



2024 NSF ERC BIENNIAL MEETING MEETING PROGRAM

SEPTEMBER 8 – 10, 2024
WESTIN ALEXANDRIA OLD TOWN
ALEXANDRIA, VA



ercbiennial.asee.org

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COOL OFF WITH A DRINK



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- We support discovery and scholarship among education researchers by providing opportunities to share and build upon findings.
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2024 NSF ERC Biennial Meeting Program

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American Society for Engineering Education

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OVERVIEW

Welcome Message

The Engineering Research Centers (ERC) team is pleased to welcome you to the 2024 ERC Biennial Meeting. Because NSF views ERCs as agents of change for academic engineering programs and the engineering community at large, this meeting is an opportunity to share best practices in convergent research, engineering education, engineering workforce development, diversity, culture of inclusion, stakeholders and industrial engagement, team formation, leadership models, and broadening participation. It is also a platform to meet other researchers and network for potential future collaborations among centers. In addition, this is a special year because we celebrate the awarding of new centers. We look forward to your participation and discussions over the next two days.

~~Sandra Cruz-Pol~~
~~Deborah Jackson~~ and The ERC Team
Nadia El-Masry

NSF Staff

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EEC Division Director
Kemi Ladeji-Osias,
EEC Acting Division Director

~~Kemi Ladeji-Osias~~
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Cara Ellis McCarthy, CELL-MET
Anna Hampton, IoT4Ag
Beth Myers, ASPIRE
Scott Ransom, CNT
Keisha Varma, ATP-Bio

THE ERC PROGRAM

The NSF-sponsored ERCs perform convergent research (CR) that leads to strong societal impact. Each ERC has interacting foundational components that go beyond the research project, including engineering workforce development (EWD) at all participant stages, diversity and culture of inclusion (DCI) where all participants gain mutual benefit, and value creation within an innovation ecosystem (IE) that will outlast the lifetime of the ERC. The ERCs are located at universities across the US, each in close partnership with related industries and stakeholders. Each ERC provides an environment in which academe and its partners can collaborate in the pursuit of strategic advances in complex engineered systems and systems-level technologies that have the potential to spawn whole new industries or to radically transform the product lines, processing technologies, or service delivery methodologies of current industries.

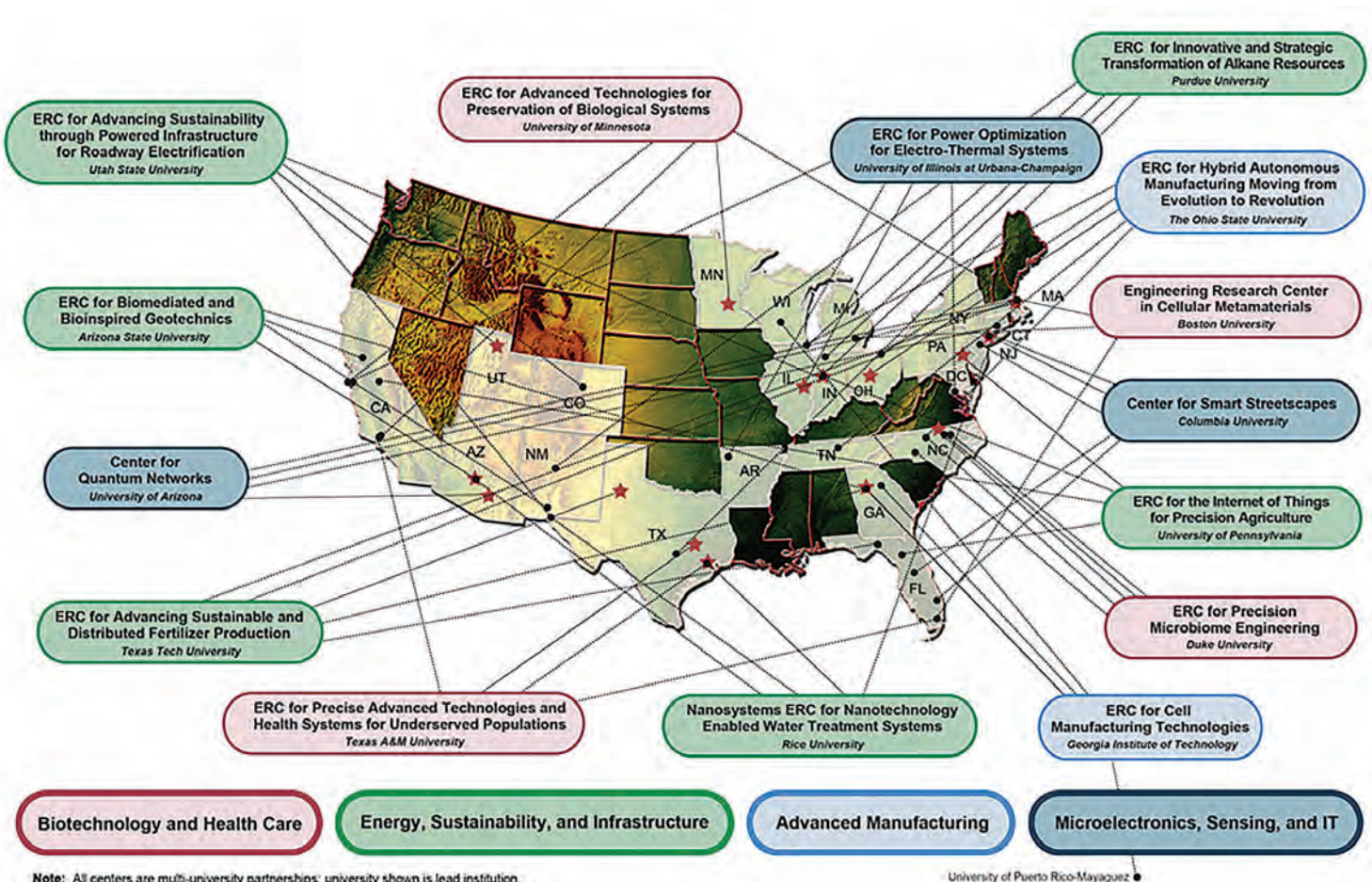
The ERCs operate between the discovery-driven culture of science and the innovation-driven culture of engineering. They provide the intellectual foundation for industry to collaborate with faculty and students on resolving generic, long-range challenges, producing the knowledge base needed for steady advances in technology and a speedy transition to the marketplace. ERC faculty, students,

