

## **An American Looks at the ERA with Admiration**

by

Norman P. Neureiter

American Association for the Advancement of Science

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As a representative of the American Association for the Advancement of Science (AAAS), it is a great honor to be asked to address this ERA conference. What a wonderful concept the European Research Area is—to try to do now for European science what your statesmen have done in bringing 27 nations together to create the EU itself.

I first came to Europe 54 years ago as a Fulbright Scholar in the Institute for Organic Chemistry at the University of Munich. The city was partly in ruins; the war still much in evidence. The deaths of millions and the destruction of much of Europe—only to have to rebuild it—seemed so pointless and such madness. Over time those thoughts jelled for me into a kind of life's plan. My *métier* was science, but I wanted to use that science to try to mitigate conflict—not inflame it. And I found that international science cooperation can be a most useful instrument to that end. That's why I am so pleased to be here today.

What I want to do is share with you what I see as the present direction of U.S. R&D policies as well as some of the huge challenges facing our Government. Many of these are also global challenges; and I hope these views will be useful as you discuss your ERA programs and perhaps also think about more cooperation with the United States.

I guess many of you have noticed that we have new people in the White House this year. President Obama himself made clear his views on science in a speech in April to our National Academy of Sciences. Listen to these quotes. “Science is more essential for our prosperity, our security, our health, our environment, and our quality of life than it has ever been before... We are restoring science to its rightful place... the days of science taking a back seat to ideology are over”... (we want ) “to ensure that federal policies are based on the best and most unbiased scientific information.”

That is really strong language and it was loudly applauded by an audience that was often frustrated by the previous Administration's policies that seemed either to ignore the scientific facts or obfuscate them with ideology—especially in areas like climate change and environmental protection. The President also moved quickly to appoint leading scientists, including two Nobel Prize winners, to very senior positions in the Government as well as to his Council of S&T Advisors. They are already on board and working very hard.

The traumatic 9/11 attack on New York in 2001 profoundly changed America. It began the Government's preoccupation with the War on Terror and brought us: wars in Afghanistan and Iraq which are still far from over; the creation of the large new government Department of Homeland Security; a major reorganization of the intelligence community; and new visa procedures that have affected scientists wanting to come to the U.S. from abroad for education, for conferences, for scientific exchanges, and even for training of technical personnel of U.S. companies operating overseas. The British called our visa program America's greatest gift to British science, believing that they now get many of the best researchers who used to come to the U.S. Furthermore, the large increases in R&D budgets during the Bush Administration were heavily concentrated in the areas of defense (primarily in development of new weapon systems) and homeland security. The total for defense R&D peaked in 2008 at \$86B and was approaching 60% of all federal R&D expenditures. Some of those programs are now being cut, but it is not easy since Congress does not always agree, especially when jobs are involved.

But there is a point to be made. Even though the drumbeat in America about the War on Terror is now softer, there are still very serious concerns in our Government about terrorism, particularly with a nuclear weapon, a biological agent, or a cyber attack on some element of critical infrastructure such as the electricity grid. Unfortunately these dangers are real and Europe is not immune. Science and technology can readily be misused. But that is all I will say today about security.

But let's look at the current U.S. scientific priorities and trends? In his Academy speech, the President laid out a rich menu of objectives. He wants to eventually get the total investment in R&D—that's both public and private sectors together--above 3% of GDP. The present U.S. number is 2.68%. Of

course, we hope that the increase will come from raising the numerator--not lowering the GNP, which seemed possible a short time ago.

Even though fiscal year 2010 began three weeks ago for the U.S. Government, the science funding bills for 2010 are still being debated in the Congress. However, the trends are pretty clear. And 2010 also benefits from this year's economic stimulus package, which was spread over two years to get the economy moving again after the financial collapse.

That stimulus package provided huge increases for the basic research agencies: NIH, NSF, NIST and the Office of Science in DOE, and more is expected in future years. The goal is to double the budgets for the physical science agencies (not NIH) from their 2006 base by 2016. The average success rate on proposals at NSF was 25% in 2008, up from 23% two years before. At NIH it was 22% in 2008 and is projected at only 20% for 2009 and 2010. These numbers are too low; there is a general consensus that about 30% is acceptable.

The broad focus areas in the 2010 budget request are education, healthcare and energy, and that is not just for R&D. The President also sees global warming as a serious threat and has set an aggressive goal for reduction of carbon emissions—down 80% by 2050. So energy efficiency and renewable energy are top priorities. Great progress in biomedical research is expected from continually applying the advances in the physical sciences to the life sciences and the curing of disease. Cancer will be a major target, and also autism. There is a plan to triple the number of NSF graduate fellowships in order to increase the number of young Americans wanting to be scientists and engineers. There will be major efforts to improve science and math education in elementary and high schools as well as to increase the number of qualified science and math teachers. NIH will receive homeland security R&D funding to develop vaccines against bioattacks—a continuation of the so-named Bioshield program. The reform of electronic health record systems will also be a key effort. And the President is asking his Council of S&T Advisors to work on national strategies to nurture and sustain a culture of scientific innovation. Very simply, at the policy level science and technology are riding high in this Administration--although there is concern about 2011 when the stimulus money is gone and budgets are expected to remain tight.

