

Geographers Leading Climate Change Studies

Climate change—the causes and consequences—is receiving elevated attention by the media and public, and geographers are at the leading edge of studies in three important ways: 1) understanding the fundamental processes of climate change, past and present; 2) examining the data record to document trends; and 3) describing, explaining, and predicting the impacts of climate change.

If you were going to follow just one person who is dealing with current climate change assessment, I would suggest Linda O. Mearns, Senior Scientist at the National Center for Atmospheric Research (NCAR) in Boulder, Colorado and Deputy Director of the Environmental and Societal Impacts Group (ESIG). Linda holds a PhD in geography/climatology from UCLA. She has performed research and published in the areas of crop-climate interactions, climate change scenario formation, climate change impacts on agro-ecosystems, and analysis of climate variability and extreme climate events in both observations and climate models. Linda has particularly worked extensively with regional climate models. She has most recently published papers exploring the effect of different spatial scales of climate change scenarios on determination of agricultural impacts of climate change. Mearns has contributed to the Intergovernmental Panel on Climate Change (IPCC) 1992, 1995, and 2001 Reports on the subjects of climate variability in general circulation models, regional climate change, and climate scenario formation. She is a member of the IPCC Task Group on Scenarios for Climate Impact Assessment, and was co-convening lead author for the chapter on Climate Scenario Development in IPCC Working Group (WG) I for the IPCC Third Assessment Report (2001), and a lead author on two other chapters in Working Groups I and II: one on Regional Projections of Climatic Change and the other (in WGII) on Scenarios. She has just completed an integrated assessment

project funded by the EPA, NASA, and USDA, on the effects of changes in climate variability on crop production in the Southeastern U.S. Linda's current projects include: an Integrated Assessment of Environmental Problems on the North Slope of Alaska (funded by NSF), Climate Change Effects on Crops in the Yangtze River Area of China (funded by NASA), and Uncertainty in Datasets used for Agricultural Assessments (NSF-MMIA). She served on the National Academy Panel on Climate, Ecosystems, Infectious Diseases, and Human Health from March 1999 to June 2001, and currently serves on the Institute of Medicine Panel on Emerging Infectious Diseases of the 21st Century. She also leads the NCAR Weather and Climate Impacts Assessment Science Initiative, which includes plans to form a climate/health research and educational program. She is also the lead PI for the recently funded North American Regional Climate Modeling Experiment.

Johannes Feddema at the University of Kansas recently published an article in *Science* on urban land cover in global climate models; Linda Mearns was a co-author. Feddema contacted NCAR and asked when they were going to start including land surface change in their global circulation models. NCAR responded by awarding Feddema the funds to begin building a global database, from existing data, on land surface change.

You may have noticed that some American academic programs in geography are adding paleoenvironmental scientists to their faculty, realizing the potential for better predictions if we can first understand the cause and effects of past environmental change. A number of people who have done great work in reconstruction of past climates—Pat "Bart" Bartlein at University of Oregon, Malcolm Cleaveland at

University of Arkansas, and Katie Hirschboeck at University of Arizona are studying various proxies for detecting climate change. Ellen Mosley Thompson (Ohio State University) has focused on paleoclimatic reconstruction from the chemical and physical properties preserved in ice cores. She has conducted ice core drilling programs in Antarctica and Greenland and along with her colleagues reconstructs paleoenvironmental conditions from the chemical and physical properties preserved in ice cores collected from Antarctica, Greenland, China, and Peru. These high resolution proxy records of dust content, atmospheric

temperature, chemical composition, and net accumulation provide unique histories, with emphasis on remote and underdeveloped regions of the Earth. Thompson's particular interests include the role of atmospheric dust and volcanic aerosols in the climate system, the reconstruction of abrupt changes in the environmental system, incorporation of ice core records into multi-proxy climate histories, and the impact of such environmental changes upon human activities.

Kam-Biu Liu at Louisiana State University has recreated past hurricane climatologies. His recent research on paleorecords of hurricanes represents breakthrough science that has taken on added meaning in the wake of hurricanes in 2005 along the Gulf Coast and in the southeastern United States. His published research prior to Hurricane Katrina seems prophetic now—warning of the likelihood of increased hurricane frequency and magnitude—and lends even more credence to the claim that we need to examine long-term hurricane patterns. It is entirely



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understandable why his research has attracted enormous attention from the public and science media. He uses pollen and hurricane overwash sediments recovered from coastal lakes and wetlands to extend the records of hurricane landfall along the Gulf of Mexico coast. Other funded research includes a lake-coring project in the Tibetan Plateau to produce high-resolution pollen records of the long-term dynamics of the SW Indian monsoon since the Last Glacial Maximum, and a pollen study of ice cores from the Dundee Ice Cap of western China.

