BESR

BOARD ON EARTH SCIENCES AND RESOURCES

AGENDA BOOKLET

MAY 10, 2021

Virtual Meeting

The National Academies of

SCIENCES
ENGINEERING
MEDICINE

Energy and Resources Needs for a Nation in Transition

Spring Event of the
Board on Earth Sciences and Resources

The energy and solid Earth resource communities are considering how their work may evolve to respond to changing societal demands as well as to climate change and its impacts. This includes discussion of the inequitable distribution of the benefits and consequences of Earth resource extraction and development. This meeting of the Board on Earth Sciences and Resources examines current energy and Earth resources research priorities, with emphasis on how addressing those priorities could also mitigate climate change and decrease adverse social and environmental impacts. Participants will discuss possible paths for these transitions, and ways in which BESR might support strategy development in these areas.

Register at: https://besrspring2021.splashthat.com/

Monday, May 10, 2021 All Times ET	
12:00 PM	**Welcome and Brief Overview of BESR** *Isabel Montañez, BESR Chair*
12:15 PM	**Paving the Way to a Decarbonized Energy Future** *Brian Anderson, NETL* Moderator: Jim Slutz, BESR Member
1:00 PM	**Speaker Panel** **Land and Water: Impacts and Tradeoffs of the Energy Transition** *Moderator: Brenda Bowen, BESR Member*
	Produced Water Reuse: Risks, Research Needs and Regulatory Implications *Nichole Saunders, Environmental Defense Fund* **The Sustainability of Renewable Energy in a Rapid Energy Transition** *Rebecca Hernandez, University of California, Davis* **Enhanced Weathering as a Billion Ton Carbon Solution** *Benjamin Houlton, Cornell University*
1:50 PM	**BREAK**

2:05 PM	**Panel Discussion** *Moderator: Brenda Bowen, BESR Member*
2:50 PM	**Synthesis and Wrap-Up** *Isabel Montañez, BESR Chair* • Emerging opportunities • Biggest challenges
ADJOURN OPEN SESSION 3:00 PM	

BIOGRAPHIES

IN THIS SECTION

SPEAKER BIOGRAPHIES

Brian Anderson is the director of the National Energy Technology Laboratory (NETL) of the Department of Energy (DOE). As director of the National Energy Technology Laboratory (NETL), Brian J. Anderson, Ph.D., manages the complete NETL complex, including delivery and execution of the Laboratory's mission and national programs in carbon-based energy and program support to the U.S. Department of Energy (DOE) Offices of Energy Efficiency and Renewable Energy; Electricity; and Cybersecurity, Energy Security and Emergency Response. Anderson leads NETL's more than 1,300 employees and guides more than 1,000 R&D projects in 50 states with a total award value of $5 billion. As director, Anderson fosters strategic relationships with utility and academic institutions, state and local governments, and important carbon management stakeholders. Under Anderson's leadership, NETL initiated critical technology development anddeployment projects including direct air capture technologies for decarbonization, chemical looping combustion with potential to reduce greenhouse gas emissions, and non-variable renewable energy for future low-carbon power systems. Anderson also guided the development and maturation of key technologies proven to have significant industry impact including microwave ammonia synthesis and carbon nanomaterials manufactured from coal. He is the recipient of the 2020 Federal Laboratory Consortium Laboratory Director of the Year award, and Secretary's Honor Award and Presidential Early Career Award for Scientists and Engineers for his research. Anderson earned his bachelor's degree in chemical engineering at West Virginia University and his master's and doctorate in chemical engineering from the Massachusetts Institute of Technology.

