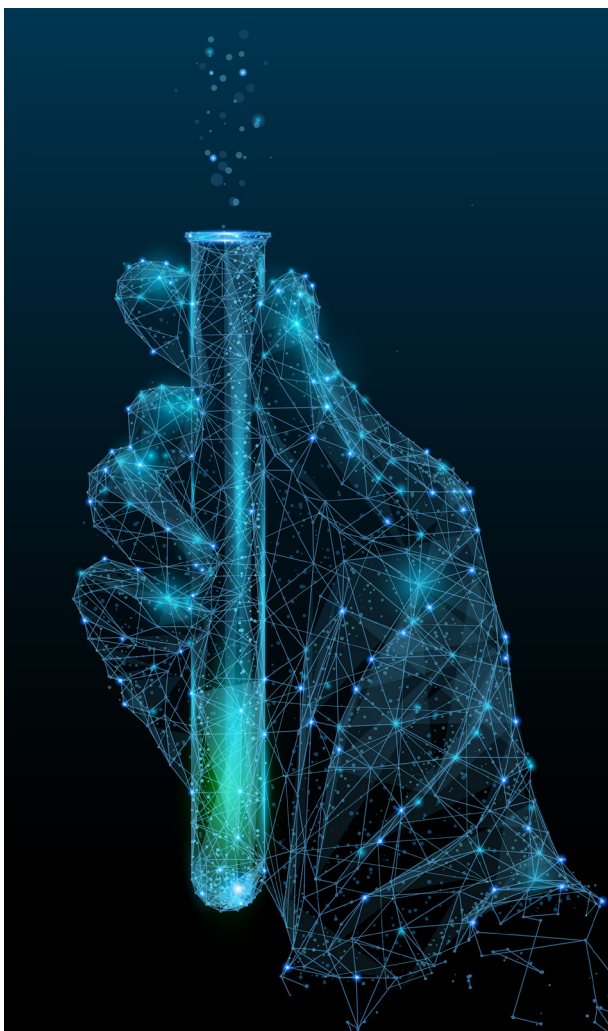




VIRTUAL

SPACE TRAVEL
STARTTECH
Adaptive Research and Technologies
from Biological and Chemical Engineering



November 18-20, 2020

Organized by AIChE®

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WELCOME ADDRESS

GREETINGS

We want to welcome you to Boston for the [2nd Space Travel: Adaptive Research and Technologies from Biological and Chemical Engineering \(STAR Tech\) Conference](#) brought to you by the Society for Biological Engineering, an American Institute for Chemical Engineers Technological Community.

The Space Travel: Adaptive Research and Technologies from Biological and Chemical Engineering Conference will focus on space travel technology and capability needs to accelerate the development of commercial and non-commercial space exploration. Our Technical Sessions this year focus on the singular topic of how you can apply your technologies to support life outside of the Planet Earth Supporting life outside Earth. Topical sessions include Advanced Life Support, Advanced In-Space Manufacturing, Habitation Construction, Medicine in Space, Radiation Protection and Mitigation as well as Resource Utilization.

This virtual experience developed by our programming team — including meeting chairs, session organizers, presenters and exhibitors — will ensure that the new format provides you with the valuable experience you expect. As you know, the STAR Tech Conference is the premier forum for engineers interested in innovation and advancements in Space Technology, as experts cover a wide range of topics relevant to cutting-edge research, new technologies and emerging growth areas. We are excited to bring AIChE's STAR Tech Conference to a larger global audience as a virtual event.

The STAR Tech program will continue to provide virtual meeting attendees with compelling technical sessions, inspiring lectures, and valuable opportunities to network with speakers, exhibitors, and chemical engineering colleagues. A single stream conference, consisting of technical sessions and networking events will enable attendees to interact with presenters during Q&As, participate in group discussions, attend panel discussions and engage with colleagues in the community. Much work has gone into making this conference a success. Suppose it were not for the contributions of our Organizing Committee, who was instrumental in selecting our speakers and shaping the program, as well as the invaluable assistance from our Industry and Academic supporters. In that case, this conference could not have happened. Moreover, the tremendous support of the AIChE staff has played an invaluable role.

Finally, we would like to thank you for attending the conference. We hope these next three days will be pleasant, educational, and inspiring.

Thank you!

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CONFERENCE ORGANIZERS

Conference Co-Chairs

Al Sacco, *Texas Tech*

Al Sacco Jr. is dean of the Edward E. Whitacre Jr. College of Engineering at Texas Tech University in Lubbock Texas. Before coming to Texas Tech, he was the George A. Snell Distinguished Professor of Engineering and the director of the Center for Advanced Microgravity Materials Processing at Northeastern University.

He flew as the payload specialist on the Space Shuttle Columbia on shuttle mission STS-73 in 1995. The 16-day mission aboard Columbia focused on materials science, biotechnology, combustion science and fluid mechanics contained within the pressurized Spacelab module.

Born in Boston, Mass., Sacco completed a bachelor's degree in chemical engineering from Northeastern University in Boston in 1973, and a doctorate in chemical engineering from the Massachusetts Institute of Technology in 1977. He then joined the faculty of the Worcester Polytechnic Institute, becoming a full professor and serving as the chair of the chemical engineering department from 1989 until 1997, when he joined the faculty at Northeastern. He has consulted for numerous companies in the fields of catalysis, solid/gas contacting, zeolite synthesis and applications, and equipment design for space applications.

