



Smart Vehicle Concepts Center (SVC)

A National Science Foundation Industry-University Cooperative Research Center



Annual Newsletter

December 2019 Issue

SVC Companies	Status
American Axle and Manufacturing	Former Member
Advanced Numerical Solutions	Former Member
Army Research Laboratory	Former Member
Battelle Memorial Institute	Current Member
BorgWarner	Former Affiliate
Bridgestone Americas Tire Operations, LLC	Former Member
Eaton Innovation Center	Former Member
Edison Welding Institute	Former Member
Ford Motor Company	Former Member
F.tech R&D*	Former Member
Goodyear Tire & Rubber	Former Member
Honda R&D Americas Inc.*	Current Member
Hyundai-Kia Motors*	Former Member
LMS Software	Invited Observer
MIT Lincoln Laboratory	Former Member
Moog Inc.	Current Member
MSC Software	Invited Observer
NASA Glenn Research Center	Current Member
Owens Corning	Former Member
Parker Hannifin	Current Member
REL, Inc.	Former Member
Romax	Invited Observer
Solidica	Former Member
Tenneco, Inc.	Former Member
The Boeing Corporation	Former Member
Tokai Rubber	Former Member
Toyota Research Institute, N.A.	Current Member
Transportation Research Center, Inc.*	Former Member
YUSA	Former Affiliate

*Indicates 2 or more memberships

Mission

The mission of the Smart Vehicle Concepts Center (SVC) is as follows: (1) conduct basic and applied research on **smart materials and structures** applied to ground and aerospace vehicles; (2) build an **unmatched base of research**, engineering education, and technology transfer with emphasis on improved vehicle performance, unprecedented safety improvements, and enhanced vehicle efficiency; and (3) prepare **next-generation engineers** at the PhD and MS levels who possess both theoretical and experimental expertise applicable to auto and aerospace vehicles. For additional details on SVC's research programs, membership fees, and personnel, please visit: www.SmartVehicleCenter.org.

Spring 2020 Meeting Information

SVC's 13th Semi-Annual Project Review and IAB Meeting

Dates: 26-27 March 2020

Location: The Ohio State University
E100 Scott Laboratory, 201 West 19th Avenue,
Columbus, OH 43210

Please visit www.SmartVehicleCenter.org for updates!

Welcome New IAB Representative

Sahil Gupta (Parker Hannifin Corp.)

New NSF IUCRC Program Director

Prakash Balan

New IAB Leadership

Jon Cartlidge (Battelle Memorial Institute) - Vice Chair

New SVC Faculty

Ardeshir Contractor (OSU)

Center Leadership



From the left: Marcelo Dapino (Center Director), Victoria Hill (VentureWell/NSF Evaluator), Ryan Hahnlen (IAB Chair/Honda R&D), Jon Cartlidge (IAB Vice-Chair/Battelle Memorial Institute)

Autumn 2019 12th Annual Project Review and IAB Meeting

The Smart Vehicle Concepts Center held its 12th Annual Autumn Meeting on September 19-20, 2019 at The Ohio State University. The lunch session and special presentation were kicked off by welcoming remarks and introduction by **Prof. Robert Siston**, associate chair of the Department of Mechanical and Aerospace Engineering.

The special lunch presentation, "[Optimum 3D assembly for lightweight structures](#)," was delivered by **Prof. Anthony Luscher**, whose talk discussed how fastening, a key driver behind cost and quality in engineered structures, affects datum formation, tolerances, strength, durability, and stiffness.

Day 1's open session continued with presentation updates from the SVC Seed Research Program and SVC REU Program awardees, followed by a Member's Perspective presentation titled "What human factors research from the past can tell us about the automation and driver challenges of the future" by **Mr. Jon Cartlidge**, SVC IAB Vice-Chair and Commercial Sales Director at Battelle Memorial Institute.

The Industrial Advisory Board convened twice during this meeting: once after the open session on Day 1 and again after the technical presentations on Day 2. The IAB meeting of Day 1 focused on completion of action items, expansion of collaborations, and preliminary discussions on the future of SVC as a graduated center. The IAB held its closed executive meeting and focused on how to leverage existing seed projects to attract new members, how to structure the next round of seed projects, and understand the technical needs of current and future members. The Day 2 Board meeting included LIFE project reviews, an update on Center operations, financials, and continued funding of SEED/REU projects. **Dr. Prakash Balan** (NSF IUCRC Program Director) presented via teleconference various NSF funding opportunities that complement the IUCRC program.



