

Center for Science and Technology Policy Research

Annual Report

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IN ENVIRONMENTAL SCIENCES

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In 2002-2003 the world witnessed many dramatic events including the invasion of Iraq, the tragic loss of the space shuttle Columbia and its crew, an extreme drought in the western United States, and in SARS the emergence of a new disease with global consequences. These events have raised serious questions about the proper role of science and technology in the U.S. response to terrorism after September 11, 2001, the direction of the country's space program, the causes and consequences of extreme climate events, and approaches to fight the spread of new diseases. The role of Science and Technology in responding to problems such as these, as well as their role in creating such problems, is the central focus of the Center for Science and Technology Policy Research. Through such focus we hope to expand the alternatives available to decision makers grappling with difficult challenges at the intersection of science, technology, and society.



Our research, education, and outreach capabilities support our mission, which is as follows:

The mission of the Center for Science and Technology Policy Research is research, education and outreach at the interface of science and decision making.

In 2002-2003 we expanded our activities and added new programs. New staff joined the Center in 2003, including Robert Frodeman, a philosopher with interests in the role that the humanities might play in science and technology policy. Bob brings with him several research projects focused on this theme. Brad Udall joined the Center's Western Water Assessment (WWA) as its Managing Director. Brad has considerable experience in the private and non-profit sectors and will help the WWA better connect its research with the needs of decision makers.

Also, in 2002-2003 Center staff produced a wide range of publications on topics as diverse as homeland security, the effectiveness of drought restrictions, the space program, climate and hydrologic modeling, and the role of the humanities in thinking about the earth sciences. We took initial steps toward the implementation of a new graduate certificate program in science and technology policy at the University of Colorado. We also expanded our outreach activities and WWW presence. It is our intent these activities lead to improved policies which allow more of the potential of science and technology to contribute to the common interest to be realized.

This Annual Report offers a snapshot of our work during 2002 - 2003. Please have a look. We welcome your feedback (pielke@colorado.edu).

What's New 2002-2003

Now entering its third year of operations, the Center continues to expand its research, education, and outreach efforts at the interface of science and decision making with the addition of highly qualified staff and many exciting new projects:

PEOPLE

- Bob Frodeman joined the Center as a Research Scientist. Bob specializes in environmental philosophy, the philosophy of technology, and the philosophy of science policy. His training includes a B.A. in history, an M.S. in the earth sciences, and a Ph.D. in philosophy from Penn State. He has held positions at the University of Texas and the University of Tennessee, and has consulted for the U.S. Geological Survey for the last nine years. In 2001-2002 Bob was the Hennebach Professor of the Humanities at the Colorado School of Mines where he launched the New Directions Initiative, which relocated to the Center. Bob is one of the principals of the Flatirons Outdoor Classroom Project at Flatirons Elementary in Boulder, Colorado, that consists of an interdisciplinary outdoor learning environment combining elements of science, art, social studies, and the humanities.
- Tara Fortin joined the Center as a CIRES Visiting Fellow. Tara received her Ph.D. in Chemistry from the University of Colorado in 2002. Her research is aimed at understanding model output in the context of decision making.
- The Western Water Assessment hired Brad Udall as its Managing Director. Brad received a B.S. in Engineering from Stanford and an M.B.A. from Colorado State. He was one of four partners at Hydrosphere, a Boulder, Colorado, consulting firm, where he was able to combine his engineering background and computer skills. Brad started the Eagle Valley Land Trust to conserve land in the Vail Valley. Over the years, he has been active in numerous non-profit endeavors in health, outdoor recreation, and conservation.
- The Center added several affiliates and visiting scholars: **Tom Chase** (CU Geography), **Doug Kenney** (CU Natural Resources Law Center), **Paul Komor** (CU Civil Engineering), **Jana Milford** (CU Mechanical Engineering), **Carl Mitcham** (Colorado School of Mines), **Balaji Rajagopalon** (CIRES, CU Civil Engineering), **Anne Ruggles** (wildlife biologist and attorney), **Joe Ryan** (CU Civil Engineering), **Dan Sarewitz** (Columbia University Center for Science and Policy Outcomes), **Doug Sicker** (CU Interdisciplinary Telecommunications), **Phil Weiser** (CU Interdisciplinary Communications and School of Law), and **Tom Yulsman** (CU Journalism).

PROJECTS

- On October 11-12, 2002, the Center sponsored a symposium entitled "Science, Technology, and Security: Knowledge for the Post-9/11 World" which brought together experts from the four CU campuses, the National Center for Atmospheric Research, the National Oceanic and Atmospheric Administration, the National Renewable Energy Lab, the National Institute of Standards and Technology, the University of Denver, Colorado State University, Colorado School of Mines, and the U.S Air Force Academy, as well as local and national security decision makers and experts to discuss the connections between science and homeland security.

- The drought of 2002 provided an opportunity for the Western Water Assessment to examine how western water managers cope with water shortages. The WWA launched a project that examined the effectiveness of drought-related watering restrictions in Colorado's Front Range. See Kenney, D. and R. Klein, 2003: Use and Effectiveness of Municipal Water Restrictions During Drought in Colorado. Journal of the American Water Resources Association (submitted).
- Bob Frodeman's book, *Geo-Logic: Breaking Ground Between Philosophy and the Earth Sciences*, was published by the State University of New York Press.
- The graduate school approved a proposal led by the Center and its faculty affiliates for a Graduate Interdisciplinary Certificate Program in Science & Technology Policy at the University of Colorado, to begin spring of 2004.
- Visiting Scholar Myanna Lahsen was awarded a grant by the National Science Foundation for a project entitled "Our' Science, 'Their' Science – The role of territory and translocality in competing scientific understandings of Amazonia's role in the global carbon cycle." Her research will be conducted in Brazil.
- The website of the International Association for Environmental Philosophy (IAEP) moved to the Center.
- The Center initiated the RAA-CU Joint Internship Program, a pilot program that places science or policy graduate students with reinsurance companies for summer internships.
- The Center arranged internships for two graduate students with the House Science Committee and the City of Westminster Water Utility Department.
- The Center launched a monthly noontime seminar series to allow Center staff, students, affiliates, and visiting scholars to interact and learn about each other's work.

Staff Highlight *Rad Byerly*

Over the past year Rad Byerly has been an invaluable resource to the Center. He consulted with students on their policy projects (term papers and thesis research) in order to bring a real-world perspective to their work based on his policy experience in Washington, D.C. He had several discussions with a student before she went to a summer intern position at the U.S. House of Representatives, Committee on Science. Rad assisted in the preparation of a major Center proposal to NSF on Decision Making Under Uncertainty. He also assisted Center members by reviewing and commenting on drafts. He participated as a non-voting informal member of Center Executive Committee.



In addition to his activities that are of direct benefit to the Center, Rad is in the early stages of writing a book on science policy. He serves on several national committees related to science and technology policy including the Committee on Staged Development of Nuclear Waste Repositories, under the aegis of the Board on Radioactive Waste Management of the National Research Council; the governance of the Associated Universities for Research in Astronomy, AURA, as a member of its Board of Directors; and as a member of the Committee on Science, Engineering, and Public Policy, COSEPP, of the American Association for the Advancement of Science, AAAS. This past year he organized, introduced, and conducted a symposium at the AAAS Annual Meeting on the One Step at a Time report produced by the Committee on Staged Development of Nuclear Waste Repositories and the general subject of disposal of nuclear waste.

Research Projects

COMPLETED PROJECTS

FLOOD DAMAGE IN THE UNITED STATES, 1926-2000: A REANALYSIS OF NATIONAL WEATHER SERVICE ESTIMATES



<http://www.flooddamagedata.org/>

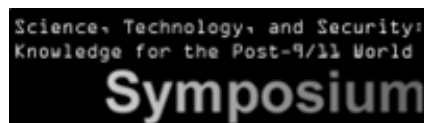
Roger Pielke, Jr., Mary Downton, and Zoe Miller (National Center for Atmospheric Research)

This project reanalyzed flood damage estimates collected by the National Weather Service (NWS) between 1926 and 2000. The reanalyzed NWS damage estimates are a valuable tool to aid researchers and decision makers in understanding the changing character of damaging floods in the United States. The data and results are available at <http://www.flooddamagedata.org/>.

SCIENCE, TECHNOLOGY, AND SECURITY: KNOWLEDGE FOR THE POST-9/11 WORLD

http://sciencepolicy.colorado.edu/events/security_symposium_2002/

The security of the United States assumed a much greater importance in the wake of the tragic events of 9/11, and is captured with the phrase “homeland security.” Scientific and technological knowledge and understanding are essential to enhance homeland security. Effective science and technology-based security policies depend critically upon assessing what knowledge is available, what knowledge is needed, and how decision makers might put that knowledge to effective use. In October 2002 more than 60 scientists, scholars, and security experts spent two days at the University of Colorado at a symposium entitled “Science, Technology and Security: Knowledge for the Post-9/11 World.” Participants sought to foster new connections and thinking among the wealth of local experts on how better to integrate scientific and technological research with decision making on issues ranging from computer security to bioterrorism. The overarching goal of the symposium was to recommend practical and effective strategies for improving the two-way connections between science and technology and security policy



The symposium brought together experts from Colorado and beyond in the physical, natural, and social sciences and the humanities to identify what we know, how to better use (and limit the misuse of) what we know, and what we need to learn, and to discuss issues and obstacles associated with each. The symposium was sponsored by the University of Colorado at Boulder, Colorado Springs, Denver and its Health Sciences Center, the University of Colorado System, Rocky Mountain Institute for Biosecurity Research at Colorado State University, the Graduate School of International Studies at Denver University, and the Alfred P. Sloan Foundation. A draft final report is available at http://sciencepolicy.colorado.edu/events/security_symposium_2002/workshop/.

ONGOING PROJECTS

ASPEN

<http://sciencepolicy.colorado.edu/aspen/>



The Atmospheric Sciences Policy Education and Network (ASPEN) Program focuses on weather policy research, education, and outreach.

Research

Research conducted by the ASPEN Program relates to weather impacts, use and value of weather forecasts, and weather policy. Publications funded wholly or in part by the ASPEN program in the past year include:

- Klein, R.A. and R.A. Pielke, Jr., 2002: Bad Weather? Then Sue the Weatherman! A review of legal liability for predictions and forecasts: Part I, Public Sector, Bulletin of the American Meteorological Society 83:1791-1799.
- Klein, R.A. and R.A. Pielke, Jr., 2002: Bad Weather? Then Sue the Weatherman! A review of legal liability for predictions and forecasts: Part II, Private Sector, Bulletin of American Meteorological Society 83: 1800-1807.
- Pielke, Jr., R.A., 2003: Supply and Demand for Atmospheric Science Professionals, Bulletin of the American Meteorological Society 84:170-173.
- Pielke, Jr., R. A. and R. A. Pielke, Sr., 2003: Fundamentals of Tropical Cyclones, Asian Disaster Preparedness News, Vol. 9 No. 1.
- Pielke, Jr., R. A., and R. A. Pielke, Sr., 2003: Hurricane as an Extreme Meteorological Event, Chapter 42 in Handbook of Weather, Climate, and Water: Atmospheric Chemistry, Hydrology, and Societal Impacts, eds. Thomas D. Potter and Bradley R. Colman, John Wiley: New York, pp. 789-805.
- Pielke, Jr., R. A., 2002: A Few Comments on End-User Forecast Products as input to the USWRP Warm Season Workshop of 5-7 March 2002. Boulder, CO,
<http://www.mmm.ucar.edu/uswrp/warmseasonabstracts/pielke.htm>.

Education

With the development of the Environmental Studies graduate program at the University of Colorado, students have a new opportunity to conduct post-graduate studies at the interface of the atmospheric sciences and policy research. Several students in the program are pursuing graduate education in atmospheric sciences policy.

Outreach

The ASPEN Program has developed community resources for those interested in the interface of weather and society. Our outreach efforts include the WeatherZine, Societal Aspects of Weather Web Portal, Extreme Events Sourcebook, Use and Value of Weather and Climate Forecast Bibliography, and Weatherpolicy listserv. Due to the non-renewal of USWRP funding, the ASPEN program is no longer publishing the WeatherZine or updating these websites, although the sites remain available online at <http://sciencepolicy.colorado.edu/aspen/outreach.html>.

