National Science Foundation
Industry-University Cooperative Research Center in
Smart Vehicle Concepts – Phase IV

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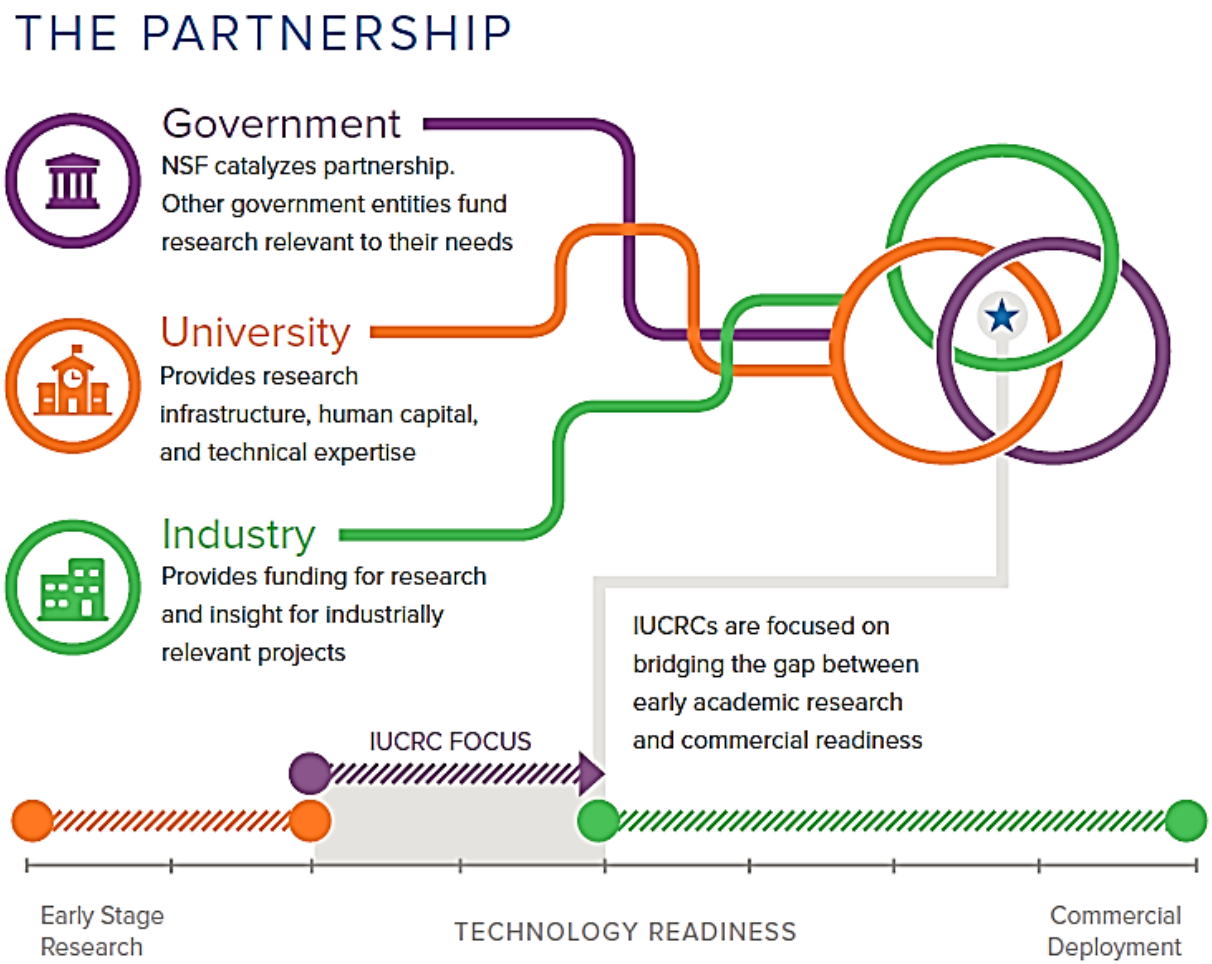
The Ohio State University

Presentation Outline

- NSF IUCRC Program, SVC mission, membership structure, and metrics
- Role of Industrial Advisory Board, research matrix, and list of projects
- General updates

NSF IUCRC Program



https://www.nsf.gov/eng/iip/iucrc/home.jsp

- Conducts **industrially-relevant**, **pre-competitive research** via multi-member, sustained partnerships among industry, academe, and government
- Provides a **financial and procedural framework** for center operations in addition to best practices learned over decades of fostering public/private partnerships that provide significant value to the nation, industry and university faculty and students
- Offers a platform for **significant leveraging** of financial investment by members to accelerate the knowledge base in emerging technological sectors and develop an industrially savvy workforce

IUCRC Facts – FY 2021-2022

THE OHIO STATE UNIVERSITY

THE STRUCTURE

Centers

Research collaborations focused on a topical area that are catalyzed by NSF and funded by industrial and government members

Sites

Geographically distinct research labs that are located at universities and participate in the IUCRC

Members

Companies and government agencies provide funding and expertise for needed innovation in their sector or industry

Program Funding

- $23.5M in Program Funding (ENG, CISE); $251K per Center
- $74.5M in Total Center Funding; $1.1M per center
- 1:2.3 Leveraging of NSF funds
- 90% of membership fees go toward research

Centers Nationally

- 70+ active Centers with 120+ U.S. University sites
- 1,057 Memberships: 164 new and 255 terminated
- 50% Large Business, 29% SB, 13% Federal members, 4% State/Local, 5% Other

Students

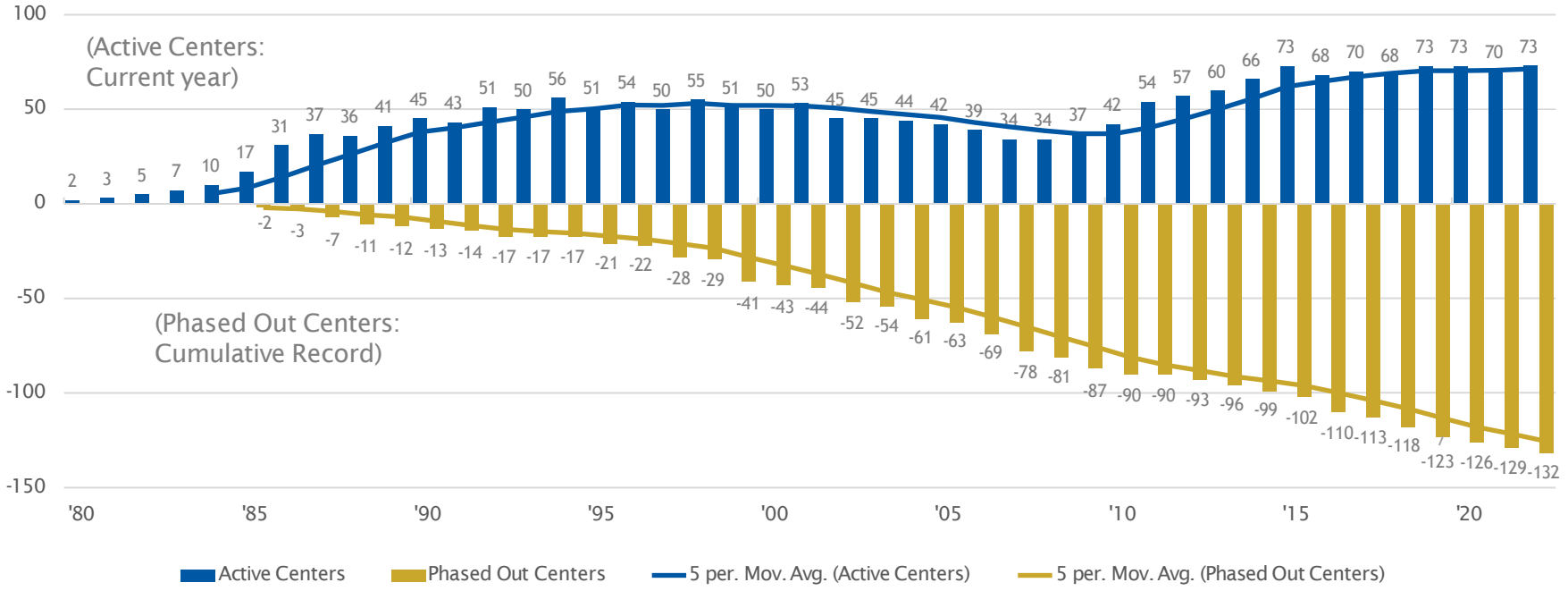
- 1,807 students engaged/26 students per center/1310 researchers
- 623 graduated, 383 hired by industry, 23 hired by gov't, 22% hired by members
- 235 PhDs, 209 MS, 178 UGs graduated in 2020-2021, trained in Center research