Spring 2019 12th Semi-Annual Project Review and IAB Meeting

The 12th Semi-Annual Spring Meeting of the Smart Vehicle Concept Center was held on March 28-29, 2019 at The Ohio State University. The meeting opened with **Prof. David Hoelzle**, MAE associate professor, providing welcome remarks and introduction to invited guest **Prof. Donald R. Houser**, MAE Faculty Emeritus and founder of the Gear Dynamics and Gear Noise Research Laboratory. In his presentation, titled "[Historical Perspective of Gear and Power Transmission Research at The Ohio State University](#)," **Prof. Houser** discussed past activities in power transmission research which includes gearing research as well as all types of belt transmission and CVTs along with a historical overview of the Gear and Power Transmission Research Laboratory at OSU.

Day 1's open session continued with two poster sessions, presentations dedicated to emerging trends in smart vehicle research, which included updates for the four seed and one REU project followed by a Member's Perspective presentation from Moog, Inc.'s **Mr. Thomas Greetham**.

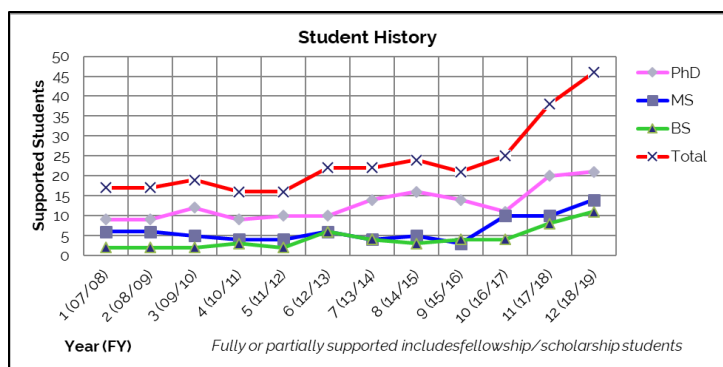
The Industrial Advisory Board (IAB) held two meetings - the first meeting focused on considering the next IAB Vice-Chair. Based on action items from the autumn 2018 meeting, center publicity videos were presented by the latest two outstanding presentation award winners, **Prasant Vijayaraghavan** and **Sean Chillelli**. The student videos were received enthusiastically by the IAB and video production will continue in future meetings. The second meeting discussed the LIFE project surveys and industry feedback along with the IAB's request that the SVC seed funding be aligned with interests of the IAB. This resulted in the creation of IAB Member Problem Statement, which will provide a list of relevant challenges that face their respective companies to emphasize areas suitable for pre-competitive research collaborations.

Publication Summary

This year has been good for Smart Vehicle Concepts Center publications. Forty-eight journal publications by faculty and students based on Center research appeared in prestigious journals; thirteen papers were presented at conferences hosted by the American Society of Mechanical Engineers (ASME), Society of Photo-Optical Instrumentation Engineers (SPIE), Institute of Electrical and Electronics Engineers (IEEE), and others.

Students Supported from August 1, 2018 to July 31, 2019

PhD	21
MS	14
BS	11
TOTAL	46



SVC Graduates (January 2012 – December 2019)

PhD	29
MS	38
BS	19

Current Employment

Former Students Employed by: *SVC Member Organization during Phase II or III	
Army Research Laboratory*	Made In Space
Bechtel	Magna Electronics
Bruel & Kjaer	Moog, Inc.*
China Automotive Systems, Inc.	NASA Glenn Research Center*
Cummins	NHK International Corp.
Edison Welding Institute*	Owens Corning*
F.tech R&D*	Procter and Gamble
Ford Motor Company*	Root Insurance
GE R&D	STERIS Corp.
General Motors	Toyota*
Goodyear*	TRW
Gorman Rupp	US Army (Aberdeen Proving Ground)
Honda R&D	
Former Students Employed by Academic Institutions:	
Boise State University	MIT Lincoln Laboratory*
IIT Bombay (India)	OSU (post-doctoral researcher)
IIT Delhi (India)	Southern Illinois University
IIT Tirupati (India)	

Accomplishments by SVC Researchers

Outstanding Student Presentation Awards



Dr. Ryan Hahnlen, SVC IAB Chair, presented the Outstanding Student Presentation Award certificate at the September 2019 meeting to **Vijay Venkatesh**. Vijay is a graduate student pursuing a PhD in mechanical engineering, advised by Prof. Vishnu Baba Sundaresan. His research work in SVC Project #58B focuses on photoluminescent phosphors for visualizing thermomechanical stresses in power electronic devices.

Arun Ramanathan was the recipient of the Outstanding Student Presentation Award based on his talk in September 2018 entitled "Flexible piezoelectric sensors for vehicle applications" (SVC Project #57). He was formally recognized in March 2019 by **Mr. Ryan Hahnlen**, SVC IAB Chair. Arun is currently a PhD student under the guidance of Prof. Marcelo Dapino, director of the SVC and the Smart Materials and Structures Laboratory.



