

The Rutgers Climate Institute (RCI) is a University-wide effort to address one of the most important issues of our time through research, education and outreach. RCI includes over 85 affiliated faculty from the natural, social and policy sciences, as well as applied professional disciplines including engineering, journalism, law, planning and public health. In September 2013, RCI was launched as a merger of the Climate and Environmental Change Initiative and the Initiative on Climate and Society. **Anthony Broccoli** (Environmental Sciences) and **Robin Leichenko** (Geography) are the Co-Directors of RCI.

We are pleased to introduce the first Rutgers Climate Bulletin, which spotlights climate-related news, events, and the research of our faculty and students.

## IPCC FIFTH ASSESSMENT REPORT

### The Physical Science Basis

Since its formation in 1988, the United Nations Intergovernmental Panel on Climate Change (IPCC) has published four comprehensive assessment reports reviewing the latest climate science. The Fifth Assessment Report (AR5) was released in stages between September 2013 and April 2014.

The IPCC does not conduct its own research. Instead, experts from around the world are selected to volunteer on chapter teams as Coordinating Lead Authors, Lead Authors, Contributing Authors and Review Editors. Coordinating Lead Authors and Lead Authors are responsible for the chapter content and may enlist Contributing Authors to provide expertise on a relevant topic.

The IPCC Working Group I approved and released its contribution to the report, Climate Change

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2013: The Physical Science Basis, in September. The report, an assessment of the physical science basis of climate change, was grounded in 9,200 peer-reviewed studies. Their report indicated that "It is extremely likely (with 95%-100% certainty) that human influence has been the dominant cause of observed warming since the mid-20th century."

Congratulations to the RCI Affiliates who are Contributing Authors to the IPCC Working Group I Report:

**Benjamin Horton**, Marine and Coastal Sciences

**Robert Kopp**, Earth and Planetary Sciences

**David Robinson**, Geography

**Alan Robock**, Environmental Sciences

In addition to his work as a Contributing Author, **Professor Robock** is a Lead Author of Chapter 8: Anthropogenic and Natural Radiative Forcing.

In March 2014, the IPCC Working Group II (WG II) released their contribution to AR5, "Climate Change 2014: Impacts, Adaptation, and Vulnerability." The report examines the impacts of climate change to date, future risks from a changing climate, and opportunities to reduce risks. It details the risks and opportunities for response by sector, with a focus on "freshwater resources, terrestrial and ocean ecosystems, coasts, food, urban and rural areas, energy and industry, human health and security, and livelihoods and poverty."

Congratulations to the following RCI affiliates who are Contributing Authors to the IPCC Working Group II Report:

**Robert Kopp**, Earth and Planetary Sciences

**Alan Robock**, Environmental Sciences

RCI Co-Director **Robin Leichenko**, Geography, served as a review editor for Chapter 12: Human Security.

In April 2014, IPCC Working Group III (WG III) released "Climate Change 2014: Mitigation of Climate Change." The report assesses options for human intervention to reduce the sources or enhance the sinks of greenhouse gas emissions.

The IPCC provides comprehensive and balanced information to policy-makers, although IPCC reports are not policy prescriptive. Since its inception the IPCC has prompted a dialogue on climate change in both the scientific and policy communities. The First Assessment Report in 1990 inspired negotiations that led to the creation in 1994 of the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC is an international environmental treaty with the ultimate objective of stabilizing "greenhouse gas concentrations at a level that would prevent dangerous anthropogenic interference with the climate system." The independent scientific, technical and socioeconomic knowledge provided by the IPCC is informative to the UNFCCC process.

## LEICHENKO PRESENTS IPCC REPORT TO SENATE OF REPUBLIC OF MEXICO

RCI Co-Director **Robin Leichenko** presented results from IPCC Working Group II during the event *Climate Change, Mitigation, Risks and Adaptation* at the Senate of the Republic of Mexico on April 21, 2014. Organized by the Mexican Academy of Sciences and the U.S. National Academy of Sciences, the goal of the

event was to raise awareness among Mexican legislators of IPCC Working Groups II and III reports and the need to create public policies to address the risks of climate change.