Sustainability

- About 40 Graduated IUCRCs remain in operation true to model

Number of Active and Phased-Out Centers by Year

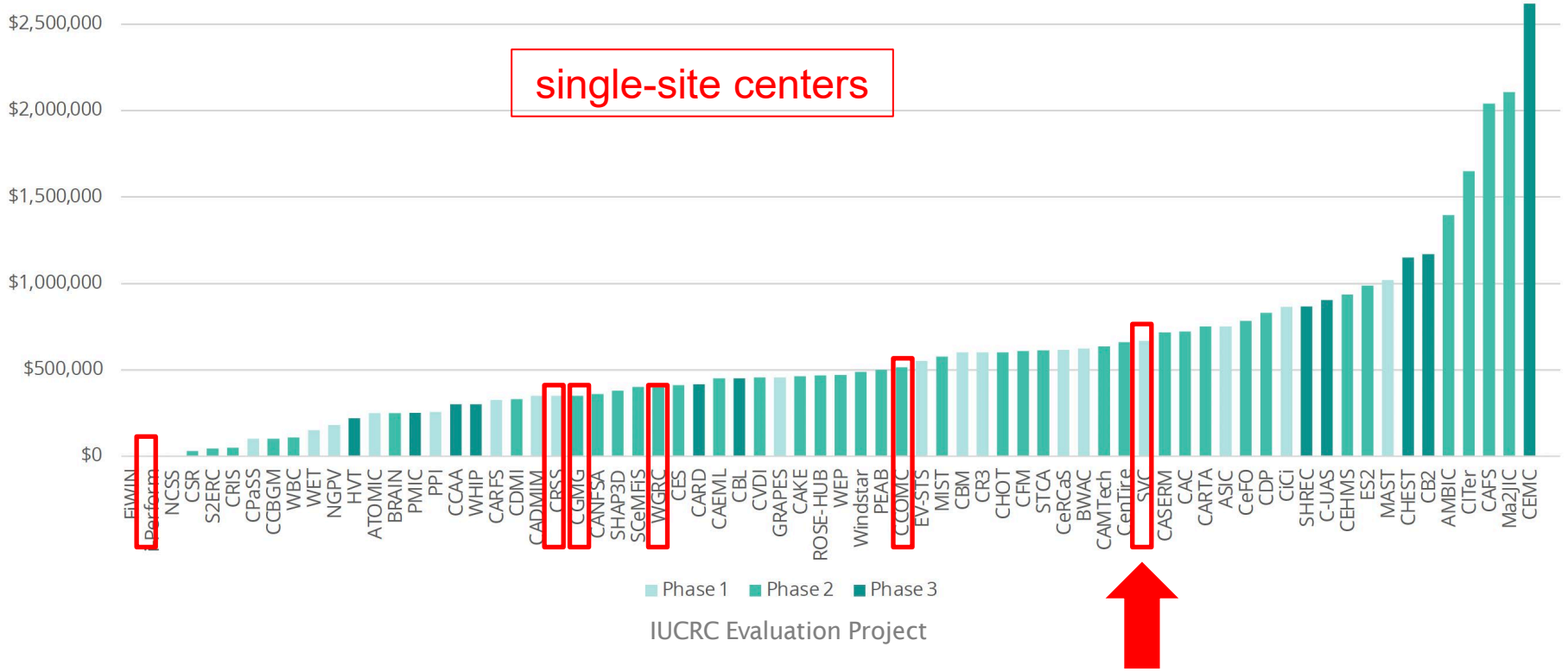
Industry/University Cooperative Research Centers



IUCRC Evaluation Project

FY2021 Total Center Program Income by Center

Industry/University Cooperative Research Centers



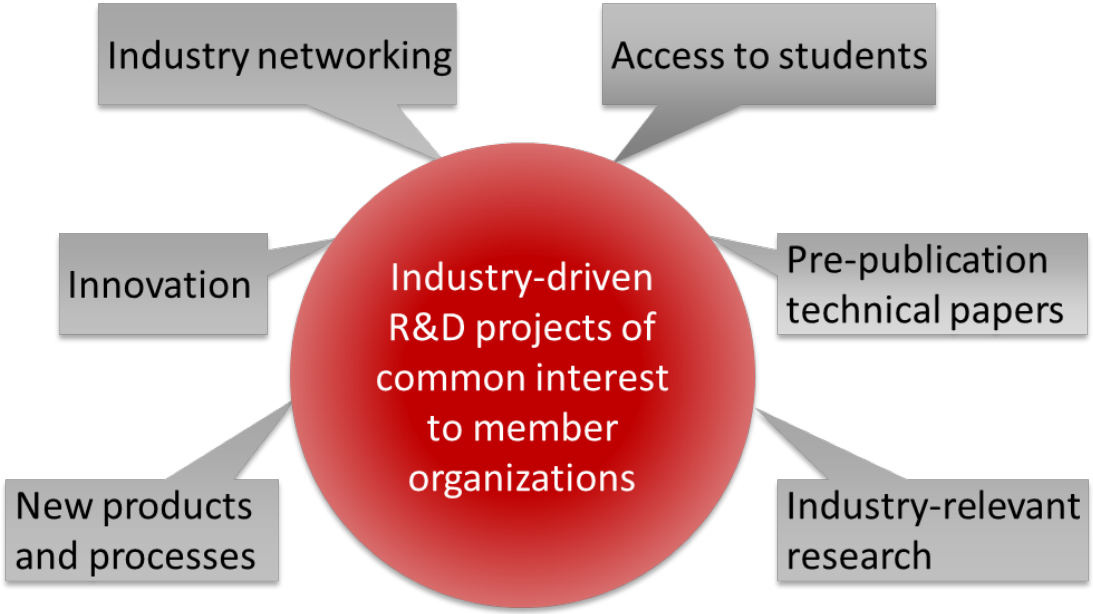
Smart Vehicle Concepts Center History

October 2005 – July 2007	Planning grant (NSF) awarded to OSU, Planning Conference at OSU, membership sign-ups, etc. (OSU)
July 2007	Center launched at OSU with funding from the NSF and Industrial Members (Phase I: Jul 2007 to Jun 2012)
February 2007 – June 2008	Projects initiated by founding members (OSU)
July 2008	TAMU joins as an academic partner (Jul 2008 - Jun 2013)
March 2012	Center renewal proposal submitted to the NSF by OSU
June 2012	Phase II Center renewed by the NSF as a single site center (Phase II: Jul 2012 – Jun 2017)
February 2017	Phase III proposal submitted No cost extension to Phase II granted until December 2017
August 2017	Phase III Center renewed by the NSF as a single-site center (Phase III: 2017-2022)
August 2022	**Phase IV: Graduated center status granted by the NSF along with no-cost project extension (Phase IV: 2022-2027)**
July 2023	End of NSF no-cost extension

Center meetings: semi-annual (spring) and annual (autumn)

SVC Mission

- Conduct pre-competitive research on **ground and air vehicles** with emphasis on **smart materials** and **emerging vehicle technologies**
- Build an **unmatched base of research**, engineering education, and technology transfer with emphasis on improved vehicle performance, structural lightweighting, electrification, and smart mobility
- Prepare **next-generation engineers** who possess both theoretical and experimental expertise applicable to auto and aero vehicles



SVC Overall Membership Structure (Phase IV)

Membership Type	Money per Year	Project Decisions	Vote	IP Access
Member	Per Membership Fee Schedule		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		
Affiliate	Same as Project Fee	No Say	0	Limited to one project only
Invited Observer	In-kind ($10K +)	No Say	0	No
Observer	In-kind (< $10K)	No Say	0	No

