Developing a Research Agenda for Carbon Dioxide Removal and Reliable Sequestration

Committee

Stephen W. Pacala

Chair

Dr. Stephen Pacala is Frederick D. Petrie Professor of Ecology and Evolutionary Biology at Princeton University. Currently, he co-directs Princeton's Carbon Mitigation Initiative which is a collaboration between Princeton University and British Petroleum to find solutions to the problem of global warming. Dr. Pacala previously acted as the Director of the Princeton Environmental Institute. His research covers a wide variety of ecological and mathematical topics with an emphasis on interactions between greenhouse gases, climate and the biosphere. Dr. Pacala has an undergraduate degree from Dartmouth College in 1978 and a Ph. D. in biology from Stanford University in 1982. He serves on the board of the Environmental Defense Fund. Among his many honors are the David Starr Jordan Prize and the George Mercer Award of the Ecological Society of America. Dr. Pacala is a member of the American Academy of Arts and Sciences and the National Academy of Sciences.

Mahdi Al-Kaisi

Member

Dr. Mahdi Al-Kaisi is a Professor of soil physics in the Department of Agronomy at Iowa State University. Dr. Al-Kaisi received his M.S. and Ph.D. in soil physics from North Dakota State University in in 1982 and 1986, respectively. Dr. Al-Kaisi has been on the faculty at Iowa State University since 2000 where his research focuses on the effects of cropping and tillage systems, crop residue management, cover crops, and nitrogen application on soil carbon dynamics and sequestration, greenhouse gas emissions, and other ecosystem services. In addition, he studies the interaction effects of agricultural practices and environmental factors such as, weather variability and landscape spatial variability on soil organic carbon sequestration and systems sustainability and productivity. The focus of his research is to develop sustainable management practices that improve soil health, productivity, and environmental services. As a result of his research, he has developed field calculators to assess soil management practices impacts, such as, tillage systems, crop residue, and crop rotation effects on soil sustainability. Also he developed soil carbon index for soils in Iowa.

Mark A. Barteau

Member

Dr. Mark A. Barteau is the Director of the University of Michigan Energy Institute and the inaugural DTE Energy Professor of Advanced Energy Research. He previously served as the Senior Vice Provost for Research and Strategic Initiatives at the University of Delaware. He was elected to the National Academy of Engineering in 2006. Barteau brings extensive experience as a researcher, inventor, academic leader, and consultant for both US and international organizations. His research focuses on chemical reactions at solid surfaces, and their applications in heterogeneous catalysis and energy processes. His research has been funded by the National Science Foundation, the Department of Energy, the Air Force Office of
Scientific Research and NASA. Mark received his Ph. D. and Masters in Chemical Engineering from Stanford University in 1981 and 1977, respectively.

Erica Belmont

Member

Dr. Erica Belmont is currently serving as an Assistant Professor of Mechanical Engineering in the College of Engineering and Applied Science at the University of Wyoming. Dr. Belmont is also the Principal Investigator of the Belmont Energy Research Group. She received her B.S. in Chemical Engineering and M.S. in Mechanical Engineering from Tufts University in Medford, Massachusetts, and her Ph. D. in Mechanical Engineering from the University of Texas at Austin. Her research interests are in combustion, solid fuels (coal, biomass), alternative fuels, renewable energy, and experimentation.

Sally M. Benson

Member

Dr. Sally M. Benson joined Stanford University as a Professor in 2007. She holds three appointments at Stanford: professor of energy resources engineering in the School of Earth, Energy and Environmental Sciences; co-director of the Precourt Institute for Energy, the campus-wide hub of energy research and education; and director of the Global Climate and Energy Project (GCEP). Dr. Benson received a B.S. in geology from Barnard College at Columbia University in 1977, and an M.S. and Ph.D. in materials science and mineral engineering from the University of California, Berkeley in 1988. An internationally recognized scientist, Dr. Benson is responsible for fostering cross-campus collaborations on energy and guiding the growth and development of a diverse research portfolio. Prior to joining Stanford, Dr. Benson was at Lawrence Berkeley National Laboratory. Dr. Benson is a groundwater hydrologist and reservoir engineer, and is regarded as a leading authority on carbon capture and storage, and emerging energy technologies. In 2012, she served as a convening lead author of the Global Energy Assessment, a multinational project coordinated by the International Institute for Applied Systems Analysis.

