



Smithsonian Institution

**THE ANTHROPOCENE:  
PLANET EARTH IN THE AGE OF HUMANS**

**A one-day symposium sponsored by the Smithsonian Institution's Grand Challenges Consortia**

**11 October 2012**

**Baird Auditorium  
National Museum of Natural History  
10<sup>th</sup> St. & Constitution Ave., NW, Washington, DC**

The world is changing at a rapid pace. Scientists have documented significant changes during the last century in climate, land-use, and biodiversity that are unprecedented over the last thousand years. These changes are also occurring at a time of rapid social, economic, political, and technological transformation. Although the Earth and life on it have always been characterized by change, the current rate and scale of these changes may be unparalleled by any time in the past since the beginning of human civilizations. Even the fields of literature and the arts are adapting as writers and artists grapple with unprecedented social and environmental upheavals.

A consensus has been reached that the tremendous scope of transformations now occurring on the Earth, with profound effects on plants, animals, and natural habitats, is primarily the result of human activities. Geologists have proposed the term *Anthropocene*, or the “Age of Man,” for this new period in the history of the planet, which follows the relatively stable Holocene period. On a geological scale the planet has entered a new era. Natural processes that control the functioning of the planet have been interrupted, refashioned, or accelerated over the last thousand years by human civilization. No longer can nature be studied or understood in isolation from the human world.

In order to address the arrival and the impact of the *Anthropocene* through the lenses of science, society and culture, the Smithsonian Institution's Grand Challenges Consortia is hosting this symposium to discuss, debate, and deliberate on these issues of change. The primary talks address issues of global change from the perspectives of history, art, culture, philosophy, economics, and science. The interdisciplinary panels of scholars that follow each presentation are meant to foster a wide-ranging discussion of the issues. It is hoped that questions entertained from audience participants will enrich these discussions.

The four Smithsonian Grand Challenges, which bridge the Institution's scientific and scholarly pursuits, are ideally situated to host a discussion of such breadth. The global changes now taking place cross-cut all of the Grand Challenges Consortia from Unlocking the Mysteries of the Universe, with a broad perspective on alterations in the atmosphere and landscapes of the Earth, to Understanding and Sustaining a Biodiverse Planet, which investigates the past, present and future of climate change effects on the natural world, to Valuing World Cultures and Understanding the American Experience, in which transformations in human history, culture, and art are spotlighted across civilizations. Each of these Grand Challenges can learn from and inform the others with respect to the massive alterations that our civilization is experiencing today and will continue to experience into the foreseeable future. Only through such discourse and debate will we be able to confront and understand the magnitude of the arrival of the *Anthropocene* in our world.

# The Anthropocene: Planet Earth in the Age of Humans

Baird Auditorium  
National Museum of Natural History  
10<sup>th</sup> Street & Constitution Avenue, NW  
Thursday, October 11, 2012  
9:15 a.m. – 6:30 p.m.

- 9:15 a.m. Opening remarks by Eva J. Pell, Under Secretary for Science, Smithsonian Institution
- 9:30 a.m. **Charles C. Mann** *1493: Homogenizing the Planet*
- Panel Discussion Moderator Justin Kasper, Rick Potts, Andrew C. Revkin, Daniel Wildcat  
Michelle Delaney
- 11:00 a.m. Break
- 11:30 am **Richard Alley** *Energizing the Anthropocene: Science for Smart Decisions*
- Panel Discussion Moderator Subhankar Banerjee, Karen Milbourne, Mary Evelyn Tucker, Scott Wing  
Christine Jones
- 1:00 pm Break
- 2:30 p.m. **Chris Jordan** *Encountering Midway*
- Panel Discussion Moderator Elizabeth Cottrell, James R. Fleming, Odile Madden, Woody Turner  
Robert Leopold
- 4:00 p.m. Break
- 4:30 p.m. **Sabine O’Hara** *Sustaining Economics for a Sustaining Planet*
- Panel Discussion Moderator Rob Nixon, Torben C. Rick, Gavin A. Schmidt, S. Joseph Wright  
W. John Kress
- 6:00 p.m. The Honorable Timothy E. Wirth Summation
- 6:30 p.m. Closing Remarks by W. John Kress
- Reception in the Rotunda

***Eva J. Pell***



Eva J. Pell, Under Secretary for Science, joined the Smithsonian Institution in January 2010. She oversees the operations of eight museums and research centers located in the United States and Panama. Previously, she was Senior Vice President for Research and Dean of the Graduate School at Pennsylvania State University. Dr. Pell earned a B.S. in biology from City College of the City University of New York in 1968, and a Ph.D. in Plant Biology from Rutgers University in 1972. Dr. Pell started her career at Penn State in 1972 and was a professor in the department of Plant Pathology for more than 35 years. Her research focused on the impact of air pollutants on vegetation and her research spanned from the molecular to the ecophysiological. In recognition of leadership in her field in 2003, Dr. Pell was elected as a Fellow of the American Association for the Advancement of Science (AAAS). In her years as senior research officer and graduate dean, Dr. Pell served on numerous national committees and organizations, and spearheaded the development of six cross-disciplinary institutes that reported to her. In addition, Dr. Pell was active in economic development and served on a number of Pennsylvania State boards; she was responsible for the Penn State Research and Technology Transfer Organization that connects Penn State researchers with industries in order to stimulate economic development. In 2011, the university recognized her contributions by naming a new building after her, the “Eva J. Pell Laboratory for Advance Biological Research”. Dr. Pell has served on panels and advisory boards for the EPA, the USDA, the Department of Commerce, and the NSF’s Biological Sciences Advisory Committee; and currently serves on the National Science and Technology’s Committee of Science and Committee on Environment, Natural Resources and Sustainability, and the Interagency Arctic Research Policy Committee.