GLOBAL CLIMATE CHANGE AND SOCIETY

<http://sciencepolicy.colorado.edu/gccs/>

Global Climate Change and Society (GCCS) is a Research Experience for Undergraduates (REU) funded by the National Science Foundation. GCCS places scientific research within its larger social context, using experience in and reflection upon ongoing scientific research to create a learning and research community among students across the physical and social sciences and humanities.



Directed by a philosopher, a planetary physicist, and a policy scientist, GCCS is a cooperative program between academia (the University of Colorado) and government laboratories in the Boulder area (the National Center for Atmospheric Research, the National Oceanographic and Atmospheric Administration, and the Cooperative Institute for Research in Environmental Sciences).

Student participants in the first two summers have come from a wide range of liberal arts colleges and universities, including Amherst College, the University of Chicago, the University of Puget Sound, Valparaiso University, Rutgers University, the University of California at Santa Cruz, the University of Wisconsin at Stevens Point, Tufts University, Wheaton College, Willamette University, Haverford College, Carleton College, Stanford University, and the University of Washington.

GCCS seeks to introduce a group of 12 undergraduates to the constellation of perspectives surrounding the question of global climate change. Students gather and evaluate scientific data and investigate the social, political, psychological,

economic, and philosophical issues surrounding the interpretation and use of these data for addressing contemporary controversies over global climate change.

This is an intensive program, involving lectures on physics, philosophy, and public policy, written reports, and evening seminars. GCCS consists of approximately equal measures of physical science, social science, and philosophy/humanities.

The program consists of three parts:

- A. Students receive an intensive introduction to key concepts in atmospheric science, philosophy, and policy science.
- B. Beginning in week 2, and continuing into week 8, students serve as half-time (20 hours/week) interns, assisting in various types of research related to global climate change at NCAR, NOAA, NIST, CIRES, and CU. Research projects may include work with data from climate models, global datasets, and field experiments with scientists at NCAR's Advanced Studies Program or its Environmental and Societal Impacts Group. Other projects are tied to research in the physical sciences, the policy sciences, or the humanities with researchers at CU, NOAA, and UCAR's Digital Library in Earth Science



2003 Program Camping Photos

Education (DLESE). Still other students study the nature of interdisciplinarity, the philosophy of science policy, science and technology studies, or the relation of science and politics, ethics, metaphysics, or aesthetics (with climate change as the case study).

C. In week 8 interns complete a short essay drawing their own conclusions concerning the relevance of global climate change research to societal needs. The program concludes with a public conference where students present their work.

Program outcomes include papers published in scientific, public policy, and philosophic journals and presentations at national conferences.



2002 Program Classroom Photos

HYDRO-CLIMATE RESEARCH AND DECISION MAKING

<http://sciencepolicy.colorado.edu/hydroclimate/>

The central theme of Hydro-Climate Research and Decision Making is to advance hydro-climate research to meet the decision-making needs of water managers in different parts of the country. Work elements include:

1. Comparison and development of methods for statistical downscaling of global-scale forecast model output to provide forecasts of precipitation and temperature at local scales in individual river basins,
2. Assessment of the use of multi-model super-ensemble techniques in hydrology to provide probabilistic forecasts of streamflow, and
3. Assessment of the issues involved in fully integrating hydrologic forecasting capabilities within atmospheric modeling systems.

We are currently working with the Colorado Basin River Forecast Center to compare our experimental streamflow forecasting procedures with the current operational procedures during the 2003 snow melt season, and are also



working with the NWS Office of Hydrologic Development to infuse our experimental forecasting techniques in the NWS Advanced Hydrologic Prediction System. Specific projects include:

- *One-Way and Two-Way Coupling of Atmospheric and Hydrologic Models*

PI: Martyn Clark

Co-PIs: Andrew P. Barrett, CIRES, Lauren E. Hay, USGS, Georg E. Grell, NOAA Forecast Systems Laboratory, William J. Gutowski, Iowa State University

Based on the expectation that rapid increases in computer power will soon allow atmospheric models to simulate land-atmosphere interactions at the small spatial scales that are of interest to hydrologists, we have designed an interdisciplinary project to assess how accurately the land surface schemes in atmospheric models can simulate runoff, and to identify and begin work on the research tasks necessary for operational hydrologic forecast capabilities to be fully integrated within atmospheric modeling systems. We will focus attention on two disparate river basins: a mountainous, snowmelt-dominated river basin (the Yampa River, northwestern Colorado) and a flat, rainfall-dominated river basin (Walnut River, Kansas).

- *Development of Operational Hydrologic Forecasting Capabilities*

PI: Martyn P. Clark

Co-PIs: Andrew P. Barrett, CIRES, Lauren E. Hay, USGS, Jeffrey S. Whittaker, NOAA Climate Diagnostics Center, John Schaake and Quigun Duan, NWS Office of Hydrologic Development.

This project brings together an interdisciplinary team of scientists to provide the capabilities for immediate improvements in operational hydrologic forecasting procedures. The work will address a critical element of the GAPP science plan: to undertake demonstration projects to evaluate and operationally implement predictions in water resource management. Our experimental hydrologic prediction system involves five main work elements: a) generate an archive of atmospheric forecasts from the same model that is used operationally; b) develop statistical relationships between this archived forecast output and precipitation and temperature at local scales in individual river basins, and apply these relationships to the operational forecast model output to produce unbiased, improved forecasts of precipitation and temperature; c) assimilate real-time station observations of precipitation and temperature and, in mountainous basins, satellite estimates of snow extent into hydrologic models to estimate basin initial conditions; d) run hydrologic models in ensemble mode to estimate forecast uncertainty; and e) apply a hydrologic post-processor to forecasts of runoff to remove systematic biases. We will collaborate with the U.S. National Weather Services Hydrology Laboratory to perform side-by-side comparisons of our techniques with the operational NWS procedures, and, where appropriate, infuse our procedures in the NWS Advanced Hydrologic Prediction System (AHPS).

WESTERN WATER ASSESSMENT

<http://sciencepolicy.colorado.edu/wwa/>

The Western Water Assessment (WWA) works within an evolving social context to increase the relevance and value of scientific information in order to improve decision-

making strategies. WWA research focuses on the decision-making processes of individuals, groups, and organizations in the Interior West who are responsible for managing water resources, who are responsible for its treatment and the protection of the aquatic environment, and who use the water.

WWA has three research themes, described as follows:

1. *Impacts of climate variability and regional growth on regional water resources*

This integrated project is based on WWA's belief that the South Platte basin in Colorado may become increasingly



Western Water Assessment

vulnerable to climate variations and extremes owing to its concentration of population and industry, together with projections of growth. Vulnerability is expected to be expressed in terms of both the difficulties in meeting competing demands for water (i.e., water shortages in various sectors) and the adverse environmental impacts caused by the combined impacts of regional growth and climate extremes.

Projects under this theme include:

- Interviews with sectors of the WWA user community in the South Platte to identify critical water problems that are sensitive to climate variability
- Analysis with the integrated South Platte assessment model to assess the sensitivity of the WWA user community to the stresses of climate variability and regional growth
- Assessment of the effects of climate variability and water management on both low flows and flushing flows, and the attendant impacts on in-stream pollution and stream metabolism
- Use of the integrative assessment model to examine the benefits and pitfalls of various coping strategies
- Understand the potential role of the South Platte assessment model for policy and planning purposes

2. Issue-Specific Partnerships with Climate-Sensitive Water Resource Managers

Our analysis of the sensitivity of water resource users to the stresses of climate variability and regional growth, coupled with an understanding of the benefits and pitfalls of various coping strategies, provides information on the factors that limit the ability of different water resource managers to provide sufficient water of adequate quality. It also helps us to understand the difficult decisions during times of water shortages, and will allow us to develop issue-specific partnerships with climate-sensitive water resource managers in order to identify the way in which climate information can be used to inform and improve various coping strategies.

Projects under this theme include:

- Develop issue-specific partnerships based on the critical water problems identified in the South Platte assessment model
- Improved hydro-climate monitoring of the Interior West
- Work with Upper Colorado reservoir managers to improve the relevance, use, and value of climate information

3. Partnerships with "Information Brokers"

The responsibility for the day-to-day production and delivery of hydro-climate information and products rests with the "information brokers" (e.g., NWS Office of Hydrology and their regional offices, Colorado State Climatologist's

Staff Highlight *Martyn Clark*

Martyn Clark and his colleagues have made significant progress under GAPP funding on the development of experimental streamflow forecasting methods. On short time scales (up to two weeks) they downscale output from global-scale Numerical Weather Prediction (NWP) models to provide (unbiased) forecasts of precipitation and temperature for individual stations in different river basins, and use these downscaled forecasts as input to hydrologic models to provide forecasts of streamflow. On seasonal time scales they condition a weather generator on climate indices (e.g., those describing ENSO conditions) as well as climate outlooks from NOAA's Climate Prediction Center, and use these modified weather sequences in hydrologic models to provide seasonal forecasts of streamflow. They have developed a partnership with operational hydrologists at the Colorado Basin River Forecast Center (CBRFC), and are working collaboratively with CBRFC hydrologists to implement these new methods in their operational forecast systems.



Office). We are working collaboratively with these groups to improve the relevance and use of operational hydro-climate products, and thus increase the value of NOAA's investment in climate research.

Projects under this theme include:

- Understand the origin and recurrence of severe/sustained drought in the Interior West
- Seasonal climate prediction on regional and local scales
- Improving operational hydrologic forecasting capabilities
- Assess if mechanisms of technology transfer can be purposively designed and implemented to further decision objectives

NEW PROJECTS

UNDERSTANDING AND ENHANCING THE LINKAGES BETWEEN DECISION MAKING AND CARBON CYCLE RESEARCH

The project is a joint activity of Columbia University's Center for Science, Policy and Outcomes, the Center for Science and Technology Policy Research at the University of Colorado/Cooperative Institute for Research in the Environmental Sciences (CIRES), and the Natural Resources Ecology Laboratory at Colorado State University. In this project, we focus on the supply of and demand for carbon cycle science information. The U.S. Global Change Research Program (USGCRP) Carbon Cycle Science initiative reflects the evolving concerns of the global change research community, and efforts to map out the future of carbon cycle research have focused on identification of scientific and technical opportunities and priorities. The capacity of the USGCRP to generate useful knowledge depends not just on its research products but also on the receptivity to these products of the diverse sectors of society that can take part in carbon cycle management. Our project is aimed at developing mechanisms for improving linkages between carbon cycle science and management decisions that may involve considerations of carbon cycle science, based on the relations between evolving scientific and technological opportunity, political reality, and demand-side capability. The central policy challenge is to create useful knowledge that can contribute to the needs of decision makers.



FLATIRONS OUTDOOR CLASSROOM

<http://sciencepolicy.colorado.edu/flatirons/>

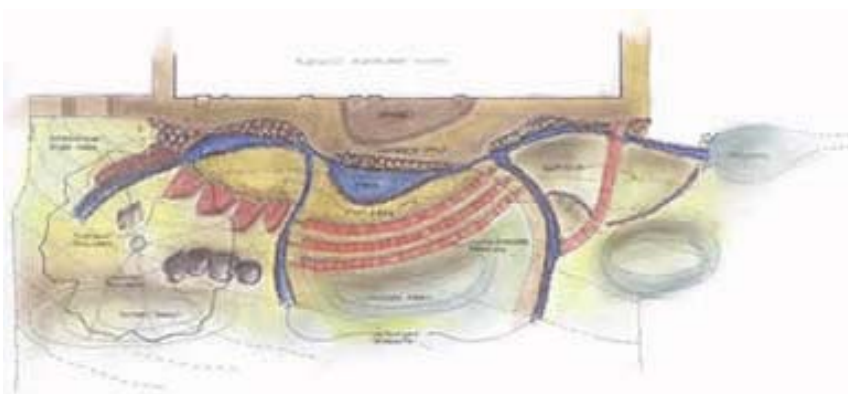
The Flatirons Outdoor Classroom is a project within the Boulder Valley School District in Boulder, Colorado, that consists of an interdisciplinary outdoor learning environment combining elements of science, art, social studies, and the humanities. The project has two parts. Phase 1 (now completed) focused on the creation of an integrated outdoor classroom space. Phase 2 proposes the development of curriculum projects to make full use of this unique space.



