2022 NSF ERC BIENNIAL MEETING

SEPTEMBER 20 – 21, 2022
DOUBLE TREE BY HILTON
CRYSTAL CITY, ALEXANDRIA, VA

ercbiennial.asee.org

The material in this participant booklet is based upon work supported by the National Science Foundation (NSF) under award number EEC- 1748840.

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NSF Engineering Research Center Biennial Meeting Program

American Society for Engineering Education
1818 N Street NW, Suite 600
Washington, DC 20036

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OVERVIEW

Welcome Message

The Engineering Research Centers (ERC) team is pleased to welcome you to the 2022 ERC Biennial Meeting. Because the National Science Foundation (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 very special year because we celebrate the culmination and achievements of seven graduating centers and the addition of four new ones. We look forward to your enthusiastic participation and discussions over the next two days.

Sandra Cruz-Pol
Deborah Jackson
and The ERC Team

National Science Foundation Staff

José Zayas-Castro
NSF EEC Division Director

Nadia El-Masry
Acting EEC Deputy Division Director

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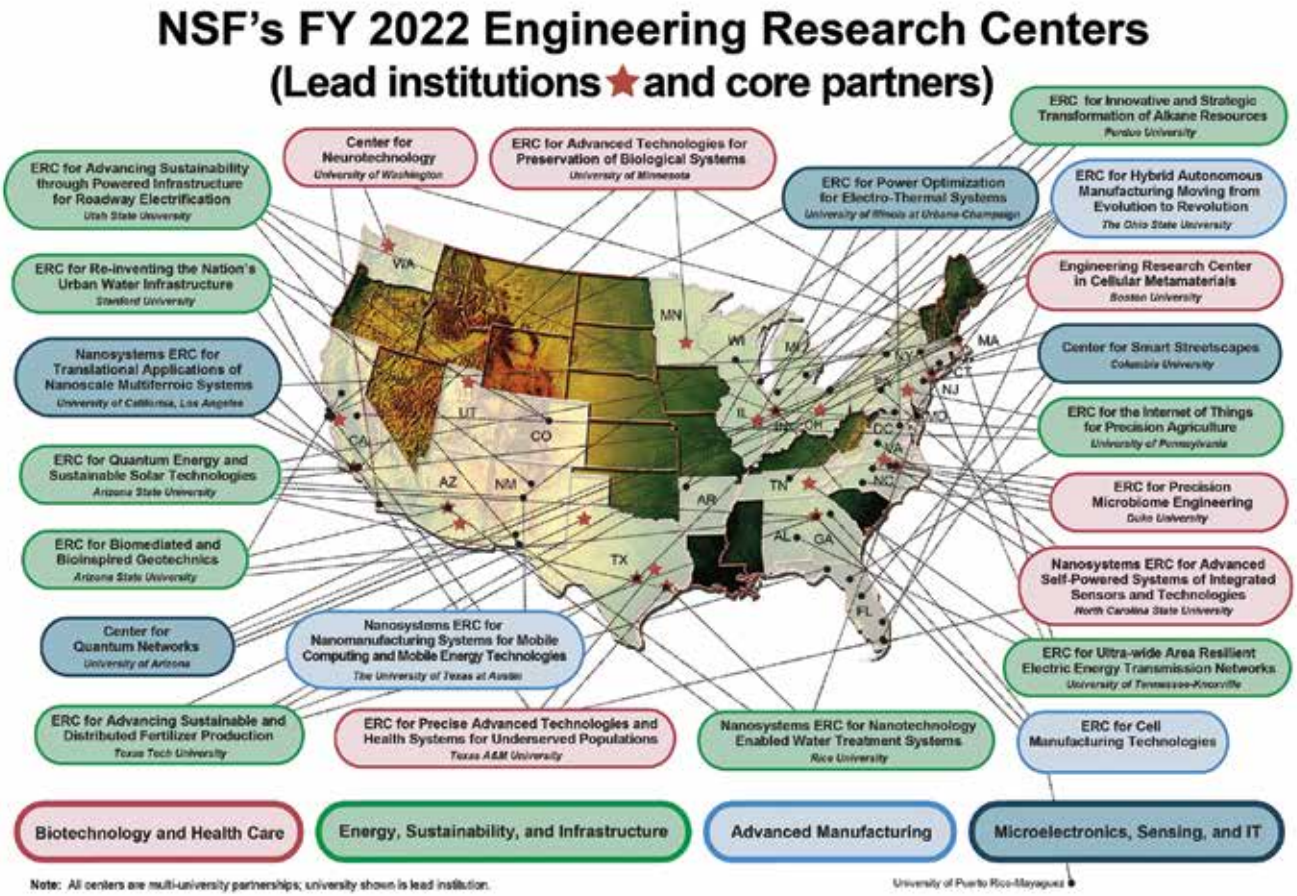
Candice Byrd, *ASSIST*
Jean Larson, *CBBG*
Mehrad Mortazavi, *IoT4Ag*
Scott Ransom, *CNT*
Ramin Sabbagh, *NASCENT*
Delia Saenz, *CBBG*

