OLLI Climate & Society — COURSE SYLLABUS

Sept. 26 - Nov. 7, 2013

1. Sept. 26 - The State of the Climate

This first class will present an overview of how Earth's climate system works. I will briefly summarize NOAA's roles in observing and monitoring the climate and advancing scientific understanding of how it works. In reviewing historical climate changes, I will discuss the key forcings and feedback mechanisms that have caused Earth to go through glacial (cold) and interglacial (warm) periods. I will discuss natural climate variability, other Earth events that can cause short-term climate changes on regional to global scales, and how climate variability differs from weather. I will discuss the state of the climate today and humanity's climate forcing "fingerprints" that we can observe and measure. Lastly, I will discuss human-induced global warming and why it matters, with emphasis on observed changes in the frequency and severity of extreme events.

About the presenter:
David Herring is a science writer and editor with extensive experience communicating about climate and Earth science. David joined NOAA's Climate Program Office in March 2008, where he serves as Director of Communication and Education, Program Manager of NOAA's Climate.gov, and leads the agency's Climate Literacy Objective. Before coming to NOAA, David worked for 16 years in the Earth Sciences Division at NASA's Goddard Space Flight Center, where he served as Project Manager for Education and Outreach, Team Leader for NASA's Earth Observatory, and the Terra satellite mission's Outreach Coordinator. David trained in journalism, science education, and science and technical communication at East Carolina University, in Greenville, NC, where he received his Masters Degree in 1992. He is an elected Fellow of the American Association for the Advancement of Science (AAAS).

2. Oct. 3 - Climate Engineering: Ethical Considerations

In recent years, as international attempts to reduce greenhouse gas emissions have repeatedly stalled, some scientists have proposed development of geoengineering methodologies, often referred to as climate engineering, to intentionally cool the climate as an alternative way to mitigate climate change. While it is broadly recognized that today's uncertainties and dangers associated with such endeavors make implementation ethically unacceptable and therefore premature, many scientists and scientific organizations advocate research on this topic in order to be better prepared should a climate catastrophe occur. However, philosophers and ethicists identify many ways in which the research itself strains ethical boundaries. In this regard, climate scientists can derive significant insight from the world of biomedical research, where analogous ethical considerations have long been analyzed and addressed. This seminar provides an overview of the ethical issues associated with climate engineering research, explores the ethical validity of popular justifications for pursuing climate engineering research, and, by analogy to medical research on human subjects, proposes how the research community might place

ethical safeguards in place should a societal decision be made to pursue the research.

About the presenter:
Dr. Joel M. Levy currently serves as a program manager for the NOAA Climate Program Office's Ocean Climate Observation Program, which is tasked with deploying and maintaining an open ocean observing system for climate. He previously managed the NOAA Atmospheric Chemistry Program, and founded and managed the NOAA Aerosol-Climate Interactions Program, the first federal research program dedicated to elucidating the role of aerosols in climate. Dr. Levy spent a decade in a variety of roles with the U.S. Global Change Research Program, including serving for several years as co-chair of its Atmospheric Chemistry Theme. More recently he served six terms as editor of the Global Oceans Chapter of the State of the Climate Report, which is published annually in the *Bulletin of the American Meteorological Society.* Prior to coming to NOAA, Dr. Levy worked as an Environmental Scientist with the Global Change Division at U.S. EPA, and as a Research Scientist at the MIT Energy Laboratory. He has also held positions as a software engineer, marketing professional and consultant in the high-tech industry, and has worked as a U.S. National Park resource management ranger in the Sierras and in the Utah desert. Dr. Levy received his Ph.D. in Physical Chemistry from MIT, and his B.S. in Chemistry from the City College of New York.