and partners integrate discovery and learning in an environment that reflects the complexities and realities of real-world technology.

The centers expose prospective students (at all levels) to industrial views to build competence in engineering practice and produce engineering graduates with the depth and breadth of education needed for success in technological innovation and for effective leadership of interdisciplinary teams throughout their careers. ERC innovations in research and education are expected to impact curricula at all levels, from precollege to life-long learning, and to be disseminated to and beyond their academic and industry partners.

ERCs fulfill the NSF's strategic goal of increasing the diversity of the scientific and engineering workforce by including all members of society, regardless of race, ethnicity, or gender, in all aspects of the centers' activities. Because the centers play critical roles in academe by integrating research, education, diversity, outreach, and industrial collaboration, NSF views ERCs as change agents for academic engineering programs and the engineering community at large.

NSF'S FY 2023 ERCS (Lead Institutions and Core Partners)



CENTERS

Advanced Manufacturing Centers

Center for Hybrid Autonomous Manufacturing Moving from Evolution to Revolution (HAMMER)

The Ohio State University; Case Western Reserve University; North Carolina Agricultural and Technical State University; Northwestern University; and the University of Tennessee, Knoxville

<https://hammer.osu.edu/>

HAMMER will accelerate the development and deployment of intelligent, autonomous manufacturing systems, enabling mass customization in local production facilities.

Biotechnology & Health Care

Center for Advanced Technologies for Preservation of Biological Systems (ATP-Bio)

University of Minnesota in partnership with Massachusetts General Hospital; University of California, Berkeley; and University of California, Riverside

<https://www.atp-bio.org/>

ATP-Bio aims to stop biological time by designing methods to cryogenically cool, hold, and rewarm living materials without harm, extending our ability to bank and transport them.

Center for Cell Manufacturing Technologies (CMaT)

Georgia Institute of Technology in partnership with the University of Georgia, the University of Wisconsin-Madison, and the University of Puerto Rico

<http://cellmanufacturingusa.org/>

CMaT's vision is to enable robust, scalable, low-cost biomanufacturing of high-quality therapeutic cells to bring affordable, curative therapies against incurable chronic diseases to everyone.

Center for Cellular Metamaterials (CELL-MET)

Boston University in partnership with Florida International University and the University of Michigan

<http://sites.bu.edu/cell-met/>

CELL-MET aims to transform cardiovascular care by combining breakthroughs in nanotechnology and manufacturing with tissue engineering and regenerative medicine, while also developing areas of expertise in education, diversity, administration, and outreach.