THE ERC PROGRAM

The National Science Foundation–sponsored Engineering Research Centers (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 United States, 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 in order 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.



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.

Center for Nanomanufacturing Systems for Mobile Computing and Energy Technologies (NASCENT)

University of Texas at Austin in partnership with the University of California, Berkeley; and the University of New Mexico

https://www.nascent-erc.org

NASCENT is creating high throughput, reliable, and versatile nanomanufacturing systems that will revolutionize future-generation mobile computing and energy devices.

Biotechnology and Health Care

Center for Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST)

North Carolina State University in partnership with Florida International University, Pennsylvania State University, the University of Michigan, The University of North Carolina at Chapel Hill, and the University of Virginia

http://assistcenter.org/

ASSIST harnesses nanotechnology to improve global health by enabling correlation between personal health and personal environment and by empowering patients and doctors to manage wellness and improve quality of life.

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, Mayagüez

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 Neurotechnology (CNT)

University of Washington in partnership with the Massachusetts Institute of Technology and San Diego State University

http://www.centerforneurotech.org/

The CNT seeks to identify the engineering principles of neural movement control and sensory processing to enable a new generation of robust, adaptive, closed loop, sensorimotor devices that interact with human nervous systems.

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.

Energy, Sustainability, and 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.

Center for Re-Inventing the Nation's Urban Water Infrastructure (ReNUWIt)

Stanford University in partnership with the University of California, Berkeley; Colorado School of Mines; and New Mexico State University

http://www.renuwit.org/

ReNUWIt advances new strategies for urban water systems, enabled by technological advances and informed by a deeper understanding of institutional frameworks, to achieve more sustainable solutions to urban water challenges.

Center for Ultra-wide Area Resilient Electric Energy Transmission Networks (CURENT)

University of Tennessee–Knoxville in partnership with Northeastern University, Rensselaer Polytechnic Institute, and Tuskegee University (cofunded with DOE)

http://curent.utk.edu/

CURENT is developing a nationwide transmission grid that is fully monitored and dynamically controlled for high efficiency, high reliability, low cost, better accommodation of renewable sources, full utilization of storage, and responsive load.

Center for Quantum Energy and Sustainable Solar Technologies (QESST)

Arizona State University in partnership with the California Institute of Technology, the University of Delaware, the Massachusetts Institute of Technology, and the University of New Mexico (cofunded with DOE)

http://qesst.asu.edu/

QESST seeks to transform the existing electricity generation system, making it sustainable, ubiquitous, and multifunctional, by developing photovoltaic and quantum energy converters, which fundamentally alter how energy is used.

Microelectronics, Sensing, and 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

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

Center for Translational Applications of Nanoscale Multiferroic Systems (TANMS)

University of California, Los Angeles in partnership with California State University, Northridge; Cornell University; Northeastern University; the University of California, Berkeley; and the University of Texas at Dallas

http://www.tanms-erc.org/

TANMS works to engineer a revolution in miniature electromagnetic electronics through the development of a new class of nanoscale multiferroic materials.