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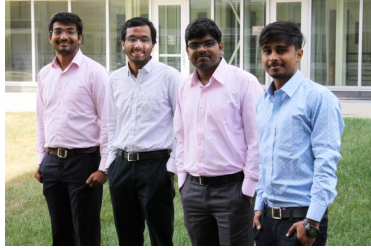
7 projects awarded \$300K through OSU Materials Research Seed Grant Program

AUGUST 7, 2019

Prof. Vicky Doan-Nguyen was awarded \$40K for her research titled: [Design and local structure identification of stable electrode-electrolyte interfaces](#)

From gears to blood vessels: Indian scholars excel during their summer at Ohio State

Posted: August 1, 2019



For the fifth consecutive year, the Research Internship for Young Academics (RIYA) program provided comprehensive research experiences for undergraduate mechanical engineering students from India. Four high-achieving students joined laboratories in The Ohio State University Department of Mechanical and Aerospace Engineering, where they took part in real-world investigations. "This is a very unique program," commented program founder and director **Professor Emeritus Raj Singh**. "The students start with a passion for research, but without significant experience. We pair them with laboratories of interest where they quickly learn problem-solving skills in an active research environment."

This year's research projects focused on the subjects of nonlinear vibration, vehicle seat isolation, planetary gears and blood vessel permeability.

Please visit [here](#) for full article.

Harne selected as Air Force Research Lab summer 2019 Fellow and recipient of the ASME Gary Anderson Early Achievement Award

AFRL Summer Faculty Fellowship study of gallium-indium-based liquid metal composites as tools for new flexible electronic soft matter with his students Zack Nick and Charles El-Helou.

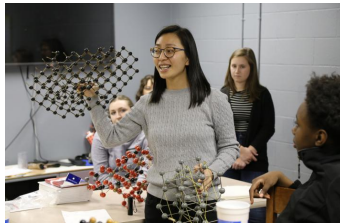


Passionate professor shares love of science with kids

Posted: May 22, 2019

Vicky Doan-Nguyen taps into kids' innate curiosity to get them excited about science.

Professor Vicky Doan-Nguyen holds molecular models while talking to middle-schoolers about phosphorescent materials. An assistant professor of materials science and engineering, Doan-Nguyen spends a lot of time thinking about how to spark kids' interest in science and maintain it. She also wants every child—especially girls—to know that anyone can be a scientist or engineer.



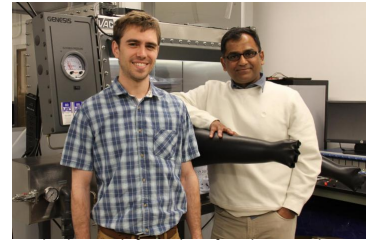
Since joining the Ohio State faculty in August 2017, Doan-Nguyen has not only been recognized for her research accomplishments, she's also spearheading two outreach programs that are successfully engaging central Ohio kids in STEM. Unlike those kids, Doan-Nguyen was introduced to engineering relatively late in life.

Please visit [here](#) for full article.

Another step forward for a promising new battery to store clean energy

Posted: May 15, 2019

Researchers have built a more efficient, more reliable potassium-oxygen battery, a step toward a potential solution for energy storage on the nation's power grid and longer-lasting batteries in cell phones and laptops.



Paul Gilmore, left, and Prof. Vishnu Sundaresan

"If you want to go to an all-renewable option for the power grid, you need economical energy storage devices that can store excess power and give that power back out when you don't have the source ready or working," said **Vishnu-Baba Sundaresan**, co-author of the study and professor of mechanical and aerospace engineering at Ohio State. "Technology like this is key, because it is cheap, it doesn't use any exotic materials, and it can be made anywhere and promote the local economy."

Please visit [here](#) for full article.

2019 College of Engineering Lumley Research Award

Posted: May 1, 2019

The College of Engineering recognizes the research contributions and productivity over the last five years of faculty and research scientists. **The 2019 College of Engineering Lumley Research Awards** are presented to a select group of outstanding researchers who have shown exceptional activity and success in pursuing new knowledge of a fundamental or applied nature. This year's recipients include SVC faculty **David Hoeltzle**

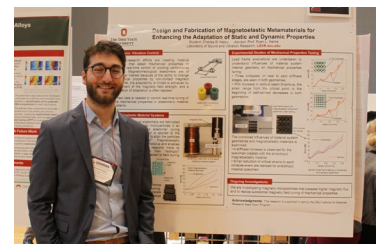


Please visit [here](#) for full article.

Charles El-Helou earns third place at Denman Undergraduate Research Forum

Posted: March 25, 2019

Undergraduate students from across campus were celebrated at the 24th annual [Denman Undergraduate Research Forum](#). Mechanical engineering major Charles El-helou won third place in the structural and material fabrication and design category for his project, "Design and Fabrication of Magnetoelastic Metamaterials for Enhancing the Adaptation of Static and Dynamic Properties." El-Helou was mentored by assistant professor **Ryan Harne**.

