

Review of NASA's Planetary Science Division's Restructured Research and Analysis Program

Committee

Stephen J. Mackwell

Chair

STEPHEN J. MACKWELL is the incoming corporate director for the Universities Space Research Association. Most recently, he serves as the outgoing director of the Lunar and Planetary Institute in Houston, Texas. Prior to that appointment, Dr. Mackwell served as the director of the Bayerisches Geoinstitut at the University of Bayreuth, Germany. Dr. Mackwell has served as program director for geophysics, Division of Earth Sciences, National Science Foundation; as member, group chief, and panel chair of the review panel for NASA's Planetary Geology and Geophysics Program; as expert reviewer for the Department of Energy's Geosciences Research Program ; and as expert consultant for the Division of Earth Sciences, National Science Foundation . Dr. Mackwell conducts laboratory-based research into the physical, chemical, and mechanical properties of geological materials under conditions relevant to the mantle and crust of Earth and other terrestrial planets. He received his Ph.D. from the Australian National University. He served on the Academies Committee on New Opportunities in Solar System Exploration, the Committee to Review Near-Earth-Object Surveys and Hazard Mitigation Strategies, the Committee on the Planetary Science Decadal Survey, the Committee on Lessons Learned in Decadal Planning in Space Science: A Workshop, the Committee on Assessment of NASA Science Mission Directorate 2014 Science Plan, the Committee on Survey of Surveys: Lessons Learned in Decadal Planning in Space Science, and currently serves on the Committee on Astrobiology and Planetary Science.

Michael F. A'Hearn

Member

MICHAEL F. A'HEARN is a Distinguished University Professor Emeritus and research professor of Astronomy at the University of Maryland, College Park (UMCP). His research is aimed at the small bodies of the solar system, particularly comets, and what they tell us about the origin of the solar system. At UMCP, he was the principal investigator (PI) for both the Deep Impact mission and the EPOXI mission in NASA's Discovery Program. He is the PI for the Small Bodies Node of NASA's Planetary Data System and is a member of two instrument teams on ESA's Rosetta mission (the ALICE UV spectrometer and the OSIRIS cameras). Dr. A'Hearn has been at the University of Maryland since 1966 (with visiting positions elsewhere). Dr. A'Hearn has received the NASA Medal for Exceptional Scientific Achievement twice, the Kuiper Prize of the AAS's Division for Planetary Sciences, and the Space Science Award of the AIAA. He received his Ph.D. in astronomy from the University of Wisconsin. His prior Academies service includes the Committee to Review Near-Earth Object Surveys and Hazard Mitigation Strategies, the Panel on Primitive Bodies of the Committee on a New Science Strategy for Solar System Exploration, aka first decadal survey, and the Task Group on Sample Returns from Small Bodies.

Joseph K. Alexander

Member

JOSEPH K. ALEXANDER is a consultant in science and technology policy at Alexander Space Policy Consultants. He was a senior program officer with the National Academies Space Studies Board (SSB) from 2005 until 2013, and he served as SSB Director from 1998 until November 2005. Prior to joining the National Academies, he was Deputy Assistant Administrator for Science in EPA's Office of Research and Development where he coordinated a broad spectrum of environmental science and led strategic planning. From 1993 to 1994, he was Associate Director of Space Sciences at the NASA Goddard Space Flight Center and served concurrently as acting chief of the Laboratory for Extraterrestrial Physics. From 1987 until 1993, he was Assistant Associate Administrator for Space Sciences and Applications in the NASA Office of Space Science and Applications where he coordinated planning and provided oversight of all scientific research programs. He also served from 1992 to 1993 as Acting Director of Life Sciences. Prior positions have included deputy NASA chief scientist, senior policy analyst at the White House Office of Science and Technology Policy, and research scientist at the Goddard Space Flight Center. His research interests were in radio astronomy and space physics.

Joseph A. Burns

Member

JOSEPH A. BURNS is the Irving Porter Church Professor of Engineering, Theoretical and Applied Mechanics, and a professor of astronomy at Cornell University. He has also served as dean of the faculty at Cornell since 2012. His research interests center on using the principles of mechanics and classical physics to understand various aspects of the current structure of the solar system. He is particularly interested in the structure and dynamics of planetary rings. Dr. Burns is a member of the Cassini Imaging Team. He has curated exhibits of those images simultaneously being shown at the American Museum of Natural History and the National Air and Space Museum. Dr. Burns is a fellow of the American Geophysical Union, the American Association for the Advancement of Science, and the Royal Astronomical Society. He is an elected member of the Russian Academy of Sciences and the International Academy of Astronautics. He has been a vice president of the American Astronomical Society and has chaired their divisions for Planetary Sciences and Dynamical Astronomy (DDA). He received the DDA's Brouwer Prize in 2013. His Academies experience includes membership on the Committee on Planetary and Lunar Exploration, the Space Studies Board, the Committee on a New Science Strategy for Solar System Exploration and the Panel on Ultraviolet, Optical, and Infrared Astronomy from Space of the Astronomy and Astrophysics Survey Committee.

