Our Shared Responsibility for the Future and Health of Materials Research Globally (Part I)

With the Help of Our Friends

"… it is difficult for scientists, on their own, to make a credible and compelling case for science funding without engaging the support of champions outside the immediate research community."

News of the tentative 3.3% increase in the total 2006 National Science Foundation budget over the FY2005 budget recommended by the House and Senate appropriations committees on November 9, 2005, was welcomed not only by NSF and those eligible for NSF support, but also by the Materials Research Society, organizations such as the Alliance for Scientific Technology and Research in America (ASTRA), and the Semiconductor Industry Association (SIA). The 3.3% increase amounts to ~\$5.65 billion, which is ~\$50 million more than the administration requested and \$180 million above the 2005 budget. In prior years, the budget would have hardly received such scrutiny, except by those very close to the process. One reaction to this increase might be that it was inevitable, particularly in light of significant funding for research in the life sciences. Moreover, it is tempting to believe that this increase is a step in the right direction toward doubling the NSF budget, as promised—We were due. While it has been a long road since the resolution in 2002 to double the NSF budget, I would caution that this 3.3% increase came largely due to necessary help from supporters not directly connected to research. They include key members of Congress, industrial leaders, and organizations such as ASTRA and SIA. We owe them heartfelt thanks. In this, my first letter as MRS President, I will highlight concerns associated with long-term science funding in the United States, particularly with regard to materials research, and the responsibility we share as a community toward developing a long-term strategy to manage and to influence this process. This letter will be the first of a three-part series; it provides a context for two subsequent letters devoted to associated challenges and opportunities from the international context and the role MRS, with its 35% international membership, plays as it carries out its mission of the advancement and dissemination of interdisciplinary materials research.

The evidence thus far is it is difficult for scientists, on their own, to make a credible and compelling case for science funding without engaging the support of champions outside the immediate research community. It became painfully obvious to those of us who visited Congress in May 2005 that some of the difficulties the physical sciences face in the United States with funding are associated with the fact that our community has essentially failed to make a strong and compelling case for science funding. Many congressional staffers did not view funding for scientific research as a priority, particularly in light of other pressing issues that confront the country. Problems with research funding for the physical sciences are compounded by the increasing pressure to justify, to prioritize, and to reduce spending; current administration plans are to reduce domestic spending by 1% for 2006. The letter, last May, by Republican Representative Frank Wolf of Virginia to the president made a strong case for an increase in funding for research in the physical sciences. The letter, which received broad bipartisan support, carefully outlined the cost to the United States in terms of the economy, education, investment in the future, and the decline in the U.S. competitive edge due to the erosion of science funding. A more recent study from the National Academies, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, prepared by a committee chaired by Norman Augustine, former CEO of Lockheed Martin, and including Intel chair Craig Barrett and other industrial leaders and three Nobel Laureates, discussed related concerns and identified areas where the government needed to ensure the United States' economic leadership and its ability to compete in the 21st century. There is now a new effort to get back on track to doubling the NSF budget. Specifically, this would be accomplished by new legislation, the National Innovation Act of 2005, recently introduced by a bipartisan group of senators. Doubling would occur by 2011.

It might appear, with this support to ensure science funding, that we are back to "business as usual." Unfortunately, improving the long-term funding situation for science will require considerable attention and intervention. First, Congress would have to act accordingly for the goals of the National Innovation Act of 2005 to be reached. Recall that after the 2002 call for doubling the budget, Congress cut the NSF budget last year. The Department of Energy's Office of Science has a budget of approximately \$3.5 billion, and most of this money is earmarked for big projects. The Energy and Water Appropriations bill (H.R. 2419), recently signed into law, reduces the funding levels for the Office of Science. After subtracting earmarks, a 0.5% reduction over 2005 levels is expected. Within the Office of Science, Basic Energy Sciences expects a rescission of about 2% before the end of the year. Clearly, DOE, like NSF, has limited resources for science-driven research. In contrast, mission-driven organizations such as the National Aeronautics and Space Administration and the National Institutes of Health have significant budgets, \$28 billion and \$16 billion, respectively. The physical sciences face important challenges ahead.

Limited science funding confronts us at a time when the field of materials is undergoing a more rapidly evolving transition than at any point in history. Self-assembly and various biologically inspired routes for materials synthesis as well as new chemical routes for the synthesis of materials (functional polymers and ceramics) have had a significant impact on the field. The ability to control composition and structure at various length scales, from nano to macro, has led to a new generation of nanostructured materials, such as polymer-based and ceramic nanocomposites, hybrid organic–inorganic materials, and biomolecular materials. These materials exhibit properties that exceed the limits of what we are able to understand or to predict, largely because they are often the result of complex collective phenomena. In addition to challenging scientific questions, new materials provide opportunities to address global technological problems, from energy and healthcare to the environment. One indicator of the excitement in the field is often reflected in the number and scope of proposals that go to NSF. The number of proposals to the NSF Division of Materials Research (DMR), as of the target date in late 2005, was ~50% larger than the previous year. In fact, the number of submissions is at an all-time high.

In conclusion, we are in the midst of the most exciting time in the history of the field while trying to manage short- and long-term funding shortfalls. Clearly, we have the added burden to develop a coherent and constructive strategy to address the funding concerns and, equally important, to manage our limited resources. We can all agree that writing multiple proposals to agencies with limited resources, resulting in a low yield and high personal stress, is not a good strategy. We have a shared responsibility for the future and health of materials research and its impact on global societal problems.

Peter F. Green
2006 MRS President