MEETING PROGRAM

TUESDAY, SEPTEMBER 20

7:00 AM – 5:30 PM	**REGISTRATION** *Crystal Ballroom Foyer*
7:00 AM – 8:00 AM	**CONTINENTAL BREAKFAST** *Salon CDE*
8:00 AM – 8:15 AM	**WELCOME AND INTRODUCTION** *Salon AB* **José Zayas-Castro,** Division Director, Division of Engineering Education and Centers, National Science Foundation
8:15 AM – 8:30 AM	**OPENING REMARKS** *Salon AB* **Susan Margulies,** Assistant Director, Directorate for Engineering, National Science Foundation
8:30 AM – 9:30 AM	**KEYNOTE 1** *Salon AB* **Curtis R. Carlson, PhD,** Distinguished Executive in Residence, Worcester Polytechnic Institute, Professor of Practice, Northeastern University, President and CEO SRI International, 1998–2014
9:30 AM – 10:00 AM	**NEW ERC INTRODUCTIONS** *Salon AB*
10:00 AM – 10:45 AM	**BREAK** *Salon CDE*
10:45 AM – 11:45 AM	**PANEL: ERC POST-GRADUATION SUSTAINABILITY** *Salon AB* Panelists: **Deborah Jackson,** NSF ENG/EEC Program Director **Sarit Bhaduri,** NSF ENG/EEC Program Director **Rajesh Rao,** Center Director, CNT
11:45 AM – 1:15 PM	**WORKING LUNCH** *Salon CDE*
1:15 PM – 2:15 PM	**KEYNOTE 2** *Salon AB* **Calvin Mackie, PhD,** President and CEO, STEM NOLA

MEETING PROGRAM

TUESDAY, SEPTEMBER 20

2:15 PM – 2:45 PM	**BREAK** *Salon CDE*
2:45 PM – 3:45 PM	**BREAKOUT SESSION 1** **Administrative Directors** *Harrison* **Center Directors** *Wilson* **Diversity Directors** *Jackson* **Education Directors** *Madison* **Industrial Liaison Officers** *Van Buren* **Student Leadership Council** *Monroe*
3:45 PM – 4:45 PM	**PRESENTATION OF BREAKOUT SUMMARIES** *Salon AB*
4:45 PM – 5:00 PM	**WRAP-UP** *Salon AB* **José Zayas-Castro,** Division Director, Division of Engineering Education and Centers, National Science Foundation
5:00 PM – 7:00 PM	**NETWORKING RECEPTION AND POSTER SESSION** *Lincoln Hall Ballroom*

MEETING PROGRAM

WEDNESDAY, SEPTEMBER 21

7:00 AM – 5:30 PM	**REGISTRATION** *Crystal Ballroom Foyer*
7:00 AM – 8:00 AM	**CONTINENTAL BREAKFAST** *Salon CDE*
8:00 AM – 8:15 AM	**WELCOME AND OPENING REMARKS** *Salon AB* **Nadia A. El-Masry,** Deputy Division Director (Acting), Division of Engineering Education and Centers, National Science Foundation
8:15 AM – 9:15 AM	**KEYNOTE 3** *Salon AB* **Naomi Halas, PhD,** Stanley C. Moore Professor of Electrical and Computer Engineering at Rice University
9:15 AM – 10:15 AM	**PANEL: FOUR FOUNDATIONAL COMPONENTS** *Salon AB* Panelists: **Gerry Cote,** Center Director, PATHS-UP **Saikat Guha,** Center Director, CQN **Fabio Ribeiro,** Center Director, CISTAR **Regan Zane,** Center Director, ASPIRE
10:15 AM – 10:30 AM	**BREAK** *Salon CDE*
10:30 AM - 12:00 PM	**PERFECT PITCH COMPETITION** *Salon AB*
12:00 PM – 1:00 PM	**WORKING LUNCH** *Salon CDE*
1:00 PM – 2:00 PM	**KEYNOTE 4** *Salon AB* **Kamran Elahian,** High-Tech Entrepreneur with Four Unicorn IPOs