**\*\*\* FIRST SESSION \*\*\***

***Charles C. Mann***



*1493: Homogenizing the Planet*

*Two hundred million years ago, the world consisted of a single giant landmass, which scientists call Pangaea. Geological forces broke up Pangaea, forever separating the hemispheres – and their ecosystems. As a result, the different corners of the earth ended up with completely different suites of plants and animals. Christopher Columbus effectively ended that separation. After 1492, the world's ecosystems collided and mixed in a human-driven exchange that has been called the greatest event in*

*the history of life since the death of the dinosaurs. The extraordinary worldwide biological mixing set off by Columbus – the Columbian Exchange, as it was named by historian Alfred W. Crosby – initiated today's globalization. It played an enormous role in subsequent human history and remains one of the signal features of our age.*

Charles C. Mann's most recent book, *1493: Uncovering the New World Columbus Created*, was named *TIME* Magazine Best Book of the Year. His previous book, *1491: New Revelations of the Americas Before Columbus*, won the U.S. National Academy of Sciences' Keck award for the best book of the year. A Correspondent for *The Atlantic Monthly*, *Science*, and *Wired*, he has covered the intersection of science, technology, and commerce for many newspapers and magazines in the United States and abroad, including *BioScience*, *The Boston Globe*, *Fortune*, *Geo* (Germany), *The New York Times* (magazine, op-ed, book review), *Panorama* (Italy), *Paris-Match* (France), *Quark* (Japan), *Smithsonian*, *Der Stern* (Germany), *Technology Review*, *Vanity Fair* and *The Washington Post* (magazine, op-ed, book review). In addition to *1491*, he has co-written four other books: *The Second Creation: Makers of the Revolution in 20th-Century Physics* (1986; rev. ed., 1995); *The Aspirin Wars: Money, Medicine, and 100 Years of Rampant Competition* (1991), *Noah's Choice: The Future of Endangered Species* (1995), and *@ Large: The Strange Case of the Internet's Biggest Invasion* (1998). He has also written for CD-ROMs, HBO, and the television show *Law and Order*, and was the text editorial coordinator for the internationally best-selling photographic projects *Material World* (1994), *Women in the Material World* (1996), and *Hungry Planet* (2005). A three-time National Magazine Award finalist, he has received writing awards from the American Bar Association, the American Institute of Physics, the Alfred P. Sloan Foundation, the Margaret Sanger Foundation and the Lannan Foundation (a 2006 Literary Fellowship).

### **Justin Kasper**



Dr. Kasper is an Astrophysicist in the Solar and Stellar X-Ray Group, High Energy Astrophysics Division of the Smithsonian Astrophysical Observatory in Cambridge, Massachusetts. He studies our heliosphere, the region of space from the core of the Sun to the outer reaches of the solar system influenced by solar gravity, light, and particles. His research focuses on the surprisingly efficient flow of energy that superheats our Sun's atmosphere to millions of degrees, hurls solar wind into the solar system at millions of miles per hour, and produces solar storms that flood space with intense radiation. He uses observatories on Earth and robotic spacecraft throughout the heliosphere to explore our solar system, understand the basic physics of energy flow, and learn how to protect our technology-dependent society from the dangers of space weather. He is the author of numerous scientific articles on solar activity, solar wind, radiation in space, and the design of instruments and spacecraft, and he serves on national advisory bodies including the recent National Academy of Sciences Decadal Survey of Solar and Space Physics. In 2011, he received the Presidential Early Career Award for Scientists and Engineers, the highest honor awarded by the White House to researchers at the beginning of their careers, and was named by *Popular Science* as one of their Brilliant Ten researchers under the age of 35. His next project is the NASA Solar Probe Plus mission, a spacecraft that will make history as the first human-built object to enter the atmosphere of our Sun. He leads the SWEAP Investigation on Solar Probe Plus, an international consortium of laboratories and universities developing the instruments that will collect and analyze atmospheric samples each time the probe dives past the Sun.

### ***Rick Potts***



Paleoanthropologist Rick Potts is the director of the Smithsonian's Human Origins Program and curator of anthropology at the National Museum of Natural History. Since joining the Smithsonian in 1985, Rick has dedicated his research to piecing together the record of Earth's environmental change and human adaptation. His ideas on how human evolution responded to environmental instability have stimulated wide attention and new research in several scientific fields. Rick has developed international collaborations among scientists interested in the ecological aspects of human evolution. He leads excavations at early human sites in the East African Rift Valley, including the famous handaxe site of Olorgesailie, Kenya, and Kanam near Lake Victoria, Kenya. He also co-directs ongoing projects in southern and northern China that compare evidence of early human behavior and environments from eastern Africa to eastern Asia. He received his Ph.D. in biological anthropology from Harvard University in 1982, after which he taught anthropology at Yale University and served as curator of physical anthropology at the Yale Peabody Museum. Rick is curator of The David H. Koch Hall of Human Origins, at the Smithsonian's Natural History Museum, and has authored the companion book, *What Does It Mean To Be Human?* When he's not time-traveling, Rick enjoys singing, Halloween, and the Phillies.