Leichenko's comments focused on the connections between climate change and human

security, and, in particular, the impacts of climate on poverty and poverty alleviation, human migration, and conflict. Leichenko served as review editor for the Human Security chapter of IPCC Working Group

II. She was joined by several other speakers, including Nobel-prize winner, Dr. Mario Molina.

## STATE OF THE CLIMATE: NEW JERSEY

### Rutgers Climate Institute's Inaugural Report

Rutgers Climate Institute released its inaugural State of the Climate: New Jersey in October 2013. The report provides an overview of recent climate events and trends, their impacts, and their implications for the future of New Jersey. The changes that we are experiencing in New Jersey are examined in the context of human-induced climate change, an important driver of past and future climate trends. The report addresses changes in temperature, precipitation and sea level rise.

Included in the report is a discussion about Hurricane Sandy and the implications that rising sea levels will have for increasing associated flooding of such events. Impacts on coastal fisheries and public health are featured as well. Rutgers Climate Institute expects to annually release a State of the Climate report for New Jersey.

## AFFILIATE SPOTLIGHTS

### PUBLIC POLARIZATION ON CLIMATE CHANGE

#### Affiliate Lauren Feldman (Communication)

Communications professor and RCI Affiliate **Lauren Feldman** presented a lecture in early April titled "Public Polarization on Climate Change: The Role of Partisan Media." Professor Feldman's research focuses on the effects of news and political media on political knowledge, attitudes, and behavior. She is interested in the ways that less-traditional sources of political information—like political satire and opinionated cable news—affect public opinion and engagement around policy issues. Her current research focuses on the role that these sources of political information play in influencing perceptions of climate change, and how to more effectively use media and communication to engage the public on this issue.



**PROFESSOR LAUREN  
FELDMAN**

The lecture, which was hosted by the Department of Human Ecology, considered the role that partisan media plays in shaping public opinion on climate change. She also discussed the role of new communication strategies, such as social media, and their potential to engage broad sections of the public around climate change.

## ARCTIC CLIMATE CHANGE AND EXTREME WEATHER

Affiliate Jennifer Francis (Marine and Coastal Sciences)

Unusual weather is sweeping the country and much of the Northern Hemisphere: this year has seen an extremely cold winter in the Eastern, Midwestern and Southern United States, warmth in Alaska and a drought in California. A Research Professor at the Institute of Marine and Coastal Sciences, RCI Affiliate **Jennifer Francis** focuses on the polar vortex, a region of cold air above the North Pole, and how it influences our weather through the jet streams.

The temperature difference between the polar vortex and the warmer air around it drives the jet stream. Dr. Francis hypothesizes that when the

temperature difference declines, as in the warming of the Arctic, the jet stream begins to meander in a slow-moving amplified flow, with large ridges and troughs. This Arctic amplification produce extreme weather patterns that seem to be “stuck.”

Francis's work is part of a pioneering field of research exploring the effects of Arctic warming on extreme weather in the Northern Hemisphere. While the extreme weather we are experiencing cannot be attributed to climate change, Francis argues that climate change makes such extreme weather patterns more likely.

## A MAPPING TOOL FOR SCIENCE-BASED DECISION-MAKING

Affiliates Lisa Auermuller (Jacques Cousteau Estuarine Research Reserve), Jeanne Herb (Bloustein School) Richard Lathrop (Ecology, Evolution and Natural Resources) and Marjorie Kaplan (RCI)

Several Rutgers researchers have teamed up to provide a geospatial data portal to help community planning for climate change adaptation. In May 2013, Rutgers University and the National Oceanic and Atmospheric Administration (NOAA) released NJ Flood Mapper, a user-friendly visualization tool that uses high resolution mapping of the land surface elevation to show areas vulnerable to sea-level rise. NJ Flood Mapper is a collaboration with the NOAA Coastal Services Center (CSC) through a partnership with the Jacques Cousteau National Estuarine Research Reserve (JCNERR) and the Grant F. Walton Center for Remote Sensing and Spatial Analysis (CRSSA), Rutgers University.