MEETING PROGRAM

WEDNESDAY, SEPTEMBER 21

2:00 PM – 3:30 PM	**BREAKOUT SESSION 2** **ERCs Unite! Collaborative Evaluation and the Multi-ERC Instrument Inventory** *Harrison* **IUCRC Overview** *Wilson* **Financial Structure and Management of an ERC** *Madison* **The Art and Science of Building Community** *Jackson* **Using Mentoring Contracts in ERCs** *Van Buren*
3:30 PM – 4:00 PM	**BREAK AND EVALUATION** *Salon CDE*
4:00 PM – 4:15 PM	**WRAP-UP AND CLOSING REMARKS** *Salon AB* **Don Millard,** Deputy Assistant Director, Directorate for Engineering, National Science Foundation
4:15 PM – 4:30 PM	**ACKNOWLEDGEMENTS** *Salon AB*
5:30 PM – 8:00 PM	**GRADUATION CEREMONY, PERFECT PITCH AWARDS, AND POSTER SESSION** *Washington Ballroom* **Susan Margulies,** Assistant Director, Directorate for Engineering, National Science Foundation Video from **Sethuraman Panchanathan,** Director, National Science Foundation

BREAKOUT SESSION 1 DESCRIPTION

Best Practices: Sharing Success Stories, Challenges, and Solutions Across ERC Communities

Participants will break into working sessions by ERC role to share and discuss highlights, challenges, solutions, and best practices related to their area. Ideas will be documented to strengthen and maintain the collaborative effort.

Breakout Session 1 QR Codes

Administrative Directors

https://tinyurl.com/BestPracticesAD

Education Directors

https://tinyurl.com/BestPracticesEWD

Center Directors

https://tinyurl.com/BestPracticesDirectors

Industrial Liaison Officers

https://tinyurl.com/BestPracticesILO

Diversity Directors

https://tinyurl.com/BestPracticesDEI

Student Leadership Council

https://tinyurl.com/BestPracticesSLC

BREAKOUT SESSION 2 DESCRIPTIONS

ERCs Unite! Collaborative Evaluation and the Multi-ERC Instrument Inventory

Jean Larson, Education Director, CBBG; **Adam Carberry,** ASU Education Lead, NEWT; **Megan O'Donnell,** Evaluator, CBBG/QESST; **Gillian Roehrig,** Education Director, ATP-Bio; **Michelle Jordan,** Education Director, QESST

Participants will engage with the Multi-ERC Instrument Inventory's (MERCII) suite of instruments designed to quantitatively and qualitatively evaluate ERCs. The new MERCII online platform (mercii.org) will also be on display for testing and sign-up. Participants are encouraged to bring their laptop to participate fully in this session.

IUCRC Overview

Behrooz Shirazi, IUCRC Program Officer, Directorate for Engineering, National Science Foundation; **Scott Ransom,** Industrial Liaison Officer, CNT

The NSF IUCRC program generates breakthrough research by enabling close and sustained engagement between industry innovators, world-class academic teams, and government agencies. Attendees at this workshop will hear from the NSF IUCRC program managers about these unique centers and how they can collaborate with ERCs as part of a sustainability plan or as stand-alone collaboration opportunities.

Financial Structure and Management of an ERC

Candice Byrd, Administrative Director, ASSIST;
Tsai-Tsai O-Lee, Administrative Director, TANMS

During this presentation style session, two experienced Administrative Directors from graduating centers will lead discussions surrounding the establishment and management of the financial structure of an ERC. Topics to include but may expand beyond the following: 1) types of funding, 2) examples of funding allocation methods, 3) annual reporting requirements, 4) establishing expectations from all ERC participants.

The Art and Science of Building Community

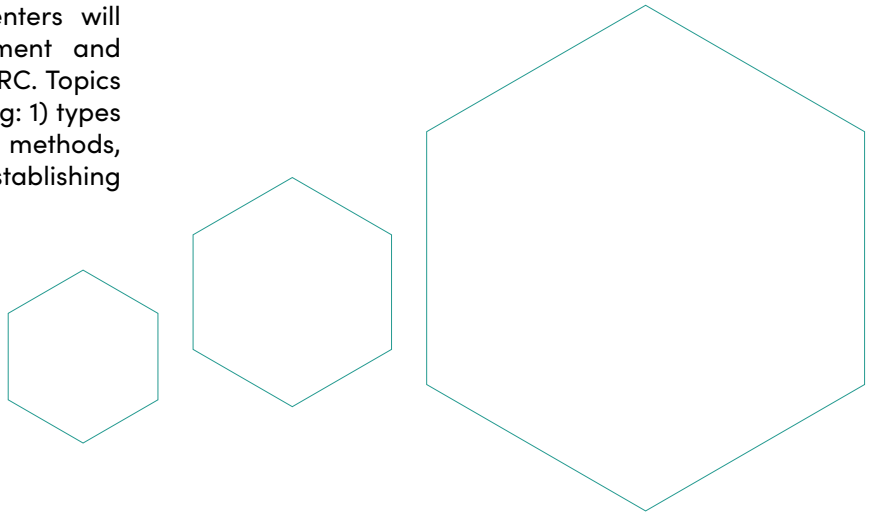
Delia Saenz, Director, Culture of Inclusion, CBBG

