

Decadal Survey on Biological and Physical Sciences in Space: Applied Physical Sciences Panel

Committee

Peter W. Voorhees

Chair

PETER W. VOORHEES is the Frank C. Engelhart Professor and Chair of the Department of Materials Science and Engineering at Northwestern University. He was a member of the Metallurgy Division at the National Institute for Standards and Technology until joining the Department of Materials Science and Engineering at Northwestern University in 1988. He has published over 160 papers in the area of the thermodynamics and kinetics of phase transformations. He has flown experiments investigating the dynamics of coarsening processes on the Shuttle and, more recently, on the International Space Station. Professor Voorhees' research interests include the dynamics of coarsening processes, nanowire growth, solid-oxide fuel cells, and the three-dimensional morphology of interfaces in materials. He received both his B.S. and his Ph.D. in materials engineering from Rensselaer Polytechnic Institute. Dr. Voorhees last served on as Chair of the National Research Council's Committee on Microgravity Research (2000-2003), and was a member of the Space Studies Board (1998-2003).

Nikolaos A. Gatsonis

Member

NIKOLAOS A. GATSONIS is the George I. Alden Professor of Engineering, Associate Head of the Mechanical Engineering Department, and Director of the Aerospace Engineering Program at Worcester Polytechnic Institute (WPI). From 1991 to 1993 he was a Postdoctoral Fellow at the Space Department of the Johns Hopkins University Applied Physics Laboratory (JHU APL). His research interests include simulation methods and modeling of macro- to nano-scale fluid and plasma transport processes, and development of plasma diagnostics. Dr. Gatsonis' research in spacecraft/environment interactions, spacecraft electric propulsion, and micro-propulsion, includes participation in several space-flight and ground-based experiments. His research has been supported by the Air Force Office of Scientific Research, NASA, the National Science Foundation, JHU APL, and through industrial collaborations. In addition to numerous awards, including the WPI Trustees Award for Outstanding Research and Creative Scholarship, Dr. Gatsonis was an Associate Editor of the AIAA Journal of Spacecraft and Rockets (2003-2006), a member of the AIAA Electric Propulsion Technical Committee (1998-2003) and the AIAA Space Science Technical Committee (1992-1996). He received his undergraduate degree in Physics from the Aristotle University of Thessaloniki in Greece, an M.S. in Atmospheric Science from the University of Michigan, and M.S. and Ph.D. degrees in the Department of Aeronautics and Astronautics of the Massachusetts Institute of Technology. He has no prior NRC experience.

Richard T. Lahey, Jr.

Member

RICHARD T. LAHEY, JR. (NAE) is the Edward E. Hood Professor Emeritus of Engineering at the Rensselaer Polytechnic Institute. He was formerly director of the Center for Multiphase Research (CMR) and dean of engineering at Rensselaer. He also served as chair of the department of nuclear engineering & science and the faculty senate. Prior to joining Rensselaer in 1975, he held several technical and managerial positions with the General Electric Company, including overall responsibility for all domestic and foreign research and development programs associated with Boiling Water Nuclear Reactor (BWR) thermal-hydraulic and safety technology. His research is focused on multiphase flow and heat transfer technology. He has received numerous honors and awards, including the E.O. Lawrence Memorial Award of the USDOE, the ANS Seaborg Medal, the AIChE Kern Award and the Glenn Murphy Award of the ASEE. He was elected to the National Academy of Engineering (NAE) for contributions to the field of multiphase flow and heat transfer and nuclear reactor safety technology. He received his B.S. in marine engineering from the U.S. Merchant Marine Academy, his M.S. in mechanical engineering from Rensselaer Polytechnic Institute, his M.E. in engineering mechanics from Columbia University and his Ph.D. in mechanical engineering from Stanford University. Dr. Lahey has served as a member of the National Research Council Committee on Microgravity Research (1997-2000), the Electric Power/Energy Systems Engineering Peer Committee (1999-20002) and the Committee on Safety and Security of Commercial Spent Nuclear Fuel Storage (2004-2005).