**Flatirons Elementary
Outdoor Classroom Project**

The classroom itself consists of four elements. A riverbed runs the length of the school building (135 feet), offering a depiction of the Boulder Creek watershed. At the top, students are able to fill a 600-gallon reservoir with water, and then send a flood down the channel. Streamflows are used for experiments in hydrology and sedimentology, as well as for thought experiments in water politics (e.g., learning about senior/junior water rights and the possible effects of 100 year floods along Boulder Creek). The water is captured in a large underground cistern, and pumped back up to the reservoir for repeated experiments. Second, a geology exhibit uses samples of local strata to represent the Flatirons and other regional features of the Rocky Mountains and High Plains. Adjacent to the rocks, on the side of the building, a large mural is being created that depicts Colorado across geologic history. Utilizing reproductions of paintings commissioned by the Denver Museum of Nature and Science--a partner on the project--teachers will be able to move

back and forth between the representations of ancient Denver and the rock outcrops, instructing students in the philosophical and political aspects of scientific research by juxtaposing the geologic strata to pictures of the geologic past. Third, a performing arts area sits adjacent to the geology exhibit, consisting of a stage and a terraced seating area, with the streambed running between. A small Zen garden also rests between the geology exhibits and the stage, providing opportunities for artistic expression and personal development. Finally, on the eastern end of the project a botanical garden has been created: in addition to various types of garden plants, the space will be used for cultivating plants used by Western pioneers. Students in each grade level will have direct curricular ties to the classroom: studying water, rock, and the soil; planting seeds, bulbs and vegetable crops; and watching and learning about insects and birds. Teachers will use each of these areas as teaching tools to explore the connections between scientific investigations and artistic expression.



Drawing of Flatirons Project Area

Phase 2 plans call for the dissemination of the curricular ideas generated by the outdoor classroom. After a series of in-services where district teachers will receive training in integrating the earth sciences and the humanities within the classroom space, regional workshops will be run at the outdoor classroom where educators can use this site as the model for research and discussion of interdisciplinary approaches to K-12 education. The goal is to create a model that will help schools nationwide apply the principles learned here for developing interdisciplinary outdoor classrooms in their own localities nationwide.

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NEW DIRECTIONS INITIATIVE

<http://sciencepolicy.colorado.edu/newdirections/>

Introduction: Rationale of Project

The environmental challenges we face are inherently cross-disciplinary in nature. Whether the question concerns global climate change, damaged mine lands, or the restoration of an urban landscape, society interweaves scientific information with ethical, historical, and cultural perspectives. The very success of science has increased its political significance as the accelerating pace of scientific discoveries challenges cultural norms and values, leaving citizens struggling to understand the societal import of scientific breakthroughs.

This is the context for science today; and this is where the humanities can help. The central hypothesis guiding New Directions is that the disciplines making up the humanities provide a largely untapped resource for helping science relate more effectively to the rest of society. (Our use of the term "humanities" includes normative-oriented social sciences: in its first phase ND participants have been equally drawn from the humanities and the social sciences.) The basic methodological approach of New Directions is to place different researchers in close, day-to-day work on a case study reaching across the disciplines. Evaluation of the case studies provides the test of our central hypothesis. Case studies force researchers to move beyond platitudes about the interface of science and society and engage one another in the real work of problem solving, providing a vibrant sense of what specifically is gained through involving the humanities in our study of environmental problems. New Directions seeks to demonstrate through experiment that public science will be improved and democratic decision-making enriched by combining humanistic perspectives with the insights of the sciences, explicitly drawing out the value implications and associations of scientific facts in order to foster more vibrant democratic debate.



The New Directions initiative was launched in the summer of 2001 with an initial 15k grant from the Colorado School of Mines. In its formative phase New Directions has drawn together leading scholars, public science agencies, and university programs in interdisciplinary research from across the country. It has also created a flow of ideas within and between a number of professional societies across the humanities and the sciences, and between these societies and public science agencies.

New Directions has attracted support from a broad range of agencies: the National Science Foundation, the National Aeronautics and Space Administration, the U.S. Geological Survey, the Environmental Protection Agency, the National Endowment for the Humanities, the National Center for Atmospheric Research, and the Geological Survey of Canada. And it has gained backing from ten universities interested in the thesis and goals of New Directions. All together, contributions have totaled 185k, with another 100k of in-kind contributions-more than tripling the initial support provided by NSF.

New Directions is working to show that the humanities can improve the two-way connections of science and society, helping citizens grapple with the challenges of the 21st century through illuminating and articulating the value dimensions of scientific insights. The success of the New Directions initiative will be gauged by the help it provides to public science and to democratic debate by making scientific results more understandable and better used by the public.

Progress to Date

New Directions has focused its efforts to date on research through collaborative projects and workshops. On the basis of the support it has received, New Directions has:

- Funded six teams to pursue case studies on integrating the earth/environmental sciences and the humanities at 10k each;
- Organized a workshop and a national conference on our topic; and
- Published one book and article on interdisciplinarity.

Projects currently underway include:

- Two essays per funded team, focusing on ‘lessons learned’ on how to effectively integrate the sciences and the humanities;
- The creation of a digital earth science library for the Gulf of Maine;
- The creation of an ecological restoration plan for the city of St. Petersburg, Russia; and
- Recommendations to universities, local, regional, and federal agencies, and communities on how to better relate their knowledge products to society.

More generally New Directions has:

- Drawn together some of the most prominent public science agencies in the U.S. (and Canada) to initiate conversations about how to use humanities perspectives to bridge the gap between science and society.
- Created a community of 7 teams working on projects that would not have existed without New Directions. These represent a series of experiments in how to make the earth/environmental sciences more relevant to society.
- Seeded other projects: of the other 25 submissions made to New Directions’ request for proposals, a number of them have found other sources of funding.
- Created an intellectual “town commons,” initiating conversations between professional associations across the humanities and various public science agencies.

INTERNATIONAL ASSOCIATION FOR ENVIRONMENTAL PHILOSOPHY

<http://www.environmentalphilosophy.org/>

IAEP embraces a broad understanding of environmental philosophy, including not only environmental ethics, but also environmental aesthetics, ontology, and theology, the philosophy of science, ecofeminism, and the philosophy of technology.

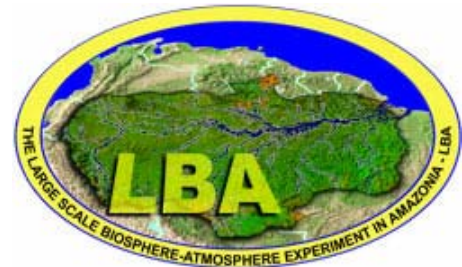


For IAEP, environmental philosophy is both rigorous and engaged. It encourages joint meetings with other academic disciplines and supports interdisciplinary student internships.

IAEP welcomes a diversity of approaches to environmental issues, including the many schools of Continental Philosophy, the history of philosophy, and the tradition of American Philosophy. The IAEP website joined the Center's website in 2003.

“OUR” SCIENCE, “THEIR” SCIENCE – THE ROLE OF TERRITORY AND TRANSLOCALITY IN COMPETING SCIENTIFIC UNDERSTANDINGS OF AMAZONIA’S ROLE IN THE GLOBAL CARBON CYCLE

This project involves empirical study of scientists’ competing scientific hypotheses related to the role of the Amazon in the global carbon cycle and hence in human-induced climate change. In particular, the project is designed to reveal socio-political patterns among differences in positions on the issue among scientists from Brazil, the U.S. and Europe and the extent to which these patterns do or do not map on to traditional territorial boundaries. Key mechanisms underpinning the identified patterns are sought through ethnographic study of the nature and influences on problem-constructions related to the environment and the carbon cycle in particular, and through attention to social networks and identity formation among key scientists and policymakers. The project involves full-time fieldwork in Brazil on the part of the PI, supplemented by three research trips to the U.S. The study is focused on scientists participating in the international Large-scale Biosphere-Atmosphere (LBA), an international global change science experiment presently being carried out in Brazil and seeks to identify how the competing positions are expressed, contested, and negotiated through the LBA. The LBA field experiments are taking place over a period of 6+ years, ending in 2004. Analysis and discussion of the data produced through the experiments will continue many years after 2004. The LBA involves international scientific collaboration and multiple experiments over a period of more than ten years. A central aim of the LBA is to identify Amazonia’s role in the global carbon cycle and hence in human-induced global climate change.



The study tests suggestions (revealed in preliminary interviews with key LBA participants) that differences in scientific understanding and hypothesis generation related to the role of the Amazon in the global carbon cycle tend to map on to differences among the various national governments involved. In Brazil, such harmony between the views of relevant government officials and national scientists is less pronounced, as Brazilian scientists are more split among themselves on the issue of sinks. Upon identifying patterns of differences among LBA scientific producers, if such patterns indeed do exist, it seeks to identify the reasons they exist and their significance for understanding and evaluating the role of scientific knowledge and international science projects in national and international affairs generally, and in treaty regimes in particular.

At a more general level the project explores the interplay between globalizing forces and situated knowledges – or the interplay of what might more precisely be referred to as locality and translocality– as well as the role of scientific knowledge in national and international affairs related to the climate treaty regime. In a world increasingly governed by reference to scientific knowledge and globalizing discourses, how do different national actors interact with competing

data produced about this contested region of the world, a region heavily laden with competing symbolic meanings at both the national and international levels? What do their understandings show about the strengths and weaknesses of globalization and of science as a globalizing and neutral arbiter in political affairs?

The study will involve 14 months of full-time fieldwork on the part of the PI. During this time, PI will reside predominantly in Brazil; U.S. and EU LBA participants will be studied during their research visits in Brazil to the extent possible. PI will first conduct semi-structured interviews. On the basis of those, she will devise a profile questionnaire and survey by means of which to explore in a more systematic manner differences in values, opinions, and beliefs among LBA knowledge producers and relevant science administrators and policymakers. Semi-structured interviews will be conducted throughout the research period, supplemented by ethnographic participant-observation at two research sites in the Amazon and at key institutions for global change science in Brazil.

DEFINING MODEL SPACE: DEVELOPING A PROTOCOL FOR THE EVALUATION OF MODELS IN DECISION MAKING

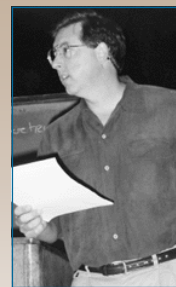
Policy makers are increasingly turning to computer models to help them find solutions to complex policy problems such as climate change. However, as models become more and more complex our ability to understand them may be compromised. In order to use models effectively in decision-making processes, it is necessary to understand their abilities and limitations. Therefore, we are developing a methodology aimed at helping decision makers evaluate the efficacy of models in policy.

The first aspect of this study is to develop a strategy to characterize a model's output space. This process involves the use of a simple model, which affords us the freedom to perform a large number of simulations with relative ease. By varying all of the necessary parameters across the full range of their reasonable values, and drawing on a variety of visualization techniques, we will ultimately be able to represent the model space graphically. Next, we will develop a protocol for the evaluation of how that 'model space' (closed representation) relates to the 'landscape space' (the actual open system). Throughout the process, we will develop a standardized set of procedures/tests to perform on a general model, taking into consideration the need to utilize statistical sampling or other procedures as model space becomes prohibitively large from the standpoint of time and computer power.

The second aspect of this study involves the use of policy analysis expertise to draw tentative conclusions concerning the implications of our results for the use of models by decision makers. Some of the questions we look forward to addressing with this study are: What questions should policy-makers be asking of models before they use their results to inform their policy decisions? When is a model useful/not useful? Does greater model complexity necessarily lead to better decisions? How should the science research agenda be prioritized to be of the greatest use to decision makers?

Staff Highlight *Robert Frodeman*

Robert Frodeman is the author of *Geo-Logic: Breaking Ground between Philosophy and the Earth Sciences* (SUNY, 2003). Using a unified vision of geology, consisting of equal parts geo-science, geo-politics, and geo-poetry, *Geo-Logic* redraws the boundaries between the humanities and the earth sciences. This book offers examples of how to relate environmental philosophy to science, public policy, and real world problems, and shows what is epistemologically distinctive about scientific work and how to respond to the cultural dynamics that are pulling these issues into the public sphere. Frodeman advocates humanizing the earth sciences and bringing philosophy into the field.



