

2018

# UNDERGRADUATE INNOVATION



THE OHIO STATE UNIVERSITY  
COLLEGE OF ENGINEERING

DEPARTMENT OF MECHANICAL  
AND AEROSPACE ENGINEERING





*Students gathered in the Scott Laboratory courtyard during autumn 2017 for the biannual ME4900 mini-project showcase, where they compete their designs against one another. This seven week design project helps prepare students for their intensive capstone experience.*

# Message from Associate Chair for Undergraduate Studies

## BLAINE LILLY

**A**s I write this, I'm nearing the end of my first year as the Associate Chair for Undergraduate Programs in the Department of Mechanical and Aerospace Engineering. The year 2017 proved to be eventful for the department, with a spotlight on our reaccreditation visit by the Accreditation Board for Engineering and Technology, Inc. (ABET) in October. The process, which occurs every six years, went exceptionally smoothly, thanks to the hard work of now retired Associate Chair Dan Mendelsohn, who directed the overall department effort and the mechanical engineering program evaluation, and Professors Cliff Whitfield and Jim Gregory who were responsible for the aeronautical and astronautical program evaluation. I'm proud to say that both of the department's undergraduate programs are thriving in every way, and continue to be two of the most sought-after curricula among undergraduates in the College of Engineering.

Our department and our university are going through a period of profound change as we strive to meet the needs of our students, our alumni, the citizens of Ohio, the nation and beyond. I first came to Ohio State as a freshman in the autumn of 1967, and over the past fifty years I've never known a time when The Ohio State University has been more a part of the national conversation than it is today. As the largest land-grant university in the U.S., we are looked to as a leader in higher education and research.

Currently our department is actively changing the undergraduate experience for engineering students. Our strong emphasis on experiential learning continues to differentiate our department both within the college and across the Big Ten. Several of the student projects presented in this year's *Undergraduate Innovation* testify to the wisdom of our decision in 2012 to provide our students with the

hands-on skills and up-to-date facilities needed to turn their design concepts into reality. The Buckeye Space Launch Initiative is a perfect example of what our students are capable of achieving when given the opportunity. The remarkable diversity of research projects, capstone designs and entrepreneurial ideas that our students pursue is a direct result of our shift as a department toward a much greater emphasis on experiential learning.

Perhaps our biggest challenge is meeting the ever-increasing demand for admission to our majors, while simultaneously growing and evolving as a department. We currently have over 1300 undergraduates in the aeronautical and astronautical engineering and mechanical engineering programs, with another 617 first-year students who are enrolled as pre-majors. When added to more than 350 graduate students, it's clear that our department enrollment exceeds that of many small four-year colleges. With the growth of our faculty ranks, as a department we have become much younger: of our 73 full-time faculty, over one-third are at the rank of assistant professor.

This is a very exciting time to be a part of Ohio State's Department of Mechanical and Aerospace Engineering, and we look forward to sharing our advances with you as we move into the future.

### **Blaine Lilly**

*Professor and Associate Chair for Undergraduate Studies  
Department of Mechanical and Aerospace Engineering*







*The Buckeye Space Launch Initiative team at the Spaceport America Cup competition in New Mexico during summer 2017.*

## Buckeye Space Launch Initiative combines experiential learning with research for a first place win

**T**he Buckeye Space Launch Initiative (BSLI) soared to first place at the Spaceport America Cup in New Mexico in June.

The annual competition challenges teams of college students to design, build and launch solid-, liquid- or hybrid-fuel rockets to a targeted altitude. The five-day event attracted more than 100 teams from across the world.

The team of 21 Ohio State students earned top honors in the 30,000-foot Student Researched and Designed

(SRAD) solid fuel rocket category. Their nine-foot long rocket, named Brutus II, soared to an altitude of 23,224 feet with a full 3U payload – the largest of any other rocket competing in the 30K field.

Of the 10 other teams in the same category, only five actually launched, and just three had successful flights.

“It’s very difficult to get to that height as it turns out,” said Nic Flesher, a rising senior aerospace engineering student and the 2017 co-leader of the BSLI structures team.

Once Brutus II launched, the team lost visual of the rocket, but they were prepared.

“We had a GPS telemetry system from RadioBro Corporation onboard so we were able to actively track it from the pad and we were able to know where it was at all times and when it landed,” explained Flesher.

BSLI also competed in the 10,000 commercial-off-the-shelf category. The 10K team developed an active drag system that controlled the rocket’s apogee. The project was a finalist for the Technical Excellence and Innovation Award. While the rocket didn’t finish in the top two, full results for the 10K have not yet been released.

Flesher expects their placement will be fairly high since the flight was successful.

“The BSLI team was able to achieve success during this competition due to the hard work and dedication showed by all members across multiple research and competition teams,” said Zac Strimbu, the 2017 BSLI president. “Additionally, the facilities, resources, and faculty that the College of Engineering provided to the BSLI team proved invaluable in growing to two competition teams this year.”

Strimbu, who is majoring in aerospace engineering with a minor in nuclear engineering, and his teammates used the knowledge they gained from their engineering courses throughout the competition.