Rebecca R. Hernandez is assistant professor of Earth System Science and Ecology in the Department of Land, Air and Water Resources and co-director of the Wild Energy Initiative. She directs field-based, data-intensive, and technology-supported research at the intersection of energy development and the environment. Her research is motivated by the belief that every human should have access to energy in a manner that is sustainable with the Earth system. Her work on energy ecology has been published in Nature Sustainability, Nature Climate Change, Proceedings of the National Academy of Sciences, Environmental Science and Technology and Renewable and Sustainable Energy Reviews and has been featured in the Washington Post, National Geographic, NPR, Forbes, and Scientific American. In 2016, she was the recipient of the E.O. Wilson Award and in 2020 she received the American Geophysical Union Global Environmental Change Award. Dr. Hernandez is a first generation college graduate and proud graduate of the community college system. She completed her A.S. in biology and geogra-phy at Saddleback Valley Community College, her B.A. in geography at the University of California, Los Angeles, her M.S. in biological science at California State University, Fullerton, and her Ph.D. in environmental Earth system science at Stanford University.

Benjamin Z. Houlton is the Ronald P. Lynch Dean of the College of Agriculture and Life Sciences and a Cornell University professor in the Departments of Ecology and Evolutionary Biology and of Global Development. An accomplished international scientist, his research interests include global ecosystem processes, climate change solutions, and agricultural sustainability. As founding co-chair of the California Collaborative for Climate Change solutions, Ben works with researchers from key research institutions to accelerate the translation of research findings into practical climate solutions. He also directs over 100 acres of farmland carbon sequestration projects to improve crop yields and create new financial markets for farmers and ranchers. Ben has published his research in leading scientific journals including Nature, Science, and the Proceedings of the National Academy of Sciences. As part of his mission to connect scientific discovery with the public, he is also a frequent guest on regional and national news programs. He received his B.S. in water chemistry from the University of Wisconsin – Stevens Point, College of Natural Resources, his M.S. in environmental engineering sciences from Syracuse University, and his Ph.D. in ecology and evolutionary biology from Princeton University.

Nichole Saunders is a senior attorney in the Environmental Defense Fund's (EDF's) Energy Program where her work is devoted to ensuring science-based regulations, policies, and industrial practices are in place to reduce human health and environmental impacts from energy development, with a particular focus on the management and disposal of oil and gas wastewater and policies to ensure environmental integrity in emerging carbon capture and sequestration projects and programs. Nichole contributes to state and federal advocacy in this arena and manages pertinent multi-stakeholder efforts to improve environmental outcomes by improving industry practices and enhancing state and federal policies. She has been with EDF since 2013 in the Austin office. Nichole received her M.S. in environmental biology and B.S. in environmental biology and psychology from Tulane University and a J.D. with highest honors from the University of Tulsa College of Law with a certificate in sustainable energy and resources law.

BOARD ON EARTH SCIENCES AND RESOURCES

The Board on Earth Sciences and Resources (BESR) was established in 1988 to provide a focal point for activities related to Earth sciences and resources and their application to policy and decision making. Through its committees, panels, and roundtables, it oversees and facilitates activities on a range of Earth science and resource issues including those related to the natural environment; the built environment; natural hazards; energy, mineral, and land resources; geographic and geospatial information; and research, data science, education, and workforce.

BESR oversees the following standing committees:

Committee on Earth Resources
Committee on Geological and Geotechnical Engineering
Committee on Solid Earth Geophysics
Geological Sciences Committee
Mapping Science Committee

The activities of the Board and its standing committees provide independent, unbiased, scientific and engineering advice to the nation on a broad range of Earth science and resource issues in response to requests and needs expressed by federal agencies, Congress, state and local government, industry, the research community, non-governmental organizations and the public. These activities also include opportunities for constructive discussion and idea exchange among various stakeholders who represent different viewpoints, areas of expertise, and communities.

BOARD MEMBERS

Isabel P. Montañez , Chair
University of California, Davis

Estella A. Atekwana
University of Delaware

Thorsten W. Becker
University of Texas at Austin

Brenda B. Bowen
The University of Utah

Nelia W. Dunbar
New Mexico Bureau of Geology and Mineral Resources

Rodney C. Ewing, NAE
Stanford University

Mary Feeley
ExxonMobil Exploration Company (retired)

William C. Hammond
Nevada Bureau of Mines and Geology & University of Nevada, Reno

Robert L. Kleinberg, NAE
Principal, Presidio Energy

Zelma Maine-Jackson
Washington State Department of Ecology (retired)