Center for Precise Advanced Technologies and Health Systems for Underserved Populations (PATHS-UP)

Texas A&M University in partnership with Florida International University; Rice University; and the University of California, Los Angeles

<https://pathsup.org/>

PATHS-UP is changing the paradigm for the health of underserved populations by developing revolutionary, cost-effective technologies and systems at the point-of-care.

Center for Precision Microbiome Engineering (PreMiEr)

Duke University, North Carolina Agricultural and Technical State University, North Carolina State University, the University of North Carolina at Chapel Hill, and the University of North Carolina at Charlotte

<https://premier.pratt.duke.edu/>

PreMiEr will create microbiome technologies that address challenges at the interface of human health and the built environment, promoting the proliferation of beneficial microorganisms and preventing colonization by infectious agents.

CENTERS

Energy, Sustainability, & Infrastructure

Center for Advancing Sustainable and Distributed Fertilizer Production (CASFER)

Texas Tech University, Case Western Reserve University, Florida A&M University, the Georgia Institute of Technology, and the Massachusetts Institute of Technology

<https://www.casfer.us>

CASFER will enable resilient and sustainable food production by developing next-generation, modular, distributed, and efficient technology for capturing, recycling, and producing decarbonized, nitrogen-based fertilizers.

Center for Advancing Sustainability through Powered Infrastructure for Roadway Electrification (ASPIRE)

Utah State University in partnership with Purdue University, University of Colorado, and University of Texas at El Paso

<https://aspire.usu.edu/>

ASPIRE seeks to create sustainable, equitable, and widespread electrification of vehicles by creating low-cost, ubiquitous, and worry-free charging.

Center for Bio-mediated and Bio-inspired Geotechnics (CBBG)

Arizona State University in partnership with the Georgia Institute of Technology; New Mexico State University; and the University of California, Davis

<https://cbbg.engineering.asu.edu/>

CBBG employs or mimics natural biological processes and materials to engineer the ground in ways that reduce infrastructure development lifecycle costs and impacts while mitigating natural hazards and environmental degradation.

Center for Innovative and Strategic Transformation of Alkane Resources (CISTAR)

Purdue University in partnership with Northwestern University, the University of New Mexico, the University of Notre Dame, and the University of Texas at Austin

<https://cistar.us/>

CISTAR's vision is to create a transformative engineered system to convert light hydrocarbons from shale resources to chemicals and transportation fuels in smaller, modular, local, and highly networked processing plants.

Center for the Internet of Things for Precision Agriculture (IoT4Ag)

University of Pennsylvania in partnership with Purdue University; University of California, Merced; and the University of Florida

<https://iot4ag.us/>

IoT4Ag seeks to ensure food, energy, and water security with new systems to increase crop production while minimizing energy and water use and environmental impacts of agricultural practices.

Center for Nanotechnology Enabled Water Treatment Systems (NEWT)

Rice University in partnership with Arizona State University, the University of Texas at El Paso, and Yale University

<http://www.newtcenter.org/>

NEWT develops high-performance and easy-to-deploy water treatment systems that will broaden access to clean drinking water from a variety of unconventional sources and enable industrial wastewater reuse at off-grid locations.

Microelectronics, Sensing, & Information Technology

Center for Power Optimization for Electro-Thermal Systems (POETS)

University of Illinois at Urbana-Champaign in partnership with Howard University, Stanford University, and the University of Arkansas

<http://poets-erc.org/>

POETS is improving the electric power density available in tightly constrained mobile environments by integrating novel 3-D cooling circuitry, power converters, and algorithms for smart power management.

Center for Quantum Networks (CQN)

University of Arizona in partnership with Harvard University, the Massachusetts Institute of Technology, and Yale University

<https://cqn-erc.org/>

CQN aims to create the first quantum network with fully error-corrected quantum connectivity over local and global scales by developing key quantum technologies and new functional building blocks that connect quantum processors.

Center for Smart Streetscapes (CS3)

Columbia University in partnership with Florida Atlantic University, Lehman College, Rutgers University, and the University of Central Florida

<https://cs3-erc.org/>

CS3 will forge livable, safe, and inclusive communities through real-time, hyperlocal technologies for streets and their surroundings.