“The fundamentals of engineering courses prepared the BSLI team to understand how to use CAD modeling and MATLAB coding on projects,” Strimbu said. “Additionally, coursework such as thermodynamics, aerodynamics, and structures all laid the foundation for the physics behind forces acting on the rocket.”

The BSLI consists of 60 team members total. The vast majority are students in the Department of Mechanical and Aerospace Engineering (MAE), along with several representatives from electrical and computer engineering, computer science and engineering and physics. The team hopes to expand to include more students from other areas of study.

*Excerpts from original article published by the College of Engineering.*



## TEAM STATS

- **Projects:** 10K foot rocket, 30K foot rocket, 100K foot rocket
- **Achievements:** 2017 Spaceport America Cup for 30K foot rocket flight
- **2018 competition:** Spaceport America, June 19-23, New Mexico
- **Members:** 60+ undergraduate students
- **Faculty advisors:** John Horack, Jen-Ping Chen
- **Test flight footage:** [go.osu.edu/bsliui](http://go.osu.edu/bsliui)

# International collaboration: RIYA scholars' work adds to the breadth of Ohio State Research

**T**his past summer five students were awarded a 2017 Research Internship for Young Academics (RIYA) Award.

Established in 2014, the RIYA program connects exceptional Indian mechanical engineering students to groundbreaking research experiences with leading Ohio State faculty and graduate students. Funded by significant support from the Singh Family Fund and other endowments, the program provides the RIYA scholars with an allowance that covers a stipend, housing subsidy and travel to the United States and back to their home county.

Professor Emeritus Rajendra Singh developed the RIYA program, in partnership with the Department of Mechanical and Aerospace Engineering, to provide Indian students with access to internationally recognized engineering faculty.

In addition to financial support, the opportunity to be mentored by renowned experts in the field is a key draw for applicants.

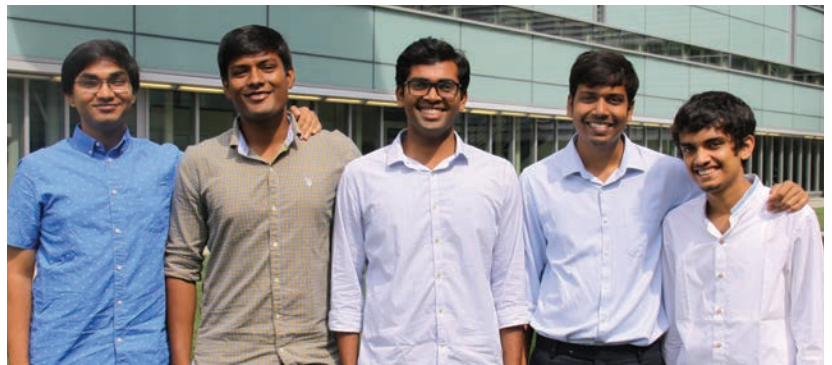
“The intent of this unique program is to provide world-class internship opportunities to some of the best undergraduate students in India, while exposing them to modern aspects of mechanical engineering,” said Singh. “It is similar to the on-campus honors research program where top undergraduates work with MAE faculty on

cutting-edge topics. The program is strictly based on gifts and we thank the donors for making this possible.”

He is already seeing a return on investment by way of the innovative research spilling out of the program.

Luke Fredette, a post-doctoral researcher in the Department of Mechanical and Aerospace Engineering, worked with the students throughout the summer. “The scholars broadened their technical horizons as well as built confidence in their ability to self-educate and grapple with very difficult problems,” he said.

“They left with a greatly enhanced understanding of the nature of research and strengthened determination to pursue a PhD. This experience is often not obtained until a student is well into their graduate program.”



*The 2017 RIYA scholars, from left to right: Yashraj Gurumukhi, Vishnu Vishal, Shashwat Ranjan Chaurasia, Priy Ranjan and Raunaq Bhirangi*



# Crowdsourcing a scholarship the young alumni way

It takes a village to raise a child, the saying goes. It can also take a village—or 120 dedicated Buckeyes—to create a scholarship.

When Liza Toher Reed ('06, '10, electrical engineering) first heard about the Ohio Scholarship Challenge—in which the university will match distribution payments on any newly endowed scholarship of \$100,000 or more—she was inspired.

While she couldn't personally donate \$100,000, Reed felt that she could reach that total with a little help from fellow Buckeye engineers.

Choosing which worthy program to support was easy. As a freshman, Reed had changed her major from math to electrical engineering specifically to participate in the Fundamentals of Engineering for Honors (FEH) program.

FEH provides an accelerated introduction to engineering and challenges students to work in teams on an advanced design-and-build project. She remained active in FEH throughout her academic career, serving as both an undergraduate and graduate teaching assistant.

"I forged lifelong bonds with other students and faculty and saw firsthand the impact the program had on the people involved," she explained. "The FEH experience stays with you as a student, and supporting fellow students by paying forward is the Buckeye way."

