

# NASA EPSCoR Research for LaRC

Thursday, January 27, 2022 | 3:00 pm – 4:30 pm Eastern

Virtual participation via Microsoft Teams

[Meeting Link](#)

## Agenda

*All times are EASTERN U.S. time zone*

3:00 pm	Welcome and Summary of Meeting Objectives	T. G. Guzik
3:02 pm	Welcome and Introduction to LaRC Research Priorities	N. M. Abreu
3:07 pm	Introduction to EPSCoR and the NASA EPSCoR Program	T. G. Guzik

### EPSCoR Researcher Flash Presentations

3:20 pm **Intelligent Flight Systems & Trusted Autonomy:**  
*Smart cities, automation, robotics*

Robotic In-Situ Resource Utilization

**Orion Lawlor (AK)**

Decentralized Formation Control of Teams of Autonomous Agents

**Marcio de Quieroz (LA)**

Scalable and Robust Multiagent Reinforcement Learning for Robot Swarms

**Chuangchuang Sun (MS)**

Q&A (4 minutes)

3:30 pm **Systems Analysis and Concepts:**

*Air transportation system architectures and vehicle concepts*

Conceptual Design and Analysis of Aerobot for Long-Endurance Mission on  
Venus

**Andreas Gross (NM)**

Multiphase High Voltage Electrified Propulsion for Spacecrafts/Aircrafts

**Omid Beik (ND)**

Q&A (4 minutes)

- 3:38 pm**    **Advanced Materials & Structural Systems:**  
*Advanced manufacturing*
- Enhanced Planetary Protection via Additive Manufacturing of Internal Structures with Integrated Mechanical and Energetic Properties for End-of-Mission Sterilization  
**Travis Walker (SD)**
- Robotic Walking Machines for Automated Additive Manufacturing, Surface Exploration & ISRU  
**Pierre Larochelle (SD)**
- Laboratory for Advanced Materials  
**Jihong Ma (VT)**
- Stochastic Modeling for Advanced Manufacturing: Machine Learning and Statistical Modeling  
**Pejman Tahmasebi (WY)**
- Soft Robotics and Advanced Manufacturing  
Q&A (4 minutes)  
**Kwang Kim (NV)**
- 3:52 pm**    Ten-minute break in virtual meeting.  
Resume at 4:02 pm eastern.
- 4:02 pm**    **Entry, Decent & Landing:**  
*Robotic mission entry vehicles*
- Modeling, Learning, and Control for Autonomy and Human-Robot Collaboration Systems  
**Yue Wang (SC)**
- Experimental Aerodynamics Laboratory  
Q&A (4 minutes)  
**Vibhav Durgesh (ID)**
- 4:10 pm**    **Terrestrial and Planetary Atmospheric Sciences:**  
*Air quality, properties of clouds, winds, aerosols, water vapor, trace gases, climate change*
- Measuring Aerosol Chlorides for Atmospheric Corrosion Studies in Arctic Climate  
**Raghu Srinivasan (AK)**
- Clemson Air Quality Lab  
Q&A (4 minutes)  
**Andrew Metcalf (SC)**



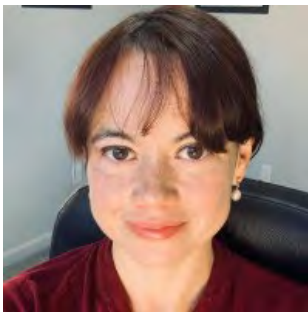
## Speakers for the 2022 NASA EPSCoR Research for LaRC in order of appearance

### **T. Gregory Guzik**



T. Gregory Guzik is the Director of the Louisiana Space Grant / NASA EPSCoR program. His scientific career has focused on astrophysical energetic particles including large class cosmic ray balloon instruments launched as long duration balloon flights in Antarctica, heavy ion particle accelerator experiments, cosmic ray instruments on-board satellites, and is part of an international collaboration working with the CALET high energy cosmic ray instrument on-board the International Space Station. Dr. Guzik has been directly involved with Space Grant and NASA EPSCoR for close to 20 years including developing and managing both entry-level and advanced experiential student ballooning programs. Dr. Guzik currently serves as the Chair of the NASA EPSCoR Caucus.

### **Neyda Abreu**



Neyda Abreu is the Senior Advocate for Science and Research at NASA Langley Research Center. Dr. Abreu aims at supporting scientists and researchers to do their best work. Experienced Scientist with a demonstrated history of working in Earth and Planetary Sciences and Materials. Interested in Sustainable Exploration of Space and Strategy.