Frodeman is also Director of the Center's New Directions Initiative and the Global Climate Change and Society Program.

INTRODUCTION

Reflecting the demands by society for relevant research, and the limited supply of those with rigorous training needed to systematically connect science and decision making, the National Research Council posits that universities today “have a double duty:”

to educate and train not only those who will have careers in research, but also those who will become entrepreneurs, managers, consultants, investors, or policy makers. Universities also can play a more active role in helping students to prepare for these roles (NRC 1999: Capitalizing on Research in Science and Technology, Committee on Science, Engineering, and Public Policy, National Academy Press. Quote from Chapter 5, <http://books.nap.edu/html/capital/chap5.html>).

At the CIRES Center for Science and Technology Policy Research we seek to develop a rigorous educational program to better prepare students for careers at the intersection of science, technology and decision-making. Center staff have partnered with the Environmental Studies Program to offer several interdisciplinary courses. In 2002-2003 we also worked with collaborators across the campus and at several other universities to develop and seek approval for a proposed Graduate Certificate in Science and Technology Policy. The proposal was approved in the summer of 2003 for implementation beginning in 2004.

GRADUATE AND UNDERGRADUATE RESEARCH ASSISTANTS

- Rebecca Brooke (Oberlin College): *Global Climate Change and Society*
- Ben Bryant (Harvey Mudd University): *Global Climate Change and Society*
- Michael Goggin (Harvard University): *Global Climate Change and Society*
- Shawn Helm (Undergraduate, University of Colorado Department of Economics): *Economic Forecasting, Carbon Cycle*
- Yeonsang Hwang (Ph.D. candidate, University of Colorado Department of Civil Engineering): *Western Water Assessment*
- Kimberly Kosmenko (Masters candidate, University of Colorado Environmental Studies): *Western Water Assessment*
- Jenifer Lamie (University of Hartford, Connecticut): *Global Climate Change and Society*
- Jessica Lang (Masters candidate, University of Colorado Environmental Studies): *Western Water Assessment*
- Genevieve Maricle (Ph.D. candidate, University of Colorado Environmental Studies): *Western Water Assessment*
- Adam Morrison (Masters candidate, University of Colorado Department of Political Science): *Western Water Assessment Drought Project*
- Anne Ruggles (J.D. candidate, University of Colorado Law School): *Science and decision making in the Klamath Basin*
- Jessica Sherman (Kenyon College): *Global Climate Change and Society*
- Suzanne Tegen (Masters candidate, University of Colorado Environmental Studies): *ENVS program support and Policy Sciences*

COURSES TAUGHT BY CENTER STAFF

Martyn Clark:

CLIMATE, WATER RESOURCES AND ENVIRONMENTAL SUSTAINABILITY

(co-taught spring semester 2003 with Douglas Kenney and John Pitlick)

Course description: Leaders of the water management community in Colorado and other western states are concerned about their ability to satisfy new and competing demands for water, particularly in light of constraints imposed by interstate compacts and obligations, the increasing value placed on environmental protection, and the impacts of



regional growth on water quality. These concerns are exacerbated by climate variability. This seminar will assess the impacts of climate variability and regional growth on western U.S. water resources, and review strategies for preventing water shortages in cities and agriculture while at the same time, providing water for recreational uses and for the protection of the environment. We will examine successes and failures of different management strategies, as well as ways that science is used or misused in support of water management.

Roger Pielke:

DECISION PROCESS (spring 2003)

The term “decision process” emphasizes that social, environmental, economic, and other outcomes are the result of decisions made—and decisions not made—by the people in those processes, as opposed to explanations based on variables that abstract from or ignore context, motivations, perceptions, and cognitive limitations of those involved in making choices. This course is designed to teach a systematic framework for analyzing processes of decision-making. The framework for analysis of decisions was first proposed in 1956 and provides the basis for much of contemporary academic policy inquiry. From the perspective of the policy scientist, the larger challenge is explore alternative courses of action within particular decision processes in order to increase the chances that decision-making outcomes will serve human dignity and common interests. Decision processes are typically highly complex, variable, and uncertain. Complexity results in part from the characteristics of issues in areas such as environment, development, security, health, economics, and so on, but also because of the vast number of participants involved in decision-making with differing perspectives about and stakes in particular outcomes. Participants have a multiplicity of conflicting understandings of “the problem at hand,” have conflicting interests, and consequently different time horizons and criteria by which alternative courses of action might be evaluated. For instance, in the United States because millions of participants are involved in any significant national decision, and a vast array of factors might affect outcomes, policymakers and analysts necessarily operate on the basis of simplified representations or maps of the policy process, whether they do so consciously or not. This course adopts the perspective, to use the words of John Dewey, that some ways of thinking are better than others. That is, that some ways of thinking are more apt to lead more reliably to choices resulting in desired outcomes.

POLICY, SCIENCE AND THE ENVIRONMENT (fall 2002)

Course description: The course has two basic goals. First, to introduce the student to conceptual tools which are useful in thinking more effectively and responsibly about any problem of policy; and second, to develop and practice skills using the tools to analyze the various dimensions of a policy process for the purpose of making recommendations about how to realize a set of preferred policy outcomes in practical settings. To meet these goals, the course focuses on three primary activities:

1. core readings and discussion on the policy sciences and various applications in environmental policy
2. periodic individual and shared assignments on substantive environmental issues
3. a semester-long term project on a subject of your choosing

PROPOSED GRADUATE INTERDISCIPLINARY CERTIFICATE PROGRAM IN SCIENCE & TECHNOLOGY POLICY

The Center received approval from the University of Colorado graduate school for a new Interdisciplinary Certificate Program in Science and Technology Policy. The program is intended to provide graduate students with an opportunity to supplement their disciplinary or interdisciplinary training with rigorous knowledge and useful skills at the nexus or interface of science, technology, policy, and society. It will train graduate students to better understand the broader societal role of their specialized training and will focus on

1. The relationships between knowledge and decision-making in the context of societal problems with political, technical, and social complexities and uncertainties

2. The roles and responsibilities of the expert in society, business, politics, and policy
3. The development of proficiency in specific areas of science and technology policy, including the acquisition of methodological skills, drawing upon the breadth of science and engineering, social science, humanities, and other expertise at the University of Colorado and its partners

The certificate program will have its first students in the spring of 2004.

SPGRADS

http://sciencepolicy.colorado.edu/sp_grads/

Launched in 2001, the Center continues to sponsor this group of graduate students and early career scientists interested in science and technology policy issues. SP Grads hosted the following speakers:

- September 20: Doug Walker of CommunityViz discussed decision-support software that has been created by The Orton Family Foundation to help people make informed, collaborative decisions about their communities and their land.
- October 16: Andy Revkin, science reporter for the New York Times, discussed his work writing about science and environmental issues.



**Doug Walker of
CommunityViz**



**Andy Revkin of
NY Times**



- November 1: Patrick Mahaffy, President and CEO of Pharmion, discussed his company's plans to market thalidomide as a treatment for leprosy and multiple myeloma and the associated scientific, social, political, and legal issues.



**Al Teich of AAAS Science
and Public Policy program**

- February 14: Dan Sarewitz of the Center for Science, Policy, and Outcomes at Columbia University held a roundtable discussion about his work relating to science policy.
- February 17: Al Teich, director of the AAAS Science and Public Policy program, gave a talk titled "Science policy at the AAAS: Inside the beltway, representing science outside the beltway."



Dan Sarewitz of CSPO

The Center continues to maintain a website for SPGrads that includes a listserv and extensive jobs page. See http://sciencepolicy.colorado.edu/sp_grads/index.html. The SPGrads listserv currently has 70 members from educational institutions including the University of Colorado, Colorado School of Mines, Colorado State University, and Cambridge University.


GRADUATE STUDENT OPPORTUNITIES

The Center has provided extracurricular opportunities for several graduate students in fields related to science and technology policy. These include:

- **The RAA-CU Joint Internship Program** (<http://sciencepolicy.colorado.edu/reinsurance/>) is a pilot program in partnership with the Reinsurance Association of America launched in the summer of 2003 that places science or policy graduate students with reinsurance companies for approximately 3 months. Students



were provided a short course on catastrophe modeling sponsored by Risk Management Solutions in London and students were placed for the balance of the summer with companies in the reinsurance industry to work with decision makers who use science in making decisions or to inform decision-making. The program will be evaluated at the end of the summer of 2003 for continuation, modification or expansion next summer.

- **ICAT Managers** (<http://www.icat.com/>). A graduate student is being supported by ICAT Managers, which writes catastrophic insurance products, to conduct a detailed study of computer simulation models for hurricanes and earthquakes to provide a better understanding of the effects of various inputs on the results and a better understanding of the reasons behind the individual model treatment of various exposures. As we better understand the models and their inherent uncertainties and sensitivities, it is possible to make more informed decisions as to which model(s) we can use as measuring tools for various business segments.
- **House Science Committee** (<http://www.house.gov/science/>). The House Science Committee drafts and approves legislation that establishes policy for certain areas of science including climate change. Genevieve Maricle, a graduate research assistant for the Center and Western Water Assessment, interned with the House Science Committee staff during the summer of 2003 to study the decision making processes of the committee to determine what information the research community could provide that would facilitate those processes. The intern may also contribute to specific legislation relating to climate change policy such as identifying the needs of users of climate change science.
- **City of Westminster Water Utility** (<http://www.ci.westminster.co.us/gov/depts/pwu/water.htm>). Jessica Lang, another graduate research assistant for the Center and Western Water Assessment, interned with the City of Westminster water utility department will study how municipal water managers make decisions about water supply and demand in order to identify climate information that would be useful to water managers, to assess the uncertainties and limitations of water supply models, and to assist water managers in developing strategies for decision making in the absence of scientific certainty.

Staff Highlight *Bobbie Klein*

Bobbie Klein collaborated with Douglas Kenney of the Natural Resources Law Center on a Western Water Assessment-funded project exploring the municipal response to the 2002 drought in Colorado's Front Range. The project found that voluntary outdoor watering restrictions resulted in lower levels of savings than mandatory restrictions and, in a few cases, resulted in higher use in 2002 than in previous years. The project's findings were the subject of articles in the Boulder Daily Camera, American Water Works Association newsletter, National Public Radio, Wyoming Public Radio, and Channel 7 news (Denver).



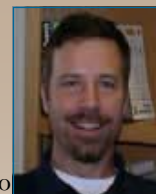
Finding Common Ground: Governance and natural resources in the American West, by Ronald Brunner et al., Yale, 2002, which included Klein's chapter on wolf recovery in the Northern Rockies, was reviewed by Choice, a publication of the Association of College and Research Libraries, American Library Association. The review stated that "Finding Common Ground is an excellent assessment of community-based initiatives...the case study examples are well chosen and thoroughly analyzed...the book...offers lessons that will serve policy makers and community policy participants very well."

2002-2003 PUBLICATIONS

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- Avallone, Linnea M., Darin W. Toohey, [Tara J. Fortin](#), Karena A. McKinney, and Jose D. Fuentes, 2003: In situ measurements of bromine oxide at two high-latitude boundary layer sites: Implications for variability, *Journal of Geophysical Research*, 108, 4089, doi:10.1029/2002JD002843.
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- Hay, L.E., [M.P. Clark](#), R.L. Wilby, W.J. Gutowski, G.H. Leavesley, Z. Pan, R.W. Arritt, and E.S. Takle, 2003: Use of regional climate model output for hydrologic simulations. *Journal of Hydrometeorology* 3, 571-590.
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- [Pielke, Jr., R.A.](#), 2003: Another Epidemic of Politics? Letter to the Editor, *Science*, vol. 300, no. 5622, pp. 1092-1093.
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- [Pielke, Jr., R.A.](#), 2002: Prospects for reducing vulnerability to hurricanes. Chapter 7 in R. Anthes, R. Simpson, and M. Garstang (eds.). *Coping with hurricanes: A review of 20th century progress* (AGU: Washington, DC).
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- [Pielke, Jr., R.A.](#), 2003: Supply and Demand for Atmospheric Science Professionals, *Bulletin of the American Meteorological Society* 84:170-173.
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Staff Highlight Mark Lohaus



Mark Lohaus, the Center's webmaster, redesigned the Center's main website (<http://sciencepolicy.colorado.edu>) to make it more user-friendly and attractive. This adds to a growing list of recent design work by Mark including: New Directions (<http://newdirections.colorado.edu>), Graduate Certificate in Science and Technology Policy (<http://sciencepolicy.colorado.edu/stcert/>), Environmental Studies Graduate Program (<http://envs.colorado.edu/graduate/>), Security Symposium (http://sciencepolicy.colorado.edu/events/security_symposium_2002/), Global Climate Change and Society (<http://sciencepolicy.colorado.edu/gccs/>), Humanities in the Parks (<http://sciencepolicy.colorado.edu/parks/>), Flatirons Outdoor Classroom Project (<http://sciencepolicy.colorado.edu/flatirons/>), and Hydro-Climate Research and Decision Making (<http://sciencepolicy.colorado.edu/hydroclimate/>).