John Hogan, *NASA*

John Hogan is an environmental scientist in the Bioengineering Branch at NASA's Ames Research Center, Moffett Field, Calif., where he supports NASA's Life Support and Habitation Systems Program.

His major research interests include developing biological and physico-chemical technologies for regenerative air, water and solid waste treatment systems, food production, and systems analysis. Selected projects include the development of optimized biological solid waste reactors/simulators, biological air filtration, and the capture and compression of carbon dioxide. He also is investigating the application of closed-loop life support principles to forward sustainable practices in terrestrial systems.

Prior to joining NASA, he was research faculty at Rutgers, the State University of New Jersey in the Department of Environmental Sciences, where he participated in a NASA funded program developing biologically-based, sustainable systems for long-term extraterrestrial human habitation. John received his B.S., M.S. and Ph.D. in Environmental Sciences at Rutgers University.

Lawrence J DeLucas, *Aerospace Corporation*

Dr. DeLucas is a Principal Scientist at the Aerospace Corporation. He was previously a Professor in the School of Optometry, Senior Scientist and Director of the Comprehensive Cancer Center X-ray Core Facility, and Director of the Center for Structural Biology at the University of Alabama at Birmingham (UAB). Dr. DeLucas received five degrees from UAB culminating in a Doctor of Optometry degree and a Ph.D. degree in Biochemistry. He also received honorary Doctor of Science degrees from the Ohio State University, Ferris State University, SUNY College of Optometry and the Illinois College of Optometry. He has published 164 peer-reviewed research articles in various scientific journals, co-authored and edited several books on protein crystal growth and membrane proteins and is a co-inventor on 43 patents involving protein crystal growth, novel biotechnologies and structure-based drug design.

DeLucas was a member of the 7 person crew of Space Shuttle Columbia for Mission "STS-50", called the United States Microgravity Laboratory-1 (USML-1) Spacelab mission. Columbia launched on June 25, 1992, returning on July 9. He traveled more than 6 million miles, completing 221 orbits of Earth and logging over 331 hours in space. In 1994 and 1995, Dr. DeLucas served as the Chief Scientist for the International Space Station at NASA Headquarters in Washington, D.C.

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Organizing Committee

Mark Blenner, *Clemson University*

Mark Blenner received a BS in Chemical Engineering from Manhattan College, and a PhD in Chemical Engineering from Columbia University. There, he studied conformational changes in proteins and peptides, with applications in environmental sensing and in vitro toxicity testing. Mark was an NIH NRSA Postdoctoral Fellow at Harvard Medical School and the Immune Disease Institute, working with Dr. Timothy Springer engineering high affinity complexes involved in force sensing during blood clotting. He solved crystal structures of these engineered proteins to help explain how certain bonds increased in strength resulting from shear forces. Currently, Mark is an Assistant Professor of Chemical and Biomolecular Engineering at Clemson University. His research group engineers proteins and enzymes for novel properties and high specificity.

Robyn Gatens, *NASA*

Ms. Robyn Gatens is the Deputy Director of the International Space Station Division at NASA Headquarters, in the Human Exploration and Operations Mission Directorate, and also serves as NASA's Systems Maturation Team lead for Environmental Control and Life Support and Environmental Monitoring Systems. Ms. Gatens began her NASA career in 1985 at the Marshall Space Flight Center, and has 31 years of experience in development and management of Environmental Control and Life Support Systems for the human spaceflight. Ms. Gatens has held various leadership positions at the NASA Marshall Space Flight Center and served as Manager for the Orion Crew Support and Thermal Systems from 2009-2012 before transferring to NASA Headquarters. Prior to being selected as Deputy Director, Ms. Gatens served as the Systems and Technology Demonstration Manager for the ISS Division, focusing agency efforts to utilize the ISS as a testbed to mature technologies needed for future missions. Ms. Gatens is also currently spearheading NASA's strategic planning for enabling a Low Earth Orbit commercial economy leveraging the ISS. Ms. Gatens holds a Bachelor of Chemical Engineering degree from the Georgia Institute of Technology.

Grace Douglas, *NASA*

Dr. Grace Douglas serves as the lead scientist for NASA's Advanced Food Technology research effort, which focuses on determining methods, technologies, and requirements for developing a safe, nutritious, and palatable food system that will promote astronaut health during long-duration space missions. Her responsibilities include assessing the risk of an inadequate food system to crew based on vehicle design and mission concept and developing the research path that will ensure the food system meets crew health requirements on spaceflight vehicles. She earned a B.S. and M.S. in food science from the Pennsylvania State University and North Carolina State University, respectively, and a Ph.D. in functional genomics from North Carolina State University.

Emmanuel Urquieta, *TRISH*

Emmanuel Urquieta holds a medical degree from Anahuac University in Mexico City and a master of science in aerospace medicine from Wright State University in Dayton, Ohio. Emmanuel completed a diploma in emergency medicine and then worked for Mexico City's Department of Public Safety as a flight surgeon in the Helicopter Emergency Medical Service "Condors" where he participated in hundreds of rescue missions and aeromedical evacuation within the Mexico City metropolitan area. He holds a private pilot certificate and an open water scuba diver certificate.

Emmanuel has participated as a crew member of an analog mission at NASA Johnson Space Center: in 2017 he was selected to participate in the Human Exploration Research Analog (HERA) XI mission where he spent 30 days in a capsule simulating a deep space long duration mission. This mission aimed to understand the behavioral and physiological effects from isolation and confinement. He currently serves as scientist at the NASA funded Translational Research Institute for Space Health, where he manages different research projects in different areas going from radiation protection to psychological changes during deep spaceflight.