SVC provides companies with several membership options. All fees are considered a minimum: Members and Affiliates are encouraged to provide supplemental funding to support the research activities associated with their project

https://svc.osu.edu/membership

Phase IV Fee Schedule for Solo Projects

Center Year	Year 1 8/1/2022-7/31/2023	Year 2 8/1/2023-7/31/2024	Year 3 8/1/2024-7/31/2025	Year 4 8/1/2025-7/31/2026	Year 5 8/1/2026-7/31/2027
Membership Fee (a)	$44K	$44K	$44K	$44K	$44K
Project Fee (b)	$22K	$24K	$26K	$28K	$30K
Admin Fee (c)	$6.6K	$6.8K	$7.0K	$7.2K	$7.4K
Cost of Solo Membership (a + b + c)	$72.6K	$74.8K	$77K	$79.2K	$81.4K

- A Member is guaranteed a solo project by paying the Membership Fee + Project Fee + Admin Fee ($72.6K for year 1 and subsequently as shown in the table)
- A Member exercising the Affiliate Member option for a given project pays the Membership Fee + Admin Fee ($50.6K for year 1 and subsequently as shown in the table) whereas the Affiliate Member pays the Project Fee ($22K for year 1 and subsequently as shown in the table)
- The Center will retain the Admin Fee to cover administrative cost ($6.6K for year 1 and subsequently as shown in the table)

Phase IV Fee Schedule for Umbrella Projects

Center Year	Year 1 8/1/2022-7/31/2023	Year 2 8/1/2023-7/31/2024	Year 3 8/1/2024-7/31/2025	Year 4 8/1/2025-7/31/2026	Year 5 8/1/2026-7/31/2027
Membership Fee (a)	$44K	$44K	$44K	$44K	$44K
Admin Fee (c)	$4K	$4K	$4K	$4K	$4K
Cost of Umbrella Membership (a + c)	$48.4K	$48.4K	$48.4K	$48.4K	$48.4K

- At least two different member organizations are needed to support a single "umbrella" project. An "umbrella" project is defined as a cluster of related sub-projects in the same overall research area, though each sub-project may have its own distinct set of objectives. Such projects may last multiple years.
- Each member of an "umbrella" project will pay $48.4K each year (Membership Fee + Administrative Fee)
- The Center will retain the Admin Fee ($4.4K) to cover administrative costs; $44K will be used for actual research expenditures

Affiliate Membership

Membership Type	Money per Year	Project Decisions	Vote	IP Access
Affiliate	**Same as Project Fee**	**No Say**	**0**	**Limited to one project only**

- No IAB vote
- Invited to the semi-annual review meetings and given IP access to one project as well as recruitment access to the graduate and undergraduate students upon graduation from OSU
- Each Affiliate can join an ongoing or initiated project that is primarily sponsored by a full Member

Invited Observer Membership

Membership Type	Money per Year	Project Decisions	Vote	IP Access
Invited Observer	In-kind ($10K +)	No Say	0	No

- This category has been defined for companies that choose to actively collaborate with SVC and supply software, smart materials, equipment, and instrumentation of $10K value or more, as well as human support to accomplish the projects
- Invited to the review meetings and given a window into the knowledge being generated and access to the graduate and undergraduate students upon graduation from OSU
- Allowed to attend the closed (members-only) sessions, though they have limited access to project reports
- No intellectual property rights unless the IAB approves it on a case-by-case basis given the unique contributions made by a specific Invited Observer to a particular project

Observer Membership

Membership Type	Money per Year	Project Decisions	Vote	IP Access
Observer	**In-kind (<10K)**	**No Say**	**0**	**No**

- This category has been defined for those companies that provide in kind support of $10K value or less
- Invited only to the “open” sessions of semi-annual meetings
- No intellectual property rights within SVC and no IAB vote

SVC Industrial Advisory Board and Evaluation

Industrial Advisory Board (IAB)

- **One representative per full membership (at most 2 IAB representatives for any company)**
  - *Chair: Ryan Hahnlen, Honda D&M of America*
  - *Vice Chair: vacant*
- **Responsibility:**
  - *Approve center bylaws and procedures*
  - *Evaluate current research thrusts and projects*
  - *Suggest new opportunities*
  - *Evaluate center operations and suggest new partnerships*
  - *Match center capabilities with unfilled research needs*

Academic Advisory Committee

- SVC project leaders and MAE Chair are consulted on important Center matters

SVC Industrial Advisory Board (current)

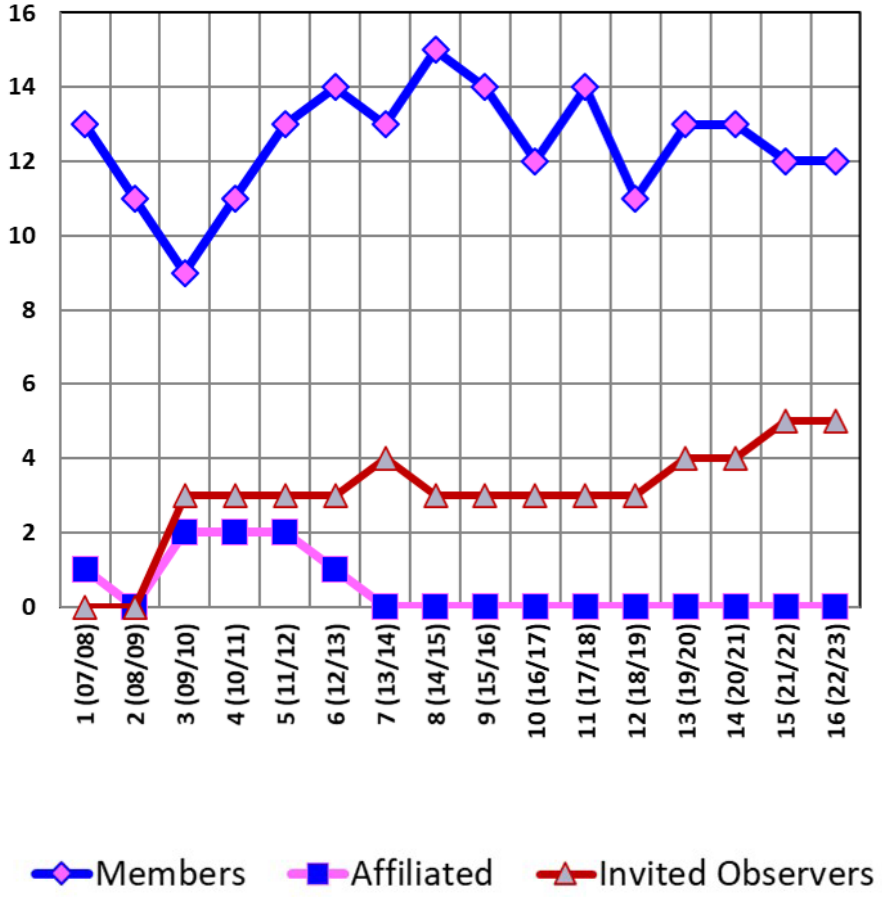
IAB Member Companies and Representatives		Ex Officio Members	
IAB Chair (2018 -)	Ryan Hahnlen	NSF Program Director	Prakash Balan
		IUCRC Evaluation Team	VentureWell
Member Companies:		Ohio State Personnel	
Autoliv	Steven Combs	SVC Director	Marcelo Dapino
Daimler Truck North America	Joshua High	SPO	Molly Wilson
Honda D&M of America	Ryan Hahnlen	Grants Coordinator	Colin Grisier
Honda Research Institute	Christopher Brooks	Program Assistant	Tommie Blackledge
NASA Glenn Research Center	Justin Scheidler		
Toyota Research Institute	Umesh Gandhi	OSU Project Leaders	
Toyota Research Institute	Paul Gilmore	Qadeer Ahmed	Marcelo Dapino
		Marcello Canova	David Hoelzle
Invited Observers:		Hanna Cho	Jung-Hyun Kim
MES, Inc.	Hiten Shah	Anne Co	Jay Sayre
OSU Frontier Center	Ardeshir Contractor	Ardeshir Contractor	Soheil Soghrati
Honorary IAB Member	*Tim Krantz (NASA GRC)*	Research Staff	
	Raj Singh (OSU)	Leon Headings	Ismail Nas
		Brad Losey	