Mark also added several new features to all of the Center's sites, including a "cookie crumb" to show visitors their location, a smarter left navigation showing the current page and pdf files, a print button to allow for better printing, and a text-only button for people who prefer to read the site without graphics. To improve the workflow process, Mark also wrote several web applications including a ticket system to manage web work requests and a content management system allowing updates to occur more quickly and for individuals with limited web skills to make many of these updates.

TALKS AND PRESENTATIONS BY CENTER STAFF

RAD BYERLY

Byerly, R., 2003: Nuclear Waste: File and Forget? Institute on the Environment, Journalism school, University of Colorado, Boulder, May 13.

Byerly, R., 2003: Future space policy in light of Challenger accident. Professor Dan Baker's class on Space Policy, ASTR 4800, University of Colorado, Boulder, March.

Byerly, R., Nuclear Waste: File and Forget? AAAS Annual Meeting, Denver, CO, February 18.

MARTYN CLARK

Clark, M., 2003: Climate Change Uncertainties: Assessing the impacts of prolonged severe drought on aquatic ecosystems and water quality in the South Platte River basin, Colorado, Ft. Collins, CO, April 3.

Clark, M., 2003: Climate, Water Resources, and Environmental Sustainability: Ensuring Adequate Water Supplies in the 21st Century, AGU Hydrology Days, Ft. Collins, CO, March 31.

Clark, M., 2003: Three effective models for RIS Research, RISA All-Hands Meeting, Scottsdale, AZ, March 11.

Clark, M., 2003: The CIRES-NOAA Western Water Assessment, American Meteorological Society Annual Meeting, Long Beach, CA, February 11.

Clark, M., 2002: Advances in Streamflow Forecasting Capabilities on Intra-Seasonal Timescales, AGU Meeting, San Francisco, CA, December.

BOB FRODEMAN

Frodeman, R., 2003: Philosophy of Science Policy, NEH Seminar, Dialogues on Two Cultures, University of Colorado, April 3 and 4.

Frodeman, R., 2003: Philosophy of (Field) Science, Penn State University, February 28.

Frodeman, R., 2003: Professing Philosophy, Practicing Philosophy, Hawaii International Conference on Arts and Humanities, January 13.

Frodeman, R., 2002: A Philosophy of Global Climate Change, Socially Robust Ecological Design workshop, University of Bielefeld, Germany, October 5.

Frodeman, R., 2002: The Future of Biotechnology, Columbia University Center for Science, Policy, and Outcomes, July 19.

BOBBIE KLEIN

Klein, R., 2003: 2002 Municipal Response to Drought in the Colorado Front Range. Hydrology Days, Ft. Collins, CO, March 31.

Klein, R., 2003: 2002 Municipal Response to Drought in the Colorado Front Range. American Meteorological Society Annual Meeting, Long Beach, CA, February 12.

Klein, R., 2002: Lasswell Prize panel on Finding Common Ground: Governance and Natural Resources in the American West, Policy Sciences Annual Institute, Yale University, New Haven, CT, October 19.

ROGER PIELKE

Pielke, Jr., R. A. 2003. Concluding Panel Discussion: Water Climate and Uncertainty, Natural Resources Law Conference on Water, Climate and Uncertainty, University of Colorado School of Law, June 13.

Pielke, Jr., R. A. 2003. Public-Private-Academic Partnerships in the Atmospheric Sciences, AMS Atmospheric Policy

Program Summer Policy Colloquium, Washington, DC, June 5.

Pielke, Jr., R. A. 2003. Misdefining "Climate Change": Consequences for Science and Action, Workshop on Mitigation and Adaptation: Toward a Mutual Agenda, Kulterwissenschaftliches Institut, Essen, Germany, May 16.

Pielke, Jr., R. A. 2003. Environmental Studies as Knowledge Integrator, Distinguished Speaker, Environmental Studies Program Graduation Ceremony, University of Colorado, May 9.

Pielke, Jr., R. A. 2003. The Politicization of Science: Learning from the Lomborg Affair, Department of Geography, University of Colorado, April 11.

Pielke, Jr., R. A. 2003. Breaking the Global Warming Gridlock, School of Mines and Geosciences, University of Utah, Salt Lake City, UT, March 6.

Pielke, Jr., R. A. 2003. Climate Policy and Professional Responsibility, Department of Meteorology, University of Utah, Salt Lake City, UT, March 6.

Pielke, Jr., R. A. 2003. Extreme events and their societal impacts: Scientific challenges and policy significance, Symposium on Environmental Responses to Anthropogenic Perturbations, Cooperative Institute for Research in Environmental Sciences, University of Colorado, February 21.

Pielke, Jr., R. A. 2003. The Politicization of Science: Defining the Problem, Annual Meeting of the American Association for the Advancement of Science, Denver, CO, February 16.

Pielke, Jr., R. A. 2003. The Politicization of Science: Learning from the Lomborg Affair, Symposium Organized for the Annual Meeting of the American Association for the Advancement of Science, Denver, CO, February 16.

Pielke, Jr., R. A. 2003. Are we missing the real climate change story? Plenary Session, National Association of Science Writers Annual Meeting, Denver, CO, February 13.

Pielke, Jr., R. A. 2003. Science and Uncertainty, Politics and Policy, Ball Aerospace, Boulder, CO, December 6.

Pielke, Jr., R. A. 2003. Global Climate Change: Rethinking the Response, Ohio State University and COSI Columbus, Columbus, OH, November 6.

Pielke, Jr., R. A. 2003. Risk Assessment and Catastrophe Modeling, ICAT Managers Reinsurance Rendezvous, Boulder, CO, October 24.

Pielke, Jr., R. A. 2002. Climate Change Assessments: How Can We Improve the Process? Forum of the Board on Atmospheric Sciences and Climate and the Climate Research Committee, National Research Council, Washington DC, October 23.

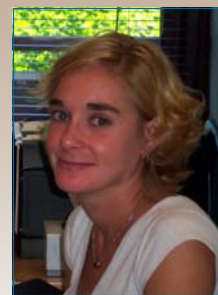
Pielke, Jr., R. A. 2002. The Future of the Policy Sciences, Policy Sciences Annual Institute, Yale University, October 18.

Pielke, Jr., R. A. 2002. Successes and Failures of Integrated Assessments, Workshop on Vulnerability of South Platte Ecosystems to Climate Variability and Societal Actions, Natural Resources Ecology Laboratory, Colorado State University, Pingree Park, CO, September 30.

Pielke, Jr., R. A. 2002. Policy Issues Associated with Extending the Life of Satellite Research Missions, Committee on Earth Sciences, National Research Council, September 9, National Academy of Sciences, Washington, DC.

Staff Highlight *Ami Nacu-Schmidt*

Ami Nacu-Schmidt, the Center's Office Manager, has been influential in overseeing the daily functioning of the Center since its inception in the summer of 2001. She designed the layout for the Center's publication, *Ogmios*, its Annual Report and brochure, and various other Center publications. She is the Associate Editor of *Ogmios*. Ami puts her highly developed problem solving skills to frequent use. Through her competence and attention to detail Ami provides valuable services for the Center staff and Center initiatives.



TALKS SPONSORED BY THE CENTER

July 10, 2002: Christopher Green, professor of economics, McGill University, "Stabilizing Atmospheric Carbon Dioxide: What will it take?"

October 17, 2002: Andrew Revkin, New York Times, "The Daily Planet: Why the Media Stumble over the Environment." CIRES Distinguished Lecture Series.

April 18, 2003: Daniel Sarewitz, Center for Science, Policy, and Outcomes, Columbia University, "Science, Values, and Climate Change: Probing the Limits of Objectivity." CIRES Distinguished Lecture Series.

The Center also contributed \$500 to the Dialogues between Two Cultures lecture series organized by the Herbst Program in the School of Engineering.

MONTHLY LUNCHTIME SEMINARS

The Center launched a monthly seminar series in the spring of 2003 to provide an opportunity for Center staff, students, and affiliates to learn about each other's work, as well as to bring in the occasional special guest.



Joe Ryan

- Faculty affiliate Joe Ryan of the Department of Civil, Environmental, and Architectural Engineering, the Environmental Engineering Program, and the Environmental Studies Program gave the first seminar titled "Abandoned Mines and Acid Mine Drainage: Achievements and Obstacles in Community-Driven Remediation" on March 31. Professor Ryan addressed the problem of acid mine drainage and its remediation in the context of current efforts to improve the water quality of the Lefthand Creek watershed in northwestern Boulder County.



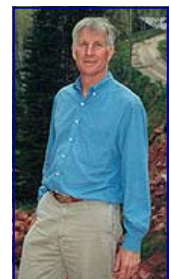
Congressman Mark Udall

- Congressman Mark Udall visited the Center on April 28 to discuss his work on the House Science Committee and with renewable energy legislation, among other topics.



Martyn Clark

- Martyn Clark, a research scientist at the Center and director of the Western Water Assessment, gave a talk titled "A Partnership with the Colorado Basin River Forecast Center: An Experiment in Technology Transfer" on May 19.
- Randy Udall, director of the Community Office for Resource Efficiency in Pitkin County, Colorado, visited the Center to discuss his article (co-authored with Susan Joy Hassol) titled "A Change of Climate," appearing in the spring 2003 edition of Issues in Science and Technology.



Randy Udall

DISCUSSION GROUPS

WEATHERPOLICY

<http://sciencepolicy.colorado.edu/mailman/listinfo/weatherpolicy>

The Weatherpolicy listserv is for people interested in weather policy. Weather policy has two inter-related components. One is "policies for weather research and decision making." This includes government policies about weather research, forecast operations, and responses focused primarily on the National Weather Service, but more broadly constituted include the Department of Agriculture, Federal Emergency Management Agency, Small Business Administration, and other agencies that deal with weather and its impacts. It also covers the private sector, notably including providers of weather information and the insurance industry. Of course, an important aspect of weather policy is the relationship between the public and private sectors.

A second component of weather policy is "weather research for decision making" and refers to the connections between research and the actions taken in preparation for and response to weather. This aspect of weather policy is variously called "forecast use and value" and "connections of research and operations." There is a small but significant body of literature in this area, but for the most part it has not been discussed in terms of policy as it has been in the climate and ocean areas.

The Weatherpolicy listserv has 115 members.

SPGRADS

http://sciencepolicy.colorado.edu/sp_grads/listinfo.html

The SPGrads email list is for graduate students and early career scientists interested in issues of science and technology policy. Specifically, the list is for discussion of a wide range of subjects related to science policy, technology policy, and technology assessment.

Science policy is described by the phrases "science for policy" and "policy for science." The former refers to how scientific information is linked to decision-making and the latter to governance of the scientific enterprise itself. Technology policy refers to the interrelationship of government, academia, and the private sector, and their shared goal of enhancing economic vitality through the transfer of knowledge to useful products and processes. Technology policy research seeks to understand these relationships and to develop, evaluate, and critique them. Technology assessment seeks to integrate knowledge of technological systems with their broader social and policy context as a contribution to the governance of science and technology. Decisions about how to allocate finite (and frequently scarce) resources can be made more effectively when decision makers consider integrated understandings of technology in society.

The SPGrads listserv has 70 members.