Tracie Prater, *NASA Marshall Space Flight Center*

Tracie Prater is an engineer in the Materials and Processes Laboratory at NASA Marshall Space Flight Center in Huntsville, Alabama, where she is currently the laboratory lead for the in-space manufacturing (ISM) project. ISM is tasked with developing the materials, processes, and design practices to enable manufacturing off-world. The

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project includes technology development in recycling, metal additive manufacturing, printed electronics, and in-process monitoring. The International Space Station serves as a critical test bed for evaluating the utility of manufacturing technologies to meet needs for sparing and repair on space missions. She also serves as a subject matter expert for NASA's Centennial Challenges prize competition program and helped to develop the 3D Printed Habitat Challenge. She has a B.S. in Physics from Eastern Kentucky University and an M.S. and Ph.D. in mechanical engineering from Vanderbilt University. Tracie is also a senior member of the American Institute of Aeronautics and Astronautics.

Gregory Odegard, *Michigan Technological University*

Greg Odegard is the Richard and Elizabeth Henes Professor of Computational Mechanics in the Department of Mechanical Engineering – Engineering Mechanics at Michigan Tech. He is the Director of the NASA Institute for Ultra-Strong Composites by Computational Design. Before joining the faculty at Michigan Tech, Greg was a researcher at NASA Langley Research Center from 2000-2004. His research is focused on computational modeling of advanced material systems. According to Google Scholar, he has been cited over 7,000 times in the literature, and has an h-index of 37. He is a Fellow of ASME, and an Associate Fellow of AIAA.

Dr. Andrew Jackson, *Texas Tech University*

Dr. Andrew Jackson is a Presidents Excellence in Research Professor and Provost's Integrated Scholar in the Department of Civil Environmental and Construction Engineering at Texas Tech University. His research interests include evaluating the of a variety of contaminants, including: perchlorate, heavy metals, explosives, and chlorinated solvents, in natural environments, along with the development of methods to study these processes at appropriate scales. He has also been actively developing biological reactors for recycling of space habitation waste streams in closed loop life support systems for over 15 years. He has published over 100 journal publications and book chapters with more than 3000 citations. Andrew has served as a principal investigator on grants sponsored by a variety of agencies including EPA, DOE, SERDP, NASA, and USDA. He is a board-certified environmental engineer, a registered professional engineer in Louisiana, and a fellow of the American Association for the Advancement of Science..

Nils Aversch, *Stanford University*

Nils is a postdoc in the Criddle Lab at Stanford University, California, and part of CUBES (the Center for Utilisation of Biological Engineering in Space), as well as a collaborating scientist at NASA Ames Research Center in Mountain View, California. Before joining CUBES, Nils was the Synthetic Biology Task-Lead with USRA at NASA Ames Research Center. He holds a PhD in Metabolic Engineering from the University of Queensland in Brisbane, Australia and an engineer's degree (Dipl. Ing.) in Biochemical Engineering, from the Technical University of Dortmund, Germany. With a recent focus on utilising C1-feedstocks, he genetically engineers microbial cell factories that produce high-performance polymers. His goal is to develop biological production platforms in support of human long-duration space-exploration missions, while creating a sustainable chemical industry on Earth "on the way".

Kenneth A. Savin, *International Space Station US National Lab*

Ken received his Ph.D. from the University of Utah in 1996 and came to Eli Lilly and Co. in 1998 from the Memorial Sloan Kettering Cancer Research Center as a senior organic chemist. He worked on several projects as a medicinal chemist in the areas of anxiety, depression and inflammatory disorders, and he has been involved in many cross-functional Lilly research collaborations. In 2008, Ken took on new a new role as a Head in Drug Disposition with responsibilities across the in-vitro, transporter, in-silico, Lead Generation and the isotopic chemistry groups within Drug Disposition. In 2009, Ken moved to Global External R&D (GER&D) where he worked to better define the approach to sourcing and performing diligence assessments of pre-clinical and discovery level opportunities. Ken moved into the role of Director of process chemistry and route design in early 2012 and then to the role of Technology, Design and Development Advisor for the Lilly development organization and then to the Clinical Innovation Group at Lilly. During Ken's final years at Lilly, he lead a team of scientists to develop and fly five experiments on the International Space Station. In May 2017, Ken retired from Lilly and is currently a Director on Scientific Partnering at the International Space Station US National Lab.