SVC Memberships

SVC Companies	Status
American Axle and Manufacturing	Former Member
Advanced Numerical Solutions	Former Member
Army Research Laboratory	Former Member
Autoliv	**Current Member**
Battelle Memorial Institute	Former Member
BorgWarner	Former Affiliate
Bridgestone Americas Tire Operations, LLC	Former Member
Daimler Truck North America	**Current 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 D&M Americas Inc. *	**Current Member**
Hyundai-Kia Motors *	Former Member
LMS Software	**Invited Observer**
MES, Inc.	**Invited Observer**
MIT Lincoln Laboratory	Former Member
Moog Inc.	Former Member
MSC Software	**Invited Observer**
NASA Glenn Research Center	**Current Member**
OSU Frontier Center	**Invited Observer**
Owens Corning	Former Member
Parker Hannifin	Former 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, Inc. *	**Current Member**
Transportation Research Center, Inc. *	Former Member
YUSA	Former Affiliate

* Multiple memberships

Membership History (2007 – current) for OSU site only



Data as of September 2023 (subject to change)

NSF Funding (Years 1 – 16) at OSU Site

Phase I	Phase II	Phase III	TOTAL NSF Funding
$561,000	$404,625	$501,189 *	$1,466,814

* Includes current REU ($48K) and INTERN ($53.2K) funding

- Total industry funding received (years 1-16): **$9.51M**
- Ratio (industry/NSF): **6.49**

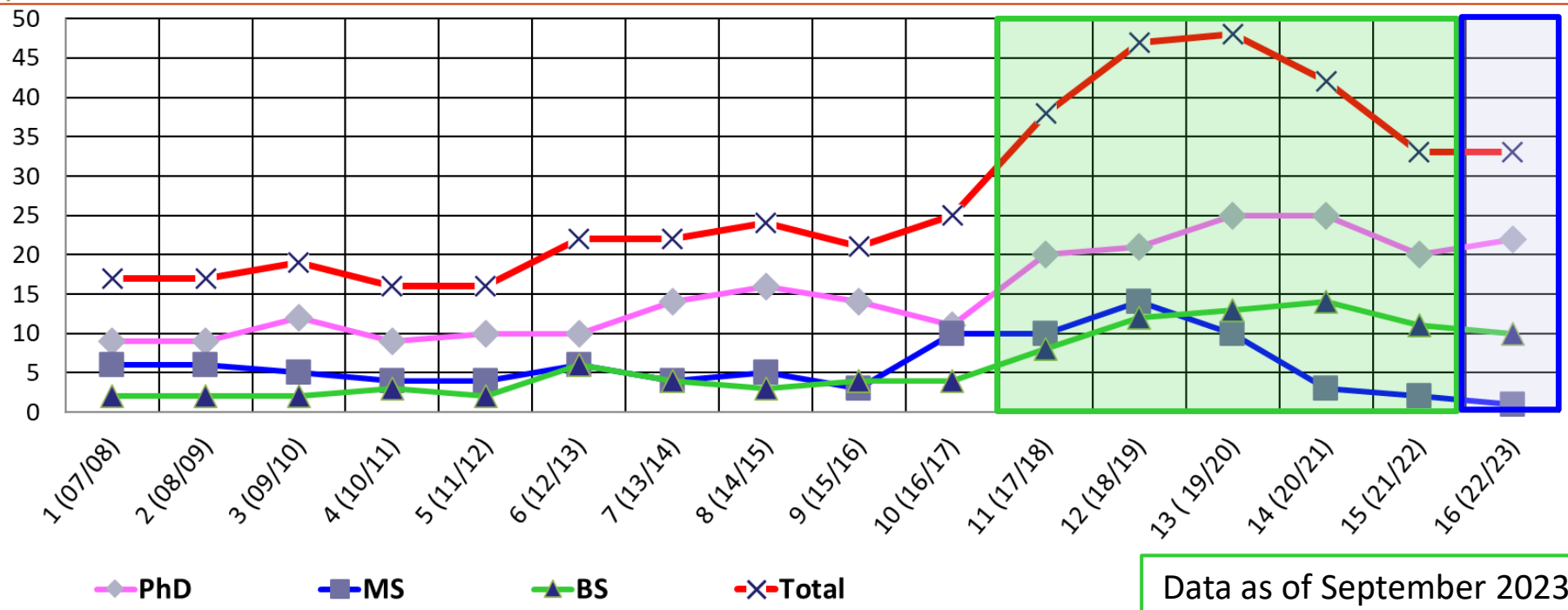
Status of Phase III, Years 1 – 2 Reporting

Date Sent	Requested by	Report Type	Performance Period	Requester	Status
Year 1: 2017 – 2018					
April 30	April 30	Evaluator Report	August 1 – April 30	VentureWell	Approved
May 23	May 31	IUCRC Structural Report	August 1 – May 23	IUCRC Evaluation Project @ NCSU	Approved
June 13	June 30	NSF Phase II Annual Report	July 1 – June 30	NSF/Fastlane	Approved
June 25	August 1	NSF Phase III Annual Report	August 1 – July 31	NSF/Fastlane	Approved
Year 2: 2018 – 2019					
April 28	April 29	Evaluator Report	August 1 – July 31	VentureWell	Approved
June 4	July 1	NSF Phase II Annual Report	July 1 – June 30	NSF/Fastlane	Approved
June 10	August 1	NSF Phase III Annual Report	August 1 – July 31	NSF/Fastlane	Approved
June 18	June 28	IUCRC Structural Report	August 1 – May 23	IUCRC Evaluation Project @ NCSU	Approved
February 16	April 30	NSF Phase II Final Report	July 1– December 31	NSF/Fastlane	Approved

Status of Phase III, Years 3 – 5 Reporting

Date Sent	Requested by	Report Type	Performance Period	Requester	Status
Year 3: 2019 – 2020					
May 13	May 28	Evaluator Report	August 1 – July 31	VentureWell	Approved
June 29	July 31	IUCRC Structural Report	August 1 – May 23	IUCRC Evaluation Project @ NCSU	Approved
June 29	July 27	NSF Phase III Annual Report	August 1 – July 31	NSF/Fastlane	Approved
Year 4: 2020 – 2021					
April 8	April 30	Evaluator Report	August 1 – July 31	VentureWell	Approved
May 18	July 31	NSF Phase III Annual Report	August 1 – July 31	NSF/Fastlane	Approved
November 5	December 10	IUCRC Structural Report	August 1 – July 31	VentureWell	Approved
Year 5: 2021 – 2022 / NCE through 2023					
April 5	April 30	Evaluator Report	August 1 – July 31	VentureWell	Approved
June 8	July 31	NSF Phase III Annual Report	August 1 – July 31	NSF/Fastlane	Approved
September 9	October 28	IUCRC Structural Report	August 1 – July 31	VentureWell	Approved
August 23	November 2023	NSF Phase III Outcomes Report	August 1 – July 31	NSF/Fastlane	Submitted
	November 2023	NSF Phase III Final Report	August 1 – July 31	NSF/Fastlane	In preparation

SVC Student Support (Years 1 – 16) at OSU Site



Data as of September 2023

Fully or partially supported includes fellowship/scholarship students

Phase III (Avg / Yr)	PhD	MS	BS Thesis	TOTAL
Supported by Center Research	22.2	7.8	11.6	41.6
Graduated from Center	3.8	6.2	4.0	13.2
Hired by Member Organizations	0.8	1.6	0	2.4

Phase IV (Avg / Yr)	PhD	MS	BS Thesis	TOTAL
Supported by Center Research	19	1.5	8.5	29
Graduated from Center	3.5	1	1.5	6.5
Hired by Member Organizations	0	0	0	0