CENTER NEWSLETTER

<http://sciencepolicy.colorado.edu/ogmius/>

The Center launched the first issue of its newsletter, Ogmius, in January 2002 and has published Ogmius three times per year since then. The highlight of each issue is an exchange among leading voices in science and technology on pertinent issues. Ogmius exchanges over the past year have included:

- **Thoughts on Catastrophic Terrorism in America**
Lewis M. Branscomb of Harvard University with response by Eugene Skolnikoff of MIT (October 2002)
- **Humanities for Policy—and a Policy for the Humanities**
Robert Frodeman of the Center and Carl Mitcham of the Colorado School of Mines with response by Malcolm Richardson of the American Academy of Arts and Sciences (January 2003)
- **Devising Resilient Responses to Potential Climate Change Impacts**
Martyn Clark of the Center and Roger Pulwarty of NOAA with response by Rob Wilby of the UK Environment Agency (May 2003)

Ogmius also includes news about Center projects, publications, and staff, job and educational opportunities in science and technology policy, and other items of interest to the community. Ogmius is available online in both html and pdf format at http://sciencepolicy.colorado.edu/ogmius/archives/issue_5/index.html. With no advertising or solicitations, Ogmius has attracted 111 subscribers from institutions including UCAR, Stanford, NOAA, Cambridge, AAAS, the State of Colorado, Cornell, the Red Cross, the University of Arizona, and the U.S. Army Corps of Engineers, and the list is growing.

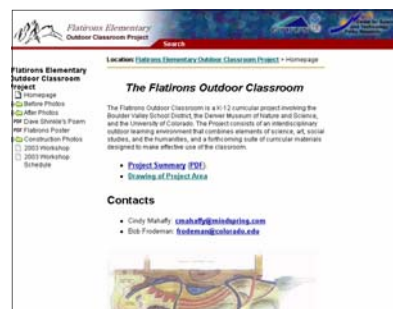


WEB PRESENCE

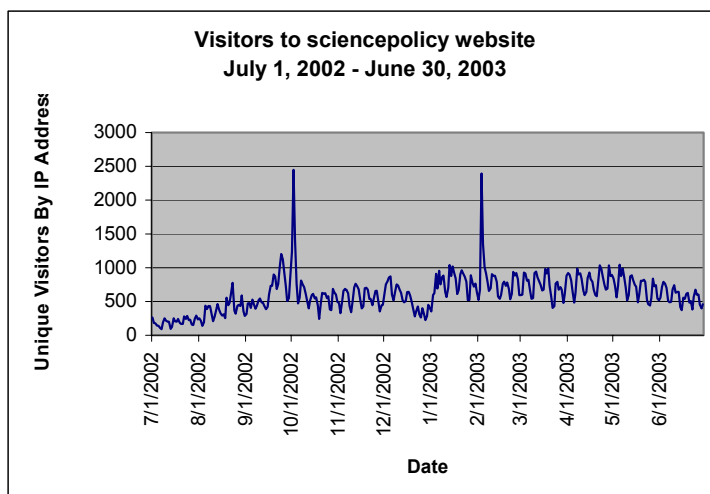
The Center continues to maintain and expand its web presence as part of its outreach efforts. Last fall University of Colorado students Jessica Baird and Jonah Kadish joined our web staff to assist our full-time webmaster, Mark Lohaus.

Additions to the Center's site include:

- **NEW DIRECTIONS INITIATIVE**, <http://sciencepolicy.colorado.edu/newdirections/>, a project involving physical scientists, social scientists, and humanists working together with public agencies, private firms, and communities to deepen our understanding of and develop effective responses to environmental problems.
- **INTERNATIONAL ASSOCIATION FOR ENVIRONMENTAL PHILOSOPHY**, <http://www.environmentalphilosophy.org/>.
- **FLATIRONS OUTDOOR CLASSROOM PROJECT**, <http://sciencepolicy.colorado.edu/flatirons/>, a K-12 curricular project involving the Boulder Valley School District, the Denver Museum of Nature and Science, and the University of Colorado. The Project consists of an interdisciplinary outdoor learning environment that combines elements of science, art, social studies, and the humanities.
- **RAA/CU JOINT INTERNSHIP PROGRAM**, <http://sciencepolicy.colorado.edu/reinsurance/>, a summer internship program graduate students in science, engineering or policy designed to provide students an opportunity to learn about and gain experience in a major global industry that relies on scientific and engineering expertise.
- **SPACE POLICY MEDIA RESOURCES PAGE**, http://sciencepolicy.colorado.edu/media_resources/space_policy/index.html, includes articles authored by Center staff concerning space policy issues.
- **DROUGHT MEDIA RESOURCES PAGE**, http://sciencepolicy.colorado.edu/media_resources/drought_policy/index.html, includes articles authored by Center staff and students concerning the 2002 drought in Colorado.



The following graph reflects how many individuals have visited our website on any given day over the past year. The big spikes (almost 2500 visitors per day) coincide with the release of Ogmios, the Center's newsletter, which provides the Center with a great deal of visibility.



MEDIA COVERAGE

The Center continues to receive significant attention from the media, both print and broadcast:

- Roger Pielke was quoted in a June 14, 2003 article in the Daily Camera, "Scientists, lawyers combine skills to tackle climate change: Collaboration vital to ensuring effective policy, says CU official" by Sarah McMahon, Camera Staff Writer.
- Roger Pielke, Jr. was quoted in the May 15, 2003 issue of *Nature* in an article titled "The Man they Love to Hate" on the controversy over the publication of *The Skeptical Environmentalist*.
- Bobbie Klein and Doug Kenney's study of the effectiveness of watering restrictions during the 2002 drought was the subject of an article in the Boulder Daily Camera, "Study: Mandatory restrictions work; Voluntary water conservation showed little effect," by Katy Human, Camera Staff Writer May 8, 2003. The study was also the subject of stories on National Public Radio, Wyoming Public Radio, Channel 7 news (Denver), and in the American Water Works Association newsletter.
- Martyn Clark was quoted in the May 2003 issue of *The Coloradan*, the University of Colorado alumni magazine, regarding new methods he has developed for forecasting stream flows.
- The 2003 AAAS session on The Politicization of Science organized by Roger Pielke, Jr. was featured in the April issue of the *IEEE Spectrum* in an article on the controversy over the publication of *The Skeptical Environmentalist*.
- The April 22, 2003, issue of *EOS* featured an article, "Initiative Bridges Gap Among Humanities, Science, and Society", by Robert Frodeman on the Center's New Directions in the Earth Sciences and Humanities project.
- The April 18, 2003 issue of *The Chronicle of Higher Education* featured an interview with Robert Frodeman on his new book, *Geo-Logic: Breaking Ground between Philosophy and the Earth Sciences*.
- Roger Pielke, Jr. was quoted in an article entitled "Policies Not Helping Global Warming, Professor Says," by J. Aaron Goldsmith, The Daily Utah Chronicle.
- Roger Pielke, Jr. was quoted in an article entitled "Impurities of politics can dilute scientific credibility" by Linda Seebach, Rocky Mountain News, March 1, 2003.
- Roger Pielke, Jr. was quoted in an article entitled "NASA ponders ways to save a wounded shuttle" by Todd Ackerman, Houston Chronicle, February 25, 2003.
- Roger Pielke, Jr. was quoted in an article entitled "Back-Door Approach to Global Warming" by Jeff Tollefson, The Santa Fe New Mexican, February 24, 2003.
- Roger Pielke, Jr. was quoted in "Pessimists are now prophets. After disaster, media attention turns to those whose warnings went unheeded. It's the Cassandra Syndrome," by Mary McNamara, LA Times, February 17, 2003.
- Roger Pielke, Jr. was interviewed by the BBC Radio Today Program on a story entitled "Are scientists becoming too influenced by politic and big business?"
- Roger Pielke, Jr. was quoted in "Shuttle problems predicted: CU researcher made forecast based on age of fleet, probability," by Jim Erickson, Rocky Mountain News, February 4, 2003.
- Roger Pielke, Jr. was quoted in "Are missions into space worth the risks or the cost?" by Kate Larsen, Daily Camera, February 4, 2003.
- Roger Pielke, Jr. was quoted in an article in the January 9, 2003 Financial Times, "Sceptical environmentalist runs into trouble in own backyard" by Vanessa Houlder.
- Martyn Clark's talk on his improved method of forecasting water availability in streams and rivers was highlighted in a Colorado Daily article, "CU Scientist to Unveil New Streamflow Method Today," Dec. 9, 2002.
- Roger Pielke, Jr. was quoted in a December 3, 2002, New York Times article, "Can Global Warming Be Studied Too Much?" by Andrew Revkin.

- Martyn Clark responded to an estimate that western water supplies could be reduced by 30% due in global warming in a USA Today article, "Global warming may leave West in the dust," Nov. 21, 2002.
- Roger Pielke, Jr. was quoted in an article, "Climatologist: Future is dry; Drought may be glimpse of climate change," by Katy Human, Daily Camera Nov. 21, 2002.
- Roger Pielke, Jr. was quoted in an article "NASA does some fancy financial footwork to deal with a budget crisis," The Economist Nov. 19, 2002.
- Roger Pielke Jr., was quoted in an article. "Trying to tame the weather," by Lia Unrau, Dallas Morning News Nov. 18, 2002.
- Roger Pielke, Jr. was quoted in a New York Times article entitled "Government Outlines Plan for Research on Warming" Nov. 13, 2002.
- Roger Pielke Jr., was quoted in the November 2002 Aerospace America magazine.
- Roger Pielke, Jr. was quoted in a Denver Post article "Increased security may slow labs' work; 9/11 fears put facilities under the microscope," by Diedra Henderson Oct. 20, 2002.
- The Boulder Daily Camera focused on Senator Gary Hart's speech to the Center's "Science, Technology, and Security: Knowledge for the Post-9/11 World" symposium in "Research at heart of security: Gary Hart says threats extend to cyberwarfare" by Matt Branaugh, Camera Business Writer Oct. 11, 2002.
- The Boulder Daily Camera discussed the Center's symposium, "Science, Technology, and Security: Knowledge for the Post-9/11 World" in "Two-day event this week at CU brings sectors together" by Matt Branaugh, Camera Business Writer Oct. 6, 2002.
- The Boulder Daily Camera reported that the Center for Science and Technology Policy Research had been officially approved by the University of Colorado. See "University of Colorado adds research center for policy" Sept. 29, 2002.
- Robert Frodeman's Flatirons Elementary Outdoor Classroom Project was the subject of a Daily Camera article "Schoolyard mimics geology: Flatirons Elementary parents raise money for outdoor classroom" by Katy Human Sept. 23, 2002.
- On August 9, 2002, Roger Pielke, Jr. was quoted in insure.com commemorating the 10-year anniversary of Hurricane Andrew.
- Roger Kennedy, a Visiting Scholar at the Center, authored an op-ed in the August 8, 2002, New York Times titled "Why the West is Burning."
- The Boulder Daily Camera reported on the Center's recent study of flood damage.
- Roger Pielke, Jr. was quoted in the Fort Collins Coloradoan on August 2, 2002 in an article on his father's recent congressional testimony.
- Roger Pielke, Jr. was quoted in a July 11, 2002 L.A. Times article titled "Storm (and Culture) Warning."
- Roger Pielke, Jr. and Chris Landsea's work on hurricane damages was cited in a series of stories in the New Orleans Times-Picayune about the rising hurricane risks in south Louisiana (see "Washing Away, Part 5: Cost of Survival, Advance Warning" by Mark Schleifstein and John McQuaid).
- A talk Roger Pielke, Jr. gave in Italy in June 2002 was the subject of an article published by Il Messaggero (in Italian).

Staff Highlight *Roger Pielke, Jr.*

In September 2002 Roger published two op-eds, one with the Houston Chronicle and one with Space News, focused on preparing for the eventual loss of a space shuttle. Roger's argument can be summarized as follows: The inevitability of losing a space shuttle means that we should now begin a conversation about the long term future of the space program, rather than wait until a crisis prompted by the eventual, and inevitable, loss of a shuttle. No one knew that four short months later such a situation would arise with the tragic loss of the Columbia and its crew. Roger worked with Center staff to collect and make accessible the work, some going back more than a decade, of Rad Byerly, Ron Brunner, and others on alternative approaches to a civil space program. These materials are available on the center's WWW site, <http://sciencepolicy.colorado.edu>.