That is because the U.S. has some big problems. Unemployment is approaching 10% nationwide, and the state of the economy is still considered fragile. The total federal budget for 2010 is \$3.6 trillion and the deficit in that is \$1.3 trillion. That means a weakening dollar and I certainly know about that from being here in Brussels. The Congress has become highly polarized on almost every issue, making compromise difficult and progress slow. For instance, on the critical energy and climate bill, it is not at all clear what the U.S. will be able to bring to Copenhagen in December. And the contentious health care reform legislation is far from finished.

On the foreign policy side there are lots of issues. Iraq is still there. Afghanistan and Pakistan seem to be getting worse. There are the nuclear challenges of Iran and North Korea—and all of these issues can place unexpected demands on budgets and increase tensions in the Congress as we move into 2010. Midterm Congressional elections take place in the fall of 2010 and by then the voters will be looking for some clear successes from the Obama policies or Democratic control of Congress could be threatened.

One major issue for decision in the coming months is the future of America's nuclear weapons. The key review process is now underway and will define the nuclear policy for this Administration. The result will influence the size of the nuclear stockpile, the deployment strategy, and plans for maintenance and security of all U.S. nuclear weapon assets. It will also be a key indicator of what steps the U.S. believes are possible to take toward the long-term goal of a zero nuclear weapons world and the vision that President Obama laid out in his Prague speech. It is certain to be hotly debated in the Congress.

Another issue requiring near-term attention is the NASA space program. The space station will be OK, and good science programs will continue. However, a recent report concluded that present funding is not adequate to sustain the existing plan for returning to the Moon and follow-on Mars exploration. The challenge will be to define a purposeful and effective manned space program and also to find the money to pay for it. A future role for private space entrepreneurs in providing space transportation has also been suggested.

A very serious issue in the U.S. research community is that, perhaps for the first time, our great public research universities are concerned about their competitiveness in the global competition for the best students and professors. Other countries seem to have concluded that U.S. scientific

leadership derives from the excellence of our universities and that model is being copied, with well-funded institutions arising in many places. At the same time, with state budgets in the U.S. declining from lower tax revenues and federal research grants not fully covering total overhead expenses, the universities are hurting. A National Academy study on the future of U.S. research universities is just now getting underway.

A related issue is the reverse brain drain of foreign scientists and engineers. After earning advanced degrees in the U.S. and working for a number of years, many of these professionals are returning home. China has been actively recruiting their expatriates with offers of first-rate laboratories, competitive salaries and attractive living conditions. Many Indians have left to apply their U.S.-acquired management and entrepreneurial skills in India's booming economy. So between the loss of talent through our visa policies and the increased opportunities for scientists abroad, the long post-war paradigm of U.S. dependence on immigrant scientists may be changing. We must get more Americans to choose careers in science and technology. And I also think it makes international S&T cooperation an even greater imperative.

Just a word about industrial R&D which accounts for about 2/3 of total U.S. R&D spending. Companies today do little or no basic research. There has emerged an understanding that the government will be the principal source of funding for basic research and the creation of scientific knowledge—much of it done at universities where teaching and research go hand in hand. Companies draw on both the research and the graduates that emerge from the universities and invest their corporate funds in applied R&D to develop the innovative products they hope will succeed in the marketplace. Another very important driver of innovation in the U.S. is entrepreneurship, fueled by venture capital, so-called angel monies, and the U.S. Government's funds for small business innovation research programs (SBIR).

In corporations today there also appears to be a clear trend toward an open innovation system. That means more networking, more partnerships, more alliances, more ties of industry to universities—looking for new ideas, not just nationally but on a global basis. That's also why U.S. research universities have patent and licensing offices, hoping to profit from their professors' inventions. The drive for innovation is universal; every country wants to innovate. But the process is not trivial. Berkeley Professor Henry Chesbrough begins his book, "Open Innovation," with the line: "Most

innovations fail. And companies that don't innovate die." It is a highly competitive world.

Let me end with a word about international S&T cooperation. At AAAS, we are trying to use science cooperation as a constructive instrument of international engagement with countries where political relations may be poor or non-existent. We call this science diplomacy and we believe it can help to build better overall relations. Present candidate countries for us are Iran, Syria, Cuba, Myanmar (or Burma) and North Korea—roughly in order of decreasing success to date.

One of the difficulties of doing science diplomacy in the U.S. is that there is no federal technical agency that has a clear mandate to support science cooperation simply to build better relations. So we have had to go to private foundations for support.

The great thing about the Framework Program and the ERA is that you have set aside money specifically for international cooperation. And your inclusion of non-EU countries in projects is very forward looking, since we all face identical problems and good ideas can come from anywhere. I see the Framework Program as one giant agent of science diplomacy; and it is a splendid concept—though it would be easier for us foreigners if you could somewhat reduce the paperwork.

Nonetheless I am very proud to announce that, for the first time, AAAS is involved in two cooperative projects under the Seventh Framework. They were jointly developed with the Austrian Research Promotion Agency and also involve Italy, Hungary, and Luxemburg. The official kickoff ceremony is tomorrow morning at the Austrian Mission.

Since I well remember the dismal outlook for science in Austria on my first visit in 1965, I take great satisfaction in seeing Austria's vigorous S&T community today with full involvement in the Framework Program.

And there is a personal reason for that. My father was born in Vienna. My grandfather was ennobled by the last Emperor of Austria for his role in creating what today is the Vienna University of Economics and Business. And my wife has an Irish passport since her father came from Ireland. That's why I feel so much at home in this ERA meeting here today. Thanks very much for listening.

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