## **Orion Lawlor**



Dr. Orion Lawlor is an associate professor of computer science at the University of Alaska Fairbanks, with research interests spanning autonomous robotics, computer graphics, ISRU manufacturing, and smart geospatial data to support autonomous robotic construction and maintenance in remote places. Dr. Lawlor has won cash prizes at the NASA Break The Ice lunar permafrost mining challenge (Phase 1), NASA 3D Printed Habitat Challenge (Phases 1 & 2), Mars Society city-state design competition with Nexus Aurora, and has participated regularly in the NASA Robotic Mining Contest.

## **Marcio de Queiroz**



Marcio de Queiroz is a Professor of Mechanical Engineering at LSU. He's the director of the iCORE Lab and coordinator for the Robotics Engineering minor. His research expertise is at the intersection of systems theory, control engineering, and robotics. Since 2011, Dr. Queiroz's primary area of activity has been coordination control of multiple autonomous robotic vehicles. Such systems are intrinsic to missions that involve air traffic management, search and rescue, area coverage, perimeter protection, or co-transportation of large objects. The iCORE Lab is home to TIGER Square, an experimental testbed for multi-agent systems, which uses small, low-cost, custom-built, differential-drive robots as the mobile robot platform. The testbed can be operated in both centralized and decentralized modes of sensing, communication, and control.

## **Chuangchuang Sun**



Dr. Chuangchuang Sun is an assistant professor in the aerospace engineering department at Mississippi State University since August 2021. Prior to that, he was a postdoctoral associate at MIT (2019-2021) and Boston University (2018-2019). He received his Ph.D. in August 2018 from the Ohio State University and a B.S. degree from the Beijing University of Aeronautics and Astronautics, China in 2013, both in Aerospace Engineering. His research interests focus on control, optimization, reinforcement learning with applications in robotics and aerospace systems.

## Andreas Gross



Andreas Gross graduated with a M.S. degree in Aerospace Engineering from the University of Stuttgart in 1997. His Ph.D. research was concerned with the frozen, equilibrium, and non-equilibrium flow through rocket motor nozzles and earned him a doctorate degree from the University of Aachen in 2002. From 2003 to 2013 he worked as a postdoc and then Assistant Research Professor at the University of Arizona on research topics involving large-eddy simulations, Reynolds-averaged Navier-Stokes calculations, data modal analysis, reduced order modeling, scaled model flight research, autonomous soaring, and renewable energy. In 2014 he joined the aerospace faculty at New Mexico State University. In 2019 he was promoted to Associate Professor. Gross is an AIAA Associate Fellow and serves as faculty advisor for the AIAA student chapter and Design/Build/Fly team. Gross holds a private pilot certificate (single engine land and glider).

## Omid Beik



Omid Beik received the Ph.D. degree in electrical and computer engineering from McMaster University, Hamilton, Ontario, Canada, in 2016. He was a Postgraduate Researcher with the Power Conversion Group, University of Manchester, U.K. (2011–2012) and a Postdoctoral Research Fellow at McMaster University, Hamilton, Ontario, Canada (2016–2017). Dr. Beik was a Senior Engineer with Magna Powertrain Inc., Concord, Ontario, Canada (2017-2018), a Lead R&D Engineer with Mirus International Inc., Brampton, Ontario, Canada (2018-2019), and a Senior Manager with Forte Mobility Co. Ltd., Aurora, Ontario, Canada (2020-2021). He is currently an Assistant Professor (tenure-track) at the Department of Electrical and Computer Engineering at North Dakota State University, Fargo, North Dakota, USA.

## Travis Walker



Dr. Travis Walker is a transport phenomena engineer who works to develop both theoretical and experimental methods that can be applied to the study of complex fluids, soft solids, miscible fluid interactions, and biological systems. He is interested in multiphase systems and the mechanics of materials. His ultimate goal is to provide new detailed insights into the macroscopic characteristics of materials and processes through an in-depth understanding of the fundamental physics that are active at the molecular level.