Richard Birdsey

Member

Dr. Richard Birdsey is a specialist in quantitative methods for large-scale forest inventories and has pioneered development of methods to estimate national carbon budgets for forest lands from forest inventory data. Dr. Birdsey is currently serving as a senior scientist at the Woods Hole Research Center after recently retiring from the United States Forest Service as a “Distinguished Scientist” and was the Program Manager for global change research in the Northern Research Station. Richard was a lead author of two Special Reports for the Intergovernmental Panel on Climate Change. He was a lead author of the first North American “State of the Carbon Cycle” report and is currently a member of the science team guiding the second report. He has contributed to several assessments of climate change in the U.S. He served three years as Chair of the U.S. Government Carbon Cycle Science Steering Group. He has published extensively on forest management and strategies to increase carbon sequestration, and facilitated the development of decision-support tools for policy and management. He was recognized by the U.S. Department of Agriculture as a major contributor to creating a new agricultural commodity – carbon. Dr. Birdsey is a member of a team of scientists developing and implementing the North American Carbon Program, an international effort to improve quantification and understand causes of carbon exchange between land, atmosphere, and oceans. In recent years he has been actively working with Mexico and Canada to improve monitoring, verification, and reporting to support climate change mitigation with an emphasis on Reducing Deforestation and Forest Degradation and promoting sustainable forest management (REDD+) and improving forest management in the 3 countries. He is currently working with the Forest Service National Forest System to implement carbon assessments for all of the U.S. National Forests.

Dane Boysen

Member

Dr. Dane Boysen is currently the Chief Technologist for Cyclotron Road, a lab-embedded mentorship program at Lawrence Berkeley National Laboratory funded by the Advanced Manufacturing Office at the U.S. Department of Energy. Prior to Cyclotron Road, Dr. Boysen was the Executive Director of Research Operations at the Gas Technology Institute (GTI). Before GTI, he served as a Program Director at the Advanced Research Projects Agency-Energy (ARPA-E), where he managed over $100 million over 30 of the nation’s most cutting-edge energy technology research and development projects. Prior to joining ARPA-E, Boysen led an $11 million project to develop liquid metal batteries for grid-scale energy storage under Professor Don Sadoway at MIT. Dane co-founded Superprotonic Inc., a venture capital-backed start-up developing solid acid electrolyte-based fuel cells. Boysen received his M.S. and Ph.D. in Materials Science at the California Institute of Technology in 1999 and 2001, respectively. Dr. Boysen’s research experience includes developing and commercializing hard energy technology.

Riley Duren

Member

Mr. Riley Duren is Chief Systems Engineer for the Earth Science and Technology Directorate at NASA's Jet Propulsion Laboratory. He received his BS in electrical engineering from Auburn University in 1992. He has worked at the intersection of engineering and science including seven space missions ranging from earth science to astrophysics. His current portfolio spans JPL's earth system science enterprise as well as applying the discipline of systems engineering to climate change decision-support. His research includes anthropogenic carbon emissions and working with diverse stakeholders to develop policy-relevant monitoring systems. He is Principal Investigator for five projects involving anthropogenic carbon dioxide and methane emissions. He has also co-led studies on geoengineering research, monitoring, and risk assessment. He is a Visiting Researcher at UCLA's Joint Institute For Regional Earth System Science and Engineering and serves on the Advisory Board for NYU's Center for Urban Science and Progress.

Charles Hopkinson, Jr.