Michael Manga, NAS
University of California, Berkeley

Martin W. McCann
Stanford University

Patricia McDowell
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BOARD ON EARTH SCIENCES AND RESOURCES

2021 MEMBERSHIP BIOGRAPHIES

updated 3/16/2021

Isabel Patricia Montañez, Chair, is a distinguished professor and chancellor's leadership professor in the Department of Earth and Planetary Sciences, University of California, Davis. Dr. Montañez is a paleoclimatologist whose research focuses on geologic archives of past atmospheric gas and ocean geochemical compositions and their linkages to climate and ecosystem changes. She received her Ph.D. from Virginia Polytechnic Institute in 1990 and has received several awards including the James Lee Wilson Medal for Excellence by a Young Scientist, the Laurence L. Sloss Award from the The Geological Society of America, and the Jean-Baptiste Lamarck Medal from the European Geosciences Union. She is a fellow of several professional societies and a past fellow of the John Simon Guggenheim Memorial Foundation. She served as President of The Geological Society of America from 2017 to 2018.

Estella A. Atekwana is the dean of the College of Earth, Ocean, and Environment at the University of Delaware, where she has been since the fall of 2017. She spent the previous decade at Oklahoma State University, where she finished as department head of the Boone Pickens School of Geology. Prior to Oklahoma State, Dean Atekwana was a faculty member at Missouri University of Science and Technology, Indiana University-Purdue University Indianapolis, and Western Michigan University. Her main research interests are in the areas of biogeophysics and tectonics. Her biogeophysical research examines the geophysical signatures of microbial cells in the Earth, the interaction between microorganisms and subsurface geologic media, and the alternation of the physical properties of geologic media as a result of microbial activity. In the tectonic realm, she has conducted geophysical investigations of incipient continental rift forming processes to understand how and where continental rifts initiate. She received her B.S. and M.S. in geology from Howard University and her Ph.D. in geophysics from Dalhousie University.

Thorsten W. Becker is the Shell Distinguished Chair in Geophysics at the Institute for Geophysics and the Department of Geological Sciences, Jackson School of Geosciences, at the University of Texas at Austin. His main research interests are in geodynamics and seismology with a focus on interactions between mantle convection and surface tectonics—studying the inner workings of terrestrial planets and how their mantle and surface systems have co-evolved over time. He combines field, laboratory, and numerical approaches into dynamical models, focusing on the physics of plate tectonics from grain-scale deformation to plate-scale flow. Recent research projects include work on seismic anisotropy, mantle heat transport and the mechanics of plate tectonics, subduction dynamics, and fault system mechanics. He has co-authored more than 130 publications and was named an AGU Fellow in 2015. Dr. Becker holds an M.Sc. in physics from J. W. Goethe University, a Ph.D. in geophysics from Harvard University, and was a postdoctoral scholar at the Scripps Institution of Oceanography at the University of California, San Diego.

Brenda B. Bowen is an associate professor of geology and geophysics and director of the Global Change and Sustainability Center at The University of Utah. She is an interdisciplinary geoscientist whose work focuses on how changing environmental conditions influence the composition of sediments, authigenic minerals, and fluids in both modern dynamic systems and ancient lithified strata. Her current projects are focused on anthropological impacts on modern surface and hydrological processes, sedimentology and

geobiology in extreme environments, geologic CO2 sequestration, and structural diagenesis and fluid flow. In addition to her geologic research and teaching, Dr. Bowen works to facilitate interdisciplinary environmental research and education that address critical issues related to understanding global change and creating sustainable solutions. She received her B.S. and M.S. in earth sciences from the University of California, Santa Cruz and her Ph.D. in geology and geophysics from The University of Utah.