### ***Andrew C. Revkin***



Andrew Revkin is the senior fellow for environmental understanding at Pace University's Academy for Applied Environmental Studies and writes the award-winning Dot Earth blog for the Op-Ed side of *The New York Times*. He has spent nearly three decades covering subjects ranging from the assault on the Amazon rain forest to the changing conditions around the Arctic, from the troubled relationship of climate science and politics to the environmental impacts of rising human populations and resource appetites. From 1995 through 2009, he covered the environment for *The Times* as a staff reporter. His quarter century of coverage of global warming has earned most of the major awards for science journalism along with the John Chancellor Award for sustained journalistic excellence from Columbia University. Revkin has been a pioneer in multimedia communication, blogging and shooting still and video imagery in far-flung places. Dot Earth was created under a John Guggenheim Foundation

Fellowship. Revkin has also carried his journalism to a new generation in *The North Pole Was Here: Puzzles and Perils at the Top of the World*, the first book on Arctic climate change written for the whole family. His other books are *The Burning Season*, which was the basis for a much-lauded HBO film, and *Global Warming: Understanding the Forecast*, which accompanied the first museum exhibition on climate change, at the American Museum of Natural History, in 1992. At Pace, he teaches courses on blogging, environmental-science communication, and documentary video with a focus on sustainable development. He has written three book chapters on communication and the environment and speaks to varied audiences around the world about the power of the Web to foster progress on a finite planet. Revkin lives in the Hudson River Valley with his wife and two sons. In spare moments, he is a performing songwriter and plays in a twangy roots jam band, Breakneck Ridge.

### ***Daniel Wildcat***



Daniel R. Wildcat is a Yuchi member of the Muscogee Nation of Oklahoma. He is director of the Haskell Environmental Research Studies (HERS) Center and Dean of the College of Natural and Social Sciences (acting) at Haskell Indian Nations University in Lawrence, Kansas. Dr. Wildcat received B.A. and M.A. degrees in sociology from the University of Kansas and an interdisciplinary Ph.D. from the University of Missouri at Kansas City. He has taught at Haskell for 25 years. Dr. Wildcat frequently speaks to community groups, educational institutions, and organizations on the issue of cultural diversity. In 1992 Dr. Wildcat was honored with the Heart Peace Award by the Kansas City organization The Future Is Now for his efforts to promote world peace and cultural diversity. In 1994 he helped form a partnership with the Hazardous Substance Research Center at Kansas State University to create the Haskell Environmental Research Studies (HERS) Center as a non-profit Native American research center to facilitate the transfer of technology and accurate environmental information to tribal governments and Native communities and to bring research opportunities to tribal college faculty and students throughout the United States. In 1996 Dr. Wildcat helped plan and organize an American Indian educational program to celebrate the 25<sup>th</sup> anniversary of Earth Day where he moderated a live nationally broadcast dialogue between traditional American Indian Elders and American Indian scientists and engineers about the way we must live if we are to ensure a healthy planet for our children.

Dr. Wildcat helped plan and design a four-part video series entitled *All Things Are Connected: The Circle of Life* (1997), which dealt with land, air, water and biological issues related to environmental science and policy issues facing Native nations. Dr. Wildcat's recent activities have revolved around forming the American Indian and Alaska Native Climate Change Working Group: a tribal college-centered network of individuals and organizations working on climate change issues. In 2008 he helped organize the *Planning for Seven Generations* climate change conference sponsored by the National Center for Atmospheric Research, and has been instrumental in other conferences and workshops on the topic of native peoples and climate change. He is the author and editor of several books: *Power and Place: Indian Education In America* (Vine Deloria), Jr.; *Destroying Dogma: Vine Deloria's Legacy on Intellectual America*, with Steve Pavlik. His recent book, *Red Alert: Saving the*

*Planet with Indigenous Knowledge*, suggests current global climate change issues will require the exercise of indigenous ingenuity - *indigenuity* - and wisdom if humankind is reduce the ecological damage well underway.

\*\*\* SECOND SESSION \*\*\*

**Richard Alley**



*Energizing the Anthropocene: Science for Smart Decisions*

*We benefit in many ways from energy use, but the great majority is supplied by unsustainable fossil fuels. Our long-term future thus requires transition to a different energy model. With high scientific confidence, burning most of the fossil-fuel resource before making the transition will release enough CO<sub>2</sub> to cause climate changes and ocean acidification that make life harder for most people. The scientifically characterized uncertainty of the impacts of rapid release of large amounts of fossil-fuel CO<sub>2</sub> includes conditions that are a little better than expected, or a little worse, or a lot worse, but with very little chance that the outcome will be beneficial or inconsequential. Renewable sources can supply much more energy than is currently used by humanity, from technologies that already are available or logical extensions thereof. Economic analyses show widespread agreement that emitting CO<sub>2</sub> imposes costs on society, and thus reductions in emissions are economically beneficial. Ignoring the benefits, estimates typically indicate that operating a renewable energy system will exceed current energy costs by order of 1% of the world economy. A sustainable energy system can provide economic benefits by reducing price volatility, and can enhance national security by reducing challenges associated with long supply lines. At least some scholarship indicates that reduction in fossil-fuel use can be accomplished by policies that actually speed economic growth. And, because the “losers” from climate change—primarily poor people in hot places, and members of future generations—are not the people causing most of the CO<sub>2</sub> emissions, motion toward a sustainable energy system addresses important ethical issues. Including sound science in decision-making can thus provide win-win-win situations. A measured transition can be made to honor investments and career decisions of fossil-fuel workers; thus, delays are costly.*