People

CENTER STAFF

- Roger Pielke, Director
- Bobbie Klein, Managing Director
- Ami Nacu-Schmidt, Office Manager
- Mark Lohaus, Webmaster
- Martyn Clark, Research Scientist
- Bob Frodeman, Research Scientist
- Brad Udall, Western Water Assessment Managing Director
- Tara Fortin, CIRES Visiting Fellow

VISITING SCHOLARS AND AFFILIATES

The Center continued to add local and national experts from a variety of policy areas to its list of affiliates and visiting scholars. Visiting scholars are significant, long-term collaborators on issues of science and technology policy who may be in residence at the Center. Visiting scholars are appointed by the Center's Director with approval by the Center's Executive Committee. Faculty affiliates are colleagues who share an interest in science and technology policy research and who are drawn from a broad community that spans traditional disciplines and organizational units. Research affiliates are non-faculty individuals who through research, education, or outreach have expressed interest in collaborating with Center personnel in support of the Center's mission. Persons interested in affiliate appointments with the Center should contact us at pielke@colorado.edu.

New 2002-03 faculty affiliates, research affiliates, and visiting scholars:

- **Thomas N. Chase**
Assistant Professor of Geography, University of Colorado-Boulder
- **Subhrendu Gangopadhyay**
Senior Research Associate, Department of Civil, Environmental, and Architectural Engineering, University of Colorado-Boulder
- **Douglas S. Kenney**
Research Associate, Natural Resources Law Center, University of Colorado-Boulder School of Law
- **Paul Komor**
Lecturer, Department of Civil Engineering, University of Colorado-Boulder, and a project director at E SOURCE, a Boulder-based energy research firm
- **Jana Milford**
Associate Professor, Mechanical Engineering and the Center for Combustion and Environmental Research, and director of the Environmental Engineering Program at the University of Colorado- Boulder. She is also a J.D. candidate at the University of Colorado School of Law
- **Carl Mitcham**
Professor of Liberal Arts and International Studies, Colorado School of Mines
- **R. Balaji (Balaji Rajagopalan)**
Assistant Professor and Fellow, Cooperative Institute for Research in Environmental Sciences, Department of Civil, Environmental and Architectural Engineering, University of Colorado-Boulder

- ***Anne Ruggles***
Wildlife biologist and attorney
- ***Joe Ryan***
Associate Professor, Department of Civil, Environmental, and Architectural Engineering,
Director of the Environmental Engineering Program, and a faculty member of the Environmental Studies
Program, University of Colorado-Boulder
- ***Dan Sarewitz***
Director, Center for Science, Policy and Outcomes, Columbia University
- ***Doug Sicker***
Assistant professor, Department of Interdisciplinary Telecommunications, University of Colorado-Boulder
- ***Phil Weiser***
Joint appointment with the Interdisciplinary Telecommunications Program and the School of Law,
University of Colorado-Boulder
- ***Tom Yulsman***
Associate professor, University of Colorado's School of Journalism & Mass Communication, and co-director
of the Center for Environmental Journalism. He also is affiliated with CU's Environmental Studies Program

Continuing affiliates and visiting scholars:

- ***Susan Avery***
Director, Cooperative Institute for Research in Environmental Sciences
- ***Rad Byerly***
Former Chief of Staff, House Science Committee
- ***Ann Keller***
Assistant Professor of Political Science and Environmental Studies, University of Colorado-Boulder
- ***Roger Kenney***
Former director, U.S. National Park Service
- ***Myanna Lahsen***
Researcher, Belfer Center for Science and International Affairs,
John F. Kennedy School of Government, Harvard
- ***Frank Laird***
Associate Professor, Graduate School of International Studies, University of Denver
- ***Jill Litt***
Assistant Professor, Department of Preventive Medicine and Biometrics, School of Medicine,
University of Colorado Health Sciences Center
- ***Jim Martin***
Director, Natural Resources Law Center, University of Colorado-Boulder
- ***Alex Wolf***
Associate Professor, Department of Computer Science, University of Colorado-Boulder

Staff Highlight *Brad Udall*



Brad joined the Center in February of 2003 as the new Managing Director of the Western Water Assessment, one of six NOAA-funded Regional Integrated Sciences and Assessments ("RISA") programs in the country.

During his first five months on the job Brad concentrated on educating himself about the Western Water Assessment and other RISAs, and on establishing good communication and an effective management structure for WWA. He attended the annual 3-day national RISA program meeting in Phoenix in March and attended a 1-day meeting of the Pacific Northwest RISA in May. Both of these events provided him with perspective on how other RISAs function and how to improve the Western Water Assessment. In addition, Brad has spent much time learning about each WWA researcher and her or his research agenda.

On the management front, Brad has concentrated on the nuts and bolts of making WWA function effectively. He has scheduled regular meetings of the WWA Management Team and regular meetings of the entire cadre of 30-plus researchers and graduate students working on the project. His current major effort is working with the Management Team to assess the past work of the Assessment and to set WWA on a course to maximize its effectiveness over the next few years.

VISITORS AND COLLABORATORS 2002-2003

- Susan Avery, CIRES
- Andy Barrett, NSIDC / CIRES
- Gary Bates, CDC
- David Brandon, Colorado Basin River Forecast Center
- Greg Cronin, CIRES Center for Limnology
- Terrell Dixon, University of Houston
- Randall Dole, CDC
- Bruce Foltz, Eckerd College
- Chris Goemans, Institute of Behavioral Science (IBS)/EB
- Dr. Christopher Green, McGill University
- William J. Gutowski, Iowa State University
- Lauren E. Hay, United States Geological Survey
- Harvey Hill, NOAA Office of Global Programs
- Martin Hoerling, CDC
- Bill Hooke, AMS
- Charles Howe, Institute of Behavioral Science (IBS)
- Shaleen Jain, CIRES / CDC
- Douglas Kenney, CU Natural Resources Law Center
- George H. Leavesley, United States Geological Survey
- William Lewis, CIRES Center for Limnology
- Andrew Light, New York University
- Fiona Lo, University of Colorado
- Patrick Mahaffy, Pharmion
- Gregory J. McCabe, United States Geological Survey
- Donald Mock, CDC
- Carl Mitcham, Colorado School of Mines

- [Claudia Nierenberg](#), NOAA/OAR
- [John Pitlick](#), Dept of Geography
- [Balaji Rajagopalan](#), Dept. of Civil, Environmental and Architectural Engineering
- [Andrea Ray](#), CDC
- [Andrew Revkin](#), New York Times
- [Lee Rozaklis](#), Hydrosphere, Inc.
- [Dan Sarewitz](#), Columbia University
- [James Saunders](#), CIRES Center for Limnology
- [John Schaake](#), NWS Office of Hydrologic Development
- [Mark C. Serreze](#), University of Colorado
- [Paul Sperry](#), CIRES
- [Al Teich](#), AAAS
- [Nancy Tuana](#), Penn State
- [Congressman Mark Udall](#), U.S. House of Representatives
- [Randy Udall](#), Community Office for Resource Efficiency, Pitkin County, CO
- [Doug Walker](#), CommunityViz
- [Robert S. Webb](#), NGDC and CDC
- [Kevin Werner](#), Colorado Basin River Forecast Center
- [John Wiener](#), Institute of Behavioral Science (IBS)
- [Robert L. Wilby](#), Environment Agency, UK
- [Klaus Wolter](#), CDC
- [Connie Woodhouse](#), INSTAAR and NGDC
- [David Yates](#), NCAR
- [Tingjun Zhang](#), University of Colorado

BOARDS AND COMMITTEE MEMBERSHIPS

RAD BYERLY

National Committee Service

- A National Research Council (NRC) committee looking at how the development of nuclear waste repositories should be managed. This study will support the Yucca Mountain Project.
- The NRC Space Studies Board which conducts policy studies for the nation's space program. Recently Byerly coordinated the board's review of a survey and prioritization of future planetary missions.
- The Board of Directors of the Associated Universities for Research in Astronomy (AURA). AURA is a consortium of universities, and its essential role is to develop and operate astronomical facilities too large for most universities to undertake alone. AURA also manages the science operations of the Hubble Space Telescope for NASA. He is also on the Board's Personnel Policy Committee.
- The Committee on Science, Engineering, and Public Policy of the American Association for the Advancement of Science.
- The Board of Visitors of the Columbia University Center for Science Policy and Outcomes.

MARTYN CLARK

- Member, Advisory Panel for the Core Project of the NOAA-OGP-GAPP Program.

ROGER PIELKE

- Member, Editorial Board, International Encyclopedia of Science, Technology, and Ethics
- Member, Editorial Board, Bulletin of the American Meteorological Society
- Member, Editorial Board, Policy Sciences
- Associate Editor, Natural Hazards Review, American Society of Civil Engineers
- Advisory Panel, Program on Societal Dimensions of Engineering, Science, and Technology, National Science Foundation
- Member, Science Steering Committee, World Weather Research Programme
- Consultant, National Academy of Sciences, Board on Environment and Natural Resources, Committee on Public-Private Partnerships in Weather and Climate Services
- Member, Expert Social Science Review Panel, National Oceanic and Atmospheric Administration Science Advisory Board
- Member, Board of Directors, WeatherData, Inc.
- Academic Advisory Board, Columbia University, Center for Science, Policy and Outcomes
- Adjunct Scientist, University of Illinois, Illinois State Water Survey

Appendices

PROGRAM PLAN

**CENTER FOR SCIENCE AND TECHNOLOGY POLICY RESEARCH
COOPERATIVE INSTITUTE FOR RESEARCH IN ENVIRONMENTAL SCIENCES
UNIVERSITY OF COLORADO AT BOULDER**

August 2002

1. General Purpose of the Unit

a. Background

The past decade has seen a growing demand by public and private decision makers for “usable” scientific information. Such information can serve decisions that have a scientific component or decisions about the structures, organizations, and priorities of science itself. An area of inquiry that seeks to meet this growing demand for information is science and technology policy research. Such research is characterized by its focus on “problems” and “decisions” (or more accurately, “decision processes”) as the units of analysis with an explicit objective of providing information that is useful and relevant in decision making. This focus on problems and decisions sets science and technology policy research apart from other efforts to integrate knowledge across traditional disciplines.

Because problems and decisions are not bounded by any discipline or set of disciplines, science and technology policy research is necessarily integrative across the physical, social, and biological sciences (as well as other fields, including the humanities). The specific decision or problem that is the focus of inquiry dictates the sort of knowledge that is relevant to the research.

The past decade also has seen growing interest among scientists in investigating research problems that require the input of more than just a single traditional discipline. At the same time, decision makers in both public and private settings have asked the science and technology communities to provide knowledge that is of more direct usefulness in their decision making. The notion of science and technology policy research provides a mechanism to reconcile these two closely related – but not identical – trends. By linking integrative science with the needs of decision makers, science and technology policy research can play a valuable role in helping the research community better focus its efforts on issues of importance to society and in helping decision makers more effectively incorporate scientific and technological advances into their decision processes.

Science and technology policy research depends critically upon cutting edge research in virtually all areas of inquiry – biology, ecology, engineering, atmospheric and oceanic sciences, hydrology, geography, medicine, sociology, economics, political science, law, philosophy, history, journalism, etc. It also depends on innovative approaches to multi-disciplinary research in order to integrate knowledge from these areas in a way that directly contributes useful information to decision makers. An explicit focus on science and technology policy research can contribute needed expertise and perspective in the quest for scientific and technical knowledge usable by decision makers.

Recognizing the importance of integrating scientific research with the needs of decision makers, the Cooperative Institute for Research in Environmental Sciences (CIRES) began to develop a Center for Science and Technology Policy Research in the fall of 2001. The Center is a major step in CIRES’ plan to promote science in service to society based on the foundation of synergy between the National Oceanic and Atmospheric Administration (NOAA) research and University academics.

b. Purpose

The Center is established within CIRES at the University of Colorado-Boulder. Its mission is to conduct research, education, and outreach at the interface of science, technology, and the needs of decision makers in public and private settings. The Center's research will be highly integrated with the ongoing activities of CIRES, the National Oceanic and Atmospheric Administration, the University, and the broader science and technology community. It seeks to become a center of excellence in the research community and a national and international leader in research, teaching, and outreach in the areas of science policy, technology policy, and technology assessment. Each of these areas is described below:

- **Science policy.** The traditional scholarly interest in science policy has for many years been captured by the phrases "science for policy" and "policy for science." The Center will explore how scientific information is linked to decision making and will also examine governance of the scientific enterprise with topics that range from broad federal government resource allocation issues to the practice of peer review.
- **Technology policy.** Technology policy refers to the interrelationship of government, academia, and the private sector, and their shared goal of enhancing economic vitality through the transfer of knowledge to useful products and processes. Technology policy research seeks to understand these relationships and to develop, evaluate, and critique them.
- **Technology assessment.** Technology assessment seeks to integrate knowledge of technological systems with their broader social and policy context as a contribution to the governance of science and technology. Decisions about how to allocate finite (and frequently scarce) resources can be made more effectively when decision makers consider integrated understandings of technology in society.