Nelia W. Dunbar has a background in geochemistry and is now the director of the New Mexico Bureau of Geology and Mineral Resources. In that role, she has the title of "State Geologist." Dunbar has worked for the Bureau since 1992, focusing on geochemistry of volcanic rocks–particularly volcanic ashes and other explosive eruptions mainly in New Mexico and Antarctica. She also received funding from the National Science Foundation (NSF) for an electron microprobe in 1996 and, until recently, managed that laboratory. Her professional interests include research on a wide range of topics broadly focused on volcanic and igneous processes in New Mexico and elsewhere. These include studies of volcanic eruption processes, geochemical evolution of magmas, chronology and chemistry of volcanic ashes, fluid migration within magmas, and geochemical alteration caused by fluids that interact with volcanic rocks. Dunbar has also spent 23 field seasons in Antarctica working on NSF-funded projects all of which are related to Antarctic volcanism and interactions between volcanism, ice, and climate. In addition to New Mexico and Antarctica, she has worked in Tibet, Peru, Ethiopia, Bolivia, and Ecuador–all on projects related to volcanism. In addition to research, Dunbar is an adjunct faculty member at the Department of Earth and Environmental Sciences at the New Mexico Institute of Mining and Technology in Socorro, taught a graduate class on electron microprobe analysis, advised graduate students and served on student committees, and is involved in outreach activities for New Mexico teachers and students. She received her B.A. degree, summa cum laude, in geology at Mount Holyoke College (1983) and then went on to a Ph.D. in geochemistry at the New Mexico Institute of Mining and Technology (1989).

Rodney C. Ewing, NAE, is the Frank Stanton Professor in Nuclear Security in the Center for International Security and Cooperation in the Freeman Spogli Institute for International Studies and a professor in the Department of Geological Sciences in the School of Earth, Energy and Environmental Sciences at Stanford University. He is also the Edward H. Kraus Distinguished University Professor Emeritus in the Department of Earth and Environmental Sciences at the University of Michigan. He is the author or co-author of over 750 research publications and the editor or co-editor of 18 monographs, proceedings volumes, or special issues of journals. He has published widely in mineralogy, geochemistry, materials science, nuclear materials, physics, and chemistry in over 90 different ISI journals. He is a founding editor of the magazine, Elements, which is now supported by 17 earth science societies. Ewing received the Hawley Medal of the Mineralogical Association of Canada in 1997 and 2002, a Guggenheim Fellowship in 2002, the Dana Medal of the Mineralogical Society of America in 2006, the Lomonosov Gold Medal of the Russian Academy of Sciences in 2006, a honorary doctorate from the Université Pierre et Marie Curie in 2007, and is a foreign fellow of the Royal Society of Canada. He was elected a member of the National Academy of Engineering in 2017. He is also a fellow of the Geological Society of America, Mineralogical Society of America, American Geophysical Union, Geochemical Society, American Ceramic Society, the American Association for the Advancement of Science, and the Materials Research Society. He has been president of the Mineralogical Society of America and the International Union of Materials Research Societies. Ewing has served on the board of directors of the Geochemical Society and the Board of Governors of the Gemological Institute of America and the Science and Security Board of the Bulletin of the Atomic Scientists. Professor Ewing has served on twelve committees and boards for the National Academies of Sciences, Engineering, and Medicine that have reviewed issues related to nuclear waste and nuclear weapons. In 2008, he was a technical cooperation expert for the International Atomic Energy Agency at the Comissão Nacional de Energia Nuclear in Rio de Janeiro, Brazil. In 2012, he was appointed by President

Obama to serve as the chair of the Nuclear Waste Technical Review Board (NWTRB), which is responsible for ongoing and integrated technical review of DOE activities related to transporting, packaging, storing, and disposing of spent nuclear fuel and high-level radioactive waste. He stepped down from the NWTRB in 2017. Ewing received a B.S. in geology from Texas Christian University and M.S. and Ph.D. degrees from Stanford University where he held an NSF Fellowship.

Mary Feeley retired as chief geoscientist from ExxonMobil Exploration Company in 2014. Her responsibilities included advising senior ExxonMobil Upstream management on strategic geoscience matters and identifying global geoscience opportunities for ExxonMobil. Dr. Feeley's graduate work was focused on understanding depositional patterns in upper slope salt basins and the Mississippi Fan using seismic stratigraphy techniques. She also spent many years working on lease sales, prospect maturation, and energy development in the Gulf of Mexico. Dr. Feeley's National Academies of Sciences, Engineering, and Medicine experience includes membership on the Ocean Studies Board from 2005 to 2010 and serving on several committees, including the 2015 Committee on Guidance for NSF on National Ocean Science Research Priorities: Decadal Survey of Ocean Sciences and most recently on the Committee on Offshore Science and Assessment for BOEM. Dr. Feeley earned her Ph.D. in oceanography from Texas A&M University.