The tool was created to assist local decision-makers in identifying planning and adaptation opportunities that will reduce their vulnerability to flooding hazards and sea-level rise. Federal Emergency Management Agency (FEMA) floodplain maps, coastal evacuation routes, state/municipal level infrastructure and socio-demographic information are included to provide a fuller picture of vulnerability to flooding hazards.

**Richard Lathrop**, the director of CRSSA, developed the mapping tool with help from his colleagues at CRSSA and a collaboration with NOAA CSC. Professor Lathrop is an RCI affiliate and a Professor in the Department of Ecology, Evolution, and Natural Resources. **Lisa**

**Auermuller**, Watershed and Coastal Training Program Coordinator at JCNERR and an RCI affiliate, worked with municipal and county level officials to ensure that NJ Flood Mapper would be a useful and informative tool for decision-makers.

Surveys of coastal community officials, emergency responders and planners, cited the utility of such a tool for planning (e.g. comparing Hurricane Sandy surge and various levels of sea level rise, looking at future flood zones, and looking at potential marsh restoration projects) and communication (such as future flood information for concerned residents, a better understanding of properties affected by high water, and the provision of information for residents considering raising or selling homes). Lathrop and Auermuller have been expanding the tool to include "Getting to Resilience" (GTR), an on-line self-assessment

designed to assist communities in reducing vulnerability and increase climate preparedness by linking planning, mitigation and adaptation actions. Communities can learn how their preparedness can yield valuable points through FEMA's Community Rating System that can lead to reductions in insurance rates.

Working with local disaster response managers, this team, joined by Jeanne Herb (Bloustein School of Planning and Public Policy) and Marjorie Kaplan (RCI Associate Director), are incorporating Flood-Mapper and GTR into the NOAA Roadmap Platform to provide additional data collected from State and local agencies that can be used for resiliency planning. This expanded platform will provide data in a form that is understandable and useful to communities, and it will enable users to create customized maps for community engagement.

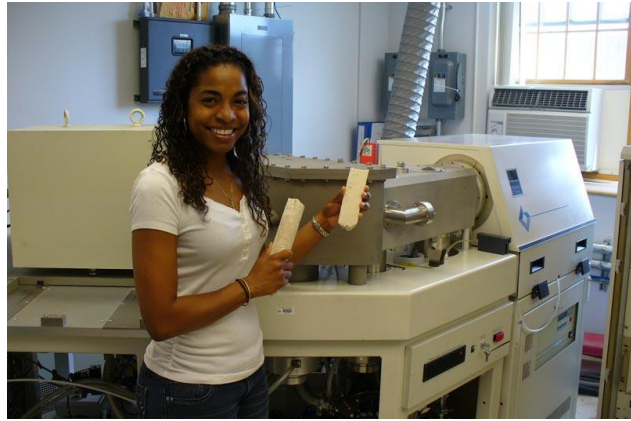
## STUDENT SPOTLIGHT

### GREENBERG FELLOWSHIP

The William H. Greenberg Fellowship was established by Mrs. Phyllis Greenberg to honor her husband who was a graduate of Rutgers University, Class of 1944. Greenberg Fellows are Rutgers University graduate students who have completed their qualifying exams and whose Ph.D. research fits within the scope of RCI. Greenberg Fellows receive support for their academic endeavors related to studying the causes of climate change, understanding its effects on society and the environment, and informing society about those impacts.

**Nicole Abdul**, the current Greenberg Fellow, is a Ph.D. candidate in the Department of Earth and Planetary Sciences. Her dissertation focuses on abrupt climate change from a sea-level, sea surface temperature, and tropical seasonality perspective, and understanding the role of the tropics on our warming planet. In her research, Nicole uses fossil corals from offshore Barbados to investigate sea-level variability during periods of abrupt climate change.

Nicole's research aims to provide improved constraints on ice volume, sea-level rise and sea surface temperature in current climate models. Her work is relevant to understanding the effects of human-induced climate change, which is simultaneously accelerating the rates at which Earth's ice sheets are melting and thermally expanding its oceans.