3. Oct. 10 - Climate and Coastal Inundation

Over eight million Americans live in areas at risk of coastal flooding, and many of the nation's assets related to military readiness, energy, commerce, and ecosystems are located at or near the ocean. In many locations along the U.S. coast, small increases in sea level over the past few decades have increased the height of storm surge and wind-waves. Hurricane Sandy may have been a storm with unusual anatomy, but it is clear that its impact was greater as a result of higher mean sea levels at the Battery in New York City. Higher mean sea levels increase the frequency, magnitude, and duration of flooding associated with a given storm, and several U.S. federal agencies and universities recently released a joint assessment report stating with very high confidence that global mean sea level will rise from 0.2 meters (8 inches) to 2.0 meters (6.6 feet) by the year 2100. Vulnerability assessment, scenario planning, and other risk-based methods have proven useful for making decisions amid similarly uncertain trends (e.g., military planning, hazard response and preparation, etc.). This class will situate in-depth analysis of physical science in the context of four plausible scenarios of global mean sea level rise, collectively identified by several federal agencies. We will discuss how this information is relevant to decision makers (urban planners, utility managers, etc.) in New York City, right now, and we will collectively brainstorm ideas about how events like Hurricane Sandy present challenging but potentially transformative national policy and planning debate.

About the presenter:
For 10 years, Adam Parris has worked extensively at the boundary of science and coastal management, serving to bridge the two. Within the past year, he served as the lead author on the report *Global Sea Level Rise Scenarios for the United States National Climate Assessment* and provided technical guidance and leadership on the Sea Level Rise Tool for the Sandy

Recovery, noted as a sign of progress in the President's *Climate Action Plan*. Adam co-led the development of a synthesis on the state of science on sea level rise and coastal vulnerability used in the Hurricane Sandy Rebuilding Strategy developed by President Obama's Hurricane Sandy Task Force. He also serves as program manager for NOAA's Regionally Integrated Sciences and Assessments (RISA) — a nationally recognized program designed to inform decision makers in managing the risks posed by climate variability and change. Prior to coming to NOAA, Adam worked in coastal geomorphology and management for the San Francisco Bay Conservation and Development Commission (BCDC), where he performed policy and planning research on the effects of sea level rise on the San Francisco Bay ecosystem. Adam has performed analyses of watershed, estuary, and coastal settings including extensive field-work throughout the state of California. His graduate research in geology, funded by the National Science Foundation and the University of Vermont, focused on patterns of climate and flooding in the northeastern United States over the past 12,000 years. Adam holds a Bachelor of Arts in Environmental Geology and English Literature from Bucknell University, and a Master of Science in Geology from the University of Vermont.

4. Oct. 17 - Climate and Marine Ecosystems

The United States is an ocean nation — our past and present are inextricably connected to oceans and marine resources, and our future depends on them. Marine ecosystems provide us with many vital services, including jobs, food, transportation routes, recreational opportunities, health benefits, climate regulation, and cultural heritage that affect people, communities, and economies across the U.S. and internationally every day. We know there are strong linkages between the planet's climate and ocean systems, and there is solid evidence that changes in the climate system are already affecting marine ecosystems and the important services and benefits we depend on. This class will explore what we know about climate-related impacts on marine ecosystems and the people that depend on them, including what's being impacted, what's at risk, and what might be done to reduce risks and adapt to changing oceans.

About the presenter:
Roger Griffis is a marine ecologist with nearly 20 years of experience with the National Oceanic and Atmospheric Administration (NOAA) developing and implementing strategies for the sustainable use and conservation of ocean and coastal resources. As Climate Change Coordinator for NOAA's National Marine Fisheries Service, Roger is responsible for helping the agency identify, prepare for, and respond to the impacts of a changing climate on its mission areas (marine fisheries management, protected species conservation, and habitat protection and restoration). Over the past two years, he has helped lead efforts to assess climate impacts on U.S. ocean ecosystems as part of the National Climate Assessment, and he co-led development of the first U.S. climate adaptation strategy to safeguard the nation's valuable fish, wildlife, and plant resources in a changing climate (www.wildlifeadaptationstrategy.gov). Prior to his current position, Roger managed NOAA's Coral Reef Conservation Program from 2001-07 and served as coastal stewardship policy advisor in NOAA's Office of Policy and Strategic Planning from 1994-2001.

5. Oct. 24 - America's Climate Choices vs. Americans' Attitudes & Understanding

This class features an overview of recent reports by the U.S. National Academy of Sciences, called *America's Climate Choices*. This series of five reports presents a detailed overview of the science of climate change, and steps that can be taken to limit the magnitude of climate change while adapting to those climate-related impacts that are inevitable or already ongoing. While there are options and solutions, will America choose to act? This class will also include discussion about new social science research on Americans' attitudes and understanding of climate science. What would it take for the United States, and the rest of the world, to identify and choose "win-win" strategies whereby we can mitigate worst-case global warming scenarios, improve our resilience to unavoidable climate impacts, ***and*** help maintain a strong economy? Participants will evaluate options and make recommendations on what they feel are America's best courses of action.