## Pierre Larochelle



Pierre Larochelle serves as Department Head and Professor of Mechanical Engineering at the South Dakota School of Mines & Technology. Previously he served as an Associate Dean and Professor of Mechanical Engineering at the Florida Institute of Technology. His research focuses on the design of complex robotic mechanical systems and enabling creativity and innovation in design. He is the founding director of the Robotics and Computational Kinematics INnovation (ROCKIN) Laboratory, has over 100 publications, holds three US patents, and serves as a consultant on robotics, automation, machine design, creativity & innovation, and computer-aided design. In 2012 at NASA's request he created a 3-day short course on Creativity & Innovation. This course has been very well received and he has taught it exclusively more than 30 times at NASA's various centers and laboratories across the nation to more than 600 of NASA scientists and engineers. He currently serves as the Chair of the U.S. Committee on the Theory of Mechanisms & Machine Science and represents the U.S. in the International Federation for the Promotion of Mechanism & Machine Science (IFToMM) (2016-22). He serves as a founding Associate Editor for the ASME Journal of Autonomous Vehicles and Systems (2020-23). Moreover, he serves on ABET's Engineering Accreditation Commission (EAC) and as an ABET Accreditation Visit Team Chair. He has served as Chair of the ASME Design Engineering Division (2018-2019), the ASME Mechanisms & Robotics Committee (2010-2014), and as an Associate Editor for the ASME Journal of Mechanisms & Robotics (2013-19), the ASME Journal of Mechanical Design (2005-11), and for Mechanics Based Design of Structures & Machines (2006-13). He is a Fellow of the American Society of Mechanical Engineers (ASME), a Senior Member of IEEE, and a member of Tau Beta Pi, Pi Tau Sigma, ASEE, and the Order of the Engineer.

## Jihong Ma



Dr. Ma is an Assistant Professor of Mechanical Engineering. She obtained her PhD in Mechanical Engineering from the University of Minnesota-Twin Cities, and her B.Eng. in Engineering Mechanics from Xi'an Jiaotong University (China). Prior to joining the faculty at Vermont, Dr. Ma was a Postdoctoral Research Associate at the Center for Nanophase Materials Sciences at Oak Ridge National Laboratory, where she worked on soft matter simulations. Dr. Ma is working on the structure-property relationship of materials at multiple scales (from nano- to macro-) via a combination of theoretical analysis, numerical simulations, and experimental characterizations. Her research goal is to uncover or enhance material performance characteristics for industrial, medical, and aerospace applications.

## Pejman Tahmasebi



Pejman Tahmasebi is working on materials characterization, machine learning, mechanical modeling and also multiscale geo-systems. Dr. Tahmasebi is working with several agencies, such as NSF, DoE, NIH, and NASA on a variety of projects.

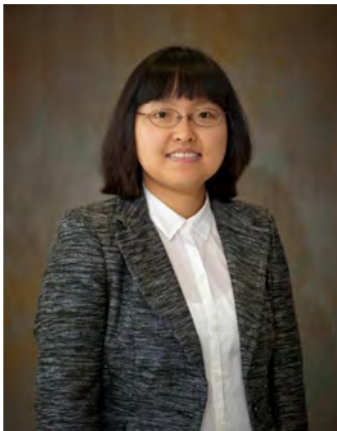


## **Kwang J. Kim**



Kwang J. (Jin) Kim is Distinguished Professor of the Mechanical Engineering Department at the University of Nevada, Las Vegas (UNLV). He graduated from Yonsei University, Korea, in 1987 and received his MS and Ph.D. from Arizona State University (ASU) in 1989 and 1992, respectively. Later, he completed a postdoctoral study at the University of Maryland-College Park UMCP (1993-1995). His research interests are in a broad spectrum of Active Materials/Sensors and Energy Systems. He has authored/ co-authored 420+ technical publications including 210 referred journal papers and 3 monographs and was awarded 3 U.S. patents. He is a Fellow of ASME and National Academy of Inventors (NAI). His laboratory, namely Active Materials and Smart Living (AMSL) Laboratory, has the capability of fabricating and testing active materials and devices.

## **Yue Wang**



Dr. Yue Wang is the Warren H. Owen – Duke Energy Associate Professor of Engineering and the Director of the Interdisciplinary and Intelligent Research (I2R) laboratory at Clemson University. Her research interests include human-robot interaction, multi-robot systems, and cyber-physical systems. Dr. Wang received both AFOSR YIP award and NSF CAREER award. Her research has been supported by NSF, AFOSR, ARC, ARO, NASA EPSCoR, ONR, AFRL, and Clemson University. Her work has resulted in over 50 journal publications, peer-reviewed conference papers and books, which are cited 1676 times (Google scholar) with an h-index of 21. Dr. Wang is a senior member of IEEE, and member of ASME and AIAA and serve as Associate Editor on several journals and conference proceedings. Her work has been featured in NSF Science360, ASEE First Bell, State News, SC EPSCoR/IDeA Research Focus, and Clemson University.

## **Vibhav Durgesh**



Dr. Vibhav Durgesh holds a Bachelor's degree in Mechanical Engineering from the Indian Institute of Technology (IIT) Kharagpur, and Master's and Ph.D. degrees in Mechanical Engineering from the University of Wyoming. Following his doctoral work, Dr. Durgesh worked as a Research Associate at the Pacific Northwest National Laboratory, WA. He is currently an Assistant Professor in the Department of Mechanical Engineering at the University of Idaho, Moscow. His research interests include both fundamental and applied topics in the field of experimental aerodynamics and fluid dynamics. He is currently working on studying the FSI behavior of flag fluttering and the impact of the observed oscillation modes of the surrounding fluid flow and aerodynamic performance of the flag.