MEETING AGENDA

SUNDAY, SEPTEMBER 8

5:00 PM – 7:00 PM **REGISTRATION**
Inventors Foyer

5:30 PM – 7:30 PM **OPENING NETWORKING RECEPTION**
Foyer DABC

MONDAY, SEPTEMBER 9

7:00 AM – 5:00 PM **REGISTRATION**
Inventors Foyer

7:00 AM – 8:00 AM **BREAKFAST**
Edison DABC

8:00 AM – 8:30 AM **WELCOME AND OPENING REMARKS**
Edison DABC

Don Millard, ENG Deputy Assistant Director, *NSF*

8:30 AM – 9:00 AM **NEW ERC INTRODUCTIONS**
Edison DABC

Kemi Ladeji-Osias, EEC Acting Division Director, *NSF*

9:00 AM – 10:30 AM **BREAKOUT SESSION BY ROLE: PART I**
SHARING SUCCESSES, CHALLENGES, AND BEST PRACTICES

1. Administrative Director – *Bell*
2. Center Director – *Banneker*
3. Diversity and Culture of Inclusion Director – *Wright*
4. Education/ Engineering Workforce Development Director – *Whitney*
5. Evaluator – *Curie*
6. Industrial Liaison Officer – *Hopkins Boardroom*
7. Student/Student Leadership Council – *Jamieson*

10:30 AM – 11:30 AM **NETWORKING BREAK**
Edison DABC

11:00 AM – 12:00 PM **KEYNOTE SESSION I:**
A SYSTEMS APPROACH TO BROADENING PARTICIPATION,
AND WHY IT STILL MATTERS
Edison DABC

Karl Reid, Vice President for Equity & Inclusion, *MIT*

12:00 PM – 1:00 PM **LUNCH**
Edison DABC

MEETING AGENDA

1:00 PM – 2:45 PM **PITCH PERFECT COMPETITION**
Edison DABC

2:45 PM – 3:15 PM **NETWORKING BREAK**
Edison DABC

3:15 PM – 4:45 PM **BREAKOUT SESSIONS BY ROLE: PART II**
DEVELOPING A SET OF BEST PRACTICES FOR NEW AND CONTINUING ERCS

1. Administrative Director – *Bell*
2. Center Director – *Banneker*
3. Diversity and Culture of Inclusion Director – *Wright*
4. Education/ Engineering Workforce Development Director – *Whitney*
5. Evaluator – *Curie*
6. Industrial Liaison Officer – *Hopkins Boardroom*
7. Student/Student Leadership Council – *Jamieson*

4:45 PM – 5:00 PM **DAY 1 WRAP-UP**
Edison DABC

Nadia El-Masry, ERC Program Director, *NSF*

5:00 PM – 6:30 PM **NETWORKING RECEPTION & POSTER SESSION**
Foyer DABC

MEETING AGENDA

TUESDAY, SEPTEMBER 10

7:00 AM – 10:00 AM **REGISTRATION**
Inventors Foyer

7:00 AM – 8:00 AM **BREAKFAST**
Edison DABC

8:00 AM – 8:15 AM **DAY 2 OPENING REMARKS**
Edison DABC

Sandra Cruz-Pol, ERC Program Director, *NSF*

8:15 AM – 9:30 AM **BREAKOUT SESSIONS BY TOPIC**

1. Sustaining and Supporting Students – *Jaimeson*
2. Center Directors, You Got the Award – Now What? – *Ballenger*
3. Effective Practices for Team Science – *Bell*
4. Elevating a Focus on Broader Impacts – *Banneker*
5. Strategies for Engaging with Stakeholders – *Wright*

9:30 AM – 10:30 AM **KEYNOTE SESSION II:
ETHICS AND INTEGRITY OF ERC RESEARCH —
ENGINEERING CULTURES OF SUSTAINABILITY**
Edison DABC

Rosalyn Berne, Anne Shirley Carter Olsson Professor of Applied Ethics, Chair, Department of Engineering and Society and Director, Online Ethics Center for Engineering and Science (OEC), *University of Virginia*

10:30 AM – 11:00 AM **NETWORKING BREAK**
Edison DABC

MEETING AGENDA

11:00 AM – 12:00 PM

**PANEL SESSION:
HOW TO FIND AND SUSTAIN ADDITIONAL FUNDING**

Edison DABC

Veena Misra, Director, NSF Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST), MC Dean Distinguished University Professor, and Department Head, Department of Electrical and Computer Engineering, *NC State University*

