A Science Strategy for the Human Exploration of Mars: Panel on Biological and Physical Sciences and Human Factors

Committee

Barrett S. Caldwell

Co-Chair

BARRETT S. CALDWELL is a professor of industrial engineering, and aeronautics and astronautics, at Purdue University. Caldwell's research team, the Group Performance Environments Research Laboratory, examines and improves how people get, share, and use information in settings including aviation, critical incident response, healthcare, and spaceflight operations. Caldwell also serves as director and principal investigator of the NASA-funded Indiana Space Grant Consortium. Previously, Caldwell was a Jefferson Science Fellow at the U.S. Department of State, assigned to environment, science, technology and health policy in the Office of Japanese Affairs. Caldwell is a fellow of the Human Factors and Ergonomics Society and Institute of Industrial and Systems Engineers. Recent National Academies service includes the Committee on Human-Systems Integration Research Topics for the 711th Human Performance Wing of the Air Force Research Laboratory. Caldwell earned a PhD in social psychology from the University of California, Davis.

Anna-Lisa Paul

Co-Chair

ANNA-LISA PAUL is the director of the Interdisciplinary Center for Biotechnology Research at the University of Florida and a research professor in the department of Horticultural Sciences, program of Plant Molecular and Cellular Biology. Paul's research is focused on plant gene expression in response to spaceflight and planetary analogs, with terrestrial research in planetary exploration including work in Antarctica and the Canadian Arctic, and with true lunar material (genomic responses of Arabidopsis to growth in lunar regolith from Apollo 11, 12 and 17). Paul has served the space research community as president of the American Society for Gravitational and Space Research (ASGSR), as a member of the ISS Standing Review Board, on NASA's GeneLab Science Council, and on the Suborbital Applications Research Group advisory board for the Commercial Spaceflight Federation. Paul is a recipient of the NASA Medal of Honor for Exceptional Scientific Achievement and is a fellow of ASGSR and the American Association for the Advancement of Science. Paul earned a PhD in plant molecular genetics from the University of Florida. National Academies service includes the Committee on Biological and Physical Sciences in Space.

Daniel M. Ammon

Member

DANIEL AMMON is vice president of research and development at Regenity Biosciences. In this role, Ammon leads a team in the area of regenerative medicine. Previously, Ammon was director of surface science at Bausch & Lomb leading a team of scientists that surfaced modified polymers and performed analyses on the modified surfaces. The techniques used included several types of mass spectrometry and surface analytical instrumentation. Ammon is a member of the National Academy of Engineering and a fellow of the American Institute for Medical and Biological Engineering. Ammon earned a PhD in analytical chemistry from the University at Buffalo.

Serena Maria Auñón-Chancellor

Member

SERENA MARIA AUÑON-CHANCELLOR is a clinical professor at the Texas A&M University College of Medicine. Auñon-Chancellor is also the Aerospace Medicine Residency program director at the University of Texas Medical Branch and serves as a management astronaut in the NASA Astronaut Office. Auñon-Chancellor also serves on NASA's Bioethics and Lifetime Surveillance of Astronaut Health advisory committees and does private consulting for aerospace companies. Previously, Auñon-Chancellor was part of the 20th NASA astronaut class and served on the International Space Station as part of both Expeditions 56 and 57. Auñon-Chancellor's research interests include thrombosis in microgravity, space radiation and its clinical effects on humans, and the major medical challenges facing astronauts during exploration class missions. Auñon-Chancellor has received the United States Air Force Flight Surgeons Julian Ward Award for excellence in aerospace medicine. Auñon-Chancellor earned an MD from the University of Texas-Houston Health Science Center. National Academies service includes the Committee on Aerospace Medicine and Medicine of Extreme Environments.

Jay C. Buckey, Jr.

Member

JAY C. BUCKEY is a professor of medicine at Dartmouth's Geisel School of Medicine and an adjunct professor of engineering at the Thayer School of Engineering at Dartmouth College. Buckey directs the Space Medicine Innovations Laboratory at Dartmouth, which performs research for NASA, the DoD, and the NIH. Buckey's research and clinical interests include space physiology, hyperbaric medicine, and the use of the brain's ability to process sound as an overall marker of brain function in conditions such as HIV and Alzheimer's disease. Buckey started and runs the hyperbaric medicine clinical program at the Dartmouth-Hitchcock Medical Center, which also performs research on new uses for hyperbaric oxygen. Buckey flew in space as a payload specialist astronaut on the STS-90 Neurolab mission. Buckey has authored Space Physiology, a practical handbook designed to help physicians and astronauts maintain crewmembers' health in space. Buckey also served as a flight surgeon in the U.S. Air Force Reserve. Buckey's honors include the Laurence R Young Bioastronautics Investigator Award, the Joseph Kerwin Award for Achievements in Space Medicine, the Jeffrey P. Sutton Scientific Achievement Award, and the Luigi Napolitano book award for Space Physiology. Buckey earned an MD from Cornell University Medical College. National Academies service includes the Committee on Space Biology and Medicine, and the Task Group on Research on the International Space Station.