Psychological and organizational sciences define a group as two or more persons who share a common goal, interact with regular frequency, evince interdependence, and experience a sense of belonging/community. Groups that foster a sense of community accrue benefits in terms of member well-being and enhanced group productivity. Thus, it behooves ERCs to find ways to build and sustain community. The alternative—a collective of individuals with different social identities, task foci, and roles, who do not intentionally address belonging—negates the potential synergy that can be cultivated. Following a brief framing of the process and outcomes of building community, this session will comprise a discussion of practices that have been used effectively by different ERCs to foster a sense of belonging. Special attention will be paid to pandemic-related and current challenges.

Using Mentoring Contracts in ERCs

Jennifer Chandler, Director for Diversity and Leadership, CBBG; **Ky'la Sims,** Student Leadership Council, ASPIRE

Mentoring contracts are agreements developed by the mentor and the mentee that specify important details for the mentoring relationship. Mentoring contracts 1) build mutual trust and respect, 2) foster effective communication, 3) address the imbalance of power, and 4) discuss, negotiate, and set expectations. This session allows participants to roleplay the creation of a mentoring contract.



KEYNOTE SPEAKERS

Curtis R. Carlson
Distinguished Executive in Residence, Worcester Polytechnic Institute

Professor of Practice, Northeastern University

President and CEO, SRI International: 1998–2014

As CEO of SRI International from 1998 to 2014, SRI became a global model for the creation of major innovations, including HDTV, Intuitive Surgical, and Siri, now on the iPhone. His teams won two Emmys, including one for HDTV.

He served on: President Obama's National Advisory Council on Innovation and Entrepreneurship; Scientific Advisory Board of Singapore; NSF Engineering Advisory Committee; SAB for the U.S. Air Force; and Taiwan's National SAB. He helped write the NAE report for NSF on "A New Vision for Center Based Research."

He is a Fellow of the National Academy of Inventors. He won the Otto Schade Prize for his basic imaging research from the Society for Information Display. Honors include the WPI Hall of Luminaries, Suffolk University Global Leadership in Innovation Award, and four honorary degrees.

He wrote with William Wilmot, *Innovation,* selected by *BusinessWeek* as a Top-10 Business Book.

Carlson's BS is in physics from WPI with a PhD in aerospace engineering from Rutgers University. He previously worked for RCA and GE before SRI. His basic research is in image quality, imaging, and video.

Calvin Mackie
President and CEO, STEM NOLA

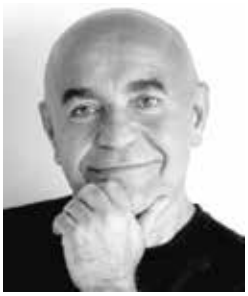
Dr. Calvin Mackie is an award-winning mentor, inventor, author, former engineering professor, internationally renowned speaker, and successful entrepreneur. Dr. Mackie is the founder of STEM NOLA, a non-profit organization founded to expose, inspire, and engage communities about the opportunities in STEM. In 7 years, STEM NOLA has engaged over 50,000 mostly low-income low-resourced K-12 students in hands-on project-based STEM activities in New Orleans communities.

Mackie graduated from Morehouse College earning a BS in Mathematics in 1990 and was simultaneously awarded a BS in Mechanical Engineering from Georgia Tech, where he subsequently earned his Master's and Ph.D. in Mechanical Engineering in 1996. He served on the engineering faculty at Tulane University for 12 years. Mackie has won numerous awards including the 2003 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring in a White House ceremony and currently serves on the Louisiana STEM (LA-STEM) advisory council.