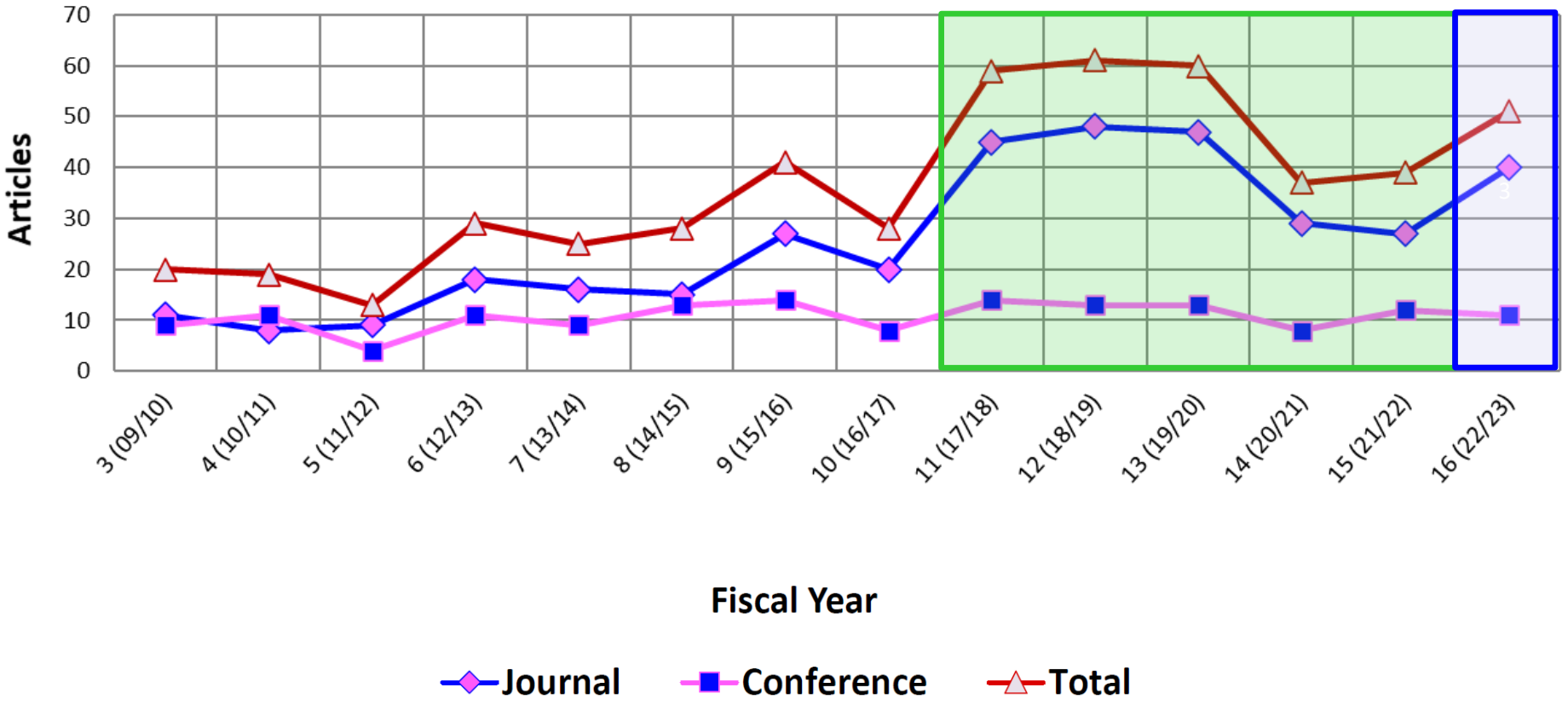
Phase II-III SVC Graduates and Current Employment

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

Graduate School:	
Aalto University	Purdue University
Carnegie Mellon	UCLA
Georgia Tech	University of Illinois
Ohio State	University of Michigan

Graduates	PhD	MS	BS
Phase II (2012-17)	23	20	10
Phase III (2017-22)	19	31	20
Phase IV (2022-23)	7	3	3

Publication Record (Years 1 – 16)



Data as of September 2023

New Research Matrix for Phases III and IV

Thrust	Interfacial Mechanisms Characterization, constitutive modeling, system integration (sensors, actuators, dynamic simulation)	Safety, Comfort, and Health Monitoring Machine and material diagnostics, human-machine interface, strain energy management	Adaptive Noise, Vibration, and Harshness (NVH) Active noise and vibration control, adaptive structures, system integration	Emerging Vehicle Technologies Vehicle electrification, autonomous vehicles, lightweighting
PAST Relevant Projects	40A, 40E, 40F, 55, 60	46, 58, 58A, 58B, 49	45, 52, 57, 57B	51A, 54B, 56, 61B
CURRENT Relevant Projects		63	57C	51B, 51C, 51D, 51E, 54, 61, 62, 64, 66, 67*
Typical Sponsors	Ford, Honda D&M, NASA Glenn, Owens Corning, Tenneco, Toyota, TRC	Autoliv, Bridgestone, Honda D&M, Moog	CVG, Honda D&M, NASA Glenn, Toyota, Parker Hannifin, Tenneco, TRC	Battelle, Honda D&M, MES, NASA Glenn, Toyota, TRC

† Pending

**new project*

SVC Seed Program Update

Second round (2022-2023)

PI	Department	Project title	Amount	Start date	Sources
Soheil Soghrati 	MAE	AI-enabled prediction of the effect of process porosities on the failure response of an additive manufacturing aluminum alloy	$30K	1/1/2023	COE and MAE

SVC Core Faculty and Research Staff

MARCELO DAPINO

Honda D&M Americas Chair
Professor; Director of SVC
Expertise: Smart materials; Nonlinear coupled systems; Design; Control

MARCELLO CANOVA

Professor
Expertise: Energy optimization and management of ground propulsion systems and hybrid-electric drivetrains

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

ANNE CO

Professor
Expertise: Advanced electrocatalytic materials; Nanoporous metals; New energy conversion and storage

ARDESHIR CONTRACTOR

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

DAVID HOELZLE

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

JUNG-HYUN KIM

Assistant Professor
Expertise: Energy storage materials and devices; Battery cell fabrication, testing, and characterization

JAY SAYRE

Research Associate Professor
Expertise: Fuel cells; Polymer composites focused on multifunctional, electrochemical, and energy absorbing materials

RAJ SINGH

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

SOHEIL SOGHRATI

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

Dr. Leon Headings: Senior Research Associate **Dr. Ismail Nas**: Postdoctoral Associate
Brad Losey: Research Associate

Center Publicity

Center Newsletters

- Annual newsletters (online as of 2014), December annually
- Latest Newsletter published December 2022 https://svc.osu.edu/sites/default/files/2022-12/December-2022-SVC-Newsletter-12.12.2022.pdf
- SVC Main Website: http://SmartVehicleCenter.org (also under https://svc.osu.edu/)
- NSF Fact Sheet: https://iucrc.nsf.gov/centers/smart-vehicle-concepts/
- NSF Events: http://www.nsf.gov/events/
- IUCRC Events: https://www.iucrcmeetings.org/

Main Mechanisms

- Open Sessions in SVC meetings
- Meetings with Potential Sponsors
- Personal Interactions
- Papers at Technical Conferences
- Student Paper Contests
- Faculty Seminars and Invited Talks
- Brochures and Quad Charts
- NSF Meetings
- Web Sites and Newsletters

Magazine Articles

- *Smart Materials: Steering innovation in vehicle design,* OSU College of Eng., News in Engineering, 2007
- *Smart Vehicle Concept Center – Research for Industry,* OSU Mechanical Engineering Newsletter, October 2008
- *Smart and Small*, Machine Design, 2008
- *Building smarter materials*, Automotive Engineering International (SAE), 2009
- *Smart Vehicle Concepts Center – Research for Industry*, ASME/AIAA newsletter, 2009
- *IOT World Today:* Ohio State Researchers Develop Smart Wind Sensor for Drones, 2022

Institutional Publications

Article in Industry-Nominated Technology Breakthroughs of NSF Industry-University Cooperative Research Centers

- *Design Concept for Smart, Adaptive Seatbelts* in 2014

Article in Ohio State University's MAE Department Research News

- *A Noise, Vibration, & Harshness Technology Success Story*, in 2013

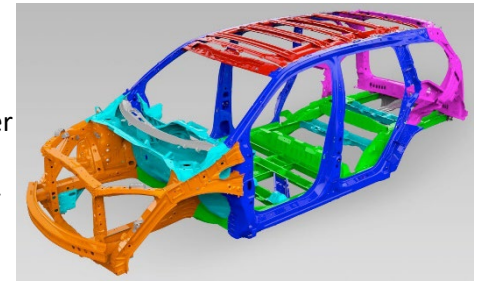
Article in Ohio State University's MAE Undergraduate News

- *An Innovative Capstone Design Experience Based on Simulation Pilot Program Made Possible by GM Foundation*, in 2014
- OSU Main News Page: https://news.osu.edu/new-wind-sensor-uses-smart-materials-to-improve-drone-performance, in Aug. 2022

Selected 2022 -2023 Accomplishments

CAMX 2023 Outstanding Technical Paper Awarded to Clemson-OSU-Honda Collaborative Team

Announced September 14, 2023



Congratulations! Your Technical Paper "Design optimization of a multi-material, fiber-reinforced composite-intensive body-in-white of a mid-size SUV" was selected as one of the CAMX 2023Outstanding Technical Paper winners.