In order to generate that support, Reed partnered with three other passionate Buckeye engineers, Marc Meckler ('07, mechanical engineering), Mark Morscher ('89, electrical engineering) and Dan Trares ('06, computer science and engineering).

Together they initiated the FEH Scholarship Challenge last April and matched every dollar donated.

"The idea of a multiplying impact for your gift seemed like something that could resonate with engineering alumni and help young alumni feel like their donation matters," said Reed.

The team tapped their personal networks and spread the word via emails, which FEH Director Rick Freuler sent to all FEH alumni, and lots of social media posts.

The challenge was an overwhelming success, raising nearly \$25,000 from more than 120 supporters. As promised, the challengers matched that amount and established the FEH Scholarship Endowment, which will provide at least one scholarship each year.

"The FEH family's willingness to invest in helping sustain the program's life-changing impact will benefit Buckeye engineering students for generations to come," said Freuler.

The challengers and additional supporters will also ensure the endowment grows to \$100,000 over the next few years, Reed explained, thus qualifying for the Ohio Scholarship Challenge match and ensuring exponential impact on future students.

*This story was originally published in Forward, the College of Engineering's giving impact report.*

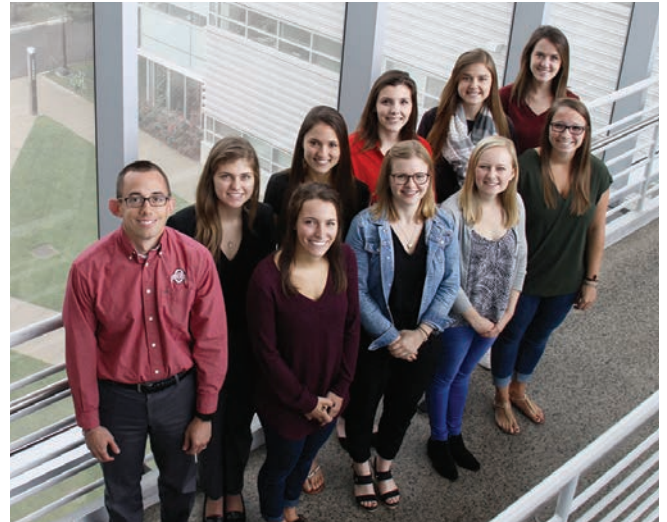


*Students in the Fundamentals of Engineering for Honors (FEH) program can choose from three design-build projects. More than 70 percent choose to build autonomous robots.*

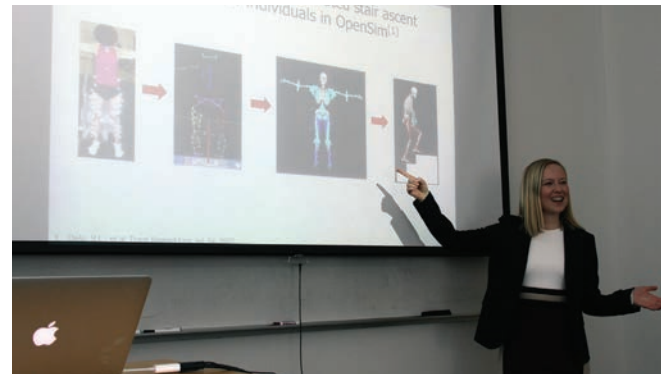
# Neuromuscular Biomechanics Research Laboratory: NMBL student research team customizes surgery

**L**ed by Associate Professor Robert Siston, the team of student researchers in MAE's NeuroMuscular Biomechanics Laboratory (NMBL) sees a future where surgical outcomes far exceed patients' expectations. By leveraging mechanical engineering principles, the team aims to optimize the functional outcomes of surgical interventions such as total knee replacement surgery. While their main focus is the treatment of knee osteoarthritis, their overarching goal is to provide a scientific basis to treat a variety of human movement disorders. Informing physical therapy and the design of assistive devices, such as braces and orthotics, is one of the lab's thrusts.

Currently, the lab team is pioneering a new approach for computer-assisted total knee replacement, where surgeons use specialized equipment to make measurements inside of the operating room and use computer simulations to estimate how muscles are used to walk, climb stairs and get out of a chair after surgery. The NMBL's comprehensive approach "represents the first effort to parameterize key aspects of this surgical technique and objectively relate intra-operative measurements to post-operative outcomes," said Siston.



*Professor Rob Siston and members of his 2017 research team*



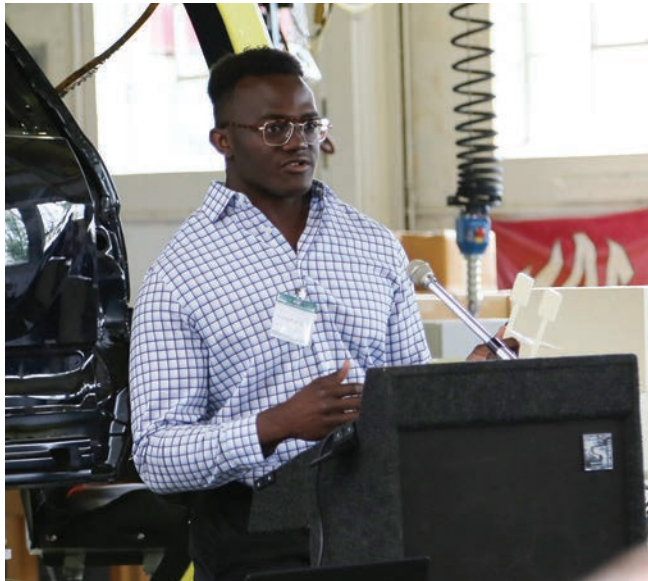
*Undergraduate mechanical engineering student Anna Lee presents her research done with the NMBL.*