Fritz Nelson has been working in climate change science since 1985, when Canada's Atmospheric Environment Service used a mapping procedure by Nelson and fellow geographer Sam Outcalt with an early general circulation model (GCM) to examine the effects of climate warming on permafrost distribution. Nelson was also involved in collaborative field research in northern Alaska in the 1990s to document the flux of greenhouse gases in tundra environments.

Geographers are involved in studying the climate data record to separate signals from noise. David Easterling at the National Climate Data Center has published a number of good papers and is a co-author of a *Science* paper on changes in extremes. The AAG John Russell Mather and Sandra Pritchard Mather Climatology Knowledge Environment (see the January 2006 AAG Newsletter) has created a living memorial, an interactive online resource available to climate researchers, educators and students worldwide for the scrutiny of climate change databases. Continuing the Mather legacy at the University of Delaware, Cort Willmott and Kenji Matsuura have compiled data from a large number of stations, both from the Global Historical Climate Network and, more extensively, from the archives of David Legates and others.

A number of geographers are involved in research on climate change (current and potential future) impacts as part of the Climate Assessment for the Southwest (CLIMAS) project (a NOAA Regional Integrated Sciences and Assessments

program). Sara Pryor at Indiana University has looked at potential changes in circulation and wind regimes in a perturbed climate. Her work is strong and has been published in a wide array of journals. Some other active geographers who are in the news include Mark Serezze (University of Colorado, Boulder) for Arctic sea ice variability, Jason Box (Ohio State University) for Greenland Ice Sheet mass balance and accelerated melting, Bryan Mark (Ohio State University) for Andean glacier retreat. Harry Lins in the USGS Office of Surface Water is a major player in the Global Change Hydrology Program. This program began in 1990 to develop data, understanding, and predictive capabilities related to water and associated aspects of carbon and the greenhouse gases as they interact with global systems. The program is part of the USGS Global Change Research Program (Geochange) which, in turn, is an element of the U.S. Global Change Research Program (USGCRP).

Working with a team of faculty and students at the University of Wyoming, we have found glaciers in the Wind River Range are particularly sensitive to climate warming. Half of the volume of Dinwoody Glacier disappeared from 1958-83, and half of what remained in 1988 had disappeared by 1995. Grasshoppers that ablated out of the ice have been carbon-dated at over 700 years old, thus revealing the ice as having formed during the Audubon Advance (c. 3000 yBP), not the more recent Little Ice Age. This is old ice that is fast disappearing. In the 1970s, the Wyoming State Legislature had considered funding a project that would have spread coal dust on these glaciers to accelerate melting and increase water supply. Although the measure was discarded, the coal dust was not needed as climate warming accomplished the same goal. In a remarkable reversal, Wyoming is now re-considering precipitation augmentation projects to increase winter snowfall over the Wind River Range!

The human dimensions of global change remain a focus of heightened interest. One multi-institution effort

worth noting is the Human-Environment Regional Observatory (HERO) Project. The study involves scientists at Pennsylvania State University, Clark University, the University of Arizona, Kansas State University, and the U.S. Geological Survey. The four human-environment regional observatories (HEROs) are located in the Southwest-Mexico border region, the High Plains of Kansas, central Pennsylvania, and central Massachusetts. They represent a diverse set of coupled human-natural environments for addressing land-use change, social and economic influences, and climate impacts. The project will contribute to human science and policy research related to human dimensions of global change and ideas of vulnerability and sustainability. This project builds on earlier work led by Bob Kates, Tom Wilbanks, Bill Turner, and other leading scholars in geography. Two bench mark volumes highlight this work, both published by Cambridge University Press: *The Earth as Transformed by Human Action* (1990) and *Global Change and Local Places* (2003). An update on the former volume would be welcomed.