About the presenter:

David Herring is a science writer and editor with extensive experience communicating about climate and Earth science. David joined NOAA's Climate Program Office in March 2008, where he serves as Director of Communication and Education, Program Manager of NOAA's Climate.gov, and leads the agency's Climate Literacy Objective. Before coming to NOAA, David worked for 16 years in the Earth Sciences Division at NASA's Goddard Space Flight Center, where he served as Project Manager for Education and Outreach, Team Leader for NASA's Earth Observatory, and the Terra satellite mission's Outreach Coordinator. David trained in journalism, science education, and science and technical communication at East Carolina University, in Greenville, NC, where he received his Masters Degree in 1992. He is an elected Fellow of the American Association for the Advancement of Science (AAAS).

6. Oct. 31 - Climate and Drought & Water

Drought, often referred to as a "creeping disaster," is not as easy to define or predict as you may think. There are various ways we quantify the hydrological and meteorological indicators of drought, yet there is no single drought index or indicator that works for all places in the U.S. at all times of the year to indicate the spatial extent or severity of a drought. In this presentation I will give an overview of the water cycle, some of the ways we quantify drought severity, and some of the ways we evaluate how people experience drought (i.e., drought impacts). I will introduce you to the U.S. Drought Monitor and give an overview of how it is produced through the assessment and integration of drought indices, impacts and expert opinion. I will then introduce you to some of the products used to forecast drought. The devastating impacts of the 2012 Central Great Plains drought will be reviewed, along with the meteorological characteristics of this drought, and our failure in forecasting this significant event. Finally, I'll end the presentation with some basics on what we know about future droughts in a changing climate.

About the presenter:

When it comes to drought, NOAA's Lisa Darby is a self-described "matchmaker." A meteorologist in the National Integrated Drought Information System (NIDIS) Program Office, she

matches people who have information about drought with people who need it. Lisa helped establish a drought early warning information system in the Apalachicola-Chattahoochee-Flint River Basin and is currently working to help establish the Carolinas Coastal Ecosystems drought early warning pilot. This involves targeting and recruiting key people in various agencies from the federal level down to the city and county level to participate in the drought early warning system. She organizes workshops for stakeholders in drought-affected regions, traveling frequently to these regions. Prior to joining NIDIS in 2008, Lisa spent 20 years working in optical remote sensing in the NOAA Earth System Research Laboratory, focusing on Doppler lidar studies of mesoscale wind flows. She also worked on an International Polar Year project called International Arctic Systems for Observing the Atmosphere (IASOA), promoting collaborative research among atmospheric observatories located north of the Arctic Circle. Lisa earned a Bachelors Degree in Meteorology from Metropolitan State College of Denver, and a Master's Degree in Atmospheric Science from Colorado State University.

7. Nov. 7 - Climate and Energy

This presentation reviews mitigation of climate change. The magnitude of future anthropogenic climate change can be reduced, or mitigated, by reducing emissions of greenhouse gases. This session will review mitigation pathways over the 21st century, the role of technology, and end with a discussion of sources of U.S. greenhouse gas emissions and how these might be reduced in the future.

About the presenter:

Dr. Steven Smith's research focuses on long-term socio-economic scenarios and the interface between socio-economic systems and the climate system. Smith's research interests include aerosols, non-CO2 greenhouse gases, the carbon cycle, biomass energy, energy technologies, and land-use changes. His recent research concerns the role of non-CO2 forcing agents in policy scenarios, including sulfate aerosols, black carbon, and non-CO2 greenhouse gases. Smith also works on interdisciplinary efforts to develop climate models for use in scientific research and decision-making. Prior to joining the Department of Energy's Pacific Northwest National Laboratory in 1999, Smith served as a project scientist at the National Center for Atmospheric Research, and was a lead author for the Intergovernmental Panel on Climate Change (IPCC) Special Report on Emissions Scenarios. He also has served on the Panel on Public Affairs of the American Physical Society, and on the Executive Committee of the APS Forum on Physics and Society. Smith holds a Ph.D. in Physics from the University of California-Los Angeles.