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TECHNICAL PROGRAM

November 18th, 2020: Manufacturing and Protection in Space

12:00 PM	12:10 PM	Day 1: Manufacturing and Protection in Space	
12:10 PM	1:10 PM	Radiation Protection and Mitigation	
12:10 PM	12:30 PM	<i>Identifying Cost Effective Radiation Shielding Using Super Computers</i>	Tim Nisi
12:30 PM	12:50 PM	<i>Active Magnetic Radiation Shielding for Long-Duration Human Spaceflight</i>	Kristine Ferrone
12:50 PM	1:10 PM	Question and Answer Panel- Radiation Protection and Mitigation	Lawrence DeLucas
1:10 PM	1:20 PM	Break	
1:20 PM	2:00 PM	Short Presentations	
1:20 PM	1:30 PM	<i>Passive, Tunable Biocide Delivery System for Spacecraft Water Processor Assembly</i>	Rogelio Garcia
1:30 PM	1:40 PM	<i>The Wolverine Cubesat Development Team: Developing Engineers of the Future</i>	Kevin L. Simmons
1:40 PM	2:00 PM	Question and Answer Panel for Short Presenters	John Hogan
2:00 PM	2:20 PM	Break	
2:20 PM	4:50 PM	Advanced/In-Space Manufacturing	
2:20 PM	2:40 PM	<i>Forging the Future: The Impact of Multi-Material Additive Manufacturing on the Future of Space Exploration.</i>	Matt Napoli
2:40 PM	3:00 PM	<i>Welding and Repair in Space</i>	Yu-Hui Chiu
3:00 PM	3:20 PM	<i>Designing Bioinks for Utilization on the International Space Station</i>	Eugene Boland
3:20 PM	3:35 PM	<i>Bioreactor Development for CO₂-Based in Situ Resource Utilization Manufacturing</i>	Benjamin Alva
3:35 PM	3:50 PM	<i>Space and Thin Film Technology Utilizing Atomic Layer Deposition for NASA Line of Business Science Discoveries</i>	Vivek Dwivedi
3:50 PM	4:50 PM	Question and Answer Panel- Advanced/In-Space Manufacturing	Tracie Prater

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November 19th, 2020: Life Support in Space

12:00 PM	12:10 PM	Day 2: Supporting Life Outside of Earth	
12:10 PM	2:30 PM	Advanced Life Support	
12:10 PM	12:30 PM	<i>Closure, Long-Duration Life Support, and Launch Costs—a Changing Environment</i>	Grant Anderson
12:30 PM	12:50 PM	<i>Design of the MIT BioSuit™ Mechanical Counter Pressure Spacesuit</i>	Akshay Kothakonda
12:50 PM	1:10 PM	<i>Mechanical Counter Pressure Space Suits</i>	Ted Southern
1:10 PM	1:30 PM	<i>New possibilities for life support systems, made possible by progress in fundamental fluids research</i>	John Graf
1:30 PM	1:50 PM	Invited Talk	Daniel Yeh
1:50 PM	2:30 PM	Question and Answer Panel- Advanced Life Support	Ken Savin
2:30 PM	2:50 PM	Break	
2:50 PM	3:25 PM	Discussion Questions and Breakout Rooms	
3:25 PM	3:30 PM	Break	
3:30 PM	5:00 PM	In-situ Resource Utilization	
3:30 PM	3:50 PM	<i>Synthetic Carotenoid-Rich Plant Organelles for Space and Earth Nutrition</i>	Briardo Llorente
3:50 PM	4:10 PM	<i>Bio-Electrochemical Systems for Sustainable Production of Chemicals from CO₂ and Electricity</i>	Frauke Kracke
4:10 PM	4:30 PM	<i>Sunlight-driven electrochemical conversion of CO₂ to useful products in Space</i>	Csaba Janáky
4:30 PM	5:00 PM	Question and Answer Panel- In-situ Resource Utilization	Nils Averech



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November 20th, 2020: Advanced Living in Space

12:00 PM	12:10 PM	Day 3: Living In Space	
12:10 PM	1:40 PM	Habitation Construction	
12:10 PM	12:30 PM	<i>The Main Goal of Space Architecture</i>	Olga Bannova
12:30 PM	12:50 PM	<i>Combustion Synthesis Technologies for Construction on the Moon and Mars</i>	Evgeny Shafirovich
12:50 PM	1:10 PM	<i>To Mars and Back: 3D-Printed Construction Technologies for a Multi-Planetary Future</i>	Michael Bentley
1:10 PM	1:40 PM	Question and Answer Panel- Habitation Construction	Moderator
1:40 PM	2:00 PM	Break	
2:00 PM	3:10 PM	Industry Panel: Advancements in Space Technology for the Future	
2:00 PM	2:15 PM	<i>Microgravity Research for All - How to Run Space Experiments with a Small Budget .</i>	Mark Kugel
2:15 PM	2:30 PM	<i>Dual Use Technology Development for Lunar and Terrestrial Surface Construction</i>	Melodie Yashar
2:30 PM	2:45 PM	<i>Panel Talk</i>	Shawna Pandya
2:30 PM	3:10 PM	Discussion and Conversation with the Panelists	Emmanuel Ordonez & Robyn Gatens
3:10 PM	3:20 PM	Break	
3:20 PM	4:50 PM	Medicine In Space	
3:20 PM	3:20 PM	<i>Space Medicine Capabilities and Challenges for Exploration Missions</i>	Moriah Thompson
3:20 PM	3:40 PM	<i>The Challenges of Medical Care Due to Distance from Earth</i>	Jimmy Wu
3:40 PM	4:00 PM	<i>An Inside View of Conducting Science Investigations In Space</i>	Tobias Niederwieser
4:00 PM	4:20 PM	<i>Space Medicine for Exploration Class Missions</i>	Shawna Pandya
4:20 PM	4:50 PM	Question and Answer Panel- Medicine In Space	Grace Douglas
4:50 PM	5:00 PM	Closing Statements from the Conference Chairs	

FEATURED SPEAKERS

INVITED SPEAKERS

Tim Nisi

IU Health Department of Radiation Oncology

Timothy Nisi is an Applications Analyst at the IU Health Department of Radiation Oncology and is currently studying Computer Science at Purdue. He is Co-Founder of two companies that specialize in 3D-printing patient-specific solutions for the medical industry. Nisi's current research is focused on using super-computer-based radiation simulations to identify optimal radiation protection measures for astronauts during deep-space exploration. He is also interested in using machine learning to increase the accuracy of space weather forecasts. Before starting his career at the IU Health Department of Radiation Oncology, Timothy earned his undergraduate degree in Economics from Loyola University of Chicago.