Larry W. Esposito

Member

LARRY W. ESPOSITO is a professor at the University of Colorado at Boulder and at the Laboratory for Atmospheric and Space Physics. He is the principal investigator of the Ultraviolet Imaging Spectrograph (UVIS) experiment on the Cassini space mission to Saturn. He was chair of the Voyager Rings Working Group and, as a member of the Pioneer Saturn Imaging Team, he discovered Saturn's F ring. His research focuses on the nature and history of planetary rings. Dr. Esposito has been a participant in numerous U.S., Russian, and European space missions and used the Hubble Space Telescope for its first observations of Venus. He was awarded the Harold C. Urey Prize from the American Astronomical Society, the Medal for Exceptional Scientific Achievement from NASA, and the Richtmyer Lecture Award from the American Association of Physics Teachers and the American Physical Society. Dr. Esposito has extensive Academies experience, including service on the Task Group on the Forward Contamination of Europa and the Committee on Planetary and Lunar Exploration.

G. S. Hubbard

Member

G. SCOTT HUBBARD is an adjunct professor in the Department of Aeronautics and Astronautics at Stanford University, the director emeritus of the Stanford Center of Excellence for Commercial Space Transportation (COE CST) and the editor-in-chief of the peer-reviewed journal *New Space*. Hubbard has been engaged in space-related research as well as program, project, and executive management for more than 40 years including 20 years with NASA - culminating as director of NASA's Ames Research Center. At Stanford, Dr. Hubbard's research interests include the study of both human and robotic exploration of space with a particular focus on technology and missions for planetary exploration, especially Mars. Examples include novel hybrid propulsion for applications such as a Mars Ascent Vehicle and drilling techniques for a future Mars sample return mission. Hubbard served as NASA's first Mars program director and successfully restructured the entire Mars program in the wake of mission failures. His book entitled, "Exploring Mars: Chronicles from a Decade of Discovery", describes his work on NASA's Mars Program. Dr. Hubbard previously served as the sole NASA representative on the Columbia Accident Investigation Board and directed the impact testing that established the definitive physical cause of the accident. He was the founder of NASA's Astrobiology Institute; conceived the Mars Pathfinder mission with its airbag landing and was the manager for NASA's highly successful Lunar Prospector Mission. Prior to joining NASA, he was a staff scientist at the Lawrence Berkeley National Laboratory and directed a high-tech start-up company. He chairs the SpaceX Commercial Crew Safety Advisory Panel. Within the COE CST, Dr. Hubbard led research to enable, facilitate and promote commercial space. He has received many honors including NASA's highest award, the Distinguished Service Medal. Hubbard has received several honorary doctorates. He earned his B.A. in physics-astronomy at Vanderbilt University. He has served on the Academies Decadal Survey for Planetary Science 2013-2022, the Committee for Astrobiology and Planetary Science and the NASA Advisory Council as an at-large member.

Torrence V. Johnson

Member

TORRENCE V. JOHNSON is a senior research scientist at Jet Propulsion Laboratory (JPL). He is also a visiting associate in planetary science at the California Institute of Technology. At JPL, his most recent position was chief scientist for Solar System Exploration. His research interests include the study of the satellites of outer planets, the dynamics and chemistry of Io using both spacecraft and ground-based telescopic observations, and laboratory studies of silicates and ices, and interpretation of planetary spacecraft data. He was an Imaging Team member during the Voyager mission's planetary phase and he was the Project Scientist for the Galileo mission from 1977 to end of mission. Currently he is an Imaging Team Member and Co-I on the Cosmic Dust analyzer on the Cassini mission. He is a fellow of the American Geophysical Union, a member of the American Academy of Arts and Sciences, and has an honorary doctorate from the University of Padua in Italy. He earned his Ph.D. in Planetary Science from the California Institute of Technology. Dr. Johnson's Academies service includes membership on the U.S. National Committee for the International Union of Geodesy and Geophysics and the Working Group on Planetary Science.