Richard M. Lueptow

Member

RICHARD M. LUEPTOW is a professor of mechanical engineering, senior associate dean of the McCormick School of Engineering and Applied Science, co-director of the Master of Product Development Program, and formerly Charles Deering McCormick Professor of Teaching Excellence at Northwestern University. Prior to joining the Northwestern faculty, he was a senior research engineer at the Haemonetics Corporation in Braintree, Massachusetts. Dr. Lueptow's research interests and expertise range from fundamental flow physics to water purification on manned spacecraft to planetary acoustics. He has studied rotating filtration, dry granular flows and granular slurries, the fundamental physics of circular Couette flow, filtration systems, fire suppression sprays, and acoustic gas composition sensors. Dr. Lueptow has received numerous awards, including the National Research Service Award from the National Institutes of Health (1978-1980), The American Society for Engineering Education Dow Outstanding Young Faculty Award (1993), the William M. Carey Award from the National Fire Protection Research Foundation (2002, 2003), and the Space Act Award from the NASA Inventions and Contributions Board for Rotating Reverse Osmosis (2004). Dr. Lueptow received his B.S. in engineering from Michigan Technological University and his Sc.D. in mechanical engineering from the Massachusetts Institute of Technology. He has frequent visiting appointments at the University of Marseille and is a Fellow of the American Physical Society.

John J. Moore

Member

JOHN J. MOORE is a materials scientist who holds the position of Trustees' Professor and head of the Department of Metallurgical and Materials Engineering at the Colorado School of Mines. Dr. Moore is also director of the interdisciplinary graduate program in materials science and director of ACSEL (Advanced Coatings and Surface Engineering Laboratory/Advanced Combustion Synthesis and Engineering Laboratory) at the Colorado School of Mines (CSM). Prior appointments held by Dr. Moore include professor and head of the Department of Chemical and Materials Engineering at the University of Auckland, New Zealand, professor of metallurgical engineering at the University of Minnesota, and manager of industrial engineering and production control at Birmingham Aluminium Castings in the United Kingdom. Dr. Moore's research interests fall in two main areas: (1) advanced coatings and surface engineering, and (2) self-propagating high temperature (combustion) synthesis (SHS) of advanced materials. Both of these research areas are operated through ACSEL at CSM. The main objective of ACSEL is to perform fundamental research in advanced Physical Vapor Deposition (PVD) and Chemical Vapor Deposition (CVD) systems that will aid the U.S. thin films, coatings and surface engineering industry, and the application of SHS in the development of new processes for net shaped metal matrix, ceramic matrix and intermetallic matrix composite materials. ACSEL is a national and international leader in research on advanced coatings, surface engineering and advanced materials synthesis and processing. Dr. Moore has published more than 600 papers in international journals on materials processing and has been awarded fourteen patents. Dr. Moore was awarded a B.Sc. in materials science and engineering from the University of Surrey, U.K., and a Ph.D. and a D.Eng. in industrial metallurgy from the University of Birmingham, UK. Dr. Moore is the Chairman of the Scientific Advisory Board of XsunX, a start-up photovoltaics company in Oregon, a member of the board of directors of Hazen Research Inc, Golden, and the Chief Scientific Officer for Advanced Materials Solutions Inc., (AMSI), Golden.

Elaine S. Oran

Member

ELAINE S. ORAN (NAE) is the senior scientist for reactive flow physics at the Naval Research Laboratory, an adjunct professor in the Department of Aerospace Engineering at the University of Michigan Ann Arbor, and a visiting professor at Leeds University. Dr. Oran designs numerical methods for simulating complex fluid dynamic processes, and then uses these methods to solve a wide variety of scientific and engineering problems. Her recent research interests include combustion and propulsion, rarefied gases and microfluidics, fluid turbulence, materials engineering, high-performance computing and parallel architectures, computational science and numerical analysis, biophysical fluid dynamics, wave equations, and astrophysical phenomena such as supernova explosions. Dr. Oran is a fellow of the American Institute of Aeronautics and Astronautics, the American Physical Society, and the Society for Industrial and Applied Mathematics, and a member of the Combustion Institute, the American Society of Mechanical Engineering, and the Society of Women Engineers. Her numerous awards include the Presidential Rank Award of Distinguished Senior Professional, the degree of Docteur Honoris Causa from Ecole Centrale de Lyon, and the Zeldovich Gold Medal from the Combustion Institute. Dr. Oran received her B.A. in chemistry and physics from Bryn Mawr College, her M.Ph. in physics from Yale University, and her Ph.D. in engineering and applied sciences from Yale University. She is currently a member of the National Research Council's Aeronautics and Space Engineering Board, and has served on many NAE committees, including the Aerospace Engineering Peer Committee, the Audit Committee (2005-2008), the Bernard M. Gordon Prize Committee (2004-2006), and currently the Nominating Committee.