Outstanding Technical Paper Awards are presented to researchers who put together well-written, interesting, and groundbreaking Technical Papers that have addressed critical areas of importance to the composites and advanced materials industry from business, applications, and research perspectives. Winners will be recognized at the Good Day CAMX Session on Wednesday, November 1, 2023. We are looking forward to seeing you there!

Once again, congratulations on your accomplishment and we look forward to seeing you in Atlanta.

CAMX Team
Kind regards,
Rocio Figueroa
Program Manager, Education & Technology
SAMPE | Society for the Advancement of Material and Process Engineering

Ralph Boyer Young Achiever Award

The Ralph Boyer Young Achiever Award is presented to alumni who have risen rapidly in their chosen profession, and made significant contributions to engineering products and/or programs before the age of 40. Boyer, a 1930 graduate of Ohio State, achieved chief engineer status, and contributed significantly to his company while still a young man.

2023: David Hoelzle & Arpit Mittal

Dapino receives the ASME Dedicated Service Award

Posted: September 12, 2023

In 1983, the ASME Board of Governors approved the establishment of the ASME Dedicated Service Award (DSA). It honors unusual dedicated voluntary service to the Society marked by outstanding performance, demonstrated effective leadership, prolonged and committed service, devotion, enthusiasm and faithfulness. The award may be presented to selected individuals who have served the Society for at least ten years in one or more of the following areas: Standards and Certification; Public Affairs & Outreach, Membership Development and Engagement, Technical & Engineering Communities, Student & Early Career Development, Board of Governors, ASME Foundation, and The ASME Auxiliary, Inc.

This year's award goes to **Marcelo J. Dapino.**

Selected 2022 -2023 Accomplishments

The Office of Graduate Education is excited to announce the 2023 Graduate Student Award to *Samantha Mendez for Outstanding Leader in Diversity, Equity, Inclusion and Service*

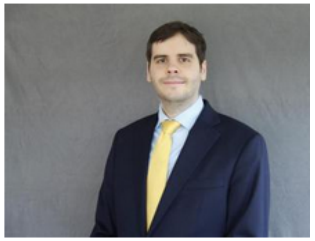
OSUengineering
@OSUengineering

🎉 Cheers to the 2023 College of Engineering Graduate Award winners: Samantha Mendez, Xiang Yue, Sophia Mayone, and our Outstanding Graduate Student Organization, the Graduate Chapter of Society of Women Engineers (GRADSWE)!

9:15 AM · Jul 5, 2023 · **1,199** Views

MAE student is selected for the NRC Research Associateship Program

Posted: May 10, 2023



Mechanical and Aerospace Engineering graduate student Nathaniel Wood has been selected for a postdoctoral fellowship with the Air Force Research Laboratory (AFRL) in Dayton, Ohio, through the National Research Council's prestigious Research Associate Program.

The NRC's Research Associateship Program provides postdoctoral scientists and engineers the opportunity to pursue research problems, largely of their ow choice and that are compatible with the interests of sponsoring laboratories.

"It feels very good to be awarded this fellowship," Wood said, "Securing propos and associateships is a key component of doing research and it feels good to s my career on a solid foundation in this respect."

His research will focus on a metal 3D printing technology called powder bed fu which uses a laser to fuse a part out of a bed of metal powder in a layer-by-laye fashion. With his research collaborators at AFRL, they will research how machin that contain multiple lasers can be used to enact advanced quality control procedures.

Wood previously worked on a project with AFRL, which is how he first heard of t opportunity to apply and helped him be successful during the application proce Each year the NRC sponsors a limited number of postdocs with the AFRL.

"Since my current research project is in collaboration with AFRL I have a close

Selected 2022 -2023 Accomplishments

Journal of Mechanisms and Robotics Honorable Mentions for 2022

Posted: September 5, 2023

The JMR acknowledges ***Yitong Zhou, Marcelo Dapino, and Leon Headings*** for the meritorious contribution of the following paper, "Modeling of Soft Robotic Grippers Integrated With Fluidic Prestressed Composite Actuators." ASME. J. Mechanisms Robotics.

The 2022 Best Paper Award is given to the paper recognized by the Editor and Editorial Board for its outstanding contribution to the field of mechanisms and robotics published by JMR in 2022.

JMR would like to congratulate each of the awarded authors and thank *all* submitting authors for their contributions to the journal in 2022. The ongoing submission of your work is critical to keeping our community apprised of the latest research and maintaining the high quality of our publication.

Finally, I would like to express my gratitude to the members of the Awards Committee for their diligent and conscientious work in reviewing and evaluating the nominated papers: Andrew Murray, Ashis Banerjee, Lionel Birglen, Irene Fassi, Joo Kim, and Chin-Hsing Kuo.

Venkat Krovi
Editor-in-Chief
Journal of Mechanisms and Robotics

Ahmed receives 2023 SAE Ralph R. Teetor Educational Award

Posted: May 19, 2023

Department of Mechanical and Aerospace Engineering Assistant Professor Qadeer Ahmed has been selected as a recipient of the 2023 Ralph R. Teetor Educational Award. The award, presented by SAE International, recognizes young engineering educators working to prepare students for careers in the industry.

The Teetor Award began in 1963 and has been presented to over 800 educators representing more than 200 institutions. Ahmed serves as a faculty advisor to the Buckeye AutoDrive student projects team where he puts time into training and educating students on av technologies. In only its second year, the team has already been successful, placing second in Year 1 competition.

Ahmed attended the SAE International Awards ceremony during SAE WCX 2023, where he was given the Ralph Teetor Award. These are the premier awards for the #mobility industry.

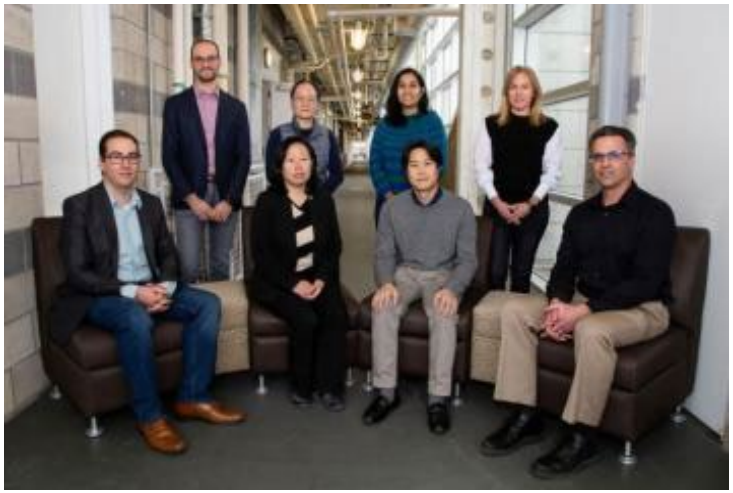
"I feel honored to be included in a group of folks who are making positive changes to the mobility industry," said Ahmed.

Selected 2022 -2023 Accomplishments

$3.8M Department of Energy grant to improve electric vehicle batteries

Posted: January 24, 2023

The Department of Energy recently announced that The Ohio State University has been awarded a $3,876,363 grant from the Department of Energy (DOE) Electric Vehicles for American Low-Carbon Living (EVs4ALL) program.



