**Annual Newsletter**

**SVC Companies**

<table>
<thead>
<tr>
<th>Company Name</th>
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<tbody>
<tr>
<td>American Axle and Manufacturing</td>
<td>Former Member</td>
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<tr>
<td>Advanced Numerical Solutions</td>
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<tr>
<td>Army Research Laboratory</td>
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<tr>
<td><strong>Autoliv</strong></td>
<td>Current Member</td>
</tr>
<tr>
<td><strong>Battelle Memorial Institute</strong></td>
<td>Current Member</td>
</tr>
<tr>
<td>BorgWarner</td>
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</tr>
<tr>
<td>Bridgestone Americas Tire Operations, LLC</td>
<td>Former Member</td>
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<tr>
<td>Eaton Innovation Center</td>
<td>Former Member</td>
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<tr>
<td>Edison Welding Institute</td>
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<tr>
<td>Ford Motor Company</td>
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</tr>
<tr>
<td>F.tech R&amp;D*</td>
<td>Former Member</td>
</tr>
<tr>
<td>Goodyear Tire &amp; Rubber</td>
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<tr>
<td><strong>Honda R&amp;D Americas Inc.</strong>*</td>
<td>Current Member</td>
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<tr>
<td>Hyundai-Kia Motors*</td>
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<tr>
<td>LMS Software</td>
<td>Invited Observer</td>
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<td>MIT Lincoln Laboratory</td>
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<td><strong>Moog Inc.</strong></td>
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<td>MSC Software</td>
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<td>NASA Glenn Research Center **</td>
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<td>Owens Corning</td>
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<tr>
<td>Parker Hannifin</td>
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<td>REL, Inc.</td>
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<td>Romax</td>
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<td>Solidica</td>
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<td>Tenneco, Inc.</td>
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<tr>
<td>The Boeing Corporation</td>
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<tr>
<td>Tokai Rubber</td>
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<tr>
<td><strong>Toyota Research Institute, Inc.</strong>*</td>
<td>Current Member</td>
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<tr>
<td>Transportation Research Center, Inc.</td>
<td>Former Member</td>
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<tr>
<td>YUSA</td>
<td>Former Affiliate</td>
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</table>

*Multiple memberships  **Member and Invited Observer

**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](http://www.SmartVehicleCenter.org).

**Spring 2021 Meeting Information**

**SVC’s 14th Semi-Annual Project Review and IAB Meeting**

**Dates:** 18-19 March 2021

**Location:** The Ohio State University (in-person TBD)

E100 Scott Laboratory, 201 West 19th Avenue, Columbus, OH 43210

Please visit [www.SmartVehicleCenter.org](http://www.SmartVehicleCenter.org) for updates!

**Welcome New IAB Representative**

Bengt Pipkorn (Autoliv)

**New SVC Faculty and Staff**

Ardeshir Contractor, Professor of Practice
Sheng Dong, Research Assistant Professor
Travis Hery, Postdoctoral Associate
Navni Verma, Postdoctoral Associate

**Center Leadership**

From the left (from Sept. 2019 meeting): 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 2020 13th Annual Project Review and IAB Meeting

The Smart Vehicle Concepts Center held its 13th Annual Autumn Meeting on September 10-11, 2020. The meeting was held virtually due to the COVID-19 pandemic. Although the meeting remained mostly unchanged relative to previous instances, adjustments were necessary to accommodate the virtual format. The day 1 presentations were pre-recorded on video and made available to our registered guests in advance, while the day 1 IAB meeting and Executive Session, day 2 technical updates, and day 2 IAB meeting were held in real-time via video conferencing.

The special keynote presentation, “Autonomous air and ground vehicles – safely adapting to complex and changing environments,” was delivered by Prof. Jim Gregory, whose talk provided an overview of his recent work with high-speed autonomous drones and a traffic management system that will help enable high-density operations in the future.

