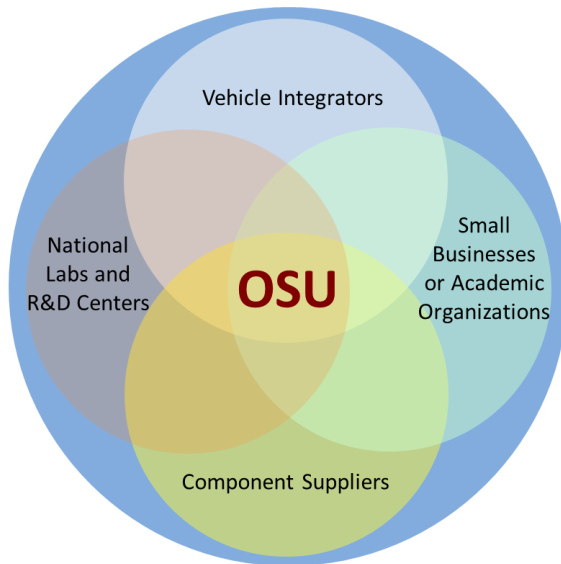




## Smart Vehicle Concepts Center (SVC)

National Science Foundation Industry-University Cooperative Research Center (est. 2007)



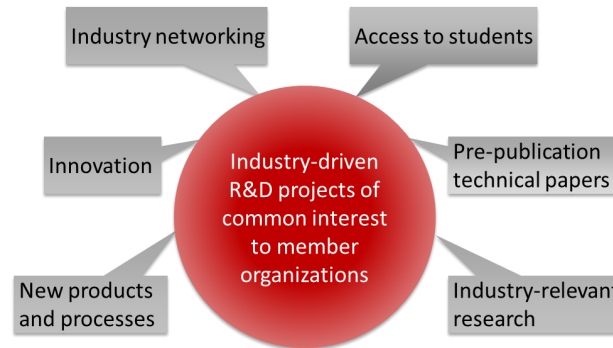
## The Ohio State University

Phase I: 2007 – 2012

Phase II: 2012 – 2017

Phase III: 2017 – 2022

## IUCRC - Cooperative Center Concept and Benefits to Industry



The National Science Foundation (NSF) Industry-University Cooperative Research Center (IUCRC) program provides industry, government, and research organizations the means to leverage research and development (R&D) investments with centers renowned for their innovative research capabilities.

- NSF program encourages collaborative research
- Focus on pre-competitive research
- Driven by industry to efficiently utilize the talents and resources of a university
- The NSF appoints an evaluator to ensure quality control
- Accomplishes research at a fraction of the cost
- Provides an avenue to investigate topics of common interest
- Allows industry to efficiently utilize the talents and resources of academic institutions
- Provides an excellent recruiting tool
- Leveraging: A nominal membership fee, when combined with cost-sharing and NSF money, gives members access to over **\$1M** per year of research and associated intellectual property

### Industrial Advisory Board (IAB)

- The IAB consists of one representative from each industrial member. The IAB consists of one representative (two for multiple memberships) from each industrial member.
- The board is responsible for evaluating current research thrusts, suggesting new opportunities, evaluating center operations, and matching center capabilities with unfilled research needs
- The IAB holds 2 meetings each year

### Pre-Competitive Research Paradigm

- Overcomes basic obstacles that prevent a technology from being used in commercial applications
- Provides an understanding of the characteristics of new technologies
- Is aimed at providing the tools, information, and data that enables future products and services
- Offers equal benefit to all Center members
- Develops industry standards and test procedures where no precedent exists

## Example SVC Sponsored Projects

### Interfacial Mechanisms: Characterization, Constitutive Modeling, System Integration (Sensors, Actuators, Dynamic Simulation)

- Characterization and modeling of rubber bushings
- Analysis of automotive system isolators
- Inverse identification method for radiator mounts
- Multiscale finite element simulation of the mechanical behavior of fiberglass insulation
- Dynamic friction characterization of icy road surfaces

### Safety, Comfort, and Health Monitoring: Machine and Material Diagnostics, Human-Machine Interface, Strain Energy Management

- Smart condition detection and monitoring
- Mechanoluminescent paintable light sources in automotive lighting systems
- Embedded fiber optic sensors for structural health monitoring
- Architecture for mechanoluminescent structural sensors and sensing platforms
- Multifunctional structural panels with electroluminescence
- Distributed programmable actuation platforms
- Dynamic self-reforming lithium/solid electrolyte interface for solid-state battery

### Adaptive Noise, Vibration, and Harshness (NVH): Active Noise and Vibration Control, Adaptive Structures, System Integration

- Morphing panels for aerodynamic performance
- Multifunctional magnetostrictive systems: experiments and computer simulation
- Multifunctional structural polymer composites for vehicle electrification
- Flexible piezoelectric sensors for vehicle applications

### Emerging Vehicle Technologies: Vehicle Electrification, Autonomous Vehicles, Lightweighting

- Vibration damping and energy harvesting
- Effect of ultrasonic additive manufacturing (UAM) process on manufactured parts
- Ultrasonic additive manufacturing: process modeling, structural reinforcement, multi-material joining reinforced polymers
- Magnetic gears and geared drives
- Smart restraints for autonomous vehicles