Matt Napoli

Made in Space

Matthew Napoli is the Vice President of In-Space Operations at Made In Space, Inc. (MIS) Napoli oversees International Space Station (ISS) payload development and operations at MIS. He leads all activities associated with the ISS including managing NASA contracts, leading multi-disciplinary teams, and completing six successful space flight science missions. As a founding member of MIS, Napoli kickstarted the industry of in-space manufacturing by building and operating the first off-world 3D printer: the 3D Printing in Zero-G Experiment. Since joining MIS in 2012, he has overseen the deployment of the Additive Manufacturing Facility (AMF), MIS Fiber Optics, the Plastic Recycler, and the Turbine Ceramic Manufacturing Module, along with seven payloads currently in development. In addition to developing new payloads, Napoli also sustains operations of an ISS facility with the AMF, a second-generation 3D printing system. The AMF has operated in the ISS National Lab for over 4 years and printed over 200 objects for dozens of different users, including NASA.

His expertise in in-space manufacturing and sustainable technology has helped expand the MIS portfolio across new sectors, including space-enabled manufacturing of advanced materials and exploration manufacturing initiatives.

Napoli earned a Master of Science in Aerospace Engineering from San Jose State University, as well as a Master of Science in Management from Stanford Graduate School of Business.

Yu-Hui Chiu

Busek Company

Dr. Yu-Hui Chiu is the Director of Applied Sciences at Busek Company in Natick, Massachusetts. Busek company is a small business specialized in the research and development of space electric propulsion technologies. She serves as a principal investigator for several SBIR/STTR programs including 3D printing of magnetic alloy, radiation modeling of COTS electronics, oxygen capture based on the metal-organic framework for spacecraft environment, and several applications of ionic liquids in space. Prior to joining Busek company in 2011, she is a research chemist in the Space Vehicles Directorate of the Air Force Research Laboratory. In AFRL from 1997-2011, she conducted basic research associated with space flights, space chemical environment, micro propulsion systems, optical and mass spectroscopy, and miniaturized space sensor development. Yu-Hui received her B.S. degree in chemistry from Soochow University in Taiwan, and her Ph.D. from SUNY Stony Brook in Physical Chemistry.

Eugene Boland

Techshot, Inc

Eugene Boland, Ph.D., has over 25 years in laboratory research, with a specific focus on developing engineering solutions for cardiovascular diseases as well as chronic wounds. His materials expertise extends from bioinert metals and ceramics to bioactive and bioresorbable electrospun polymers and proteins. After receiving his Bachelor of Science in Biomedical Engineering from Marquette University in 1994, Dr. Boland went on to receive his Ph.D. in Biomedical Engineering from Virginia Commonwealth University in 2004 after 6 years in cardiovascular medical device field.

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He is currently leading a collaborative team managing the Techshot BioFabrication Facility (BFF) installed aboard the International Space Station both for our own tissue and neo-organ commercial efforts and as a materials research and development platform for the microgravity community. In addition, he is leading efforts at Techshot to develop biologically-derived inks (mimetic bioinks) to take advantage of the unique capability that microgravity offers in tissue development as well as a method to induce, expand and differentiate human induced pluripotent stem cells in a microgravity environment. He has led numerous past projects including a feasibility study on Martian Ecopoiesis using bacteria and algae for nitrogen fixation and oxygen production.

Benjamin Alva

NASA Ames Research Center

Benjamin Alva is a Research Associate in the Bioengineering Branch at NASA Ames Research Center and undergraduate honors student in Cellular and Molecular Bioengineering within the Biomedical Engineering Department with a minor in Chemistry at the University of Minnesota Twin Cities. His work has focused on synthetic cellular biology, founding the student research group STARS for collaborative space-oriented projects. He has worked with NASA for several years on projects that involved microbial preservation mechanisms of ancient Mars, sensor design for the Venus rover, and presently bioreactor development for bio manufacturing on the Moon and Mars.

Vivek Dwivedi

NASA Goddard Space Flight Center

Dr. Vivek Dwivedi is the Associate Branch Head with the Thermal Engineering and Analysis Branch at the NASA Goddard Space Flight Center focusing on thin film applications and research utilizing Atomic Layer Deposition for thermal, optical, and additive applications. He received his Ph.D. in Chemical Engineering from the University of Maryland, College Park where his focus was on a novel multi-scale model of an Atomic Layer Deposition Process in high aspect ratio geometries. Dr. Dwivedi's research interests include reactor design, energy storage, space flight optics, gas sensing, catalysis and engineering education. During his time at NASA, Vivek has matured multiple technologies including passive thermal films, tuned nanopillars, applications in 3D carbon nanotube growth and modification of pigments, powders and foams. Dr. Dwivedi is a native Washingtonian who is actively involved in numerous organizations including the American Institute of Chemical Engineers (AIChE) National Capital Section (NCS).