## Raghu Srinivasan



Dr. Raghu Srinivasan is an assistant professor in the Mechanical Engineering Department at UAA's College of Engineering. He established, and currently serves as the director of the Environmental Degradation lab at UAA. He grew up in India and moved to Hawaii to do Ph.D. in atmospheric corrosion before landing here in Alaska. His research interests include atmospheric corrosion of light alloys, materials compatibility, and materials selection.

## Andrew Metcalf



Andrew Metcalf is an Assistant Professor in Environmental Engineering and Earth Sciences at Clemson University. He directs the Clemson Air Quality Lab and teaches courses on air pollution engineering, combustion and air pollution control technologies, Earth's atmosphere and climate, and atmospheric aerosols. Dr. Metcalf has expertise in aerosol instrumentation and field measurements and is currently focused on techniques using electrical mobility and laser light scattering and absorption. Ongoing research projects include ambient sampling of prescribed fire activities in the Upstate of South Carolina, analysis of airborne field project datasets for aerosol-cloud interactions, developing low-cost air quality sensor packs for a dense network of ambient monitoring for satellite retrieval validation, and understanding the relationship between outdoor and indoor air quality. Dr. Metcalf has been previously funded by the SC NASA EPSCoR \$25k Research Grant Program (RGP) and is currently mentoring a student who was awarded a NASA SC Space Grant Consortium Graduate Research Fellowship (GRF).

## Jyotsna Sharma



Dr. Sharma joined LSU as an Assistant Professor in Petroleum Engineering in 2019, after working in the energy industry for over eight years at Chevron, Schlumberger, and Shell. Her primary research interests include fiber optic sensing and machine learning applications in the energy industry. Dr. Sharma conducts experiments both at bench-scale and well-scale (several thousand feet) in her optical sensing lab and at the LSU well-facility. She has worked extensively on Chevron's fiber optic monitoring program in the U.S., Indonesia, and Venezuela. She also consults for E&P companies for fiber optics data interpretation. She has a multidisciplinary background with Ph.D. in petroleum engineering and B.Tech. in electrical engineering. Dr. Sharma has given invited talks on optical sensing at Stanford University, University of Wyoming, Exxon, and Shell and authored numerous publications on fiber optic sensing and machine learning.

## Ashanthi Maxworth



Ashanthi Maxworth is originally from Sri Lanka where she obtained her bachelor's degree in Electronics and Telecommunications Engineering from the University of Moratuwa. She obtained her Master's and Ph.D. from the University of Colorado Denver in 2014 and 2017 in Electrical Engineering with an emphasis on space physics. Her Ph.D. dissertation was on Magnetospheric Whistler Mode Ray-tracing with Finite Electron and Ion Temperature. For her doctoral dissertation, she used the NASA Global Core Plasmasphere Model (GCPM) and the Van Alleb Probe – EMFISIS data to verify her simulation results. After graduation, she completed two and half years of a postdoctoral fellowship at the University of Saskatchewan Canada with the Institution of Atmospheric and Space Physics, analyzing the natural and man-made data collected by the Radio Receiver Instrument (RRI) on the Canadian e-POP satellite.

## Earl Scime



Earl Scime is the Oleg D. Jefimenko Professor of Physics and Astronomy at West Virginia University (WVU). He currently serves as the Director of the School of Mathematical and Data Sciences at WVU and is a past Chair of the American Physical Society's Division of Plasma Physics. He moved to WVU in 1994 from Los Alamos National Laboratory, where he was a DoE Distinguished Postdoctoral Fellow. His research interests span fusion plasmas, space plasmas and industrial plasmas – with a cross-cutting focus on particle heating and velocity distribution function measurements. He was part of the Ulysses mission electron instrument team and his neutral atom imaging instrument concept was used for the IMAGE and TWINS missions. He has continued to measure particle velocity distributions in laboratory and space plasmas through a variety of diagnostic techniques. His current space instrument development work has focused on microscale fabrication for particle instruments. He has contributed to over 190 peer-reviewed publications and was named a Fellow of the American Physical Society in 2011.

## Eric Sproles



Eric Sproles is an Assistant Professor of Earth Sciences at Montana State University (MSU). His work integrates geospatial science and remote sensing with field-based measurements and models to better understand the geospatial and climatic controls on the world's water resources. At MSU, Eric leads the Geospatial Snow, Water, and Ice Resources Lab (GeoSWIRL), who as a team collectively applies geospatial approaches to bridge the scaling gaps between field- and space-based measurements of the hydrosphere and cryosphere.