William C. Hammond is a professor of geodesy and geophysics in the Nevada Geodetic Laboratory, which resides in the Nevada Bureau of Mines and Geology at the University of Nevada, Reno. He does research using space geodesy to study active processes in the solid Earth. These processes include tectonic and seismic cycle deformation, mountain building, geophysical loading, tectonic controls on geothermal resources, mantle processes, and interactions between tectonic and magmatic systems. Recently he has published academic research papers in using GPS and InSAR to study vertical motion of Earth's surface and its interaction with the climate system. He currently operates the MAGNET GPS network in the eastern Sierra Nevada and the western Great Basin, a geodetic research infrastructure for observing crustal deformation and seismic hazards. His recent past service includes chairing the Advisory Committee for the NSF-supported EarthScope Plate Boundary Observatory GPS network, secretary of the geodesy section of the American Geophysical Union, and Associate Editor for the Bulletin of the Seismological Society of America. He is author or co-author of ~90 peer reviewed and non-peer reviewed articles, book chapters, maps, conference proceedings, guidebooks, and reports. He earned degrees in applied mathematics and geophysics, and was a postdoc at the US Geological Survey in Menlo Park, California.

Robert L. Kleinberg, NAE, is a Senior Research Scholar at the Center on Global Energy Policy of Columbia University and is a Senior Fellow of the Institute for Sustainable Energy at Boston University. From 1980 to 2018, he was employed by Schlumberger, the premier oilfield service company, and attained the rank of Schlumberger Fellow, one of about a dozen who hold this rank in a workforce of 100,000. Prior to joining Schlumberger, Dr. Kleinberg worked at the Exxon Corporate Research Laboratory. Dr. Kleinberg's work at Schlumberger focused on geophysical measurements and the characterization and delineation of unconventional fossil fuel resources including shale gas and tight oil. His current work centers on energy technology and economics and on environmental issues connected with oil and gas development. Dr. Kleinberg has authored more than 120 academic and professional papers, holds 41 U.S. patents, and is the inventor of several geophysical instruments that have been commercialized on a worldwide basis. Dr. Kleinberg was the 2018-2019 American Physical Society's Distinguished Lecturer on the Application of Physics and is a member of the National Academy of Engineering. He received his B.S. in chemistry (1971) from the University of California, Berkeley and his Ph.D. in physics (1978) from the University of California, San Diego.

Zelma Maine-Jackson has been a hydrologist with the Washington State Department of Ecology Nuclear Waste Program for over 20 years–providing technical oversight for groundwater cleanup of radioactive and hazardous waste for the Hanford Site. Ms. Maine-Jackson was an exploration geologist in the early 1970s with Atlantic Richfield Oil Company where she explored the Rocky Mountain Region for sandstone-type uranium deposits and located several successful, productive mines. In the early 1980s, she transitioned from uranium exploration to environmental remediation of uranium contamination at the U.S. Department of Energy's 586-square-mile Hanford Nuclear Site in eastern Washington State. To integrate a scientific dialog into communities across the country, she has served on Washington's African American Affairs Commission through four governors and as a two-term appointee to the Washington State Community Economic Revitalization Board. She was an advisory member to the Washington State Department of Natural Resources, holds founding membership in the National Association of Black Geoscientists, and board positions with the American Red Cross, United Way, Rotary International, STEM education high schools, and various public schools. Recently, Ms. Maine-Jackson was named a Daughter of Hanford because of her connection and longevity of work at the Hanford Site. As an indigenous member of the Gullah-Geechee Nation, she is dedicated to conserving Loggerhead sea turtles at South Carolina's Hunting Island State Park and to sustaining and restoring wildlife population and habitats in the Ashepoo, Combahee and Edisto Basin. She attended Virginia State University for her undergrad work and holds a master's degree in economic geology from the University of Washington in Seattle.