Jennifer Seelig, Director of Community Partnerships, *Utah State University*

Johnna Temenoff, Carol Ann and David D. Flanagan Professor, Wallace H. Coulter Department of Biomedical Engineering, *Georgia Tech*

Moderator:

Nadia El-Masry, ERC Program Director, *NSF*

12:00 PM – 1:00 PM

LUNCH

Edison DABC

1:00 PM – 1:30 PM

**KEYNOTE SESSION III:
THE IMPACT OF AI ON THE ECONOMY**

Edison DABC

Hanna Halaburda, Associate Professor of Technology, Operations, and Statistics, Leonard N. Stern School of Business, *NYU*

1:30 PM – 2:15 PM

ROUNDTABLE DISCUSSIONS

Edison DABC

2:15 PM – 3:00 PM

PERFECT PITCH AWARDS, WRAP-UP, EVALUATION SURVEY, AND CLOSING REMARKS

Edison DABC

Speaker:

Susan Margulies, ENG Assistant Director, *NSF*

BREAKOUT SESSIONS BY ROLE DETAILS

Participants will break into two working sessions by ERC role. During the first session, role groups will share and discuss highlights, challenges, solutions, and best practices related to their area. During the second session, role groups will build upon the day's discussions to develop a formalized set of best practices for new and continuing ERCs. Ideas will be documented to strengthen and maintain the collaborative effort..

Breakout Session QR Codes

Administrative Director



bit.ly/ERC24_AD

Center Director



bit.ly/ERC24_CD

Diversity Director



bit.ly/ERC24_DCI

Education Director



bit.ly/ERC24_EWD

Evaluator



bit.ly/ERC24_Eval

Industrial Liaison Officer



bit.ly/ERC24_ILO

Student Leadership Council



bit.ly/ERC24_SLC

KEYNOTE SPEAKERS



Rosalyn Berne
Anne Shirley Carter Olsson Professor,
Applied Science
Chair, Department of Engineering and
Society, School of Engineering and
Applied Sciences
Co-Director, Online Ethics Center for
Engineering and Science
University of Virginia

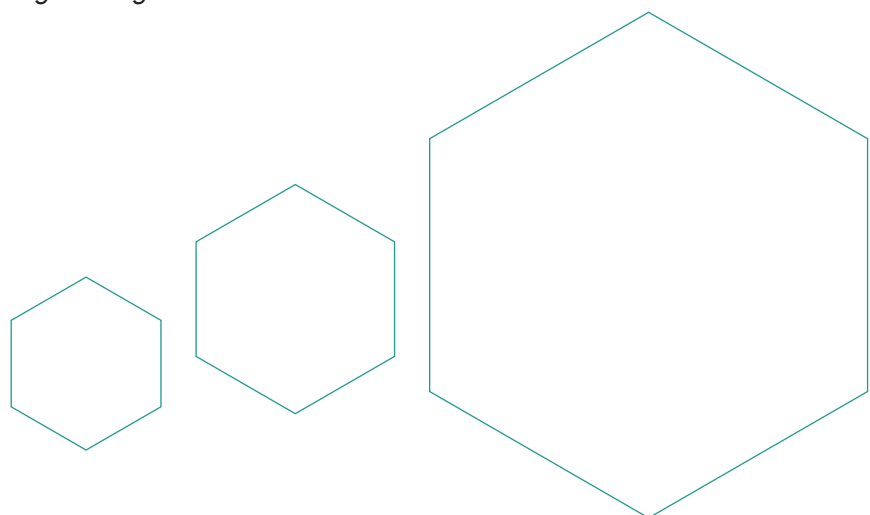
Rosalyn W. Berne, PhD holds the Anne Shirley Carter Olsson Professorship of Applied Ethics and Chairs the Department of Engineering and Society in the School of Engineering and Applied Sciences at the University of Virginia. She also co-directs the Online Ethics Center for Engineering and Science. As an ethics scholar, Berne explores the intersecting realms of emerging and converging technologies, science fiction and myth, and the links between the human and non-human worlds. Her NSF Career Award produced the book-length publication: *Nanotalk: Conversations with Scientists and Engineers about Ethics, Meaning, and Belief in the Development of Nanotechnology* (2006). Berne's other books include *Creating Life from Life: Biotechnology and Science Fiction* (2014); *Waiting in the Silence—a Science Fiction novel* (2012); and the award-winning books *When the Horses Whisper* (2013) and *Waking to Beauty* (2016). Forthcoming is her edited volume: *Animals, Ethics and Engineering* (2024). During a leave of absence from UVA, Dr. Berne served as Director of the Center for Engineering Ethics and Society at the National Academy of Engineering. She is a current member of the National Academies' Committee on Geological and Geotechnical Engineering, and the Ethics Committee of the American Society for Engineering Education. Recently she has served as adviser to the Kern Family Foundation KEEN (Kern Engineering Entrepreneurship Network) *Educating the Whole Engineer: Engineering Fundamentals, Character Education, and Entrepreneurial Mindset* and to the Lemelson Foundations' *Engineering One Planet* project, and as a standing council member of the NSF-funded *Engineering Research Visioning Alliance* (ERVA).