Dr. Richard Alley (Ph.D. 1987 in Geology from Wisconsin) is Evan Pugh Professor of Geosciences and Associate of the Earth and Environmental Systems Institute at The Pennsylvania State University. He studies the great ice sheets to aid in prediction of future changes in climate and sea level, and has conducted three field seasons in Antarctica, eight in Greenland, and three in Alaska. He has been honored for research (including election to the US National Academy of Sciences, the Tyler Prize for Environmental Achievement, the Heinz Prize, the Revelle Medal of the American Geophysical Union, the Seligman Crystal of the International Glaciological Society, and others), teaching (four teaching-related awards at Penn State), and service (including the Public Service Award of the Geological Society of America, the American Geological Institute Award For Outstanding Contribution to Public Understanding of the Geosciences, and the Schneider Award for Science Communication). Dr. Alley has served on many advisory panels, including having chaired the National Research Council’s Panel on Abrupt Climate Change and participated in the UN Intergovernmental Panel on Climate Change (which was co-recipient of the 2007 Nobel Peace Prize), and has provided requested advice to

numerous government officials in multiple administrations including a US Vice President, the President's Science Advisor, and committees and individual members of the US Senate and the House of Representatives. He has published over 225 refereed papers. He is presenter for the PBS TV special on climate and energy *Earth: The Operators' Manual*, and author of the book. His popular account of climate change and ice cores, *The Two-Mile Time Machine*, was Phi Beta Kappa's science book of the year in 2001. Dr. Alley is happily married with two daughters, two cats, a bicycle, and a pair of soccer cleats.

### ***Subhankar Banerjee***



Subhankar Banerjee is an Indian-born American photographer, writer, and environmental scholar. Over the past decade he has worked tirelessly for the conservation of eco-culturally significant areas of the Arctic, and to raise awareness about indigenous human rights and climate change. His first book, *Arctic National Wildlife Refuge: Seasons of Life and Land*, has become an influential conservation document. He is editor of a new anthology, *Arctic Voices: Resistance at the Tipping Point* (Seven Stories Press). Subhankar has given more than one hundred lectures, including at the United Nations, Columbia, Harvard, and Princeton universities. His photographs have been exhibited in more than fifty venues, including the 18th Biennale of Sydney. In 2010, he founded ClimateStoryTellers.org. His academic appointments have included visiting scholar at the University of Utah, artist-in-residence at Dartmouth College, distinguished visiting professor at Fordham University, and director's visitor at the Institute for Advanced Study in Princeton. In 2011, he was named a Distinguished Alumni by New Mexico State University. For his conservation efforts, Subhankar received a 2012 Cultural Freedom Award from the Lannan Foundation, a Greenleaf Artist Award from the UN Environment Programme, national conservation awards from the Sierra Club and National Wildlife Federation, and was named an Arctic Hero by Alaska Wilderness League.

### ***Karen E. Milbourne***



Karen E. Milbourne is Curator at the National Museum of African Art, Smithsonian Institution. Previously, she has served as Associate Curator of African Art and Department Chair for the Arts of Africa, the Americas, the Pacific Islands and Asia at the Baltimore Museum of Art and Assistant Professor of Art History at the University of Kentucky. She received her Ph.D. from the University of Iowa in 2003 and has been the recipient of numerous awards, including a Fulbright and the Smithsonian Secretary's Award for Excellence. Her expertise includes the arts and pageantry of



western Zambia and contemporary African art. She is currently curating the major exhibition and publication project, *Earth Matters: Land as Material and Metaphor in the Arts of Africa*.

***Mary Evelyn Tucker***



Mary Evelyn Tucker is a Senior Lecturer and Research Scholar at Yale University where she holds appointments in the Divinity School and in the School of Forestry and Environmental Studies. She is co-director with John Grim of the Forum on Religion and Ecology at Yale. This arose out of a series of 10 conferences that they organized at Harvard on World Religions and Ecology that resulted in 10 edited volumes from Harvard. She is a research associate at the Reischauer Institute of Japanese Studies at Harvard. In 2011, she completed the *Journey of the Universe* with Brian Swimme which includes a volume published by Yale University Press, a PBS film, and an educational series of interviews. Among her many publications is *Worldly Wonder: Religions Enter Their Ecological Phase* (2003). She is a member of the Interfaith Partnership for the Environment at the United Nations Environment Programme. She served on the International Earth Charter Drafting Committee from 1997-2000. She holds a BA from Trinity College, an MA from SUNY, an MA from Fordham, and a Ph.D. from Columbia University.

***Scott Wing***



Scott L. Wing was born in New Orleans and grew up there and in Durham, North Carolina. His childhood interest in fossils was reinforced by fieldwork in Wyoming while he was an undergraduate at Yale University, where he received his B.S. in Biology in 1976. He completed his Ph.D. in Biology at Yale in 1981, after which he was a National Research Council Postdoctoral Fellow at the U.S. Geological Survey in Menlo Park, California for one year. He worked for the U.S.G.S. for an additional year as a geologist, then moved to the Smithsonian Institution in 1984. Wing's research at the Smithsonian has focused on fossil plants, with emphasis on understanding how climate has changed in the past, and how terrestrial ecosystems have responded to climate change. He is currently working on a project to uncover the causes and effects of a sudden global warming event that occurred 56 million years ago, and another project to study the origin of tropical rainforests. Wing has published

more than 70 scientific papers and edited 5 books; he holds adjunct or honorary positions at University of Maryland, University of Michigan, University of Birmingham, and the Florida Museum of Natural History, and is a Fellow of the Paleontological Society and the Geological Society of America. Wing has been involved in a number of exhibit projects, including *FossiLab*, where visitors to the Smithsonian can interact with scientists working on fossils in a glass-walled laboratory, and currently with the Deep Time project, which is planning the renovation of 30,000 sq. ft. of exhibits space covering the history of life on earth.

