineering in June, and is the Director of Smart Mobility Program. Most recently, Atkinson was Director of ARPA-E in Washington, DC where he led a diverse portfolio of energy research funded by the agency.

**Learn more about MAE professor Chris Atkinson:**  
[go.osu.edu/Atkinson](https://go.osu.edu/Atkinson)

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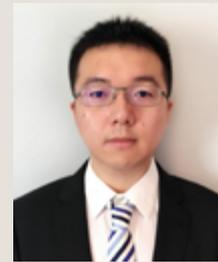
*@OhioStateMAE*



*Department of Mechanical and  
Aerospace Engineering at The Ohio State University*

# STUDENT RECOGNITION

## Ming Yang selected as Ohio State Presidential Fellow



Ohio State mechanical engineering PhD student **Ming Yang** was selected as one of this year's recipients of the Ohio State Presidential Fellowship.

Yang is advised by Dr. **Soheil Soghrati** and is a fourth year doctoral candidate who came to Ohio State from China.

The fellowship is given to students who “embody the highest standards of scholarship” in the graduate programs at the university going into the last stages of their dissertation research or terminal degree project. Recipients are given a monthly stipend for living expenses so they can focus solely on completing their research, as well as help with travel expenses to present at national conferences.

Yang's research focuses on creating an efficient numerical framework, including microstructure reconstruction, mesh generation, finite element simulation, and deep learning algorithms, for the computational modeling of novel materials with complex

microstructures. It will significantly reduce the time and labor cost associated with the modeling process.

**Read more: [go.osu.edu/MingYang](https://go.osu.edu/MingYang)**

## MAE PhD student awarded SMART fellowship



PhD student, **Jordan Thayer** has been awarded a SMART Fellowship by the United States Department of Defense (DOD).

Thayer is advised by MAE professor **Jack McNamara**, and works in the Multiphysics Interactions Research Group (MIRG) directed by McNamara. Through MIRG Thayer also works in collaboration with professor **Datta Gaitonde**.

The Science, Mathematics And Research for Transformation (SMART) Scholarship for Service Program is an opportunity for students pursuing an undergraduate or graduate degree in Science, Technology, Engineering, and Mathematics (STEM) disciplines to receive a full scholarship and be gainfully employed upon degree completion. The award provides full tuition, health insurance,

living expenses, and employment at a DOD facility after graduation. Selection for an award is based on an essay, letters of reference, and educational/work background information.

Thayer's fellowship was awarded by The Air Force Research Laboratory Aerospace Systems Directorate (AFRL) at Arnold Air Force Base. His research will focus on fluid-structure interactions in high-speed, unsteady flow environments.

## MAE PhD student selected to receive a NDSEG Fellowship Award

Ohio State mechanical engineering PhD student **Rob Clark** has been selected to receive a 2020 National Defense Science and Engineering Graduate (NDSEG) Fellowship Award.



Clark's research was advised by Dr. **Jeffery Bons** and focused on deposition of particulates in high temperature environments, notably gas turbine engines.

For his proposal to NDSEG, Clark focused on the thermodynamic design, modeling, and optimization of thermal management systems for future military aircraft.

The fellowship is awarded in recognition of his academic

excellence in science, technology, engineering and math achievements from over 4176 applications that were received this year, according to NDSEG. NDSEG fellowships need to promote education in science and engineering disciplines relevant to the mission of the Department of Defense.

## Graduate student and assistant professor receive fellowship from AFRL/DAGSI



The team of mechanical engineering graduate student **Mohamad Al Nashar** and assistant professor **Alok Sutradhar** have received

a fellowship award to support their research in materials and manufacturing.

The fellowship comes from the Air Force Research Laboratory Dayton Area Graduate Studies Institute (AFRL/DAGSI). Sutradhar and Al Nashar's fellowship title is “Topology Optimization of Coupled Mechanical and Electromagnetic Designs.”

“In this project, we combine mechanical and electromagnetic topology optimization to design novel electromagnetic systems,” said Sutradhar.

The design proposed by the project will lead to new performance and integration opportunities. This includes systems that are lighter,

more compact and affordable.

The focus of the work is topology optimized electromagnetic designs, and creating CNN-based neural network surrogate models for electromagnetic field distribution. Sutradhar and Al Nashar plan to begin their project in the summer.