The Industrial Advisory Board convened twice during this meeting. The IAB meeting of day 1 focused on approval of previous meeting minutes, completion of action items, and continued discussions on the future of SVC as a graduated center. The IAB held its closed Executive Session focusing on engagement with national laboratories, Center advertisement, and post-graduation discussions. The day 2 IAB meeting included LIFE project reviews, an update on Center operations, financials, and members’ perspectives.

Publication Summary

This year has been good for Smart Vehicle Concepts Center publications. Forty-seven journal publications by faculty and students based on Center research appeared in prestigious journals; thirteen papers were presented at society conferences, and 17 theses were successfully defended.

Spring 2020 13th Semi-Annual Project Review and IAB Meeting

The 13th Semi-Annual Spring Meeting of the Smart Vehicle Concept Center was originally planned to be held over the typical two-day program, however due to COVID-19, an abridged virtual meeting was held by the Industrial Advisory Board and SVC leaders on March 27, 2020. All technical presentations and posters were prepared by the students and researchers, and made available to the registered industry guests and IAB representatives on the conference proceedings. No LIFE feedback was collected since no oral presentations were given.

The SVC leadership and Industrial Advisory Board met via video conference over a 90-minute period to discuss Center operations, the members’ perspective, sustainability issues, and post-graduation plans. Prof. Marcelo Dapino was pleased to introduce a newly committed company member, Autoliv with Dr. Bengt Pipkorn as their IAB representative. New faculty leaders Ardeshir Contractor and Sheng Dong were introduced as welcome additions to the Center with their expertise and seed projects.

Dr. Ryan Hahnlen announced the September 2019 Outstanding Student Award was conferred to Srivatsava Krishnan for his presentation “Mechanoluminescent paintable light sources in automotive lighting systems” with Prof. Vishnu Baba Sundaresan as project leader and mentored by Duane Detwiler, Nichole Verwys, Katy Richardson, and Anthony Smith of Honda R&D Americas.

## Patents

<table>
<thead>
<tr>
<th>Date</th>
<th>Patent Status</th>
<th>Invention</th>
<th>Inventors</th>
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<tbody>
<tr>
<td>January 2020</td>
<td>Granted</td>
<td>UAM resistance spot weld joint transition for multimaterial automotive structures</td>
<td>R. Hahnlen, M. Dapino, L. Headings, M. Gingerich</td>
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<td>October 2019</td>
<td>Provisional Patent</td>
<td>Electrically-activated laminated films for optical morphing in vehicle panels</td>
<td>M. Dapino, L. Headings, VSC Chilbara</td>
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<td>September 2019</td>
<td>Provisional Patent</td>
<td>Systems and methods for joining and repair using ultrasonic additive manufacturing with a contoured sonotrode</td>
<td>M. Dapino, L. Headings, M. Gingerich</td>
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<tr>
<td>September 2019</td>
<td>Provisional Patent</td>
<td>Reinforcement-metal laminates joined and sealed using ultrasonic additive manufacturing</td>
<td>M. Dapino, L. Headings, M. Gingerich</td>
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<tr>
<td>February 2019</td>
<td>Patent Pending</td>
<td>UAM resistance spot weld joint transition for multimaterial automotive structures</td>
<td>R. Hahnlen, D. Detwier, A. Sheldon, M. Dapino, M. Gingerich, L. Headings</td>
</tr>
<tr>
<td>2019</td>
<td>Provisional Patent</td>
<td>Functionally-graded cathode architecture for potassium-oxygen batteries</td>
<td>V. Sundaresan, P. Gilmore</td>
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Click here for Sept. 2020 State of the Center
Students Supported from August 1, 2019 to July 31, 2020

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<td>PhD</td>
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Accomplishments by SVC Researchers

**Professor Vishnu Sundaresan joins DARPA**

OSU associate professor Dr. Vishnu Sundaresan joined DARPA (Defense Advanced Research Projects Agency) as a rotating program manager in the Defense Sciences Office in September 2020. His current interests include high-energy density energy storage devices, structural computing for adaptive structures, and novel chemistries for emerging manufacturing paradigms. At DARPA, Sundaresan looks to bring together the fundamentals of chemical physics of materials, dynamics and control theory, and structural design to develop novel device architectures for a broad portfolio of applications.