Michael Manga, NAS, is professor and chair in the Department of Earth and Planetary Science at the University of California, Berkeley (UCB). His research focuses on the processes that control the storage, ascent, and eruption of magmas and the impacts of those eruptions on surface environments. Current projects also include studies of geysers, the interactions between hydrological processes and earthquakes including the origin of induced seismicity, the evolution of hydrological systems on Mars, and the tectonics of Jupiter's moon Europa. He chaired the National Academies of Sciences, Engineering, and Medicine's 2017 report "Volcanic Eruptions and Their Repose, Unrest, Precursors, and Timing." He is the recipient of several awards including a MacArthur fellowship in 2005, The Geological Society of America's Donath Medal, the American Geophysical Union's Macelwane Medal, the European Geoscience Union's Bunsen Medal for research in geochemistry, mineralogy, and petrology, and UCB's campus Distinguished Teaching Award in 2017 – the first to be issued from the Department of Earth and Planetary Science. In 2018, he was elected to the National Academy of Sciences for internationally recognized work including elegant experimental and theoretical work and creative field studies. Dr. Manga received a B.Sc. in solid Earth geophysics from McGill University and a M.Sc. in engineering sciences and a Ph.D. in Earth and planetary sciences from Harvard University.

Martin W. McCann is president of Jack R. Benjamin and Associates, Inc. and is also a consulting professor of civil and environmental engineering at Stanford University. At Stanford, he is a former chair of the National Performance of Dams Program, which created a national network to report dam safety incidents and to archive this information for use by the geotechnical and seismic engineering communities. Dr. McCann's professional background and research have focused on probabilistic hazards analysis including hydrologic events, risk assessment, reliability and uncertainty analysis, and systems analysis. He has been a consultant to several government and private sector groups in the U.S. and abroad and has served on three National Research Council committees including the Committee on Integrating Dam and Levee Safety and Community Resilience. He currently chairs the BESR's standing Committee on Geological and Geotechnical Engineering. Dr. McCann received a B.S. in civil engineering from Villanova University and an M.S. in structural engineering and a Ph.D. in civil engineering from Stanford University.

Patricia McDowell is a physical geographer whose work has focused on fluvial geomorphology, particularly natural and human controls of river channel and floodplain morphology, response of river systems to environmental change, biogeomorphology, river restoration, and restoration monitoring. Her work has been conducted in Oregon, the Midwest U.S., New England, and Alaska. She teaches courses in geomorphology, fluvial geomorphology, and watershed science and policy. She is active in several organizations and committees charged with planning, implementing, and monitoring river restoration in various river basins of Oregon. She has served on several National Academies of Sciences, Engineering, and Medicine study committees on aspects of river management. The Geomorphology Specialty Group of the American Association of Geographers awarded her its distinguished career award. She is professor emerita of the Department of Geography and the Environmental Studies Program at University of Oregon, where she has been a faculty member since 1982. She was department head of the Department of Geography for seven years and served as Associate Vice President of Research for two years. She has degrees in architecture and city and regional planning from Illinois Institute of Technology and a Ph. D. from the University of Wisconsin-Madison.

Harvey J. Miller is the Bob and Mary Reusche Chair in Geographic Information Science, director of the Center for Urban and Regional Analysis, and professor in the Department of Geography, The Ohio State University. He is also a courtesy professor in the City and Regional Planning program in the Knowlton School of Architecture, on the advisory board of the Sustainability Institute, and an affiliated faculty of the Translational Data Analytics Institute, all at Ohio State. Dr. Miller's research and teaching interests are at the intersection between geographic information science and transportation, in particular, the analysis of human mobility within cities and regions. The main questions driving his research include sustainable transportation, livable cities, and the relationships between human mobility, health, and social equity. Dr. Miller's awards and honors include the Edward L. Ullman Award for Outstanding Contributions to Transportation Geography from the Association of American Geographers (2009) and the Research Award for scholarly contributions to Geographic Information Science from the University Consortium for Geographic Information Science (2015). Dr. Miller received his B.A. and M.A. in geography from Kent State University and his Ph.D. in geography from Ohio State University.