## Wen Cai receives Ohio State Presidential Fellowship

Ohio State mechanical engineering PhD student **Wen Cai** was selected as one of this year's recipients of the Ohio State Presidential Fellowship.



The fellowship is given to students who “embody the highest standards of scholarship” in the graduate programs at the university going into the last stages of their dissertation research or terminal degree project. Recipients are given a monthly stipend for living expenses so they can focus solely on completing their research, as well as help with travel expenses to present at national conferences.

Wen's research focuses on the investigations on nonlinear energy harvesters in complex vibration environments for robust direct current power delivery. With the research she hopes to combine the advancements of mechanical and electrical sub-systems to ensure sustainable direct current power

delivery in complex vibration environments. Her advisor was Ohio State mechanical engineering professor **Ryan Harne**.

## Ohio State student wins first prize at international student conference



Collin O'Neill, an Ohio Space Grant Consortium Fellow and a graduate student pursuing a master's in aerospace engineering, won the first prize in

the international student conference in the undergraduate category on Jan. 6 at the American Institute of Aeronautics and Astronautics (AIAA) SciTech Forum in Orlando, Florida.

O'Neill competed against six other regional-winning contestants from around the world with his research, presentation and paper. The competition was based on several categories like quality of the presentation and paper, impact on industry and how novel the work is.

The research focused on active flow control for offset diffusers for aircraft engines. Diffusers provide the required airflow for aircraft engines and are typically straight, but O'Neill's research focused on using plasma actuators to solve the problems with flow that arise when an aircraft uses a diffuser that is offset.



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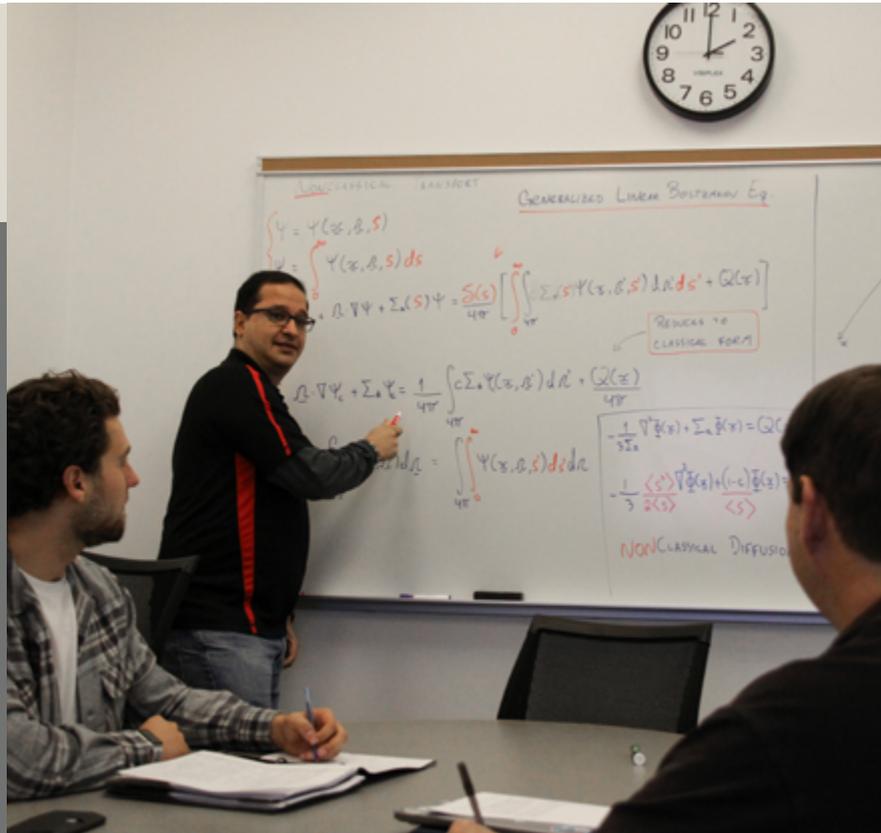
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MAE professor Richard Vasques is co-coordinating a research  
collaboration on non-classical particle transport between Ohio State and  
Rio de Janeiro State University (page 7)