In partnership with the Department of Environmental Studies, as well as disciplinary departments in the social and physical sciences, law, humanities, engineering, and others, the Center will develop a pedagogical presence at both undergraduate and graduate levels. This will include development of focused seminars, topical and cross-disciplinary courses, and an internship program.

The Center will emphasize outreach to the academic community and private and public decision makers using tools such as the Internet, newsletters, and multidisciplinary workshops.

2. Congruence with Role and Mission of University, Campus, and Parent Unit

The Center falls within the integrating CIRES focus on "science in service to society." The Center will advance the mission of CIRES, which is to act as a national resource for multidisciplinary research and education in the environment sciences. The Center intends to be a national and international leader in research, teaching, and outreach in the multidisciplinary areas of science policy, technology policy, and technology assessment.

The Center's focus on science and technology policy research contributes directly to the University's mission:

Our mission is to advance and impart knowledge across a comprehensive range of disciplines to benefit the people of Colorado, the nation, and the world by educating undergraduate and graduate students in the accumulated knowledge of humankind, discovering new knowledge through research and creative work, and fostering critical thought, artistic creativity, professional competence, and responsible citizenship.

More concretely, the Center's research, teaching, and outreach activities will help advance many of the goals of CU-Boulder's Strategic Plan, as well as the CU 2010 Vision for the University of Colorado:

- Strategic Plan Goal - Enhance Student Learning
CU 2010 Goal - Culture of Excellence

The Center will enhance professional and educational opportunities in currently underrepresented multidisciplinary areas such as teaching students to understand and shape the connections of scientific research with the needs of decision

makers. It will offer opportunities for students to engage in creative scholarship that crosses many disciplines to address important policy issues related to the environment, technology, medicine, and engineering, among others.

- Strategic Plan Goal - Serve Our Communities
CU 2010 Goal - University without Walls

The Center will emphasize two-way communication with the academic community as well as with private and public decision makers using a wide range of tools including the Internet, newsletters, and workshops. It will also work closely with CIRES and University public outreach and education efforts. The Center's focus on developing useful information necessitates an active program of outreach.

- Strategic Plan Goal - Ask "What's best for students?"

The Center's focus on "problems" and "decisions" will enhance the University's capabilities to offer critical thinking courses and, more specifically, to teach students how it is that scientific and technological advancements are related to real-world issues faced by society every day. The Center will contribute to the training of the next generation of practitioners and scholars at the interface of science and society.

- Strategic Plan Goal - Increase Support for Teaching, Research, and Creative Work
CU 2010 Goal - University without Walls

The Center's work is multidisciplinary. It will continue to use innovations in technology such as the Internet to improve its research, teaching, and outreach efforts. The Center will work with many departments on campus and in the broader University system, as well as with partners at other institutions to facilitate and enhance research and teaching.

- Strategic Plan Goal - Foster a Supportive Campus Community

The Center's program of research will require bringing together scholars from disparate disciplines to address issues that lie at the interface of many areas of expertise. The Center will work actively to foster an open environment for scholarship and outreach that respects the importance of diversity of participation and civility of interaction.

- Strategic Plan Goal - Develop a Campus-Wide Program in Technology, Learning and Society
CU 2010 Goal - University without Walls

The Center's focus positions it well to contribute direction to the University's goal of being a leader in developing the workforce of the 21st century.

3. Institutional Capability for Implementing the Unit

CIRES currently houses five existing centers. Consequently, the institutional capability exists at CIRES for overseeing and implementing centers. This capability includes administrative infrastructure (including financial management), office space, and computational resources.

4. Administrative Structure

The Center will be led by a Director, with the assistance of a Managing Director. The Center Director will be selected by the CIRES Director after consultation with the External Advisory Board of the Center. The Center Director shall be a member of the faculty of the University of Colorado. The Managing Director will be selected by the Center Director. The Center Director is formally responsible for providing overall direction for research, teaching, and outreach, and for reporting on Center activities as requested. The CIRES Chief Financial Officer is responsible for oversight of all CIRES' budgetary matters. The Center's Managing Director is responsible for management of the Center's budget. The Center will encourage participation by faculty and professionals from all University of Colorado campuses, other higher educational institutions, government agencies, and the private sector.

5. By-Laws

See attached.

6. Resource Implications

The Center will support its activities through two routes: (1) Center staff will seek to develop a lasting endowment in support of the Center's core operating expenses, described in more detail in the Center's Development Plan; and (2) the Center will secure funding for specific research projects through traditional agency, foundation, and other competitions.

A Center goal is to become self-funded. Unless determined through other agreements, creation of the Center will involve no additional commitments from either the University or NOAA beyond those associated with the CIRES MOU and obligations presently in place. Because CIRES is assuming responsibility for the Center's infrastructure needs, impacts on the University should be minimal.

A five-year financial plan is appended. All expenditures are contingent on the continued funding by NOAA of the Cooperative Agreement that underwrites CIRES and has been in place for 30 years. All Center personnel funded through the Cooperative Agreement are temporary and their appointments are contingent on funding availability.

BY LAWS

CENTER FOR SCIENCE AND TECHNOLOGY POLICY RESEARCH COOPERATIVE INSTITUTE FOR RESEARCH IN ENVIRONMENTAL SCIENCES UNIVERSITY OF COLORADO AT BOULDER

August 2002

Motto: "Science Serving Society"

Mission Statement: The mission of the Center for Science and Technology Policy Research is research, education, and outreach at the interface of science, technology, and decision making.

1. Purpose

The Center for Science and Technology Policy Research (the Center) is established within the Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado-Boulder, to focus on research, education, and outreach at the interface of science, technology, and the needs of decision makers in public and private settings. The Center's research will be highly integrated with the ongoing activities of CIRES, the National Oceanic and Atmospheric Administration, the University, and the broader science and technology community.

2. Elaboration of Purpose

The Center strives to be a national and international leader in research, teaching, and outreach in the areas of science policy, technology policy, and technology assessment. Each of these areas is described below:

- **Science policy.** The traditional scholarly interest in science policy has for many years been captured by the phrases "science for policy" and "policy for science." The Center will explore how scientific information is linked to decision making and will also examine governance of the scientific enterprise with topics that range from broad federal government resource allocation issues to the practice of peer review.
- **Technology policy.** Technology policy refers to the interrelationship of government, academia, and the private sector, and their shared goal of enhancing economic vitality through the transfer of knowledge to useful products and processes. Technology policy research seeks to understand these relationships and to develop, evaluate, and critique them.
- **Technology assessment.** Technology assessment seeks to integrate knowledge of technological systems with their broader social and policy context as a contribution to the governance of science and technology. Decisions about how to allocate finite (and frequently scarce) resources can be made more effectively when decision

makers consider integrated understandings of technology in society.

3. Participation/Membership

- a. Staff includes individuals who are supported primarily or exclusively through Center funds.
- b. Affiliates are individuals conducting joint research with Center staff but whose primary support is from outside the Center. They are appointed by the Center Director for renewable 2-year terms. Affiliates may be nominated for appointment by self, by a member of the Executive Committee, or by a member of the External Advisory Board. An initial affiliate appointment or its renewal requires advice and consent of the Executive Committee. Center Affiliate appointments can take several forms:
 - i. University of Colorado Faculty Affiliates are members of the faculty of the University of Colorado who through research, education, or outreach have expressed interest in collaborating with Center personnel in support of the Center's mission.
 - ii. Faculty Affiliates from outside the University of Colorado are members of the faculty of a university or college other than the University of Colorado who through research, education, or outreach have expressed interest in collaborating with Center personnel in support of the Center's mission.
 - iii. CIRES/University of Colorado Research Affiliates are non-faculty employees of CIRES or the University of Colorado who through research, education, or outreach have expressed interest in collaborating with Center personnel in support of the Center's mission.
 - iv. Non-CIRES/University of Colorado Research Affiliates are from institutions other than CIRES or the University of Colorado who through research, education, or outreach have expressed interest in collaborating with Center personnel in support of the Center's mission.
- c. Visiting Scholars are scholars affiliated with other institutions who, for the period of their visit, are appointed by the Center Director to visiting positions in residence within the Center.
- d. Students are enrolled in degree programs at an institution of higher education and may receive support from Center awards.

Unless otherwise specified, the rights, privileges, and responsibilities of Center staff, affiliates, visiting scholars, and students are governed by the administrative policies and procedures of the University of Colorado.

4. Governance

The Center is led by the Director with the assistance of the Managing Director. The Center Director is responsible for management of Center research and related activities, Center personnel, and reporting on Center activities. He or she is advised in this capacity by:

- i) an internal Executive Committee of the Center. The internal Executive Committee shall consist of no less than three Center staff as defined in 3(a), which shall include the Center Director. Executive Committee members other than the Center Director shall be appointed by the Center Director. In addition, the CIRES Director shall serve on the internal Executive Committee in ex officio status. The Executive Committee shall meet at regular intervals (usually bi-monthly during the academic year) to attend to the administrative matters of the Center.
- ii) an External Advisory Board which shall consist of the CIRES Director and no more than three others who shall be selected by the Executive Committee and approved by the CIRES Director, and who shall serve two-year terms. The External Advisory Committee shall meet at least once each calendar year.

During travel by the Center Director or upon delegation, the Managing Director shall assume the Center Director's responsibilities.

The CIRES Chief Financial Officer is responsible for oversight of all CIRES' budgetary matters. The Center's Managing Director is responsible for management of the Center's budget.

5. Selection and Appointment of Director and Managing Director

The CIRES Director shall select the initial Center Director and, after consultation with the External Advisory Board, successor Center Directors. The Center Director shall be a member of the faculty of the University of Colorado.

The Center Director shall select the Managing Director.

6. Amendments

The CIRES Director gives final approval to recommendations for amendments to these by-laws that are based on a majority vote of the Executive Committee.

GRANT ACTIVITY

Current and Submitted Grants: 2002-2003

Funding Agency	Title
CIRES	Use of Multi-model super-ensemble techniques in hydrology
DOE	Investigation of the Spatial and Temporal Variations of the Seasonally Frozen Ground in the Contingent United States
NASA	Development of Improved Hydrologic Forecasting Capabilities Using Space-based Observations
NASA, USGS, Others	New Directions
National Science Foundation	Collaborative Research: Hydro-Climatology of the Major Eurasian Arctic Drainages
National Science Foundation	Collaborative Research: A land surface model hind-cast for the terrestrial Arctic drainage system
National Science Foundation	CONTEXT
National Science Foundation	Flatirons Outdoor Classroom Summer Workshop
National Science Foundation	New Directions
National Science Foundation	Our Science and Their Science- Conflicting Agendas and Disputed Theories Concerning Amazonia
National Science Foundation	REU Site: Climate Modeling and Societal Impacts: Scientific, Political, and Philosophic Themes
National Science Foundation	Science Policy Assessment and Research on Climate for Decision Making Under Uncertainty
NOAA	Development of Operational Hydrologic Forecasting Capabilities
NOAA	One-Way and Two-Way Coupling of Atmospheric and Hydrologic Models
NOAA	Understanding and Enhancing the Linkages Between Decision-Making and Carbon Cycle Research
NOAA	Western Water Assessment
NOAA	Understanding the Spatio-Temporal variability of the North American Monsoon: Implications to Water Resources Management in the South Western U.S.
U.S. Weather Research Program	Atmospheric Sciences and Policy Education Network (ASPEN) Program



CENTER FOR SCIENCE AND TECHNOLOGY POLICY RESEARCH

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