Grant Anderson

Paragon Space Development Corporation

Mr. Anderson co-founded Paragon in 1993. From the time of inception of the company until early this year, he has been the VP of Engineering and Chief Engineer of the company and was responsible for the design and implementation of not only many of Paragon's technical achievements, but also its processes of engineering rigor in a stepped approach of requirements, design, build, test and delivery. This process has been cited by many customers as unique, disciplined and highly productive. Coming from a background of not only technical but financial and managerial training, he has held diverse positions at Paragon including Treasurer/Secretary, CFO, Sr. VP of Operations, Chief Operating Officer and Director of Manufacturing.

Recognized as a leader in the life support in extreme environments field, Mr. Anderson has lead the systems and conceptual design of multiple spacecraft under contract to Lockheed Martin, NASA, Inspiration Mars Foundation and others. He holds multiple patents in a diverse range of disciplines including testing systems, isolation systems, radiator systems and overall systems design. He has lead development and qualification of experimental flight hardware for five shuttle flights, two Mir missions, a Russian Progress, and the first commercial payload on ISS. Prior to starting Paragon, Mr. Anderson was the Chief Design Engineer for the International Space Station Solar Array Program—the largest solar arrays ever built—while employed at Lockheed Martin, Sunnyvale, CA.

Mr. Anderson holds two degrees from Stanford University in Mechanical Engineering (B.S.) and Aeronautical and Astronautical Engineering (M.S.) and is a registered Professional Engineer in the state of California. His diverse

FEATURED SPEAKERS

education/training included non-technical roles such as Controller for a Palo Alto, CA real estate firm during college where he implemented some of the first computers into the company's financial systems to track and monitor property financial performance. Working at an aviation consultancy, he participated in the start-up of two airlines through route analysis, equipment analysis and strategy advice. One went on to be America West, now part of US Airways. Mr. Anderson is also a graduate of the International Space University 1991 summer session with emphasis on space business and management.

Akshay Kothakonda

Massachusetts Institute of Technology

Akshay Kothakonda is a PhD candidate in the Department of Aeronautics and Astronautics at Massachusetts Institute of Technology. Working at MIT's Human Systems Laboratory, his research involves development of the MIT BioSuit™, an advanced spacesuit concept that functions on the principle of mechanical counter pressure of a tensioned fabric on the skin. The goal behind this effort is enhancing astronaut mobility on planetary surfaces of Moon and Mars. His work focuses on investigating novel polymers and textiles that would enable application of required pressure, enable suit don/doff, and minimize mechanical work in joint movements. His work is under advisement of Professor Dava Newman.

Akshay earned his Bachelor of Engineering in Mechanical Engineering from University of Pune (India) and Master of Science in Astronautical Engineering from University of Southern California. His research interests include spacesuits, Extravehicular Activity, and human spaceflight operations.

Ted Southern

Final Frontier Design

Ted Southern is the president and co-founder of Final Frontier Design. Ted has served as the Principal Investigator for 5 NASA SBIR contracts since 2011, is the lead for a Space Act Agreement with NASA's Commercial Space Capabilities Office (CSCO), and is currently overseeing multiple softgoods development contracts for NASA's Lunar xEMU space suit. Ted also served as the primary contractor for a fixed price contract with NASA JSC for space suit glove development, and has overseen the development and build of 4 generations of commercial IVA space suits at FFD. Ted is the acting president of FFD and oversees management, accounting, day-to-day operations, and long term vision of the company, as well as overseeing specific projects.

Prior to working with space suits, Ted worked in the costume and special effects industry for more than 15 years, with design and fabrication experience on major television, movie, Broadway, opera, fine art, and commercial productions, including Victoria's Secret, Cirque du Soleil, Gladstone Gallery, and Paramount Pictures. Ted also teaches the "Future Wearables" class as part of the School of Visual Arts Interactive Design Masters program. Ted studied as an music undergraduate at the University of Puget Sound, and received a MFA from Pratt Institute in 2007.

John Graf

NASA

Daniel Yeh

University of San Francisco

Briardo Llorente

Macquarie University

Briardo is a CSIRO Synthetic Biology Future Science Fellow at Macquarie University in Sydney, Australia, and an Associate Investigator of the Australian Research Council Center of Excellence in Synthetic Biology. Briardo's current work is focused on implementing synthetic biology approaches to study evolution and developing biotechnological innovations. He is also interested in engineering biological systems to help support the human exploration of space. Before moving to Australia, Briardo held a position as a Marie Curie Fellow at the GRAG in Barcelona, Spain. Briardo completed his Ph.D. at the University of Buenos Aires in Argentina and worked as a visiting researcher at the Salk Institute in California and the University of Aarhus in Denmark.

FEATURED SPEAKERS

Frauke Kracke

Stanford University

Frauke is a bio-chemical engineer with a strong background in microbial metabolism and cellular electron transfer. She holds a Diploma in bio-chemical engineering from The Technical University of Dortmund, Germany, and a PhD from the University of Queensland in Brisbane, Australia.

Her current research at Stanford University focuses on microbial electrosynthesis, a process that uses electricity to directly steer microbial redox reactions. She is particularly interested to deploy this exciting concept for the development of sustainable production processes of chemicals and fuels from CO₂ and renewable energy.