Jeffrey N. Rubin was the emergency manager for Oregon's largest fire district from 2001 to 2019. His work focuses on hazard and threat analysis, planning, and risk perception and communication. Dr. Rubin served on the U.S. Department of Homeland Security (Science and Technology Directorate) First Responder Resource Group from 2009 to 2020 and was the vice chair of the Governor's Task Force on Resilience Plan Implementation in Oregon. He is a Fellow and elected Councilor of the Geological Society of America, a certified emergency manager, and a nationally registered emergency medical technician. He holds a B.S. in geology and geophysics from Yale University and a M.A. and Ph.D. in geological sciences from the University of Texas at Austin.

Jim Slutz is the director of study operations for the National Petroleum Council (NPC), an independent federal advisory committee to the United States, reporting to the Secretary of Energy. Prior to NPC, Jim led a global consulting practice with projects in North America, Asia, and Europe. Previously, Mr. Slutz served as Acting Assistant Secretary of Fossil Energy at the United States Department of Energy (DOE) and before that as Deputy Assistant Secretary of Oil and Natural Gas at DOE. Prior to joining DOE, Jim served as the Indiana Oil and Gas Director, regulating the State's upstream oil and gas industry and natural gas storage wells. He is a former Vice-Chair of the Interstate Oil and Gas Compact Commission. Mr. Slutz holds an MBA degree from The Ohio State University, Fisher College of Business, and a B.S. degree from The Ohio State University, School of Natural Resources. Jim serves as chair of the Committee on Earth Resources and is a member of the Board of Earth Sciences and Resources of the National Academies of

Sciences. In addition, he serves as an advisor to the National Bureau of Asia Research and is a Board Member of the local chapter of the Society of Petroleum Engineers (SPE), currently serving as program chair for the Inaugural 2021 SPE/AAPG/SEG Washington DC Technology and Sustainability Symposium. Jim has published papers in collaboration with the American Enterprise Institute, The East West Center, the U.S. Chamber of Commerce Foundation, and the National Bureau of Asia Research.

Elizabeth J. Wilson is the inaugural director of the Arthur L. Irving Institute for Energy and Society and professor in the Environmental Studies Department at Dartmouth College. She studies how energy systems are changing in the face of new technologies and new societal pressures. Her work focuses on the implementation of energy and environmental policies and laws in practice. She is interested in how institutions support and thwart energy system transitions and focuses on the interplays between technology innovation, policy creation, and institutional decision making. Her recent books include *Energy Law and Policy* (West Academic Publishing with Davies, Klass, Tomain, and Osofsky) and *Smart Grid (R)evolution: Electric Power Struggles* (Cambridge Press with Stephens and Peterson). Wilson's research group is working on an NSF supported grant on decision making in regional transmission organizations. Wilson was a professor at the University of Minnesota and was recently awarded a 2015 Andrew Carnegie Fellowship and spent the 2016-2017 academic year at the Danish Technical University. She was selected as a 2014-2015 Committee on Institutional Cooperation's Academic Leadership Fellow. She was chosen as a Leopold Leadership Fellow in 2011. She spent the 2009-2010 academic year as a visiting professor at Tsinghua University in Beijing, supported by McKnight Land-Grant Professorship. Prior to joining the University of Minnesota, she worked with the U.S. Environmental Protection Agency. Before that, Wilson worked in Belgium, Burundi, and Tanzania. She holds a masters degree in human ecology from the Free University of Brussels in Belgium and a doctorate in engineering and public policy from Carnegie Mellon University.