All of the good work by geographers and other climate change scientists has led to a scientific consensus on climate change. Writing in the December 3, 2004 issue of *Science*, Naomi Oreskes reported the results of a survey of all 928 climate change papers published in refereed scientific journals between 1993 and 2003 (ISI database). Remarkably, none of the papers disagreed with the scientific consensus that human activities are heating Earth's surface and lower atmosphere. The American Association for the Advancement of Science (AAAS) concludes: "This analysis shows that scientists publishing in the peer-reviewed literature agree with IPCC, the National Academy of Sciences, and public statements of their professional societies. Politicians, economists, journalists, and others may have the impression of confusion, disagreement, or discord among climate scientists, but that

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MyCOE Seeks Student Proposals for 2006

The My Community, Our Earth (MyCOE) Partnership invites proposals from students to conduct community-oriented research projects on sustainable development topics in the U.S. Gulf States, Wider Mississippi River Basin, and Greater Caribbean Region. Selected projects will use geographic methods and tools, such as GIS, and will utilize USDA data to approach a locally relevant issue on any aspect of sustainability. The proposals will enable a special learning experience that includes the opportunity to gain valuable workforce experience, practice skills, apply knowledge, and engage with local communities on real-world issues. MyCOE seeks to link research, education, and community outreach in a set of structured activities designed in part as an

internship or work-related practicum, in part as a fellowship for rigorous study and part life experience, dealing with hands-on issues in real communities. Awardees will receive modest stipends, be provided with expert mentoring resources, and will participate in international learning exchange with other student is in the region through the MyCOE network.

Eligible participants are students enrolled in related programs of interest (geography, environmental studies, agriculture, etc.) at an accredited institution of higher education (community colleges, liberal arts colleges, universities, etc.). Priority will be given to proposals by undergraduate students over graduate students. Applicants must be U.S. citizens or permanent residents.

Students will propose to work locally and on-site with USDA affiliated offices and/or related groups, and the MyCOE program will initiate and facilitate working relationships on behalf of the selected participants. Targeted sites are in the U.S. Gulf or Greater Mississippi River Basin as well as Fort Worth, Texas and Morgantown, West Virginia.

Proposals will be accepted and considered on a rolling basis throughout 2006 for projects running in 2006 and 2007. Please indicate the timeframe for the project, including proposed start and end dates.

For full project criteria, submission instructions, participation requirements and benefits visit www.geography.org/sustainable or email Patricia Solís at psolis@aag.org.

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impression is incorrect...there is a scientific consensus on the reality of anthropogenic climate change." Thus, one would expect the scientific consensus would be translated into government action and public policy. A number of barriers have prevented that from happening to various degrees around the world, but most especially in the United States. Brent Yarnel and Craig Colten belong to a group called New Dimen-

sions, which has the goal of developing "new models for interdisciplinary collaboration, where physical scientists, social scientists, and humanists work together with public agencies, the private sector, and communities to deepen our understanding of and develop effective responses to societal problems." The work of critical geographers will continue to shed light on the confounding factors that de-link science and public policy.

The AAG Council recently adopted a resolution addressing the current scientific consensus on climate change and urging action by the U.S. and other governments on the issue. The full text of the resolution is contained on page 21 of this issue of the *AAG Newsletter* as part of the Council Minutes.

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Members of Note

AAG Vice President-elect **Thomas Baerwald** was interviewed by Spike O'Dell of Chicago's WGN Radio on March 13, 2006, about the AAG's 2006 Annual Meeting in Chicago. An audio file of the interview is available online at www.wgnradio.com/weblog/podspike/.

The *Chicago Sun-Times* ran an article by former AAG President **Alexander Murphy** entitled "Geographic Illiteracy Led us to be Hoodwinked into War." The article, which appeared March 18, 2006, discussed the reduction of geography

education in America and the geographically un-informed arguments used before the Iraq war. It is available at www.suntimes.com/output/otherviews/cst-edt-ref181.html.

A letter written by **James F. Marran** in response to the above-noted article by Alexander Murphy was published in the *Chicago Sun-Times* on March 28, 2006.

The Scandanavian research project of **David R. Jansson**, Vassar College, was described in a January 12, 2006 article in one of Finland's Swedish language

newspapers, *Nya Åland*. The title of the article, "USA-professor undersöker ÅF" by Anna Björkroos, translates essentially as "USA professor studies [or investigates] Ålands Framtid [Åland's Future, which is a new political party on Åland, a Swedish-speaking archipelago in Finland]. The article discusses Jansson's research project on geographic identity on Åland, which begins with a case study of this political party, and its desire for independence from Finland for the archipelago.