Member

Dr. Charles Hopkinson is a Professor of Marine Sciences at the University of Georgia. Dr. Hopkinson earned both his Ph.D. and M.S. in Marine Science from Louisiana State University in 1979 and 1973, respectively. Dr. Hopkinson served as a Chairman of the Radiation Safety Committee of the Marine Biological Laboratory in Woods Hole, Massachusetts from 1993 until 2008. Charles is currently a member of the American Society of Limnology and Oceanography and the Coastal and Estuarine Research Federation. Dr. Hopkinson's current research interests are in the biogeochemistry of watersheds, wetlands, estuaries, and continental shelves as well as climate change and land/sea coupling.

Christopher Jones

Member

Dr. Christopher Jones is a Love Family Professor of Chemical and Biomolecular Engineering in the School of Chemical and Biomolecular Engineering at Georgia Tech. Christopher earned his M.S. and Ph.D. degrees in chemical engineering at the California Institute of Technology in 1997 and 1999, respectively. Dr. Jones was named the Associate Vice President for Research at Georgia Tech in November 2013. In this role, he directs 50% of his time on campus-wide research administration, managing internally funded research programs in coordination with the colleges and with a primary focus on interdisciplinary research efforts, and policy related to research institutes, centers and research core facilities. Dr. Jones directs a research program focused primarily on catalysis and CO_2 separation, sequestration and utilization.

Peter B. Kelemen

Member

Dr. Peter Kelemen is Arthur D. Storke Professor and Chair of the Department of Earth and Environmental Sciences at Columbia University. Dr. Kelemen received his Ph.D. and M.S. from the University of Washington in 1987 and 1985, respectively. Dr. Kelemen is a member of the National Academy of Sciences. He is a Fellow of the American Geophysical Union, the Geochemical Society and European Association of Geochemistry, and the Mineralogical Society of America. He is a Research Associate at the American Museum of Natural History, and an Adjunct Scientist at the Woods Hole Oceanographic Institute, where he was a Senior Scientist and Charles Francis Adams Chair until 2004. He has worked on the genesis and evolution of oceanic and continental crust, chemical cycles in subduction zones, and new mechanisms for earthquake initiation. His primary focus is on geologic capture and storage of CO2 (CCS), and reaction-driven cracking processes in natural and engineered settings, with application to CCS, geothermal power generation, hydrocarbon extraction, and in situ mining, and most recently included CO2 capture and storage and mineral carbonation and hydration.

Annie Levasseur

Member

Dr. Annie Levasseur is the Scientific Coordinator of CIRAIG (International Reference Centre for the Life Cycle of Products, Processes and Services) and Researcher in the Department of Chemical Engineering at Polytechnique Montréal. Dr. Levasseur received her Ph.D. in Chemical Engineering from Polytechnique Montréal in 2011, and is currently the Chair of the UNEP-SETAC LCIA Global Guidance – Global Warming Task Force, a group of international climate and life cycle assessment (LCA) researchers working to develop guidelines for the use of climate metrics in LCA.

Keith Paustian

Member

Dr. Keith Paustian is Professor in the Department of Soil and Crop Sciences and Senior Research Scientist at the Natural Resource Ecology Laboratory at Colorado State University. Dr. Paustian received his M.S. in Forest Ecology from Colorado State University in 1980, and his Ph.D. in Systems Ecology and Agroecology from the Swedish University of Agricultural Sciences in 1987. Keith served as a Coordinating Lead Author for the Intergovernmental Panel on Climate Change (IPCC) Greenhouse Gas Inventory Taskforce and has served on numerous other national and international committees involving climate and carbon cycle research. He has previously Co-chaired a Task Force on “Climate Change and Greenhouse Gas Mitigation: Challenges and Opportunities for Agriculture” by the Council on Agricultural Science and Technology (CAST), and was lead author on a Pew Center report on “Agriculture’s Role in Greenhouse Gas Mitigation”. Dr. Paustian’s research interests include soil organic matter dynamics, carbon and nitrogen cycling in cropland and grassland ecosystems, and the evaluation of environmental impacts of agricultural bioenergy production.