Sundaresan has a Bachelor of engineering from PSG College of Technology and doctorate from Virginia Tech, both in mechanical engineering.

Ohio State's RIYA Program persevered amidst COVID-19 pandemic

**Posted: August 13, 2020**

Sai Venkat, a third-year undergraduate in the Department of Mechanical Engineering at IIT Madras, was mentored by Raj Singh on a research project based on the vibro-impact phenomenon observed in torsional systems with clearances. His work was focused on understanding and improving this model by using different methods, Sai Venkat said. The benefits of this research could have applications in the automobile industry.

Doing this project completely online came with its own set of challenges for Sai Venkat who is a self-proclaimed visual learner.

“I could understand things much better if I saw it and felt it. Most of my earlier projects were also more experimental where I could get the feel of the things,” Sai Venkat said.

“This made me change my learning strategy to understand concepts without any visual aid. This was challenging and fun. Ultimately, this was a completely new experience for me.”

Sai Venkat plans to pursue more research in either robotics or non-linear dynamics while pursuing a masters and Ph.D.

Harsh Manani, an undergraduate student at the Indian Institute of Technology Bombay, worked with Prof. Ardeshir Contractor and Dr. Navni Verma in Smart Vehicle Concepts Center on a project based on energy generation from a curved solar panel mounted on a vehicle roof.

Manani found challenges of an online internship because in his area the connection to the internet was poor and the major time change difference. Even though, he had a great experience and he says it prepared him for remote work in the future.

“I would like to thank Prof. Singh, Prof. Contractor, Dr. Verma and other people for making this program possible during this pandemic,” he said. “Despite the devastating impact COVID-19 is having over the world, The RIYA program helped me gain clarity about research and future decisions.”

Manani plans to pursue a Ph.D. after completing undergrad with a dual degree from IIT Bombay.

Professor Raj Singh will serve as the president of the INTER-NOISE 2021 Congress

The Congress will be held in Washington, D.C. on 1-4 August 2021. The theme is “Next 50 Years of Noise Control” and the program will cover all aspects of noise control engineering, acoustics and vibration.
Arun Ramanathan earns 2020 MAE GTA Award

Posted: May 28, 2020

Arun Ramanathan earned the 2020 Graduate Teaching Associate Award in the Department of Mechanical and Aerospace Engineering. Arun is pursuing a PhD in mechanical engineering with focus on flexible distributed sensors for vehicle applications under the guidance of Prof. Marcelo Dapino. He is a post-candidacy PhD candidate in the Smart Materials and Structures Laboratory and the Smart Vehicle Concepts Center.

Arun earned the GTA award as a teaching assistant in Spring Semester 2020 for ME 3260, System Dynamics and Vibrations.

We wish Arun all the best in his endeavors and congratulate him for this achievement!

MAE PhD student Ming Yang selected as Ohio State Presidential Fellow

Posted: May 13, 2020

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.

NEW GRANT: An STTR phase II was granted by the Air Force to SVC partner SciFi Innovations, LLC for the project “Smart carbon fiber integration,” a collaborative effort involving SciFi’s CEO Rick Myers, OSU professor Marcelo Dapino, and University of Tennessee professor Suresh Babu. The focus of this grant is to conduct the fundamental research necessary to bring carbon fiber-metal structures to Air Force’s attritable aircraft, and to advance commercialization efforts toward moving the technology to the civilian market.

Hoelzle’s surgical robot brought to life by MAE graduate student and OSU machinist

Posted: March 5, 2020

Dr. David Hoelzle, a professor in the Department of Mechanical and Aerospace Engineering, and Dr. Desmond D’Souza, a surgeon at The Ohio State University Comprehensive Cancer Center – Arthur G. James Cancer Hospital and Richard J. Solove Research Institute, are working in tandem to develop a device that will be able to print soft tissues, bones, and someday even organs inside the human body during surgery.