### Smart Vehicle Concepts Center (SVC) History

- The Smart Vehicle Concepts Center was officially launched in July 2007 with support from NSF and industrial members
- Phase I: 2007 - 2012
- Texas A&M University joined SVC as an academic partner from summer 2008 to spring 2013
- SVC was renewed for another 5 years (Phase II: 2012—2017) effective July 1, 2012 as a single-site center
- SVC was renewed for another 5 years (Phase III: 2017—2022) effective August 1, 2017

**SVC Core Faculty**



**Marcelo Dapino**  
**Honda R&D Americas Designated Chair**  
**Professor; Director of SVC**  
Expertise: Smart materials; Nonlinear coupled systems; Design; Control



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



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



**Ardeshir Contractor**  
**Professor**  
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



**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 multiple response of advanced/bio-materials and structures



**Vishnu Sundaresan**  
**Associate Professor**  
Expertise: Piezoelectric materials; Active polymers; Bio-derived materials

**SVC Research Staff**

- Gerald Gourdin**  
Postdoctoral Associate
- Leon Headings**  
Senior Research Associate
- Navni Verma**  
Postdoctoral Associate

**SVC Companies**

American Axle and Manufacturing	Former Member
Advanced Numerical Solutions	Former Member
Army Research Laboratory	Former Member
<b>Autoliv</b>	<b>Current Member</b>
<b>Battelle Memorial Institute</b>	<b>Current Member</b>
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
<b>Honda R&amp;D Americas Inc.*</b>	<b>Current Member</b>
Hyundai-Kia Motors*	Former Member
<b>LMS Software</b>	<b>Invited Observer</b>
<b>MES, Inc.</b>	<b>Invited Observer</b>
MIT Lincoln Laboratory	Former Member
<b>Moog Inc.</b>	<b>Current Member</b>
<b>MSC Software</b>	<b>Invited Observer</b>
<b>NASA Glenn Research Center**</b>	<b>Current Member</b>
Owens Corning	Former Member
<b>Parker Hannifin</b>	<b>Current Member</b>
REL, Inc.	Former Member
<b>Romax</b>	<b>Invited Observer</b>
Solidica	Former Member
Tenneco, Inc.	Former Member
The Boeing Corporation	Former Member
Tokai Rubber	Former Member
<b>Toyota Research Institute, Inc.*</b>	<b>Current Member</b>
Transportation Research Center, Inc.*	Former Member
YUSA	Former Affiliate

\*Indicates multiple memberships    \*\*Invited Observer

**SVC Mission**

- Conduct basic and applied research on ground and aerospace vehicle components and systems
- Build an unmatched base of research, engineering education, and technology transfer with emphasis on improved vehicle performance
- Develop well-trained engineers and researchers (at the undergraduate, MS, and PhD levels) with both experimental and theoretical viewpoints

**What Does SVC Offer?**

- Comparative evaluation of existing materials or concepts
- Development of new sensors, actuators, and control algorithms
- New (revolutionary) design paradigms using smart materials
- Better understanding of vehicle constraints and environments
- New vehicle components and sub-systems
- New analytical and computational models
- Tools to improve vehicle development cycles and understand the limits of existing components

**Status**



**Contact Information**

**Prof. Marcelo Dapino**  
 Center Director  
 E-mail: dapino.1@osu.edu

Information on the semi-annual and annual SVC meetings is posted here:  
<https://svc.osu.edu/meetings>

**Membership Fee Structure**

For membership details, visit our page at  
<https://svc.osu.edu/membership>

Membership Type	Money per Year	Project Decisions	Vote	IP Access
<b>Member</b>	<b>Per Membership Fee Schedule</b>		1 per membership (limit 2)	Yes
Solo Guaranteed Project	Membership Fee +Project Fee +Admin Fee	Project is guaranteed		
Umbrella Project	Membership Fee +Admin Fee	Made by the IAB		
<b>Affiliate</b>	<b>Same as Project Fee</b>	<b>No Say</b>	<b>0</b>	Limited to one project only
Invited Observer	In-kind (\$10K+)	No Say	0	No
Observer	In-kind (<\$10K)	No Say	0	No

Center Year	2017	2018	2019	2020	2021-22
Membership Fee (a)	\$40K	\$40K	\$40K	\$40K	\$40K
Project Fee (b)	\$12K	\$14K	\$16K	\$18K	\$20K
Admin Fee (c)	\$5.2K	\$5.4K	\$5.6K	\$5.8K	\$6K
<b>Cost of Solo Membership (a + b + c)</b>	<b>\$57.2K</b>	<b>\$59.4K</b>	<b>\$61.6K</b>	<b>\$63.8K</b>	<b>\$66K</b>

**SVC Website**  
 Please visit us online:  
<https://svc.osu.edu>

**NSF Fact Sheet on the SVC:**  
<http://www.iucrc.org/center/smart-vehicle-concepts>