PAST MEETING TOPICS

Board on Earth Sciences and Resources

- May 2021: Energy and Resources Needs for a Nation in Transition
- Oct 2020: Increasing Diversity and Inclusion for Underrepresented Scholars in Earth Sciences: Addressing an Urgent Challenge
- May 2020: Research Highlights from BESR Members
- Jun 2019: Geohazards and Cascading Effects: Opportunities for leveraging instruments, monitoring approaches, and science capabilities among different science communities
- Oct 2018: Minerals, Water, and Energy: The Science That Drives Their Interdependencies, Feedback, and Tradeoffs
- Apr 2018: Environmental Dynamics and Exposure Pathways of Subsurface Contaminants
- Nov 2017: Geoscience in Four Dimensions – Seafloor Mining
- May 2017: Space Observations of Earth's Surface, Interior, and Dynamics
- Nov 2016: The Cascadia Subduction Zone: Science, Impacts, and Response
- Apr 2016: The Evolving Soil Interface of the Earth System

Committee on Earth Resources

- Apr 2021: Earth Resources for the Energy Transition: Webinar Series
- Dec 2020: Pathways Toward the Future Just, Equitable, Diverse, and Inclusive (JEDI) Energy Workforce
- May 2020: Earth Resources in the Energy Transition: A Focus on Carbon Capture, Utilization, and Storage
- Oct 2019: Characterization and Management of the Subsurface: Insights from the Development of Geothermal, Oil and Gas, and Mineral Resources
- Jun 2019: Subsurface Data and Machine Learning
- Oct 2018: Process, Challenges, and Opportunities for Research on Upstream Aspects of U.S. Coal Production
- May 2018: Critical Minerals and Materials
- Nov 2017: Geoscience in Four Dimensions; Seafloor Mining
- Apr 2017: Hard-Rock Mines
- Nov 2016: Mineral and Energy Resource Issues for the Coming Decade
- May 2016: Next Generation Oil and Gas Research: Science and Technology to Drive Innovation

Committee on Geological and Geotechnical Engineering

- Apr 2021: Advancing Geo-Professional Perspectives in Risk-Informed Decision Making
- Oct 2020: Incorporating Geoprofessional Input into Improved Infrastructure Decision Making
- Oct 2019: Recent and emerging geological and geotechnical issues faced by federal government agencies
- Jun 2019: Managing Mine Waste Risks—Practice, Limitations, Needed Research

- Oct 2017: Corrosion of Buried Steel in Earth Applications
- Feb 2017: Advancing the State of Practice in the Assessment of Earthquake-Induced Soil Liquefaction and Its Consequences

Committee on Solid Earth Geophysics

- March 2021: Novel Geophysical Datasets for Environmental Applications: Moving from Discovering Signals to Societal Benefits
- Nov 2020: Solid Earth Science and Sea Level Change
- Apr 2020: Enhancing Quantitative Capacity of Geoscience Programs
- Oct 2019: Beyond the Black Box: The Future of Machine Learning and Data-Intensive Computing in the Solid Earth Geosciences
- May 2019: New Opportunities to Study Tectonic Precursors
- Nov 2018: (Re)assessing Seismic Hazard Across the United States
- June 2018: Seismic Hazards in Near- and Long-Term Nuclear Waste Storage and Legacy seismic data
- Nov 2017: Integrative Subduction Zone Science: Moving into the next decade
- May 2017: Communicating the Value of Geoscience to Society
- Nov 2016: The Cascadia Subduction Zone: Science, Impacts, and Response
- Apr 2016: Collaborative Graduate Training Initiatives in High Performance Computing for the Solid Earth Sciences

Geographical Sciences Committee

- May 2021: Disaster Response During a Pandemic
- Oct 2020: COVID-19 and the Geography of Vulnerability
- Nov 2019: Federal Landscape of Geographical Mapping Science (joint w/MSC)
- May 2019: Effects of Energy Transition on Opportunities in Rural America
- Dec 2018: Vulnerability of U.S. Energy Infrastructure to Coastal Flooding
- May 2018: Opportunities and Consequences of Using Sensors to Capture Human Geographical Behaviors
- Oct 2017: Equity in Access and Health Effects of Exposure to Nature

Mapping Science Committee

- May 2021: Geospatial Needs for Environmental Justice
- Nov 2019: Federal Landscape of Geographical and Mapping Science (joint w/GSC)
- Mar 2017: Cloud-Enabled Mapping Science
- Apr 2016: National Address Database/Smart Cities