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Testimony Regarding the FY 2010 Budget Request
Submitted 27 March 2009

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Subcommittee on Commerce, Justice, Science and Related Agencies
Committee on Appropriations, U.S. House of Representatives

I submit this testimony for the record of the U.S. House of Representatives Committee on Appropriations, Subcommittee on Commerce, Justice, Science and Related Agencies. My name is Jack Fellows and I am Vice President at the University Corporation for Atmospheric Research (UCAR). UCAR is a non-profit consortium of 73 North American research universities that manages and operates the National Center for Atmospheric Research (NCAR) and additional programs that support and extend the country's scientific research and education capabilities.

Chairman Mollohan, Ranking Member Wolf, and Members of the Subcommittee, I thank you for the opportunity to appear before you today. **On behalf of the atmospheric sciences community represented by UCAR, I would like to urge you to support in the FY 2010 appropriations bill, an appropriate amount for:**

- **the Office and Science and Technology Policy to restore its ability to lead the interagency effort to develop and implement sound science and technology programs, policies, and budgets;**
- **the President's request of $7 billion for the National Science Foundation;**
- **appropriate funding to accomplish the overall National Aeronautics and Space Administration mission, with an increase of at least $200 million for the critical tasks confronting the Earth Science program; and**
- **$5 billion for the National Oceanic and Atmospheric Administration.**

Also on behalf of the community, I want to thank the Committee for recognizing with the American Recovery and Reinvestment Act and the FY 2009 Omnibus Appropriations Bill the critical role that science must play in restoring this country's economic strength and world leadership.

For the past several years, funding for critical science agencies has been essentially flat. Scientists have been laid off, programs cancelled, infrastructure weakened, and our status as the world's leader threatened in some areas of science. Scientific research drives innovation around the world. For every research dollar invested by the citizens of this country, the return in knowledge, technology, innovative products, and tools that help solve societal problems is substantial. Many studies on the rate of return of research investments show that the average of this return is over 15 percent. Increased investment in scientific research and technology development will contribute tremendously to pulling this country out of the recession and, as the President says in his Budget Request, laying "a new foundation of growth upon which we can renew the promise of America." It will also help offset the worrisome shift in the epicenter of world science and technology activities toward several rapidly growing Asian economies, led by

China's emergence. To build that new foundation, and to renew the national promise for our children and generations to come, science, technology development, and education budgets must continue to grow. The FY 2010 appropriations provide a next step in the grand opportunity we have before us.

While I have stated that science budgets must grow, it is essential that growth happen in a responsible and efficient manner that contributes to solving problems and building a better future without bankrupting it. This is a fine line to walk in these difficult times. The environmental and societal problems to be addressed through science have never been more urgent or worrisome – and it would be easy to just throw money at these challenges, but we must be strategic. The atmospheric sciences, in particular, can play a critically important role in:

- developing strategies to mitigate damaging effects of climate change,
- providing the underlying knowledge upon which all communities can base climate change adaptation strategies,
- providing the understanding upon which to base an effective national climate and energy strategy,
- predicting climate change at the regional level and changes in severe weather (including weather that exacerbates wildland fires and catastrophic flooding),
- predicting the effects of solar storms on global communications,
- contributing information relevant to the nation's homeland security and defense,
- training the next generation of environmental leaders and stewards, and
- helping to build a new green economy.

The weather and climate enterprise has worked hard to identify its strategic role in this effort, including developing a "Community Document" that outlines what it will take to make our nation more resilient to severe weather and climate change. This document makes specific program, budget, and management recommendations for this task and can be found at: http://www.ucar.edu/td/. These are daunting task require major resources and talent to implement. Through the country's funding mechanisms, Congress and the Administration have the power to drive organizational changes that could revolutionize the way we approach and fund science and the supporting infrastructure, thereby benefitting the nation by making achievable and affordable all of the goals listed above. Allow me to explain in the following specific comments.