# Industry-centric program offers students advanced manufacturing and entrepreneurial skills

The Ohio State University College of Engineering is among the best in the country at designing and delivering hands-on education for its students.

In 2017, Ohio State's Center for Design and Manufacturing Excellence launched the Experiential Entrepreneurship Education (E3) Program to respond to emerging advanced manufacturing talent demands and to a growing interest in applied innovation among students.



*At the launch event for CDME's Experiential Entrepreneurship Education (E3) program, MAE student Emmanuel Adu spoke about his own R&D project sponsored by the one-of-a-kind program. He aims to develop optimized injection molding process parameters for varying thermoplastic materials.*

Funded with \$3.5 million from the Bernice L. Clausus Engineering Innovation Fund, the E3 Program is the nation's first to combine product design, commercialization, manufacturing and business model learning with onsite prototyping capabilities and real-time, industry-sponsored R&D projects.

"This is the future of technology-based, entrepreneurship education," said CDME Executive Director John Bair, "where faculty, students and industry professionals will study and practice the commercialization of innovative products and services."

"When we talk to industry partners, they always emphasize access to students and their desire for graduates with industry-ready experience," Bair added.

More than 30 students already employed part-time by CDME have become E3's first cohort of participants. Bair thinks that number could swell to 150 by next year, although not all will be employees. While approximately 75 percent of current participants are engineering majors, all Ohio State students are eligible to participate. Not only will students learn skills and tools that increase their marketability among prospective employers, they also will be inspired and equipped to be entrepreneurs.

*Excerpts from original article published by the College of Engineering*



*Supermileage team members Connor Yarcheck (BS ME) and MAE student Jackie Karl-DeFrain seek feedback on their work from Dan Nagashima, a Honda R&D Americas principal engineer. Photo by Kevin Fitzsimons*

## Honda-Ohio State partnership steers education and industry

In just its first year, Ohio State's Supermileage SAE student team developed and constructed a single-person vehicle with a fuel-efficiency of 96 mpg. The second year, it more than doubled to 256 mpg. Now, the teammates are brainstorming how to reach even greater efficiency.

To drive that impressive progress, the students turn toward some experts: the team at Honda R&D Americas Inc.

"Due to our team's focus on engine modifications this year, we have sought a second opinion from members of Honda's engine research department," said Supermileage team co-captain Jackie Karl-DeFrain, a mechanical engineering and Chinese double major.

The 18-member Supermileage team isn't Honda's first partnership with Ohio State, by far.

"Honda and Ohio State have established a long and successful history of partnership and collaboration spanning almost 30 years," says Mike Wiseman, Honda's co-director of the Honda-Ohio State Partnership.

At Ohio State's Center for Automotive Research, the Supermileage team came to the attention of Honda engineers.

"We noticed the extensive commitment the students had for motorsports, and the passion the students displayed for vehicles and powertrains was inspiring," says Dan

## HONDA SCHOLARS

Additional departmental student-industry ties with Honda include participants in the Honda Scholars program.

### MAE students among 2017 Honda Scholars:

Emilie Baker, ME	Olivia Hemmelgarn, ME	Prabhat Kumar, ME	Matthew Riczko, ME
Emily Curtiss, ME	Elizabeth Hyem, ME	Lincoln Markle, ME	Jarrod Sherrick, ME
Stan Groszek, ME	Landon Johnson, ME	Riley Niekamp, ME	David Tobin, ME
Chase Hemmelgarn, ME	Ben Kott, ME	Matthew Rowland, ME	Zach Wurzelbacher, ME

Nagashima, a Honda R&D Americas principal engineer based in Raymond, Ohio. “We saw it as an opportunity to partner with a great academic institution and create awareness about the work we do here in Central Ohio at Honda.”

Students grow their engineering design and project management skills by applying learned classroom theories in Supermileage, an engineering design competition organized by SAE International, an association of engineers and related technical experts in the aerospace, automotive and commercial vehicle industries.

From Honda’s engineering expertise, the students receive knowledge they can use for the competition and put into context for real world vehicle development.

Honda is not only helping prepare future engineers for careers in the transportation industry, but also providing continuous professional development for its own employees through collaborations with Ohio State, according to Wiseman.