Hanna Halaburda
Associate Professor of Technology,
Operations, and Statistics
Leonard N. Stern School of Business
New York University

Hanna Halaburda joined New York University Stern School of Business as an Associate Professor of Technology, Operations and Statistics in September 2019. In her research, Professor Halaburda studies how technology changes economic forces and thus affects business models and interactions in the marketplace. One strand of her work focuses on competition between digital platforms. Since 2011, she has built a research program in digital currencies and blockchain technologies, including analyses of incentives in consensus protocols, cryptocurrency adoption, smart contracts, and token issuance. Professor Halaburda's work has been published in *Management Science*, *RAND*, *American Economic Journal*, *Games and Economic Behavior*, and other academic journals. In 2015 she co-authored *Beyond Bitcoin: The Economics of Digital Currency*, the first book analyzing digital currencies from the economic perspective. The book's 2nd edition, co-authored with Miklos Sarvary and Guillaume Haeringer, was published by Palgrave Macmillan in 2022.

Prior to joining NYU Stern, Professor Halaburda was an Assistant Professor at Harvard Business School, and a senior economist at the Bank of Canada. She holds Master's degrees in Economics from the Warsaw School of Economics and in Philosophy from Warsaw University, and a PhD in Economics from Northwestern University.



KEYNOTE SPEAKERS



Veena Misra

Director, NSF Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST)
MC Dean Distinguished University Professor Head, Department of Electrical and Computer Engineering
NC State University

Veena Misra is the Director of the NSF Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST). She received her Bachelor's, Master's, and Ph.D. from NC State University in electrical engineering in 1991, 1992, and 1995, respectively. After working at the Advanced Products Research and Development Laboratories, Motorola Inc. in Austin, TX, she joined the North Carolina State University faculty in 1998.

She has authored or co-authored over 150 papers in the areas of state-of-the-art low-power CMOS devices, power devices, alternative high-mobility substrates, nanoscale magnetics, and energy harvesting. Misra received the 2001 NSF CAREER Award, the 2011 Alcoa Foundation Engineering Research Achievement award, and most recently the 2022 Holladay Medal for Excellence. She was also named to serve on the Microsystems Exploratory Council for Defense Advanced Research Projects Agency in 2022. In 2024, Misra was named as the tenth Department Head for Electrical and Computer Engineering at NC State.



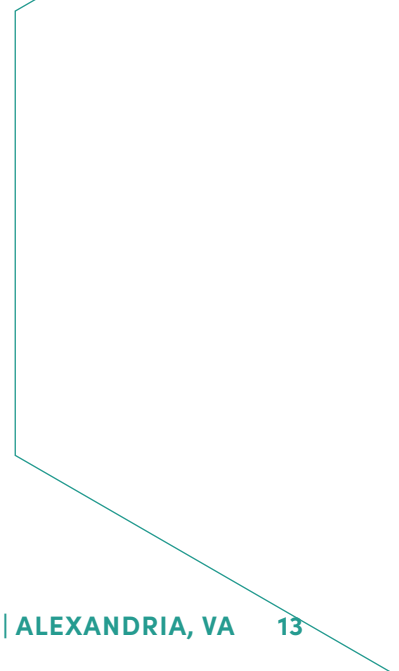
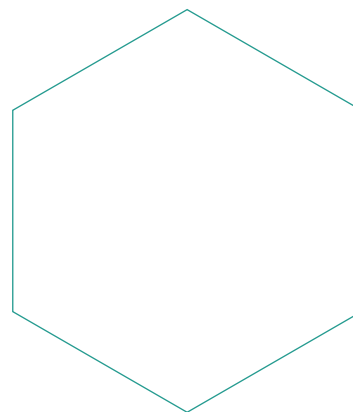
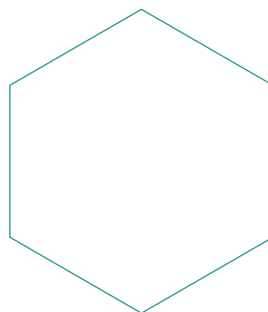
Karl Reid