**GREENBERG FELLOW NICOLE ABDUL HOLDS 2 KEY SAMPLES OF FOSSIL CORAL USED TO RECONSTRUCT PAST SEA-LEVEL AND SEA SURFACE TEMPERATURE.**

## RESEARCH WORKING GROUPS

### ARCTIC WORKING GROUP

Affiliates Hal Salzman (Bloustein) and Åsa Rennermalm (Geography)

An Arctic working group brings together the growing number of faculty at Rutgers and nearby campuses who are engaged in the study of the social dynamics and policy implications of rapid climate-driven change in the Arctic region. This group sponsors seminars, workshops, panels and other events on campus. This group is led by Professor **Åsa Rennermalm**, Department of Geography, and Professor **Hal Salzman**, Edward J. Bloustein School of Planning and Public Policy.

The Arctic working group has been contributing to the Rutgers series Polar Perspectives on Art and Science. The series was made possible through a collaboration between the Edward J. Bloustein School of Planning & Public Policy, the Rutgers Department of Geography, Rutgers Climate Institute, Rutgers Centers for Global Advancement and International Affairs (GAIA Centers), the Zimmerli Art Museum, the Cook Campus Dean and the Advancement of



**FROM LEFT TO RIGHT, DIANE BURKO, ARTIST; PROFESSOR ASA RENNERMALM, GEOGRAPHY; PROFESSOR HAL SALZMAN, BLOUSTEIN.**

Hydrologic Science, Inc. Let's Talk About Water. It has included lectures, film screenings, and an art exhibition at Zimmerli Art Museum.

The Chasing Ice film screening and panel discussion, which occurred October 23rd at Rutgers University Cinema, was part of the series. The film screening was followed by a panel

discussion that featured Rutgers faculty working on understanding the changing polar environments and how they are connected to New Jersey. You can read more about the Chasing Ice event under the Event Highlights section of this Bulletin.

On November 6th, artist Diane Burko gave an illustrated lecture titled Freeze Frame: Art and the Cryosphere, in which she discussed her recent trips

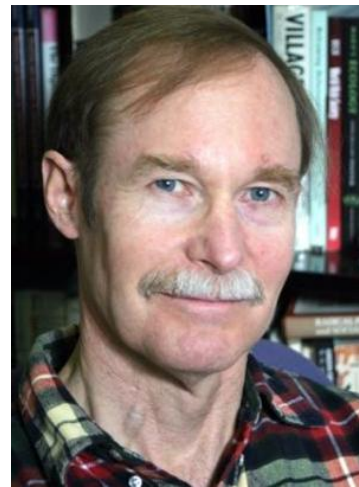
to the Arctic and Antarctica and her experience creating paintings that confront climate change. Her work is on view at the Zimmerli Art Museum, in their exhibition "Diane Burko: Glacial Perspectives," until July 31, 2014. Diane Burko's lecture was presented in relation to the Spring 2014 Byrne Seminar "Arctic Lens: A Journey to The Great North through Film," taught by Professors Rennermalm and Salzman.

## LAND USE TRANSITIONS IN THE TROPICS WORKING GROUP

Affiliate Thomas Rudel (Human Ecology)

A land use transitions in the tropics working group focuses on tropical regrowth and REDD+ (Reducing Emissions from Deforestation and Degradation). REDD+ policies go beyond deforestation and forest degradation to include the role of sustainable management of forests and the conservation and enhancement of forest carbon stocks. This working group supports guest speakers, graduate student travel, and a discussion group exploring joint research projects and developing ways to bring these topics into the classroom. It is led by **Thomas Rudel**, Distinguished Professor in the Department of Human Ecology.