“Our long-standing partnership with Honda is an example we seek to replicate quite often at the university,” concludes Joanna Pinkerton, formerly Ohio State’s co-director of the Honda-Ohio State Partnership. “Valuable input from associates, managers and executives in industry can have an incredible impact

on students’ understanding of the need to apply their acquired knowledge post-graduation. The process of working on scoping of research and future investment with corporate partners keeps us focused on having the most impact possible as a land-grant institution serving the economy of our state.”

*Excerpts from original article published by the Office of Energy and Environment*



*Ohio State's student-designed and -built Supermileage SAE vehicle in the Motorsports Building at the Center for Automotive Research.*



# Caterpillar partners with Ohio State on remote co-op program

Three students from the Department of Mechanical and Aerospace Engineering are among those participating in a new partnership with Caterpillar, Inc.

Meredith Ash, Jose Lozada and Samantha Harel work remotely in the company's Parallel Co-op Program at Ohio State, while continuing their studies. The new program allows students to work remotely and while collaborating with their respective mentors or teams at Caterpillar's R&D headquarters near Peoria, Illinois.

Ohio State is the third university that Caterpillar has partnered with for this program. Students in the program work 10 hours a week during the school year and full time during the summer.

Caterpillar's Parallel Co-op Program at Ohio State is run through the Simulation Innovation and Modeling Center (SIMCenter). The center's objective is to train students through applied simulation with the help of faculty mentors who work with industry partners. The center provides desk space and a place for students to store their equipment. Caterpillar oversees student guidance, communication and pay.

SIMCenter Director Shawn Midlam-Mohler said the opportunity for students to work for an industry partner like Caterpillar while still taking classes is invaluable.

"This partnership with Caterpillar is a great opportunity for Ohio State students interested in simulation. They gain relevant technical experience working with a great company, while also having the flexibility of an on-campus job," Midlam-Mohler said.



*Buckeye engineers (from left) Dylan Barrison, Meredith Ash, Jose Lozada, Mitzi Fernandez and Samantha Harel are the first Ohio State students to participate in Caterpillar's Parallel Co-op Program.*

"We're excited about this expansion of our relationship and looking forward to working in greater depth with Ohio State students," Caterpillar Engineering Supervisor Mark Niemeyer said. "The co-op program offers students real-world experience on real Caterpillar projects and lets us to tap into the creativity of some of the best and brightest future engineers."

The mechanical engineering students join computer science and engineering student Dylan Barrison and electrical engineering student Mitzi Fernandez in the program.

*Excerpts originally published by the College of Engineering.*

# Nuclear engineering minor adds value to undergraduate program

The department houses the Nuclear Engineering Program, one of its three graduate programs, which was ranked 12th in the nation in *U.S. News and World Report's* 2018 edition of America's Best Graduate Schools.

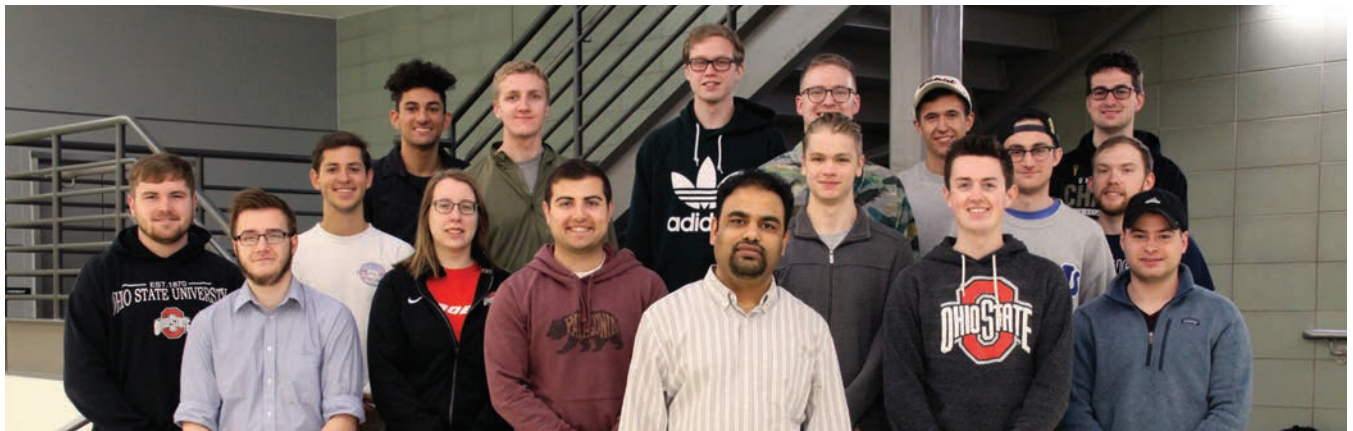
"The nuclear engineering minor was a natural outgrowth of our graduate program," says Faculty Director of the Minor in Nuclear Engineering Vaibhav Sinha. "With the increasing demand by industry for students with general experience in nuclear engineering, we responded by developing this minor."

Additional value of the program lies in its hands-on learning aspect and research opportunities. "Students in many minor programs do not typically complete research or have the opportunity to do hands-on work," says Sinha. "Having that option available to students was

important for us to include, and is available thanks to the research already being done by faculty."