\*\*\* THIRD SESSION \*\*\*

***Chris Jordan***



***Encountering Midway***

*On Midway Atoll, a remote cluster of islands more than 2000 miles from the nearest continent, the detritus of our mass consumption surfaces in an astonishing place: inside the stomachs of thousands of dead baby albatrosses. The nesting chicks are fed lethal quantities of plastic by their parents, who mistake the floating trash for food as they forage over the vast, polluted Pacific Ocean. For me, kneeling over their carcasses is like looking into a macabre mirror. These birds reflect back an appallingly emblematic result of the collective trance of our consumerism and runaway industrial growth. Like the albatross, we first-world humans find ourselves lacking the ability to discern anymore what is nourishing from what is toxic to our lives and our spirits. Choked to death on our waste, the mythical albatross calls upon us to recognize that our greatest challenge lies not out there, but in here.*

Chris Jordan is an internationally acclaimed artist and cultural activist based in Seattle, USA. His work explores contemporary mass culture from a variety of photographic and conceptual perspectives, connecting the viewer viscerally to the enormity and power of humanity's collective behaviors. Edge-walking the lines between beauty and horror, abstraction and representation, the near and the far, the visible and the invisible, his work asks us to consider our own role in the overwhelmingly complex world we find ourselves part of. Jordan's works have been exhibited and published worldwide.

***Elizabeth Cottrell***



Liz Cottrell fell in love with volcanoes at Brown University where she unraveled the cataclysmic eruption of Santorini volcano, Greece and received her Bachelor's of Science in geochemistry. Cottrell went on to receive her PhD from Columbia University where she studied the global magma

ocean that scientists now believe enveloped the early Earth. Her current research focuses on the evolution of the Earth, from the formation of the Earth's metal core 4.6 billion years ago, to the ongoing modification of Earth's interior by the plate tectonic cycle. She now directs Smithsonian's Global Volcanism Program. In her work, Liz relies on samples brought to the surface by volcanoes and experiments she performs in her laboratory because, despite what you may have seen in the movies, you can't visit the center of the Earth! In her lab she uses sophisticated equipment to simulate the extreme conditions found deep below volcanoes – creating pressures equivalent to the center of the Earth and temperatures hotter than the sun. She analyzes her experiments at the micron scale to reveal the processes that have shaped our planet. Her research has been supported by the National Science Foundation, the Sloan Foundation, a Fulbright Scholarship, the American Association of University Women, the Department of Energy, and the Smithsonian Institution. Her publications appear in journals including *Science*, *Earth and Planetary Science Letters*, *Geochimica et Cosmochimica Acta*, *Geochemistry Geophysics Geosystems*, *Contributions to Mineralogy and Petrology*, and *Chemical Geology*. She joined the Smithsonian in 2006.

### ***James R. Fleming***



James Rodger Fleming (Ph.D. history Princeton University) is professor of science, technology, and society at Colby College, Maine. He is a fellow of the American Association for the Advancement of Science and the American Meteorological Society, distinguished lecturer for Sigma Xi, and series editor of Palgrave Studies in the History of Science and Technology. In Smithsonian circles, he was a predoctoral fellow with the Joseph Henry Papers in 1985 and held the Charles A. Lindbergh Chair at Air and Space in 2005. Jim's books include *Meteorology in America, 1800-1870* (Johns Hopkins University Press, 1990), *Historical Perspectives on Climate Change* (Oxford University Press, 1998), and *Fixing the Sky: The checkered history of weather and climate control* (Columbia University Press, 2010)— winner of the 2011 Sally Hacker Prize from the Society for the History of Technology and the Louis J. Battan Author's Award from the American Meteorological Society. His new research involves an edited volume on Toxic Airs, a history of the emergence of atmospheric science, and a biography of the “wild spirit” we now call carbon dioxide.

### ***Odile Madden***



Odile Madden is a materials scientist and head of the modern materials research program at the

Smithsonian's Museum Conservation Institute. She is the Principal Investigator of *The Age of Plastic* research program, a collaboration of scientists, curators, conservators, artists, and scholars that explores the phenomenon of polymer composites and their impacts on 19th-21st century life, culture, and the environment. Odile's current research involves plastic marine pollution, the role of polymer-plasticizer interaction in material degradation, characterization and reverse engineering of historic "plastic" artifacts, and technical study of the National Air and Space Museum collection. Odile earned her Ph.D. in Materials Science and Engineering with a minor in Classics at the University of Arizona. She also holds degrees in the History of Art and Archaeology, Art Conservation, and Italian from New York University and UCLA.

### ***Woody Turner***



Woody Turner is the Program Scientist for Biological Diversity and Program Manager for Ecological Forecasting in the NASA Headquarters Science Mission Directorate. As program scientist, he oversees the agency's basic research efforts to use satellite-derived information to understand the relationship of biodiversity to climate, landscape change, and ecosystem function. The NASA Ecological Forecasting Program is an applications activity seeking to bring together satellite observations and ecological models to support decision making for conservation biology and sustainable regional development. Born in Nashville, TN, Woody graduated from the University of North Carolina, Chapel Hill in 1982 and earned master's degrees in public affairs from Princeton University in 1987 and in conservation biology from the University of Maryland in 2001. He lives in Chevy Chase, Maryland, with his wife Jennifer and their two children.