Office of Science and Technology Policy (OSTP). Collaboration and coordination among U.S. scientific agencies to address the major, expensive challenges confronting us is critical, yet the role of the very office that could have a positive effect (OSTP) was weakened seriously during the last administration. Dr. John Holdren, the new OSTP director, is capable of providing the strong scientific leadership that this country needs. By giving him guidance, resources, and the mandate needed to be effective, the Committee will enable him to make changes that could control costs, target the most critical science, and motivate agency leadership to collaborate rather than compete.

A current problem that needs to be addressed is the response to the federal law requiring the President to develop a coordinated, national policy on global climate change. A recent National Research Council (NRC) evaluation of the U.S. Climate Change Science Program (CCSP –

formerly the U.S. Global Change Research Program [USGCRP]) concluded that, while our ability to predict climate change has improved, our understanding of the impacts on society is "relatively immature." (See the NRC report, *Understanding and Responding to Climate Change 2008 Edition*.) This lack of knowledge about regional and local effects of climate change will have serious consequences for the nation if not fixed soon through a coordinated effort in which all relevant agencies play a part. Given appropriate resources and direction, OSTP could coordinate that effort and reinvigorate the CCSP/USGCRP Program.

A second, related example involves the Earth and solar observations upon which we build all knowledge of the systems that support and enable life on this planet. There has been an erosion of key observational programs in this country at the precise time when policy makers need them the most. Cost overruns have contributed to the problem. The 2007 NRC report, *Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond*, outlines national priorities and timing for missions that would extend observations of this planet and inform the science and policies that will affect our lives for centuries to come.

To fund these missions will be expensive, so we need to be smart about it and good stewards of our resources. I applaud the Committee's FY 2009 guidance to OSTP to work with NASA and NOAA to develop a plan to encourage commercial, low-cost solutions and for OSTP to coordinate the research and development for a next-generation of ground-based radar. I'd recommend that you go farther with this guidance in the FY2010 bill, in particular, asking OSTP to create an integrated national strategy for both ground-based and space-based observing systems for our research, education, and policy needs. It is quite likely that you would build satellites differently if they were integrated with ground-based systems. Also, these don't all have to be large, expensive missions. There is tremendous wisdom in having a subset of these missions be done on small satellites, and there are groups that have impressive histories of delivering complex small-satellite missions on schedule and within budget. We must have these observations! Our lives depend on them, but we also need to do this in way that cost matters. We can't continue to tolerate enormous cost overruns that devastate other critical services to our citizens. I'd also recommend that you direct OSTP to examine how OMB and OSTP partnered together to coordinate these activities through the USGCRP in the 1980s and 1990s and apply these best practices again. The Community Document mentioned earlier can provide you guidance on this.

National Science Foundation (NSF). NSF provides approximately 20 percent of the nation's basic research funding and infrastructure through extremely effective competitive processes that ensure that grants are awarded to the best proposals. Stimulus funds gave NSF much needed capacity, and the Administration's goal to double NSF funding over 10 years must be met, at a minimum.

In this most critical moment for the health of our planet and the future of life as we know it, the geosciences contribute knowledge that is absolutely necessary to understanding climate, weather, the dynamics of water resources, solar effects on Earth, the interactions of Earth's systems`, energy resources, geologic hazards, and all aspects of the global oceans. It is estimated that the component of the U.S. economy exposed to risks associated with weather and climate variability alone reaches $3 trillion annually. The America COMPETES Act of 2002 authorized the

doubling of funding for the physical sciences, but inexplicably did not include the geosciences in its definition. For the health of the planet, I urge the Committee to pay special attention to funding for NSF's Geosciences Directorate (GEO).

Within the FY 2009 funding for NSF, the Committee provided $10 million to develop a climate change education program plan. A similar emphasis is mentioned in the President's Request for FY 2010. The country need not reinvent the wheel here, but should leverage existing programs and infrastructure. For example, programs such as GLOBE (www.globe.gov) is planning a climate campaign involving over a million K-12 students and teachers around the world next year; the National Science Digital Program (www.nsdl.org); and Unidata (www.unidata.ucar.edu) are just a few examples of existing education programs and resources that could address this issue and have long and successful track records.