Front row (l to r): Postdoctoral Researcher Jose Lorie Lopez, **Prof. Co, Prof. Kim, Assoc. Prof. Jay Sayre.** Back row: **Prof. Canova**, IMR Research Scientist Qingmin Xu, IMR Research Engineer Navni Verma, IMR Innovation Manager Kari Roth

Doctoral student receives Women of Color GEM Student Leadership Award

Posted: January 13, 2023

Samantha Mendez, a third-year materials science and engineering PhD student, received the 2022 Women of Color National Consortium for Graduate Degrees for Minorities in Engineering and Science (GEM) Student Leadership Award.

Presented at the 2022 Women of Color STEM Conference, the Women of Color GEM Student Leadership Award recognizes a student with creative energy and an accomplished academic record. Past winners have had an impact on other students and their future interests, while also making valuable contributions to society. The National GEM Consortium seeks to increase the participation of underrepresented groups at the master's and doctoral levels in engineering and science by awarding fellowships to students.

Selected 2022 -2023 Accomplishments

Hanna Cho wins NSF BRITE Pivot Award

Posted: January 9, 2023

The Department of Energy recently announced that The Ohio State University has been awarded a $3,876,363 grant from the Department of Energy (DOE) Electric Vehicles for American Low-Carbon Living (EVs4ALL) program.

Hanna Cho, an associate professor of mechanical and aerospace engineering, has received a $548,014 Boosting Research Ideas for Transformative and Equitable Advances in Engineering (BRITE) Pivot Award from the National Science Foundation (NSF) for her research on how bone remodels itself into an ideal structure and material in an aim to understand the piezoelectric effect of collagen.

Vivek wins a Best Poster Award at the Annual MAE Graduate Research Day

Posted: November 28, 2022

Vivek's poster presented his research on automotive safety systems, exploring smart reversible mechanical latching systems toward securing vehicle occupants in unconventional and severe loading conditions where conventional restraints provide insufficient protection. The work is supported by Autoliv and Honda within the NSF IUCRC Smart Vehicle Concepts Center.

MAE Research Day allows Department of Mechanical and Aerospace Engineering students to present their research to a broad audience consisting of prospective graduate students, current OSU students, faculty, and staff. This is a joint activity hosted by the Department of Mechanical and Aerospace Engineering and the Mechanical and Aerospace Engineering Graduate student Association (MEGA). The event was held October 28, 2022 in Scott Laboratory.

The top three out of fifty poster presenters receive funding to use for professional development or travel reimbursement to participate in conferences related to their research, and also receive credit for one research seminar.

Vivek is a doctoral student in the Smart Materials and Structures Lab; he is advised by Prof. Marcelo Dapino.

Selected 2022 -2023 Accomplishments

Ahmed named associate editor for IEEE TTE

Posted: September 15, 2022

Qadeer Ahmed, an assistant professor in the Department of Mechanical and Aerospace Engineering, has been named an associate editor for IEEE Transactions on Transportation Electrification. He has served previously as a reviewer for IEEE, but this is his first time serving as an associate editor.

New wind sensor uses smart materials to improve drone performance

Posted: August 12, 2022

Engineers have designed and successfully tested a more efficient wind sensor for use on drones, balloons and other autonomous aircraft.

These wind sensors – called anemometers – are used to monitor wind speed and direction. As demand for autonomous aircraft increases, better wind sensors are needed to make it easier for these vehicles to both sense weather changes and perform safer take-offs and landings, according to researchers.

Such enhancements could improve how people use their local airspace, whether it be through drones delivering packages or passengers one day flying on unmanned aircraft, said Marcelo Dapino, co-author of the study and a professor in mechanical and aerospace engineering at The Ohio State University.

Drones need wind sensors to be able to take off safely as well as sense nearby objects in the sky. (photo: Getty Images)

Intellectual Property Generated by SVC Faculty

Inventions Disclosed		US Utility Patents Filed		US Patents Issued	
2023	Historical	2023	Historical	2023	Historical
4	80	4	47	3	16

Office of Innovation and Economic Development – Technology Commercialization

As of September 2023

List of Patents in Phase IV

Date	Patent Status	Invention	Inventors
Aug. 2023	11,724,334 B2	Continuous ultrasonic additive manufacturing system	M. Dapino, M. Gingerich, R. Hahnlen L. Headings
July 2023	11,697,172 B2	Systems and methods for joining and repaid using ultrasonic additive manufacturing with a contoured sonotrode	M. Dapino, M. Gingerich, L. Headings
May 2023	11,642,835	Application cases for Endoscopic Additive Manufacturing	Hoelzle, David|Asghari Adib, Ali|D'Souza, Desmond|Mansour, Daniel|Simeunovic, Andrej
Nov. 2022	11,511,367 B2	Hybrid structures for joining of metals and continuous fiber materials	M. Dapino, D. Detwiler, M. Gingerich, R. Hahnlen, L. Headings, M. Scheidt, A. Sheldon
Nov. 2022	18,054,534	Estimating internal temperature distribution withing parts being manufactured via the power bed fusion process	N. Wood, D. Hoelzle
Nov. 2022	18,054,535	Adaptive FEM meshing for estimating internal temperature distributions within parts being manufactured via the powder bed fusion process	N. Wood, D. Hoelzle
Oct. 2022	11,465,390 B2	Post-process interface development for metal-matric composites	M. Dapino, M. Gingerich, R. Hahnlen L. Headings
Aug. 2022	11,411,227	Energy generation from fabric electrochemistry	S. Prakash, A. Co, et al.

List of Patents in Phase III

Date	Patent Status	Invention	Inventors
July 2021	Granted 11,072,374	Morphing fender skirt for a steered wheel	U.N. Gandhi, M.J. Dapino, V.S.C. Chillara, and L.M. Headings
Jan. 2021	Granted 10,886,516	Active membrane with controlled ion-transport	V.B. Sundaresan, V. Venugopal, R. Northcutt, T. Hery
Jan. 2021	Granted 10,888,428	Additive manufacturing device for biomaterials	D. Hoelzle
Oct. 2020	Granted 10,807,186	Hybrid structures for joining of metals and continuous fiber materials	R. Hahnlen, D. Detwiler, A. Sheldon, M. Dapino, M. Gingerich, M. Scheidt, and L. Headings
May 2020	Granted 10,656,175	Cantilever for atomic force microscopy	S. M. Dharmasena, S. Kim, L.A. Bergman, A.F. Vakakis, H. Cho
Jan. 2020	Granted 10,532,421	UAM resistance spot weld joint transition for multimaterial automotive structures	R. Hahnlen, M. Dapino, L. Headings, M. Gingerich
Jan. 2020	Granted 10,546,572	Folded transducer array for compact and deployable wave-energy guiding system	R. Harne
Oct. 2019	Granted 10,458,501	Designs and manufacturing methods for lightweight hyperdamping materials providing large attenuation of broadband-frequency structure-borne sound	R. Harne

Summary

- Emphasis of SVC is on **pre-competitive research** – exploratory and high-risk
- SVC creates research at the intersection of **smart material technologies** and **mobility applications** (automotive, aircraft, rotorcraft)
- The Center is in **Year 1 of Phase IV (2022-2023)** with OSU as a single site
- Phase IV accepted in August 2022 with about **$3.3M committed** (for years 16, 17, 18, 19, and 20) from 10 distinct industry members
- OSU cost share (reduction in indirect cost rate and staff support) is used to leverage resources. As a **graduated center**, NSF funding is no longer available. The Admin Fee paid by each member is used to defray the administrative costs.
- Strong **education and placement** outcomes:
  - About 70 Center-supported PhD/MS/BS students graduated in Phase III
  - About 15% of our graduates have joined SVC sponsors
  - Some of the SVC alumni serve or have served on the IAB