In late May 2013, Professor Rudel and his colleagues organized and attended a two-day international workshop titled Pastures, Climate Change and Sustainable Intensification at the International Center for Tropical Agriculture in Cali, Colombia. The tropics working group also supported summer field research on REDD+ in



**PROFESSOR TOM RUDEL**

Indonesia and Panama, which culminated in a graduate student symposium held at Rutgers in December 2013. The symposium was titled Socio-Ecological Changes in the Tropics: Graduate Student Reconnaissance Trip Reports from the Summer of 2013. It featured presentations on summer field research in Panama, Indonesia, Costa Rica, and Colombia. The event was sponsored by the Departments of Geography and Human Ecology and the GAIA Centers at Rutgers.

## EVENT HIGHLIGHTS

## PEOPLE, NOT POLAR BEARS

## The Evolving Understanding of Climate Risk &amp; National Security

Rear Admiral USN (retired), David Titley, currently a Professor of Practice in Meteorology and Founding Director of the Center for Solutions to Weather and Climate Risk at the Penn State Department of Meteorology spoke to a packed audience on the Cook Campus, New Brunswick on the risks of climate change to national security.

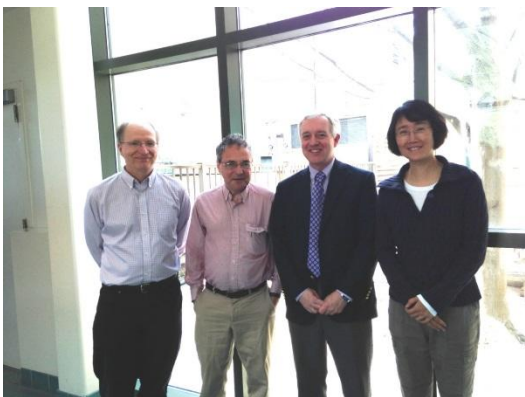
Dr. Titley addressed key questions including: why is climate change a national security issue; how do we know it is happening; and what is the defense establishment doing to prepare for climate change? He noted that the Navy recognizes that the earth is warming and the ocean is storing most of the heat, and that the Arctic is warming twice as fast as the rest of the planet. He pointed out that Arctic warming is causing summer sea ice to rapidly melt and thin, thereby opening the region to increasing access and maritime activity.

A few national security issues that can be impacted by climate change include infrastructure (for example, naval bases are

located along coastlines which are at risk of sea level rise and extreme weather conditions) and energy implications (for military and domestic use). Food security issues are a concern, as 2 billion people get their primary source of food from the ocean which is being impacted by ocean acidification from increased carbon in the atmosphere. Droughts and floods impact food prices which can exacerbate instability in already unstable regions threatening global security.

Dr. Titley noted that to tackle the challenge of climate change, nations should focus on what they can agree on rather than blaming one country or another for the climate crisis. "I still believe this country can do really amazing things when we get focused, but time is running out, meaning the more costly it will be as the challenge becomes harder and harder the longer we wait."

The talk was jointly sponsored by Rutgers Climate Institute, Rutgers Energy Institute and Rutgers Department of Earth and Planetary Sciences.



**GUEST LECTURER REAR ADMIRAL DAVID TITLEY, US NAVY (RET.) 3<sup>RD</sup> FROM LEFT WITH PROGRAM HOSTS (LEFT TO RIGHT) ANTHONY BROCCOLI, PAUL FALKOWSKI, AND YING-FAN REINFELDER.**



## SHORED UP FILM SCREENING AND PANEL DISCUSSION

On February 24, 2014, Rutgers Climate Institute collaborated with the Cook Campus Dean, Undergraduate Academic Affairs, Environmental Science Graduate Student Association, Rutgers Meteorology Club, Rutgers Environmental Science and Engineering Club, Rutgers Undergraduate Geography Society, and the Rutgers Oceanography Club to co-host a film screening of "Shored Up" that drew over 170 students, faculty, and members of the public to the Cook Campus Center on the New Brunswick campus. Shored Up is a documentary that focuses on the impacts and risks of sea-level change on coastal communities from New Jersey to North Carolina.

The film screening was followed by a panel discussion, featuring several experts who also appeared in the film. Panelists included Tim Dillingham, Executive Director of the American Littoral Society; RCI Affiliate **Benjamin Horton**, Professor at the Institute of Marine and Coastal

Science; Jeffrey A. Gebert, Chief, Coastal Planning Section, US Army Corps of Engineers, Philadelphia District; and RCI Affiliate **Norbert Psuty**, Professor Emeritus at the Institute of Marine and Coastal Science. Anthony Broccoli, RCI Co-Director and Professor of Environmental Science at Rutgers, moderated the panel.