Minor program students learn experientially by performing real-time simulations using the nuclear power plant simulator, executing experiments at the Nuclear Reactor Lab to learn about various radiation detection and instrumentation techniques and developing advanced knowledge in nuclear thermal hydraulics, radiation protection and shielding.

The minor is meant to complement a variety of majors from STEM fields and to provide students with the knowledge and skills for many entry-level positions in the nuclear industry. "The minor leverages the department's depth of knowledge to equip students with a foundational understanding of the field of nuclear engineering," Sinha continues.



Students in the nuclear engineering minor program with Vaibhav Sinha, faculty director

# Undergraduate Research

Students in the department have the opportunity to participate in Undergraduate Research. This structured program results in an undergraduate thesis, including an oral defense, and focuses on a research project completed with a faculty member.

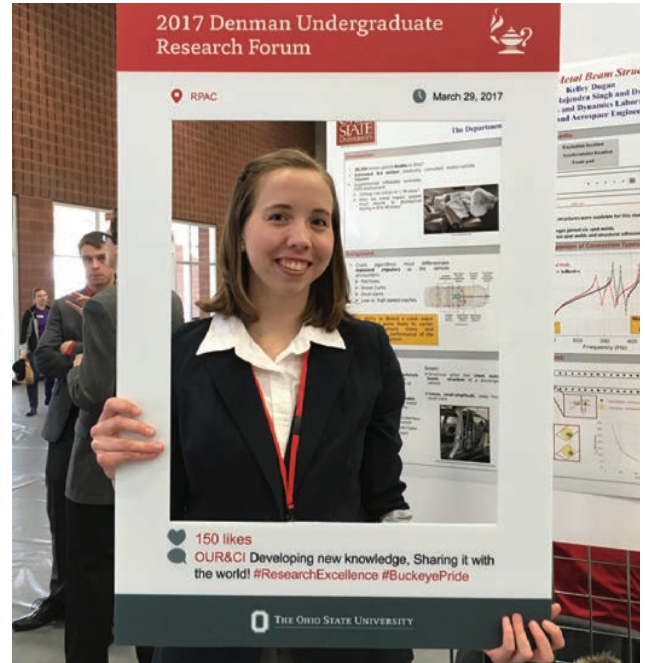
The technical and professional skills learned during the program complement classwork and offer participants experiences above the traditional curriculum. Students interested in pursuing a graduate degree can especially benefit from the mentorship and experience learned through undergraduate research.

*“The transferrable skills gained by students in the program are essential to students entering today’s field of engineering, whether that’s continuing to graduate school or entering the industry,” says Rob Siston, faculty director of the program.*

The concentration taught is very unique to the department. “Not only do students complete a research project, but they also take specific coursework that introduces them to the various aspects of research,” Siston continues.

A variety of majors represented among the students allows for communication skills to be refined and developed. “By the end of the program, the students really take ownership of their education within the cohort,” describes Siston.

*Through undergraduate research, students have the opportunity to participate in various events, including the Denman Undergraduate Research Forum (top) and Engineering & Architecture Undergraduate Research Forum.*





mechanical and Aerospace

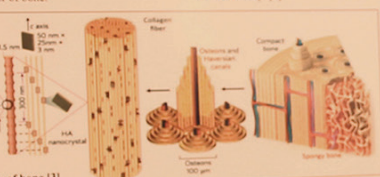
# Characterization of Bone Tissue under a Precise Displacement Control Using Atomic Force Microscope (AFM)

Advisor: Dr. Hanna Cho

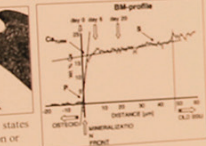
Structure in the skeletal system of our body is made of bone tissue. Bone tissue is a composite material consisting of soft organic matrix (collagen) and hard inorganic mineral. At the nanoscale, bone tissue has a hierarchical structure over a wide range of length scales. Bone tissue is beneficial to our body under various loading conditions by its mechanical properties for its needs. The following process maintains bone healthy according to the data from the 2005-2010 National Examination Survey (NHANES), of adults aged 65 and over had osteoporosis or femur neck during 2005 to 2010. The purpose of this project is to understand the mechanism to maintain bone health.



**The comparison of normal bone and osteoporotic bone:** The most common bone disease, Osteoporosis, is caused by low bone mass, when bones lose minerals. Losing minerals results in bone weak and fracture easily. [2]



Structure of bone [3]



**Bone Mineralization** The collagen molecules are secreted by osteoblasts (bone forming cells) to build a structural matrix, which is strengthened by the subsequent mineral deposition. Thus, the mineralization process during bone formation is a key factor of controlling the mechanical properties of bone. The bone mineralization profile exhibits two stages of mineralization rate with different time constants [5]

## Hypothesis:

The mechanochemical response of collagen to loading can control the kinetic process of intra- and inter-fibrillar mineralization.

## Objectives

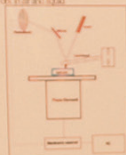
1. To design a stage with a precise displacement control to apply various loading to a bone sample.
2. To characterize bone tissues while the strain of the sample varied within 0 and 0.01.