Peter B. Kelemen

Member

PETER B. KELEMEN (NAS) is the Arthur D. Storke Memorial Professor at Columbia University. He also serves as the chair of the Department of Earth & Environmental Sciences. His current research interests are in the geologic capture and storage of CO₂ (CCS) via mineral carbonation, the subduction zone carbon cycle, and reaction-driven cracking processes in natural and engineered settings, with application to CCS, geothermal power generation, hydrocarbon extraction, and in situ mining. In addition, he is working on reactive transport of melt and fluids in the Earth's upper mantle and crust, genesis and evolution of oceanic and continental crust, subduction zone processes, and viscous mechanisms for earthquake initiation in the mantle and beneath glaciers. Dr. Kelemen was a founding partner of Dihedral Exploration, a mineral exploration consultancy specializing in field work requiring technical climbing skills, with whom he searched for ore deposits in British Columbia, Alaska and Greenland. He is a member of the US National Academy of Sciences, and a Fellow of the American Geophysical Union, the Mineralogical Society of America and the Geochemical Society. He has received the AGU Bowen Award and Columbia University's Lenfest Distinguished Faculty Award. He has participated in a broad range of NSF-based Workshops and planning meetings related to Earth Sciences and Marine Geology & Geophysics. He received his Ph.D. in geological sciences from the University of Washington. He has no previous Academies committee service.

Makenzie Lystrup

Member

MAKENZIE LYSTRUP is the director of advanced systems and business development at Ball Aerospace civil space. At Ball, Dr. Lystrup leads the new business organization that addresses customers including NASA, NOAA, and other civil government agencies. She also leads strategic planning for the Civil Space business unit. Her research interests have been in infrared spectroscopic observations of giant planet upper atmospheres and planetary ionosphere-magnetosphere interactions. Previously, Dr. Lystrup was a science policy congressional fellow and an National Science Foundation astronomy and astrophysics postdoctoral fellow at the University of Colorado's Laboratory for Atmospheric and Space Physics. She received her Ph.D. in astrophysics from University College London. She has not previously served on an Academies committee.

Juan Perez-Mercader

Member

JUAN PEREZ-MERCADER is a senior research fellow and principal investigator of a large group at Harvard University in the Department of Earth and Planetary Sciences. His current research interests are in the physics and chemistry of self-organizing behavior, information in non-equilibrium physico-chemical systems, chemical computation, origins of life, theoretical biology and life detection. He previously served as the first director of Spain's Centro de Astrobiología (CAB), which he helped found in Association with the NASA Astrobiology Institute. He is also Profesor de Investigación in Spain's National Research Council (CSIC) and an External Faculty at the Santa Fe Institute. Dr. Perez-Mercader has authored about 150 research papers published in the best journals and five books, including a best-selling popular science book in Spanish. He has two patents in biotechnology and one pending in chemical computing. He is an elected member of the International Academy of Astronautics and of the European Academy of Sciences and Arts. He is the recipient of many honors and distinctions. Among these are one of the prizes given in 1994 by the Gravity Research Foundation, the European Physical Society Lecturer for the 2005 Celebrations in Bern of Einstein's 1905 work there, and the NASA Public Service Medal, as well as NASA's Group's Achievement Award for exceptional achievement on REMS. He received his Ph.D. in physics from the City College of New York. He has not previously served on an Academies committee.

John D. Rummel

Member

JOHN D. RUMMEL is a senior scientist with the SETI Institute in Mountain View, California, where he works on astrobiology and planetary protection science and policy issues. He is currently a visiting scholar at the McGill University Institute of Air and Space Law, working on models of future space governance for protection and use of space environments. He was formerly the director of the Institute for Coastal Science and Policy and a professor of Biology at East Carolina University, where he continued his interests in ecosystems ecology, community ecology, and evolutionary biology. He maintains an active interest in the ecology and biogeography of deep sea hydrothermal vents, and the potential for life elsewhere in the universe. He previously worked as both the planetary protection officer and the senior scientist for astrobiology at NASA, and as director of research administration and education at the Marine Biological Laboratory in Woods Hole, Massachusetts. He is the recipient of numerous performance and achievement awards for his work at NASA, and is a fellow of the American Association for the Advancement of Science, and the recipient of the Life Sciences Award from the International Academy of Astronautics. He received his Ph.D. from Stanford University for research in community ecology and evolution. Dr. Rummel is a former member of the Academies' Committee on Planetary and Lunar Exploration, and served as the chair of the Panel on Planetary Protection of the International Council for Science's Committee on Space Research, from 1999 until 2014. He was also a member of the NASA Advisory Council's Planetary Protection Subcommittee until 2015.