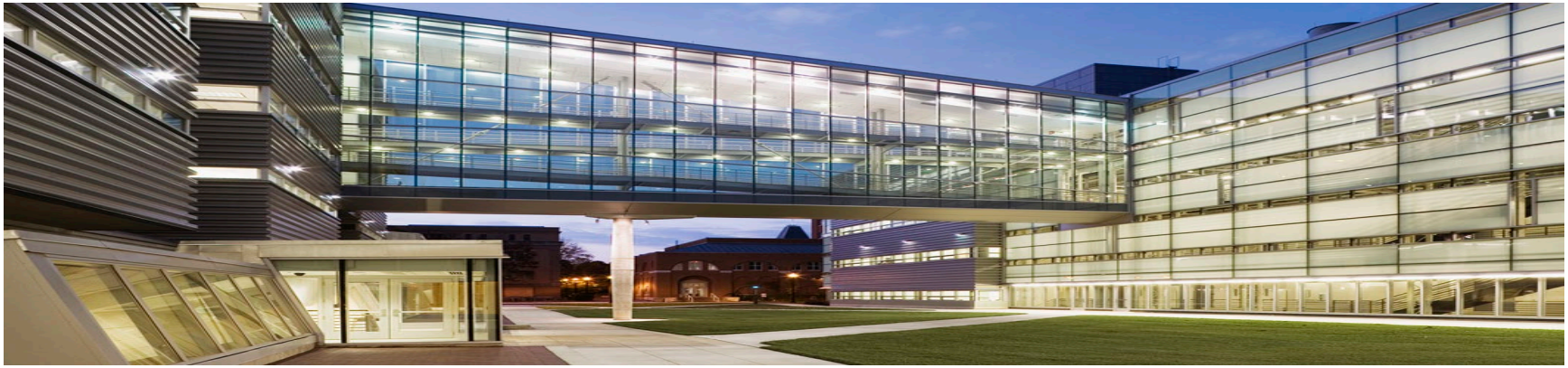
Next IAB Meetings and Spring 2024 Meeting

Spring (17th Semi-Annual) Meeting

Date: 2 -3 May 2024

Location: Ohio State University

- *Open session (for guests and sponsors) on Day 1*
- *Project reviews (sponsors only) on Day 2*
- *IAB meeting(s)*
- *Student poster display on Day 1*

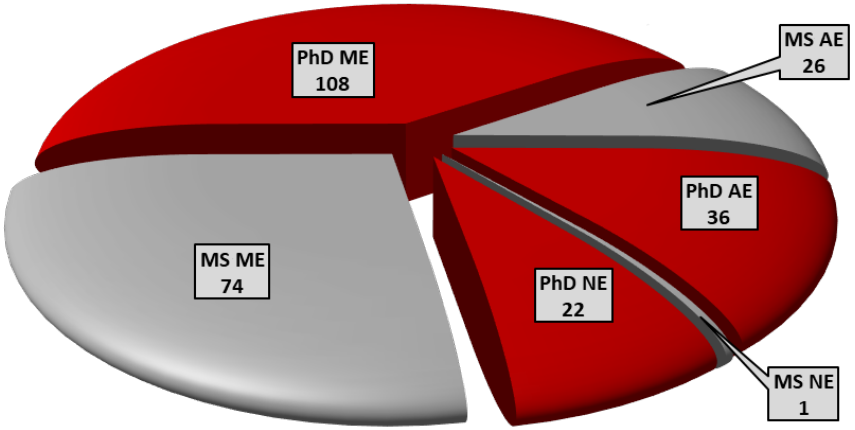


Mechanical and Aerospace Engineering

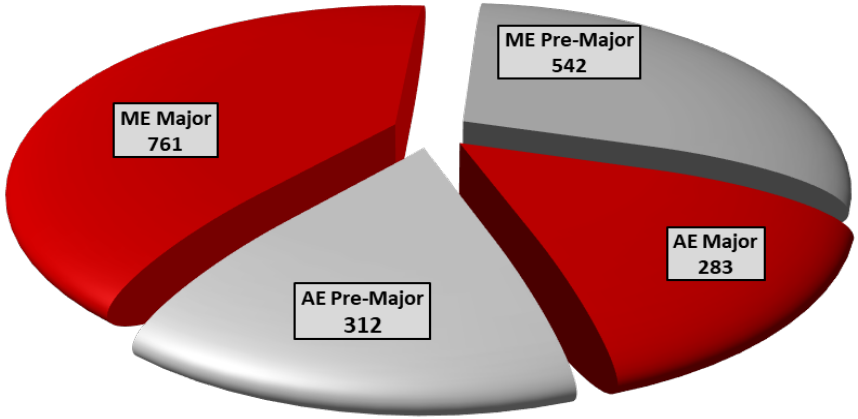
THE OHIO STATE UNIVERSITY

Department of Mechanical & Aerospace Engineering (MAE) Statistics

Graduate Student Enrollment
Autumn Semester 2022*
MAE Graduate Students



Undergraduate Student Enrollment
Autumn Semester 2022*
MAE Undergraduate Students



MAE Degrees Granted* Summer 2021 - Spring 2022					
Mechanical	**283**	**Aerospace**	**93**	**Nuclear**	**4**
BS	211	BS	75		
MS	44	MS	8	MS	0
PhD	28	PhD	10	PhD	4

O - H - I - O !

**Current data from the College of Engineering*

December 2022 Newsletter

Circulated to people (to all who registered at for Spring and Autumn 2022 meetings) available at http://smartvehiclecenter.org

Smart Vehicle Concepts Center (SVC)
A National Science Foundation
Industry-University Cooperative Research Center

Autumn 2022 15th Annual Project Review and IAB Meeting

Spring 2022 15th Semi-Annual Project Review and IAB Meeting

Accomplishments by SVC Researchers

Vivek wins a Best Poster Award at the Annual MAE Graduate Research Day

Ahmed named associate editor of IEEE TTE

SAE Forest R. McFarland Award

Intellectual Property Generated by SVC Faculty

Inventions Disclosed		US Utility Patents Filed		US Patents Issued	
2022	Historical	2022	Historical	2022	Historical
12	76	13	40	5	13

Publication Summary

Congratulations SVC Graduates!

Bachelor of Science in Mechanical Engineering	
Sylvia Cressman	Divij Prasad
Sajan Patel	Lakshmi Surag Singavarapu
Doctor of Philosophy	
Hongqi Guo	Ismail Nas
Jinha Kwon	Akiva Wernick
Souvik Mukhopadhayay	Gowtham Venkatraman

From Spring 2022 to present
Bold face indicates thesis option

Department of Mechanical & Aerospace

Graduate Student Enrollment
Autumn Semester 2022
MAE Graduate Students

MAE Degrees G		
Summer 2021 - Sp		
Mechanical	283	Aerospace
BS	211	BS
MS	44	MS
PhD	28	PhD

Links to NSF, IUCRC, and (

NSF home page
IUCRC home page
Acoustics & Dynamics Laboratory
Automated Computational Mechanical Laboratory
Center for Automotive Research
Computation Lab for Energy Applied Research (CLEAR)

General Motors	Toyota*
Goodyear*	Transportation Research Center*
Gorman Rupp	TRW Automotive
Honda D&M	US Army (Aberdeen Proving Ground)
Former Students Employed by Academic Institutions:	
Boise State University	MIT Lincoln Laboratory*
IIT Bombay (India)	OSU (post-doctoral researcher)
IIT Delhi (India)	South China University of Technology
IIT Tirupati (India)	Southern Illinois University

SVC Faculty

MARCELO DAPINO
Honda R&D Americas Chair Professor; Director of SVC
Expertise: Smart materials; Nonlinear coupled systems; Design; Control

QADEER AHMED
Assistant Professor
Expertise: Optima and learning based control; Machine learning and data analytics; Health monitoring, fault diagnosis, cybersecurity

MARCELLO CANOVA
Professor
Expertise: Energy optimization and management of ground propulsion systems and hybrid-electric drivetrains

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

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

ARDESHIR CONTRACTOR
Clinical Professor
Expertise: Solar energy; Smart grids; Electric mobility; Renewable energy storage; Material modernization

ANNE CO
Professor
Expertise: Advanced electrocatalytic materials; Nanoporous metals; New energy conversion and storage

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

JUNG-HYUN KIM
Assistant Professor
Expertise: Energy-storage materials and devices; Li-ion materials and systems; Materials synthesis and battery cell fabrication, testing, and characterization

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

SOHEIL SOGHRATI
Associate Professor
Expertise: Advanced FEM; Modeling multiscale response of advanced/biomaterials and structures

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