## Methodology

### Atomic Force Microscope (AFM)

To characterize the morphology and piezoelectric properties of bone, AFM is used as the experiment.

1. Image materials' surface topography/structure.
2. Detect material properties.
3. Work piezoelectric signal.



### Tested Sample: Mouse femur

In this experiment, mouse femur was used as the sample. The average length of bone is 14 mm.



### Schematic of the stage design:

The design stage integrated with force and displacement control is used to provide the controlled strain on samples.



## Results:

**Stage:** The stage integrated with precise displacement control.



### The assembled stage

The Logic of Control:

Control program integrated with feedback loop provides precise force and displacement control.



## Bibliography

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## Acknowledgment

I would like to thank my advisor, Dr. Hanna Cho. She was always willing to discuss about the project. I would like to thank my friends, Jada, Sarah, Aaron, and Kevin for their generous help during research.

**Micro/Nano Multiphysical Dynam**  
For more information: <https://mnd>

OHIO STATE UNIVERSITY

# Mechanical Engineering Capstone Design Projects

Capstones are the primary culminating projects of the undergraduate mechanical engineering curriculum. Students carry out a formal design experience, from problem formulation and requirements generation to prototyping and testing. The course sequence immerses students in the design process, bringing together and reinforcing core engineering and professional skills.

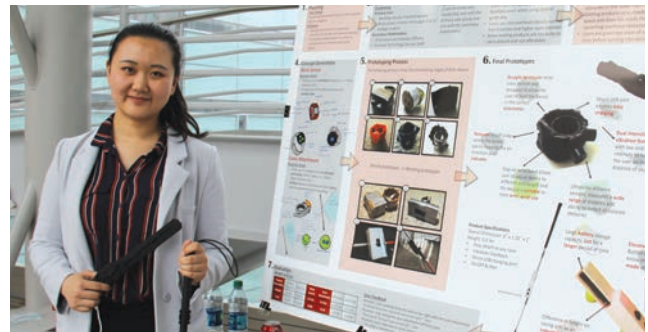
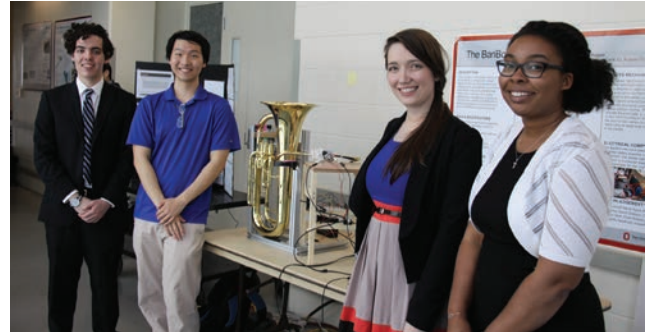
“The capstone program pushes students to integrate and extend their fundamental engineering skills beyond classroom theory,” says Assistant Professor and Program Director Russell Marzette. “They are challenged to put their knowledge and problem-solving skills to the test.”

Skills such as communication and teamwork are highlighted in the process, and project management concepts are introduced.

Mechanical engineering students have the option to choose from a variety of capstone course options. In addition to a general capstone experience, other offerings include: student design competitions, humanitarian, medical devices, smart products, product design and multidisciplinary design.

Capstone projects allow students to partner with various organizations, which benefit from the final projects. “The capstone offerings aren’t just achieving ABET accreditation outcomes, they are helping our students gain real-world experience,” continues Marzette, “addressing real-world needs in the community.”

*Students demonstrate capstone projects during the department's 2017 Research & Design Day event.*



## CAPSTONE HIGHLIGHT:

### MAE and Columbus Police partnership increases community safety

For the Columbus Division of Police, a partnership with the Department of Mechanical and Aerospace Engineering (MAE) came just in the nick of time.

Having the nation's second largest non-federal shooting range has always been a point of pride for the division. The 26,550-square-foot range has allowed the City of Columbus to train 70 new police officers each year. To say that the system is heavily used is an understatement: the division runs it 20 hours each day for six days each week.

Unfortunately, the range also created a problem that the division was not prepared to handle. Each week, debris from more than 80,000 rounds of fire was building up in the shooting range's conveyor system. Replete with lead, the bullet rounds were creating a toxic environment for those training to become the newest members of the city's police force. The problem was also causing the entire shooting range to shut down until the bullet fragments were cleared.

That's when mechanical engineering students Mark Cecil, Maddie Elias, Patrick Politowicz and James Roche jumped into action as a part of their spring capstone project.

To fix the first problem, the student team redesigned, fabricated and installed new system components from galvanized steel in order to create a new tail ramp and side shields. This replaced the shooting range's original design, and it was a game changer.

The debris now travels the length of the 50-yard belt



*The mechanical engineering capstone team with representatives from the Columbus Division of Police and components of their project.*

instead of piling up. The team's integrated ramp and vertical back plate design also made it possible for the system to be more easily serviced.

"This is a perfect example of a student team persevering through a challenging problem-solving and continuous improvement capstone project," said Assistant Professor Russell Marzette, who leads the department's general capstone course each semester.