### **\*\*\* FOURTH SESSION \*\*\***

### ***Sabine O'Hara***



*Sustaining Economics for a Sustaining Planet*

*The age of the anthropocene is characterized by unprecedented human impact on planetary systems. Nowhere is this impact as evident as in the global economy. The term global economy is itself revealing since it conjures up images of an economy that is disconnected from its local and regional*

*context. Yet it is precisely these social, cultural, and environmental context systems that first make economic activity possible and that can sustain it in the long term.*

*This lecture will offer a contextual view of economic activity that recognizes economic activity as inextricably linked to the social, cultural, and environmental contexts within which it takes place. This alternative view of a sustaining economics makes evident that those processes that take place outside of the economic process itself, but that sustain input generation, material transformation and waste absorption, are critical to the creation of economic activity and the benefits derived from it. These external but essential processes are referred to as sustaining services. An economy that maintains or enhances sustaining services can be considered a sustaining economy that creates wealth; one that undermines or destroys them diminishes wealth. It is argued that the transition to such a context-based view of a sustaining economy is essential and has profound consequences for rethinking economic policy and its broader social and environmental implications.*

Dr. Sabine O'Hara is the recently appointed Dean of the College of Agriculture, Urban Sustainability & Environmental Sciences (CAUSES) and Director, Agricultural Experiment Station and Cooperative Extension Service at the University of the District of Columbia (UDC). She is a respected author, researcher and higher education executive and is well known for her expertise in sustainable economic development, global education and executive leadership. As Dean of CAUSES, she is responsible for academic, research and outreach program in the tradition of the land-grant university. Dr. O'Hara is a strong advocate of higher education who believes that education cannot merely provide answers to our questions; it must also question our answers. From 2007 to 2010 she served as Executive Director of the Council for International Exchange of Scholars (CIES) a preeminent international exchange organization that administers the Fulbright Scholar Program and collaborates with over 3000 universities in more than 130 countries. Before joining CIES, O'Hara was the founder of Global Ecology LLC, the 10th President of Roanoke College in Salem, VA, held faculty and administrative positions at Concordia College in Moorhead, MN, at Green Mountain College in Poultney, VT, at Rensselaer Polytechnic Institute in Troy, NY, and was a Visiting Scholar at Harvard University. A native of Germany, O'Hara earned a doctorate in environmental economics from the University of Göttingen, Germany. She serves on the board of directors of several national and international organizations, including as past president of the United States Society for Ecological Economics, past secretary of the Council of Scientific Society Presidents, on the International Advisory Board of King Abdul-Aziz University, the International Task Force of the American Chemical Society, and as reviewer and editorial board member of several academic journals.

### ***Rob Nixon***



Rob Nixon is currently the Rachel Carson Professor of English at the University of Wisconsin-Madison. Professor Nixon received his Ph.D. from Columbia University and is the author of *London Calling: V. S. Naipaul, Postcolonial Mandarin* (Oxford University Press); *Homelands, Harlem and Hollywood: South African Culture and the World Beyond* (Routledge); *Dreambirds: the Natural History of a Fantasy* (Picador); and *Slow Violence and the Environmentalism of the Poor* (Harvard University Press 2011). Professor Nixon is a frequent contributor to the *New York Times*; his writing

has also appeared in publications such as *The New Yorker*, *Atlantic Monthly*, *London Review of Books*, *Times Literary Supplement*, *Village Voice*, *The Nation*, *The Guardian*, *Outside*, *Chronicle of Higher Education*, *The Independent*, *Critical Inquiry*, *PMLA*, *Social Text*, *Slate*, *South Atlantic Quarterly*, *Transition*, *Cultural Critique*, *Contemporary Literature*, *Journal of Commonwealth and Postcolonial Studies*, *Ariel*, *Modern Fiction Studies*, *New Formations*, and *Black Renaissance/Renaissance Noire*. He has published over ninety journal articles, essays, and book chapters.

Professor Nixon teaches environmental studies, postcolonial studies, creative nonfiction, African literature, world literature, and twentieth century British literature. He is a former chair of the Border and Transcultural Studies Research Circle and is affiliated with the Nelson Institute for Environmental Studies, the Center for Culture, History, and the Environment (CHE), the African Studies program, and the Creative Writing Program. Professor Nixon has been the recipient of a Guggenheim Fellowship, a Fulbright-Hays Fellowship, a MacArthur Foundation Peace and Security Fellowship, and a National Endowment for Humanities Fellowship. He is currently a Senior Fellow at the University of Wisconsin-Madison Institute for Research in the Humanities.

### ***Torben C. Rick***



Torben Rick is Curator of North American Archaeology and Director of the Program in Human Ecology and Archaeobiology in the Department of Anthropology, National Museum of Natural History, Smithsonian Institution. He received his PhD in Anthropology from the University of Oregon (2004). Before joining the Smithsonian in 2008, he was Assistant Professor of Anthropology at Southern Methodist University. Rick's research focuses on the archaeology and historical ecology of coastal and island peoples, especially on the North American Pacific and Atlantic Coasts. He has active field projects on California's Channel Islands and the Chesapeake Bay, which are collaborative with researchers from a variety of disciplines (anthropology, biology, ecology, etc.) and focus on ancient and modern human environmental interactions.

### ***Gavin Schmidt***



Gavin Schmidt is a climate modeller at the NASA Goddard Institute for Space Studies in New York and is interested in modeling past, present and future climate. He works on developing and improving coupled climate models and, in particular, is interested in how their results can be compared to paleoclimatic proxy data. He has worked on assessing the climate response to multiple forcings, including solar irradiance, atmospheric chemistry, aerosols, and greenhouse gases. He received a BA

(Hons) in Mathematics from Oxford University, a PhD in Applied Mathematics from University College London and was a NOAA Postdoctoral Fellow in Climate and Global Change Research. He is a co-chair of the CLIVAR/PAGES Intersection Panel and is an Associate Editor for the Journal of Climate. He was cited by *Scientific American* as one of the 50 Research Leaders of 2004, and has worked on Education and Outreach with the American Museum of Natural History, the College de France and the New York Academy of Sciences. He has over 90 peer-reviewed publications and is the co-author with Josh Wolfe of “Climate Change: Picturing the Science” (W. W. Norton, 2009), a collaboration between climate scientists and photographers. He was awarded the inaugural AGU Climate Communications Prize in 2011.