For the creation of the physical device, Andrej Simeunovic, a NSF Graduate Fellow in Ohio State’s Hoelzle Research Lab, and Kevin Wolf, the 3D Printing Laboratory Supervisor, Research Machinist, and Student Shop Supervisor at Ohio State’s machine shop, collaborated to make a surgical robot that is now ready for testing.

“A lot of research is purely theoretical, whereas this project is the opposite. Most of my time is spent making the device and making it work correctly, so we can then use it to demonstrate real-world outcomes,” Simeunovic said. “For me personally, that is something I really value.

Professor named International Society for Optics and Photonics fellow

Posted: February 14, 2020

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).

SPIE fellows earn this distinction by making significant scientific and technical contributions to the multidisciplinary fields of optics, photonics, and imaging. More than 1,500 SPIE members have become Fellows since the Society’s inception in 1955.

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 260 technical articles and book chapters while serving as primary advisor on over 50 dissertations and theses.
Department of Mechanical & Aerospace Engineering (MAE) Statistics

Graduate Student Enrollment
Autumn Semester 2020
MAE Graduate Students

Undergraduate Student Enrollment
Autumn Semester 2020
MAE Undergraduate Students

MAE Degrees Granted
Academic Year 2019 - 2020

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Links to NSF, IUCRC, and OSU Laboratories

NSF home page
http://www.nsf.gov/
IUCRC home page
https://www.nsf.gov/eng/iip/iucrc/home.jsp/
Smart Vehicle Concepts Center page
https://svc.engineering.osu.edu/
Acoustics & Dynamics Laboratory
https://adl.osu.edu/
Smart Materials and Structures Laboratory
https://smsl.osu.edu/
Automated Computational Mechanical Laboratory
https://acml.engineering.osu.edu/
Integrated Material Systems Laboratory
https://imsl.engineering.osu.edu/
Doan-Nguyen Group
https://u.osu.edu/doan-nguyen.1/
Hoelzle Research Lab
https://hrl.engineering.osu.edu/
Micro/Nano Multiphysical Dynamics Lab
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

**SHENG DONG**  
Research Assistant Professor  
**Expertise**: Ultrasonic lubrication; Dynamic system modeling; Structural health monitoring

**J.P. CHEN**  
Associate Professor  
**Expertise**: Computational fluid dynamics; CFD simulation and coding; Turbulence modeling; Turbomachinery

**DAVID HOELZLE**  
Associate Professor  
**Expertise**: Learning/adaptive control systems; Additive manufacturing processes; Microsystems for mechanobiology research; Dynamics systems analysis

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

**RAJ SINGH**  
Emeritus Professor  
**Expertise**: Noise & vibration control; Geared systems; Nonlinear dynamics; DSP

**ARDESHIR CONTRACTOR**  
Professor of Practice  
**Expertise**: Solar energy; Smart grids; Electric mobility; Renewable energy storage; Materials for energy conversion

**SOHEIL SOGHRATI**  
Associate Professor  
**Expertise**: Advanced FEM; Modeling multiscale response of advanced/bio-materials and structures

**ARDESHIR CONTRACTOR**  
Professor of Practice  
**Expertise**: Solar energy; Smart grids; Electric mobility; Renewable energy storage; Materials for energy conversion

**RAJ SINGH**  
Emeritus Professor  
**Expertise**: Noise & vibration control; Geared systems; Nonlinear dynamics; DSP

**VICKY DOAN-Nguyen**  
Assistant Professor  
**Expertise**: Synthesis; In-situ structural characterization; Smart materials; Advanced materials for energy storage/conversion

**VISHNU SUNDARESAN**  
Associate Professor  
**Expertise**: Piezoelectric materials; Active polymers; Bio-derived materials

SVC Research Staff

**LEON HEADINGS**  
Senior Research Associate

**TRAVIS HERY**  
Postdoctoral Associate

**NAVNI VERMA**  
Postdoctoral Associate

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