Csaba Janáky

University of Szeged, Hungary

Dr. Csaba Janáky is an Associate Professor at Department of Physical Chemistry and Materials Science, University of Szeged, Hungary. He is the principal investigator of the MTA-SZTE „Momentum” Photoelectrochemistry Research Group, supported by the Hungarian Academy of Sciences and the European Research Council (ERC-Starting Grant). Csaba is also responsible for Green Economy and Climate Policy at the university. He is an emerging expert of materials science oriented electrochemistry and photoelectrochemistry. He has developed new electrode materials for energy applications, such as CO₂ reduction, water oxidation, O₂- reduction, and H₂ evolution. He has published over 80 articles in peer-reviewed journals including four review-, two perspective, and one viewpoint article, with an overall impact factor of 600. He is member of the Editorial Advisory Board of ACS Energy Letters (a premier scientific journal of energy research), and the Young Academy of Europe.

Olga Bannova

University of Houston

Dr. Bannova is a Research Professor at the University of Houston's College of Engineering, Director of the Master of Science in Space Architecture program and Sasakawa International Center for Space Architecture – an academic leader in the field of space architecture and in planning and designing of facilities for extreme environments on Earth. Dr. Bannova conducts research and design studies of orbital and surface habitats and settlements, including inflatable structures, special design influences and requirements for different gravity conditions in space, and habitat concepts for extreme environments on Earth. As SICSA director she is leading the center and its MS-Space Architecture program advancing students' enrollment and success, developing research and design projects in connection with the space industry. She has authored dozens of technical papers.

Dr. Bannova is active in professional leadership positions associated with international and interdisciplinary student programs, development of technical concepts and reports, lecturing and promoting space exploration and advising students around the world. Research studies and grants include DSG Habitability, Lunar Base, and Deployable Airlock Studies (Boeing), 2 NASA's Minimum Functionality Habitation Element studies (Boeing and ILC Dover), SpaceHab's Lunar Exploration System, Commercial Launch Facility in West Texas (TAC), Houston Spaceport (HAS).

Dr. Bannova has been educating students who are persuading the world's only Master of Science in Space Architecture degree for 14 years. Her students are coming from different backgrounds: aerospace engineering, architecture, human factors, and include professionals from NASA and NASA contractors.

Evgeny Shafirovich

University of Texas at El Paso

Dr. Evgeny Shafirovich is a Professor of Mechanical Engineering at the University of Texas at El Paso (UTEP). He received his M.S. degree in Mechanical Engineering from the Department of Aerospace Propulsion at the Moscow Aviation Institute in 1981 and PhD in Chemical Physics from the Russian Academy of Sciences in 1988. Before joining UTEP in 2008, he conducted research at the Russian Academy of Sciences, CNRS (Orléans, France), the University of Notre Dame, and Purdue University. His research interests include combustion of propellants and other energetic materials as well as combustion synthesis of advanced materials for energy and aerospace applications.

FEATURED SPEAKERS

Michael Bentley

Space Factory

Moriah Thompson

NASA Johnson Space Center

Dr. Moriah Thompson started her career in the field of engineering, graduating from Texas A&M University in 2009 with a degree in biomedical engineering. Her involvement with NASA began while working as a researcher at the Space Engineering Institute during her undergraduate studies. Dr. Thompson earned her medical degree from UT Southwestern in Dallas, Texas in 2014. During medical school she joined the NASA Pathways Internship program, becoming the first medical student participant in this program. As a Pathways Intern, she would alternate semesters of medical school with full time employment at the NASA Johnson Space Center. Dr. Thompson completed her emergency medicine residency training at the Mayo Clinic in 2017, where she served as Chief Resident. Following this, she completed an additional residency program in aerospace medicine at the University of Texas Medical Branch (UTMB) in Galveston, where she also served as Chief Resident. She has had the opportunity to participate in several unique opportunities including flight surgeon training with the U.S. Air Force and providing medical care in McMurdo Station, Antarctica. Dr. Thompson earned a Master of Public Health degree from UTMB Galveston in 2018. Currently, Dr. Thompson serves as a Flight Surgeon at the NASA Johnson Space Center in Houston, Texas. She supports mission operations and provides direct clinical care in the Flight Medicine Clinic at NASA JSC. Dr. Thompson also serves as the lead of the Exploration Medical Integrated Product Team (XMIPT), a multi-disciplinary group focused on improving medical capabilities to support exploration-class human spaceflight missions.

Jimmy Wu

Baylor College of Medicine, Center for Space Medicine

Jimmy Wu is an instructor at Baylor College of Medicine, Center for Space Medicine (CSM) and associate director of the Exploration Medicine Laboratory with the focus of using technology and engineering solutions to provide medical care in space. With CSM, Jimmy develops, evaluates, and integrates technologies that will reduce human system risk during exploration space flight missions. Jimmy is also a member of the Translational Research Institute for Space Health (TRISH) serving as their Senior Biomedical Engineer. Jimmy's role with TRISH includes team lead of medical technology projects and facilitate delivery of project deliverables to TRISH and NASA.

Previously, Jimmy worked at NASA Johnson Space Center for fourteen years providing engineering, integration, operations, research and development, information technology, and project management support to projects addressing human health and performance during space flight missions.