### ***S. Joseph Wright***



S. Joseph Wright is Senior Scientist at the Smithsonian Tropical Research Institute in Panama. He was born in Quebec and received his B.A. from Princeton University (1974) and his Ph.D. from the University of California at Los Angeles (1980). He has published more than 200 peer-reviewed articles, which have been cited more than 10,000 times. He served as President of the Association for Tropical Biology and Conservation. His research interests include forest ecology, plant phenology and conservation biology. He developed protocols to study flower and seed production and seedling biology that have been replicated in 14 forests in eight tropical countries. His work on the future of tropical forests concerns nutrient deposition, global atmospheric and climate change, the consequences of overhunting (the ‘bushmeat crisis’) for plant species composition, the second chance abandoned lands and secondary forests present for tropical conservation, and evidence for successful strategies for the conservation of tropical forests.

**\*\*\* FIFTH SESSION \*\*\***

### ***The Honorable Timothy E. Wirth***



Timothy E. Wirth is the President of the United Nations Foundation and the Better World Fund. Both organizations were founded in 1998 through a major financial commitment from Ted Turner to support and strengthen the work of the United Nations. Wirth began his political career as a White House Fellow under President Lyndon Johnson and served as Deputy Assistant Secretary for Education in the Nixon Administration. In 1970, Wirth returned to his home state of Colorado and successfully ran for

the U.S. House of Representatives in 1974. As Chair of the Communications Subcommittee, he led Congressional initiatives to deregulate the communications industry in America. Wirth also authored the Indian Peaks Wilderness Act of 1978, served on the Speaker's Steering and Policy Committee, and was one of the founders of The Democratic Leadership Council. For eight consecutive years, he was selected as one of the 25 most effective Members of Congress.

Wirth was elected to the U.S. Senate in 1986 where he focused on environmental issues, particularly global climate change and population stabilization. In 1988, he organized the historic Hansen hearings on climate change. With his close friend, the late Senator John Heinz (R-PA), he authored "Project 88", outlining the groundbreaking "Cap and Trade" idea which became law in the Clean Air Act Amendments of 1990. He authored the far-reaching Colorado Wilderness Bill which became law in 1993, and with Senator Alan Simpson (R-WY) as a co-sponsor, he authored major legislation focused on population stabilization. Following two decades of elected politics, Wirth was national Co-chair of the Clinton-Gore campaign, and from 1993 to 1997 served in the U.S. Department of State as the first Undersecretary for Global Affairs. He helped organize U.S. foreign policy in the areas of refugees, population, environment, science, human rights and narcotics. He chaired the United States Delegation at the 1994 Cairo Conference on Population and Development, and was the lead U.S. negotiator for the Kyoto Climate Conference. He resigned from the Administration in late 1997 to accept Ted Turner's invitation to be President of the newly created United Nations Foundation.

As President of the UN Foundation (UNF) since its inception in early 1998, Wirth has organized and led the formulation of the Foundation's mission and program priorities, which include the environment, women and population, and children's health. The Foundation also engages in extensive public advocacy, fundraising, and institutional strengthening efforts on behalf of the United Nations. Prior to entering politics, Wirth was in private business in Colorado. The son of teachers, he was a scholarship student and graduate of Harvard College, served as a Harvard "Baby Dean" after graduation, and received a Ph.D. from Stanford University.

**\*\*\* MODERATORS \*\*\***

***Michelle Delaney***



Michelle Anne Delaney serves as Senior Program Officer in the Office of the Under Secretary for History, Art, and Culture and as Director of the Consortium for Understanding the American Experience. She works with senior leadership, museum directors and staff to develop and implement the Smithsonian's strategic plans, national campaign, educational, web and digital strategy, and revenue and business policies. Prior to this position, Delaney worked in the Smithsonian's Photographic History Collection, National Museum of American History since 1989, and served as curator of photography since 2009. Her research interests are American visual culture, early Daguerreian-era photography, history of art photography, Eadweard Muybridge's locomotion studies, contemporary photojournalism and Washington, D.C. photography. Delaney has successfully directed



several Smithsonian collections-based and scholarly research grants, and a 2006 Getty Foundation Conservation grant studying the Smithsonian's collection of Hillotypes, early experiments in color photography. She and her co-editors received a 2009 Smithsonian Secretary's Research Prize for the exhibition catalog *The Scurlock Studio and Black Washington: Picturing the Promise*. Her most recent exhibition project is a companion to her first book, *Buffalo Bill's Wild West Warriors: A Photographic History* by Gertrude Käsebier, jointly sponsored by the Buffalo Bill Historical Center, Cody, Wyoming, and the National Museum of American History. In 2009, Delaney was appointed an associate editor for visual culture for *The Papers of William F. Cody*. She received her master's degree in American Studies from the George Washington University. Ms. Delaney was named Director of the Smithsonian's new Consortium for Understanding the American Experience July 2010.