SHORED UP PANELISTS (LEFT TO RIGHT) TIM DILLINGHAM, JEFFREY GEBERT, BENJAMIN HORTON AND NORBERT PSUTY.

## BRIDGING THE CLIMATE DIVIDE

### Informing the Response to Hurricane Sandy and Implications for Future Vulnerability

In late October 2012, Hurricane Sandy made landfall in New Jersey, impacting New Jersey in profound ways. The conference "Bridging the Climate Divide" was held in October 2013 in commemoration of the first anniversary of that event and examined the factors leading up to the storm, its impacts, the response and recovery, and the implications for future vulnerability. It was open to the public.

The conference highlighted the scholarship that Rutgers' faculty and staff continue to bring to the climate change arena. The keynote address was delivered by RCI Affiliate **Joseph J. Seneca**, Professor of environmental economics and policy at the Edward J. Bloustein School of Planning and Public Policy, on "Sandy, Climate Policy, and Rutgers: An Overview."



CONFERENCE PANEL 1 DISCUSSED THE FACTORS THAT LED TO HURRICANE SANDY AND ASSOCIATED IMPACTS.

Panelists represented a wide cross-section of faculty and staff from such departments as Marine and Coastal Sciences, Human Ecology, Social Work, Geography, Earth and Planetary Sciences, Civil and Environmental Engineering, Environmental Sciences, Latino and Hispanic

Caribbean Studies, and Mathematics. The welcome was delivered by Richard L. Edwards, executive vice president for academic affairs. If you missed this event, you can view the presentations from home by visiting the Past Events page on the RCI website.

## CHASING ICE FILM SCREENING AND PANEL DISCUSSION

On October 23, 2013, Rutgers Climate Institute, in collaboration with the Bloustein School of Planning & Public Policy, the Rutgers Department of Geography, Rutgers Centers for Global Advancement and International Affairs (GAIA Centers), the Zimmerli Art Museum, the Cook Campus Dean and the Advancement of Hydrologic Science, Inc., co-hosted a film screening of Chasing Ice which drew 150 students, faculty, and members of the public. Chasing Ice is the story of James Balog's mission to change the tide of history by setting up cameras around the Arctic ice sheet in order to gather undeniable evidence of our changing planet.

Attendees also viewed the Rutgers Film Bureau's trailer of their documentary, "Beyond the Ice," which focuses on scientists conducting climate research in the Antarctic. Dena Seidel, director of the Rutgers Center for Digital Filmmaking, spent six weeks with a film crew in the Antarctic to collect footage of the scientists.

The Chasing Ice film screening and panel discussion was part of the series Polar Perspectives on Art and Science. The film screening was followed by a panel discussion that featured Rutgers faculty working on understanding the

changing polar environments and how they are connected to New Jersey. RCI Affiliate, Professor **Åsa Rennermalm** (Geography), who leads expeditions to the Greenland ice sheet, moderated the panel.

Panelists included **David Robinson**, Professor of Geography and the New Jersey State Climatologist; **Jennifer Francis**, Research Professor at the Institute of Marine & Coastal Sciences, who researches the influence of Arctic warming on the US; **Oscar Schofield**, Professor of Oceanography, who researches the impacts of changing oceans on the earth; and Professor Seidel.



**CHASING ICE: PANELISTS, FROM LEFT TO RIGHT, ARE JENNIFER FRANCIS, DAVID ROBINSON, OSCAR SCHOFIELD, DENA SEIDEL AND ASA RENNERMALM.**

The Rutgers Climate Institute is a University-wide effort to address one of the most important issues of our time through research, education and outreach. The Institute draws upon strengths in many departments at Rutgers by facilitating collaboration across a broad range of disciplines in the natural, social and policy sciences.

**Rutgers Climate Institute**

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