Tobias Niederwieser

BioServe Space Technologies

Dr. Tobias Niederwieser is a research associate at BioServe Space Technologies within the University of Colorado Boulder where he helps to design, build, and test payloads for scientific research in the space environment. Key projects that have flown on 5 different missions on platforms such as NASA (International Space Station), SpaceX (Dragon, Falcon 9), Northrop Grumman (Cygnus, Antares), and ULA (Atlas V) include: AEM-E - a life support system for the launch of 40 mice onboard the Cygnus spacecraft for 10 days towards the ISS, SABL - three smart life science incubators operating continuously onboard the ISS for the last five years supporting 12+ high-impact science experiments per year, and PLASM - an automated experiment apparatus currently under development for a yeast radiation study onboard Orion during the Artemis-1 test flight around the Moon. Tobias earned his PhD on evaluating bioregenerative life support system technologies using green algae for air revitalization, wastewater recycling, and food production in spacecraft. Previously, Tobias earned his Bachelor's degree in aerospace engineering from the Technical University Munich, Germany in 2013, his Master's degree from the University of Colorado Boulder in 2015, and attended the International Space University Space Studies Program in 2016 in Haifa, Israel. Tobias' work has been recognized with Aviation Week's Twenty20 Award, American Institute of Aeronautics

FEATURED SPEAKERS

and Astronautics' Orville and Wilbur Wright Graduate Award, Space and Satellite Professionals International's 20 under 35 award, as well as NASA Johnson Space Center's Expedition 59 Group Achievement Award.

Shawna Pandya

Project PoSSUM

Dr. Shawna Pandya is a scientist-astronaut candidate with Project PoSSUM, physician, aquanaut, speaker, martial artist, advanced diver, skydiver, pilot-in-training, VP Immersive Medicine with Luxsonic Technologies and Fellow of the Explorers' Club. She is also Director of the International Institute of Astronautical Sciences (IIAS)/PoSSUM Space Medicine Group, Chief Instructor of the IIAS/PoSSUM Operational Space Medicine course, Chair of Strategic Directives for the PoSSUM13, clinical lecturer at the University of Alberta, a newly appointed Primary Investigator (PI) for the Shad Canada-Blue Origin student microgravity competition, session organizer for ASCEND 2020, Life Sciences Team Lead for the Association of Spaceflight Professionals, and serves as medical advisor to several space companies, including Orbital Assembly Construction and Mission: Space Food. Dr. Pandya holds degrees in neuroscience (BSc Hons. Neuroscience, University of Alberta), space (MSc Space Studies, International Space University), and medicine (MD, University of Alberta), and a certification in entrepreneurship (Graduate Studies Program, Singularity University). She is currently completing a fellowship in Wilderness Medicine (Academy of Wilderness Medicine).

Panelist Biographies

Mark Kugel

Yuri Gravity

Mark Kugel is the Co-Founder and Chief Commercial Officer of the German space company YURI. YURI is the one-stop shop for microgravity research. With reusable and modular bioreactors, access to a variety of ISS facilities, suborbital launchers and parabolic flights, they make microgravity research accessible to anyone. Payloads they have launched and are planning to launch include protein crystallization experiments, neural stem cells, cancer cells, fruit flies and rice plants. Mark serves as the link between the researcher's requirements and the engineering team, advocating for microgravity research and its benefits. He holds a M.Sc. degree from the Technical University of Munich.

Melodie Yasher

Space Exploration Architecture (SEArch+)

Melodie Yasher is a design architect, technologist, and researcher. She is co-founder of Space Exploration Architecture (SEArch+), a group developing human-supporting concepts for space exploration, and a Senior Research Associate within the Human Systems Integration Division at NASA Ames. SEArch+ was awarded the top prize in Design within NASA's Centennial Challenge for 3D-Printed Habitat on Mars in Phase 1 for "Mars Ice House" and Phase 3 for "Mars X-House." SEArch+ has worked with UTAS/Collins Aerospace, NASA Langley, NASA Marshall, among others.

CODE OF CONDUCT

AICHE's volunteers are the core of the Institute and make all of its programs, conferences and educational efforts possible. These offerings provide excellent opportunities for AIChE members and meeting attendees to gain greater technical expertise, grow their networks, and enhance their careers. AIChE events provide engineers, scientists, and students a platform to present, discuss, publish and exhibit their discoveries and technical advances.

At all times, volunteers and meeting attendees should act in accordance with AIChE's Code of Ethics, upholding and advancing the integrity, honor and dignity of the chemical engineering profession. AIChE's Board of Directors has developed these guidelines to foster a positive environment of trust, respect, open communications, and ethical behavior. These guidelines apply to meetings, conferences, workshops, courses and other events organized by AIChE or any of its entities and also to volunteers who conduct other business and affairs on behalf of AIChE.

SPECIFICALLY:

1. Volunteers and meeting attendees should understand and support AIChE's Code of Ethics.
2. Volunteers and meeting attendees should contribute to a collegial, inclusive, positive and respectful environment for fellow volunteers and attendees, and other stakeholders, including AIChE staff.
3. Volunteers and meeting attendees should avoid making inappropriate statements or taking inappropriate action based on race, gender, age, religion, ethnicity, nationality, sexual orientation, gender expression, gender identity, marital status, political affiliation, presence of disabilities, or educational background. We should show consistent respect for colleagues, regardless of discipline, employment status, and organizations for which they work, whether industry, academia, or government.
4. Disruptive, harassing or other inappropriate statements or behavior toward other volunteers, members, and other stakeholders, including AIChE staff, is unacceptable.
5. Volunteers and meeting attendees should obey all applicable laws and regulations of the relevant governmental authorities while volunteering or attending meetings. Volunteers and meeting attendees taking part in any AIChE event, including the Chem-E-Car Competition®, should also comply with all applicable safety guidelines.

Any violations of the foregoing should be reported to the President or the Executive Director of the Institute.

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