***"I loved being able to use the skills that I've developed in my MAE courses, such as root-cause analysis and design evaluation, to support this industry-sponsored project," said Maddie Elias, who also graduated this spring.***

"Thanks to this collaboration, I'll be able to take this real-world experience with me into my new career."



# Teaching Excellence in Undergraduate Education

**T**he Department of Mechanical and Aerospace Engineering is committed to enhancing the undergraduate educational experience. By using the clinical faculty model to provide more practical, industry-based instruction for students, the department responds to the needs of the engineering field for graduates.

Recent appointees—over the past two years—as faculty of practice:

**Clarissa Belloni's** undergraduate research group investigates related turbines, both from an experimental perspective and using computational fluid dynamics.

At Ohio State **Ali Jhemi** teaches courses on flight vehicle dynamics, design of space vehicles systems, introduction to aerospace and helicopter aerodynamics.

In his role as general capstone course director, **Russell Marzette** brings practical application and professional growth to MAE students through academic, industry and community engagement.

Aside from serving as faculty advisor of both the department's undergraduate minor in nuclear engineering and American Nuclear Society Student Section, **Vaibhav Sinha** teaches a number of both undergraduate and graduate courses.

## UNDERGRADUATE HONORS, AWARDS AND RECOGNITION

### STUDENTS

- Outstanding students were among those honored at the department's annual Honors and Awards Banquet in April – [go.osu.edu/uiawards](https://go.osu.edu/uiawards)

### RESEARCH TEAMS

- Team Honeybadger claimed the \$25,000 top prize of the LIFT Prize in Robotic Blacksmithing [go.osu.edu/uires1](https://go.osu.edu/uires1)
- Aerospace student group flew to second place in NASA's University Student Design Challenge with their blimp – [go.osu.edu/uires2](https://go.osu.edu/uires2)

### STUDENT PROJECT TEAMS

- Buckeye Current electric motorcycle raced to first place in the Pikes Peak International Hill Climb Electric Motorcycle Division – [go.osu.edu/uist1](https://go.osu.edu/uist1)
- Buckeye Space Launch Initiative landed first place at the Spaceport America Cup – [go.osu.edu/uist2](https://go.osu.edu/uist2)
- Ohio State EcoCAR 3 nabbed first place in the national EcoCAR 3 competition – [go.osu.edu/uist3](https://go.osu.edu/uist3)
- Design/Build/Fly (DBF) was awarded at the American Institute of Aeronautics and Astronautics (AIAA) competition – [go.osu.edu/uist5](https://go.osu.edu/uist5)
- Formula Buckeyes SAE earned 13th place at Formula SAE Michigan and 3rd place at Formula North – [go.osu.edu/uist4](https://go.osu.edu/uist4)

# STANDOUT ALUMNUS | MICHAEL STRAUCH

## MAE young alum receives Sigma Gamma Tau 2017 Great Lakes Region Award

Michael Strauch's interest in aviation began at age seven.

"This idea of creation fascinated me," said Strauch ('17 aerospace engineering). "The possibility of combining that captivation with my curiosity in flight is what convinced me that one day I would design and build airplanes. From that moment on, I set my sights on becoming an aerospace engineer."

On April 24, Strauch was named the 2017 recipient of Sigma Gamma Tau's Harry H. Hilton Great Lakes Region Award. Sigma Gamma Tau, an aerospace engineering honorary, aims to identify and award achievement and excellence among students, alumni and professionals in the field of aeronautical and astronautical engineering.

Each year, Sigma Gamma Tau recognizes outstanding undergraduate students at both the regional and national levels, and Strauch's achievements both on and off Ohio State's campus earned him the 2017 honor. The award recognizes him as the top student in Sigma Gamma Tau within the region.

Nominated by the university's Sigma Gamma Tau chapter, Strauch's accomplishments include being selected as a Buckeye Leadership Fellow (BLF). Through his role as a fellow, he laid the groundwork for a potential aerospace startup company called EcoTaxi. Strauch hopes that his company will provide an alternative method of aircraft ground transportation.

His passion for aerospace engineering wasn't just limited to campus. Strauch has gone out of his way to



*Strauch competed as a member of Ohio State's Design/Build/Fly team where he served as the subsystems team lead.*

find opportunities to gain real-world experience. He interned at the NASA Armstrong Flight Research Center in Edwards, California, where he worked to master the core competencies of aeronautics. He also participated in cooperative, or co-op, educational experiences with GE Aviation, the Warsaw Institute of Aviation and GE's Middle River Aircraft Systems subsidiary.

While in Warsaw, Poland, Strauch joined MAE graduate Matt Arnott ('17 aerospace engineering) in developing a basic computer model to predict the performance of a theoretical aircraft at different sizes.

***"I now believe that in order to become an innovator and a disruptive force in this industry, a sound technical foundation is necessary," said Strauch. "I am excited to be a part of the next generation of aerospace innovators."***

*Kam King, Department of Mechanical and Aerospace Engineering*



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