KEYNOTE SPEAKERS

Naomi J. Halas
Stanley C. Moore Professor of Electrical and Computer Engineering at Rice University

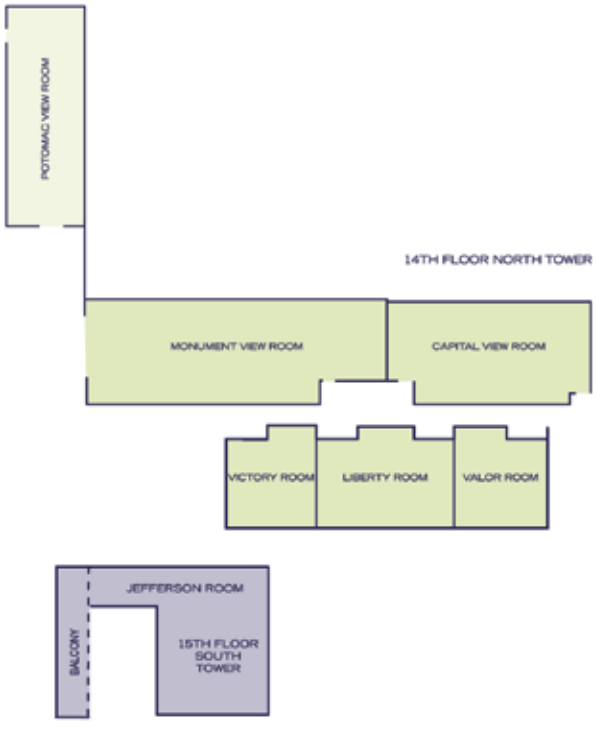
Naomi J. Halas is the Stanley C. Moore Professor of Electrical and Computer Engineering at Rice University, with faculty appointments in Physics and Astronomy, Chemistry, Materials Science and Nanoengineering, and Bioengineering. She received her BS degree in Chemistry from La Salle University in Philadelphia and her PhD in Physics from Bryn Mawr College. She was a graduate fellow at IBM in Yorktown, NY for her PhD research and a postdoctoral fellow at AT&T Bell Laboratories prior to joining Rice. She has been a pioneer in demonstrating that the geometry of metallic nanoparticles determine their optical properties, pursuing fundamental studies in plasmonics and nanophotonics, as well as applications of nanophotonics ranging from biomedicine to photocatalysis to water treatment. She is the author of more than 350 refereed publications with more than 80,000 citations (Web of Science), has more than 25 issued patents, and has presented more than 600 invited talks. Two companies have been founded based on her research: Nanospectra Biosciences (Photothermal Cancer Therapy for prostate cancer) and Syzygy Plasmonics (low-temperature photocatalysis for sustainable fuels). Halas has been elected to the National Academies of Sciences and Engineering, the Royal Society of Chemistry (UK), and the American Academy of Arts and Sciences.



Kamran Elahian
High-Tech Entrepreneur with Four Unicorn IPOs

Kamran is Founder and Chairman of Global Innovation Catalyst, LLC and advises various governments on the needed transition from fossil-based economies to sustainable innovation economies. In the past, as a global high-tech entrepreneur, he cofounded 10 companies. Four of them were unicorn IPOs with a total market cap of over $12 billion. For 15 years, he was Chairman of Global Catalyst Partners, a global VC firm ($350 million under his management) with investments in the U.S., Japan, China, India, Israel and Singapore. Underlying his vision for global philanthropy is the conviction that modern Information and Communication Technologies (ICT) can be instrumental in dissolving barriers between nations and bridging the social and political differences among people. This vision was reflected in Schools-Online, a nonprofit he cofounded in 1996 to connect the world, one school at a time (6,400 schools in 36 countries were provided with computers and access to the Internet) and merged with Relief International in 2003; Global Catalyst Foundation, cofounded in 2000 to improve lives through effective education and youth empowerment (with special emphasis on young women) using the leverage of ICT; and UN-GAID, a United Nations global forum that promotes ICT in developing countries where he served as Co-Chairman (2009-2011).

VENUE FLOOR PLANS



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ercbiennial.asee.org