National Aeronautics and Space Administration (NASA) Science. NASA's Science program plays a central role in understanding our planet and the behavior of the Sun. Yet despite increasing policy-driven demand for information and analysis the funding in this area is not keeping up with needed support for observing systems and research, and, in fact, funding for this account declined from FY 2008 to FY 2009. NASA's overall role in this country's scientific endeavor is so strategic and central to our well being that the Science account should be one of this nation's highest priorities. ***I urge the Members to increase the NASA Science funding level to at least $4.703 billion, $200 million above the FY 2009 final appropriation.***

I appreciate the Committee's focus on Earth Science in the FY 2009 budget, particularly in the context of the cuts that other areas have received in this account. With climate change accelerating more rapidly than expected, there are few NASA responsibilities more important than monitoring the Earth's environment. The President's Request highlights "space-based research that supports the Administration's commitment to deploy a global climate change research and monitoring system," and mentions using the NRC recommended priorities as a guide in the development of new space-based research sensors. As mentioned above, cost increases will make on-time implementation of these recommendations difficult, but falling behind schedule increases the risk of losing continuity in important observational data, which presents serious calibration issues even if new sensors are eventually launched. These data and the accompanying research programs are critical to the health of our economy, to the health of the Earth, and to our national security. ***I urge Committee Members to plan for needed future investments to implement the Decadal Survey recommendations and to encourage innovative approaches (as mentioned under the OSTP section) that will enable us to sustain observations of our own planet and the Sun.***

National Oceanic and Atmospheric Administration (NOAA). In the FY 2009 budget for NOAA, the Committee stated that the agency does not provide enough extramural research funding and encouraged NOAA to provide additional support in future budget requests. I urge the Committee to follow up on this requirement in the FY 2010 funding bill. Inadequate budgets for NOAA's multifaceted mission have always resulted in too little extramural funding, too little leveraging of research funded by other agencies, and sub-optimal relations with the scientific community.

In FY 2009 funding bill language the Committee also urged NOAA "to make atmospheric sciences a priority within the resources made available in the bill and to request additional resources in subsequent years to advance this research." NOAA should take full advantage of partnerships with the climate research community to make significant progress in this area. Much to its credit, the agency has announced that it would like to take the lead in establishing a national climate service. While the concept of such a service is not fully developed, if implemented correctly, it would support education, training, research, and communications efforts to use data, computer models, and application tools for the maximum benefit of society as the nation and state and local governments struggle to deal with a changing climate. A national climate service will require resources and extremely strong leadership to pull together all contributing agencies and to reach stakeholders efficiently and effectively. This is yet another example of where leadership from OSTP and OMB will be critical. It will be very challenging for NOAA to establish a national climate service on its own that involves over 15 agencies. The health of our environment and our quality of life depend on the success of a national climate service. Through funding, the Committee can provide tremendous help in establishing this service, but the Committee can also provide strong guidance to OSTP to explore a range of options for the service

NOAA has the potential to make much greater contributions, especially through activities such as a new climate service. With the new Administration, NOAA has excellent leadership at the top and a tremendous opportunity to enhance its operations and services by better partnering with the research community and private sector to meet its mission. Perhaps it is also time to consider organic legislation for NOAA, since it has operated for decades through confusing guidance set forth in hundreds of bills. While my recommendation of $5.0 billion is not sufficient to meet all of NOAA's current obligations well, it would at least begin to alleviate the pressures that have built up over many years and set a more realistic base on which to organize and mobilize this agency to meet current and future obligations that are of great importance to the health of this nation.

Conclusion. As President Obama has said, this country has a once-in-a-lifetime opportunity to chart a new path. With regard to the science community, that path should include certain paradigm shifts to deal with the challenges that threaten our way of life. I have attempted to outline how the Committee can help us achieve those shifts for the good of our citizens and the world. We must not waste this moment.

I sincerely thank the members of the Committee for your stewardship of the nation's scientific enterprise and your understanding that the future strength of the nation depends on the investments we make in science and technology today. I am pleased to answer any questions.