Vice President for Equity and Inclusion
Massachusetts Institute of Technology

Dr. Karl Reid is the inaugural Vice President for Equity and Inclusion at MIT where he leads the Institute's Community and Equity Office. A certified diversity professional (CDP), he also serves as the co-PI for the NSF INCLUDES Engineering

PLUS Alliance. Prior to returning to his alma mater in March 2024 to assume this new role, he served as the Senior Vice Provost and Chief Inclusion Officer at Northeastern University. He also held the title of Professor of Practice in the Graduate School of Education.

Dr. Reid came to Northeastern from the National Society of Black Engineers (NSBE), where he served as Executive Director and co-founder of the NSF-funded 50k Coalition, a national effort designed to increase the representation of women and BIPOC students in engineering. He joined NSBE from the United Negro College Fund (UNCF), where he held the title of Senior Vice President for Research, Innovation and Member College Engagement. In a previous stint at MIT, Dr. Reid was an Associate Dean of Undergraduate Education and the Executive Director of Engineering Outreach Programs for the School of Engineering, after spending 12 years in product and project management in the tech industry. He holds bachelor's and master's degrees in Materials Science and Engineering from MIT, and a doctorate in education from Harvard University.



KEYNOTE SPEAKERS



Jennifer Seelig
Director of Community Partnerships
Utah State University

Jennifer Seelig leads Utah State University's (USU) Institute of Government and Politics. Jennifer works closely with ASPIRE, a National Science Foundation (NSF) Generation 4 Engineering Research Center (ERC) that conducts vital R&D to pave the way for real-world deployment to improve the health and quality of life for everyone by catalyzing sustainable and equitable electrification across the transportation industries. Jennifer has been involved in politics and public service for three decades at a policy-making and leadership level in both the private and public sectors for such entities as the City of Salt Lake, the Utah League of Cities and Towns, and 1-800 CONTACTS. Jennifer was elected by District 23 residents in November of 2006 to the Utah House of Representatives. In 2012, her caucus colleagues elected her House Minority Leader - the first female in Utah's history to serve in this role.

She retired from elected office in 2015 to finish her PhD in Political Science - which was completed in the fall of 2018 from the University of Utah. She additionally has a Master of Public Administration degree from the University of Utah and a BA in English from the University of Louisville.



Johnna Temenoff
Carol Ann and David D. Flanagan
Professor
Coulter Department of Biomedical
Engineering
Georgia Tech/Emory University

Dr. Johnna S. Temenoff is the Carol Ann and David D. Flanagan Professor the Coulter Department of Biomedical Engineering at Georgia Tech/Emory University. She is also currently the Director of the NSF Engineering Research Center in Cell Manufacturing Technologies (CMaT) and the Director of the Marcus Center for Therapeutic Cell Characterization and Manufacturing (MC3M). Scientifically, Dr. Temenoff is interested in scaling culture of therapeutic cells and tailoring the molecular interactions between glycosaminoglycans and proteins/cells for use in regenerative medicine applications. Her laboratory focuses primarily on promoting repair after injuries to the tissues of the shoulder, including cartilage, tendon, and muscle.

Dr. Temenoff has been honored with several prestigious awards, such as the NSF CAREER Award, Arthritis Foundation Investigator Award, and Society for Biomaterials (SFB) Clemson Award for Contributions to the Literature, and was named to the College of Fellows of the American Institute for Medical and Biological Engineers (AIMBE), as a Fellow of the Biomedical Engineering Society (BMES), as a Fellow of the International Academy of Medical and Biological Engineering (IAMBE) and as a Fellow of Biomaterials Science and Engineering, International Union of Societies for Biomaterials Science and Engineering (IUSBSE).

She has co-authored a highly successful introductory textbook - *Biomaterials: The Intersection of Biology and Materials Science*, by J.S. Temenoff and A.G. Mikos (now in a 2nd edition), for which Dr. Temenoff and Dr. Mikos were awarded the American Society for Engineering Education's Meriam/Wiley Distinguished Author Award for best new engineering textbook.

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