Ana Diaz Artiles

Member

ANA DIAZ ARTILES is an associate professor in the department of aerospace engineering at Texas A&M University (TAMU). Diaz Artiles also holds courtesy appointments in the Department of Kinesiology and Sport Management and the Department of Medical Physiology. Diaz Artiles previously worked for five years in Kourou, French Guiana as a member of the Ariane 5 launch team. At TAMU, Diaz Artiles directs the "Bioastronautics and Human Performance" lab with a research program that focuses on investigating human health and performance in aerospace environments and on developing technologies to mitigate the body's adaptation to extreme stressors, with the primary motivation to advance human space exploration. Specific areas of interest include human spaceflight, human physiology and behavior in altered-gravity environments, extravehicular activity, and human-systems interaction. Diaz Artiles's honors include the Fulbright Fellowship, the Amelia Earhart Fellowship from Zonta International, and the Thora Halstead Early Career Award from the American Society for Gravitational and Space Research. Diaz Artiles earned a PhD in aeronautics and astronautics from the Massachusetts Institute of Technology.

Nick Kanas

Member

NICK KANAS is professor emeritus in psychiatry at the University of California, San Francisco, and was associate chief of mental health at the San Francisco VA Medical Center. Kanas was an NSBRI- and NASA-funded principal investigator doing psychosocial research with 30 astronauts and cosmonauts on the Mir and ISS and studying crew autonomy during several space simulation missions (NEEMO, Haughton-Mars, Mars 500 pilot). Kanas is a former trustee of the International Academy of Astronautics. Kanas has written three books related to psychosocial issues in space, the most recent being “Behavioral Health and Human Interactions in Space,” which won the International Academy of Astronautics Life Science Book Award. Kanas’s honors include the Royer Award for Academic Psychiatry, the Aerospace Medical Association Longacre Award for Outstanding Accomplishment in the Psychological and Psychiatric Aspects of Aerospace Medicine, and the International Academy of Astronautics Life Science Award. Kanas earned an MD from the University of California, Los Angeles. National Academies service includes the Human Behavior and Mental Health Panel for the 2011 Decadal Survey on Biological and Physical Sciences in Space.

Craig E. Kundrot

Member

CRAIG E. KUNDROT retired as the first director of NASA’s Biological and Physical Sciences Division. Previously, Kundrot served as the director of BPS’s predecessor organization, Space Life and Physical Sciences Research and Applications Division. Kundrot’s earlier positions include Life Science Research capability leader (including Astrobiology and Planetary Protection); deputy program scientist for NASA’s Human Research Program; chair of NASA’s Institutional Review Board for human subject research (including astronauts) and its international counterpart, the Human Research Multilateral Review Board; branch chief for microgravity program’s material science and biotechnology programs; and senior research scientist. Kundrot’s honors include several Center Director Commendations and NASA’s Outstanding Leadership Medal. Kundrot’s research area was understanding the structure and function of proteins and RNA using x-ray crystallography and computational methods. Kundrot earned a Ph.D. in molecular biophysics and biochemistry from Yale University.

Bruce M. Link

Member

BRUCE M. LINK is chief science officer with Amentum for the Fully Integrated Lifecycle Mission Support Services (FILMSS 2) contract at NASA Ames. Previously, Link was based at the Kennedy Space Center working to shape and align science objectives with NASA's exploration strategy. Link's work has spanned a broad range of problems including regolith, waste recycling, water purification, novel food systems and plant growth systems. Link has contributed to the "Science Objectives for Human Exploration of Mars Workshop Report," which was co-sponsored by NASA's Science Mission Directorate and Exploration Systems Development Mission Directorate. As well as "Thriving in Space: Ensuring the Future of Biological and Physical Sciences Research: A Decadal Survey for 2023-2032" for the National Academies of Science. Link has extensive knowledge in instrumentation, genetics, biotechnologies, computational science, and innovation. Link serves on an advisory board for the Biological Engineering Program at North Carolina A&T State University. Link earned a PhD in biology from the Pennsylvania State University.

Donna Roberts

Member

DONNA ROBERTS is deputy chief scientist at the Center for the Advancement of Science in Space (CASIS) supporting the development of interagency microgravity research programs in low Earth orbit for the ISS National Lab. Prior to joining CASIS, Roberts was a professor in the Department of Radiology and Radiological Science at the Medical University of South Carolina. In addition to clinical work as a practicing neuroradiologist, Roberts served as principal investigator for NASA-funded studies investigating the impact of spaceflight on the human brain and cognition. Roberts previously worked for Lockheed Engineering and Sciences Company where she provided program management support to the NASA Life Sciences Division at NASA-HQ and has served as a voting member of the FDA Medical Imaging Drugs Advisory Committee. Roberts has also provided consultation services to magnetic resonance imaging companies. Roberts's honors include the International Space Station Compelling Results Award from the American Astronautical Society. Roberts earned an MD from the Medical University of South Carolina.

Luis Zea

Member

LUIS ZEA is founder of Jaguar Space, LLC and adjunct professor in the Smead Aerospace Engineering Sciences Department at the University of Colorado Boulder. Zea’s scientific work is based on the use of microgravity to find novel solution to medical problems on Earth as well as to enable safe, long-term human spaceflight. As an aerospace engineer and gravitational microbiology scientist, Zea has worked on several experiments performed in space, from the Space Shuttle to the International Space Station, and served as principal investigator of NASA-funded projects going to lower Earth orbit and around the Moon in Artemis I. Zea is a co-editor of Springer Nature’s Handbook of Space Pharmaceuticals and served as the co-director of Guatemala’s first satellite. Zea’s honors include the Karman Fellowship, an honorary doctorate from Universidad del Valle de Guatemala, and the Thora Halstead Early Career Award from the American Society for Gravitational and Space Research (ASGSR). Zea also serves on the ASGSR governing board and the organizing committee for the Central American Space Congress. Zea earned a PhD in aerospace engineering sciences with a focus in bioastronautics from the University of Colorado Boulder. National Academies service includes the 2023 Decadal Survey on Biological and Physical Sciences in Space.