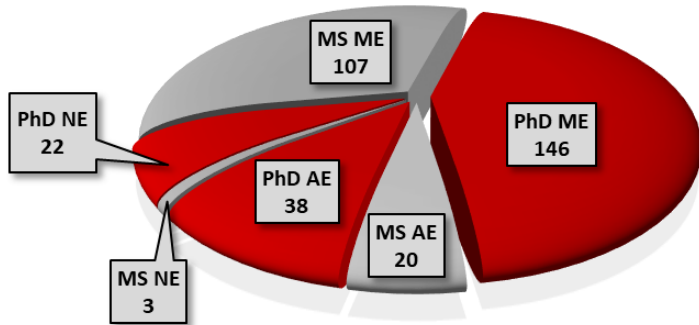


Please visit [here](#) for full article.

Department of Mechanical & Aerospace Engineering (MAE) Statistics

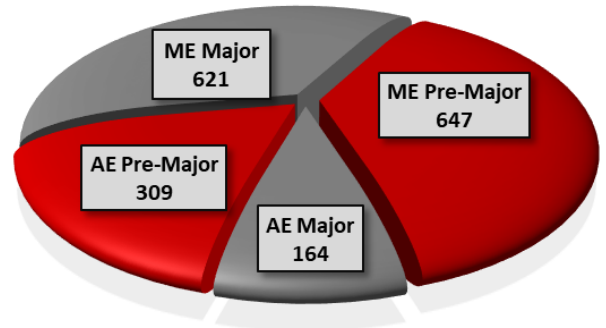
Graduate Student Enrollment Autumn Semester 2019

336 MAE Graduate Students



Undergraduate Student Enrollment Autumn Semester 2019

1741 MAE Undergraduate Students



MAE Degrees Granted Academic Year 2018-2019					
Mechanical	302	Aerospace	80	Nuclear	100
BS	199	BS	72		
MS	80	MS	11	MS	6
PhD	23	PhD	6	PhD	4



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Links to NSF IUCRC and OSU Laboratories

[NSF home page](#)
[IUCRC home page](#)
[Smart Vehicle Concepts Center page](#)
[Acoustics & Dynamics Laboratory](#)
[Smart Materials and Structures Laboratory](#)
[Automated Computational Mechanical Laboratory](#)
[Laboratory of Sound and Vibration Research](#)
[Integrated Material Systems Laboratory](#)
[Doan-Nguyen Group](#)
[Hoelzle Research Lab](#)
[Micro/Nano Multiphysical Dynamics Lab](#)

<http://www.nsf.gov/>
<https://www.nsf.gov/eng/iip/iucrc/home.jsp/>
<https://svc.engineering.osu.edu/>
<https://adl.osu.edu/>
<https://smsl.osu.edu/>
<https://acml.engineering.osu.edu/>
<https://lsvr.osu.edu/>
<https://integratedsystemslab.org/>
<https://u.osu.edu/doan-nguyen.1/>
<https://hrl.engineering.osu.edu/>
<https://mnmdl.osu.edu/>

SVC Core Faculty



MARCELO DAPINO

Honda R&D Americas Chair

Professor; Director of SVC

Expertise: Smart materials; Nonlinear coupled systems; Design; Control



J.P. CHEN

Associate Professor

Expertise: Computational fluid dynamics; CFD simulation and coding; Turbulence modeling; Turbomachinery



HANNA CHO

Assistant Professor

Expertise: Nonlinear NEMS/MEMS; AFM cantilever dynamics; Multi-functional ferroelectric material energy systems; Nano- and bio-science



ARDESHIR CONTRACTOR

Professor of Practice

Expertise: Solar energy; Smart grids; Electric mobility; Renewable energy storage; Materials for energy conversion



VICKY DOAN-NGUYEN

Assistant Professor

Expertise: Synthesis; In-situ structural characterization; Smart materials; Advanced materials for energy storage/conversion



RYAN HARNE

Assistant Professor

Expertise: Structural acoustics; Vibration energy harvesting; Nonlinear dynamics



DAVID HOELZLE

Associate Professor

Expertise: Learning/adaptive control systems; Additive manufacturing processes; Microsystems for mechanobiology research; Dynamics systems analysis



RAJ SINGH

Emeritus Professor

Expertise: Noise & vibration control; Geared systems; Nonlinear dynamics; DSP



SOHEIL SOGHRATI

Associate Professor

Expertise: Advanced FEM; Modeling multiscale response of advanced/bio-materials and structures



VISHNU SUNDARESAN

Associate Professor

Expertise: Piezoelectric materials; Active polymers; Bio-derived materials



The Smart Vehicle Concepts Center would like to wish everyone a Safe and Happy Holiday Season!