Jianwu Tang

Member

Dr. Jianwu (Jim) Tang is an Associate Scientist in The Ecosystems Center of the Marine Biological Laboratory in Woods Hole, Massachusetts. Dr. Tang received his Ph. D. in ecosystem sciences from the University of California, Berkeley in 2003. Following his degree program, Dr. Tang was a Research Associate at the University of Minnesota focusing on forest carbon cycles. Dr. Tang is currently serving on the Steering Committee for the Global Science and Data Network for Coastal Blue Carbon, funded by the Carbon Cycle Interagency Working Group (CCIWG), and is a member of the American Geophysical Union and Ecological Society of America. Dr. Tang is currently researching greenhouse gas (CO_2, CH_4, and N_2O) emissions from agro-ecosystems and wetlands and their responses to management and disturbance. The wetland work evaluates the role of “blue carbon” in coastal wetlands and the significance of wetland restoration in carbon sequestration.

Tiffany Troxler

Member

Dr. Tiffany Troxler is the Director and Associate Director for Science of the Sea Level Solutions Center. The Center's work is to advance knowledge, decision making and actions toward mitigating the causes and adapting to the effects of sea-level rise. She is also Research Associate Professor in the Department of Biological Sciences at Florida International University in Miami, Florida. Some of her projects include collaborative research that examines the effects of saltwater inundation on Everglades coastal wetlands, assesses management actions associated with Everglades restoration and advances interdisciplinary urban solutions to sea-level rise. She is also collaborating on the Florida Coastal Everglades Long-Term Ecological Research program. She is co-editor and contributing author on two IPCC methodological reports that guide national greenhouse gas inventories on managed wetlands. Dr. Troxler received her Masters and Ph. D. in Biological Sciences from Florida International University in 2001 and 2005, respectively.

Michael Wara

Member

Dr. Michael Wara is an Associate Professor of Law at Stanford University. Dr. Wara received his J. D. from Stanford Law School and his Ph.D. in Ocean Sciences from University of California, Santa Cruz. An expert on energy and environmental law, Michael Wara's research focuses on climate and electricity policy. Professor Wara's current scholarship lies at the intersection between environmental law, energy law, international relations, atmospheric science, and technology policy. Dr. Wara joined Stanford Law in 2007 as a research fellow in environmental law and as a lecturer in law. Previously, he was an associate in Holland & Knight's Government Practice Group, where his practice focused on climate change, land use, and environmental law. Dr. Wara is a research fellow at the Program in Energy and Sustainable Development in Stanford's Freeman Spogli Institute for International Studies, a Faculty Fellow at the Steyer-Taylor Center for Energy Policy and Finance, and a Center Fellow at the Woods Institute for the Environment.

Jennifer Wilcox

Member

Dr. Jennifer Wilcox is an Associate Professor of Chemical and Biological Engineering at the Colorado School of Mines. Dr. Wilcox earned a B.A. in mathematics from Wellesley College and a Ph.D. in chemical engineering from the University of Arizona. Dr. Wilcox received an ARO Young Investigator Award (Membrane Design for Optimal Hydrogen Separation), an ACS PRF Young Investigator Award (Heterogeneous Kinetics of Mercury in Combustion Flue Gas), and an NSF CAREER Award (Arsenic and Selenium Speciation in Combustion Flue Gas). She has served on a number of committees, including the National Academy of Sciences, Engineering, and Medicine and the American Physical Society, to assess CO2 capture methods and impacts on climate. Along with her lab, Dr. Wilcox's research interests combine experimental and theoretical methods to investigate capture and sequestration of trace metals (mercury, arsenic, and selenium) and carbon dioxide.