### ***Christine Jones***



Christine Jones Forman has worked as an astrophysicist at the Harvard-Smithsonian Center for Astrophysics since 1978. In 2010, she started her position as Director of the Consortium for Unlocking the Mysteries of the Universe. In addition to her work at the Harvard-Smithsonian Center for Astrophysics, she is a lecturer at Harvard University. She has been the recipient of several honors and awards that include the Ninger Meteorite Award (1970); NASA Group Achievement Award for HEAO-2 X-ray Calibration Team (1978); Harvard Bart J. Bok Prize (1979); NASA Group Achievement Award (1980); AAS-HEAD Bruno Rossi Prize (1985); NASA Group Achievement Award (1991); Fellow, American Association for the Advancement of Science (1995); NASA Group Achievement Award (2000); NASA Exceptional Achievement Medal (2000); Marcel Grossman Individual Award (2009); Honorary Fellow in Astronomy, Royal Astronomical Society (2011). Since 2008 she is the Vice-President, American Astronomical Society and since 2009, the president, Division XI, International Astronomical Union. Dr. Jones received her bachelor's degree from Harvard and Radcliffe Colleges in 1971 and her master's and doctorate degrees from Harvard University in 1972 and 1974 respectively.

### ***Robert Leopold***



Robert Leopold serves as Senior Program Officer for History, Art, and Culture and as the Director of the Consortium for World Cultures, working with senior leadership, museum directors and staff to

develop and implement the Smithsonian's strategic plans, national campaign, educational, web and digital strategy, and revenue and business policies. He is also a Professorial Lecturer in Museum Studies at George Washington University, where he teaches *Digital Imaging for Museums: Policy and Practice*, a course that builds on his experience managing imaging programs and creating online exhibits that support scholarly research and promote the repatriation of knowledge to source communities. Dr. Leopold served as project director and technical consultant for the online exhibit *Lakota Winter Counts*, which received a Webby Award from the International Academy of Digital Arts and Sciences and a U.N. World Summit Award. Previously, at the National Museum of Natural History, Dr. Leopold served as director of the National Anthropological Archives and Human Studies Film Archives, where he received major grants from the Mellon Foundation and the Save America's Treasures program to preserve and digitize endangered languages documentation, historical photographs and indigenous artwork and contributed his expertise to language revitalization initiatives in native communities. Leopold has a special interest in how scholars and source communities negotiate access to culturally sensitive materials in libraries, archives and museums. He is a co-author of the *Protocols for Native American Archival Materials* (2006) and was a co-sponsor of the international symposium *Ethnographic Archives, Communities of Origin and Intangible Cultural Heritage* (2006). He currently serves on the Cultural Property Working Group and the Committee on Ethics and Professional Conduct of the Society of American Archivists, as well as the advisory panel of the Long Now Foundation's Rosetta Project. Dr. Leopold is a former Fulbright Fellow who conducted ethnographic research on social organization, ritual and cosmology in Liberia from 1985-87. He earned his bachelor's degree in English literature from the State University of New York at Binghamton (1979) and his doctorate in social and cultural anthropology from Indiana University (1991).

### ***W. John Kress***



W. John Kress is a curator and research scientist with the Department of Botany at the National Museum of Natural History and the Director of the Consortium for Understanding and Sustaining a Biodiverse Planet. He was born in Illinois and received his education at Harvard University (B. A., 1975) and Duke University (Ph. D. 1981) where he studied tropical biology, ethnobotany, evolution, and plant systematics. Among his over 125 scientific and popular papers on tropical botany are his books entitled *Heliconia: An Identification Guide*, *Heliconias – Las Lamaradas de la Selva Colombiana*, *A New Century of Biology* (with Gary Barrett), *A Checklist of the Trees, Shrubs, Herbs, and Climbers of Myanmar*, and *Plant Conservation – A Natural History Approach* (with Gary Krupnick), and *DNA Barcodes – Methods and Protocols* (with David Erickson). His recent book, *The Weeping Goldsmith* (Abbeville Press), describes his experiences exploring for plants in the isolated country of Myanmar. Dr. Kress is also interested in the intersection of science and art. To this end he has published two original art projects: one called *Botanica Magnifica* (Abbeville Press) with

photographer Jonathan Singer, and the second a book on plant evolution, entitled *The Art of Plant Evolution* (Kew Publications), with Dr. Shirley Sherwood using contemporary botanical art to illustrate the diversity of the plant world. He is a Fellow of the American Association for the Advancement of Science and currently Executive Director of the Association for Tropical Biology and Conservation. Dr. Kress is an Adjunct Professor at Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, in Yunnan. He has mentored numerous graduate students and post-doctoral fellows as well as more than 20 undergraduate interns and summer students at the Smithsonian.

## ACKNOWLEDGEMENTS

The Smithsonian Grand Challenges Consortia would like to thank the Bill & Melinda Gates Foundation for its support as well as the Symposium Organizing Committee for their contributions to the success of this event.

Kelly Chance, Sr. Astrophysicist, Smithsonian Astrophysical Observatory  
Bill DiMichele, Curator of Fossil Plants, National Museum of Natural History  
Christine France, Physical Scientist, Museum Conservation Institute  
Elizabeth Kennedy Gische, Museum Program Mgr., National Museum of the American Indian  
Justin Kasper, Astrophysicist, Smithsonian Astrophysical Observatory  
Igor Krupnik, Anthropologist, National Museum of Natural History  
Odile Madden, Materials Scientist, Museum Conservation Institute  
Joanna Marsh, The James Dicke Curator of Contemporary Art, Smithsonian American Art Museum  
Karen Milbourne, Curator of Art, National Museum of African Art  
Rick Potts, Paleoanthropologist, National Museum of Natural History  
Jeffrey Stine, Curator, National Museum of American History  
Scott Wing, Curator of Fossil Plants, National Museum of Natural History