Amy L. Rechenmacher

Member

AMY L. RECHENMACHER is an assistant professor in the Sonny Astani Department of Civil and Environmental Engineering at the University of Southern California (USC). Prior to joining the faculty of USC, she was an assistant professor at Johns Hopkins University, where she taught soil mechanics and digital imaging methods. She also worked briefly as a soil specialist on an archaeological excavation of the ancient Mut Temple ruins in Egypt. Dr. Rechenmacher studies the mechanics of granular flows, in particular the behavior of local flows in three contexts: in shear bands, or fractures; in fault gouges; and to help researchers understand and quantify the thermodynamics of dense granular flows. She is a member of two national engineering honor societies, Tau Beta Pi and Chi Epsilon, and numerous professional engineering organizations, including the American Society of Civil Engineers, the American Geophysical Union, Geo-Institute and the International Association of Foundation Drilling. Dr. Rechenmacher recently received the 2008 National Science Foundation Early Career Award for her work in granular behavior and geotechnical engineering applications. She earned her B.S. from Iowa State University, her M.A. from Cornell University, both in civil engineering and her Ph.D. in geotechnical engineering from Northwestern University's McCormick School of Engineering.

James T'ien

Member

JAMES S. T'IENT is the Leonard Case Jr. professor of engineering in the department of mechanical and aerospace engineering at Case Western Reserve University. Dr. T'ien's research interests are in the areas of combustion, propulsion, fire research and chemically reacting flows. Current funding for his projects comes from NASA, and National Institute of Standards and Technology, and the Department of Homeland Security. He has received numerous awards, including a Daniel and Florence Guggenheim Fellowship in Jet Propulsion and a Public Service Medal from NASA (2000). In addition, he is an Honorable Member of the Combustion Institute's Chinese Taipei Section and a member of the American Society of Mechanical Engineers and the American Institute of Aeronautics and Astronautics (AIAA). He has served on numerous advisory committees and working groups, including NASA's Microgravity Combustion Science Discipline Working Group and AIAA's Microgravity Science and Space Processes Committee. Dr. T'ien received his B.S. in mechanical engineering from the National Taiwan University, his M.S. in engineering science from Purdue University, and his Ph.D. in aerospace and mechanical sciences from Princeton University. He recently served on the National Research Council's Committee to Identify Innovative Research Needs to Foster Improved Fire Safety in the United States (2001-2003).

Mark M. Weislogel

Member

MARK M. WEISLOGEL is a professor in the Thermal and Fluid Sciences Group in the Maseeh College of Engineering and Computer Science at Portland State University. Weislogel has research experience from government and private institutions. While employed by NASA, he proposed and conducted experiments relating to microgravity fluid mechanics. This unique subtopic area within fluid mechanics provides significant challenges for designers of fluids management systems for aerospace applications as well as exciting learning opportunities for students. Weislogel continues to make extensive use of NASA ground-based low-gravity facilities such as drop towers and low-g aircraft and has completed experiments on a Space Shuttle, the Russian Mir Space Station, and the International Space Station. While in the private sector, Weislogel served as principal investigator for applied research projects concerning high-performance heat transport systems, micrometeorite-safe space-based radiators, microscale cooling systems, emergency oxygen supply systems, and astronaut sleep stations. His research at PSU includes passive non-capillary cooling cycles for satellite thermal control and capillary fluidics at both micro- and macro length scales. His teaching interests include heat transfer, fluid mechanics, and applied mathematics as it relates to these subjects. Weislogel has written over 50 publications; see www.eas.pdx.edu/~mmw/ for further details. Mark Weislogel has B.S. and M.S. degrees from Washington State University and earned a Ph.D. from Northwestern University in 1996.