MRSEC Report Calls for More Funding

Downward funding trends are threatening the competitiveness of the National Science Foundation's Materials Research Science and Engineering Centers (MRSECs). Since its creation in 1994, the MRSEC program has enabled excellent, cutting-edge research. But according to a new report, the program needs to be restructured to remain effective in a changing budget and research landscape.

Since 1994, the requirements for MRSEC-funded projects have grown, but average funding for centers has declined by up to 10% in inflation-adjusted dollars. The cost of supporting graduate students has risen dramatically over the last 10 years, while the MRSEC mean grant size has not. MRSEC funding for maintaining and building instrumentation required for frontier research has not kept pace either.

"The MRSEC program produces excellent materials science, especially in catalyzing the conception of new research programs," said Matthew Tirrell, chair of the MRSEC Impact Assessment Committee which authored the report. But he continued, "There has been a growth of responsibilities attached to MRSECs, without a parallel growth of funding, to the point that, MRSECs cannot stretch their budgets to meet all of their new responsibilities well."

Continued funding declines will have serious consequences. "Another decade of similar decreases will undermine the ability of the MRSEC program to make future valuable contributions," the committee wrote in the report.

The report presents the results of a study conducted by the National Research Council at NSF's request. NSF asked for an assessment of the MRSEC program's performance and impact, and for recommendations on what its role should be in the future. Data was gathered through MRSEC site visits, telephone interviews, questionnaires, and studies of publications and citations.

"It's clear from the report that the MRSEC program has important impacts on materials research and education, experimental facilities, public outreach, industrial collaboration, and technology transfer," said Lance Haworth, Acting Director of the Division of Materials Research for the National Science Foundation (NSF). "It's also clear that the resources provided by NSF must keep pace with the performance and achievements expected from individual MRSECs."

The report suggests that the MRSEC program might better facilitate advances in research by focusing on specific objectives and allowing individual centers to capitalize on their strengths. They suggest creating a two-tiered funding program under the NSF Division of Materials Research (DMR).

One funding mechanism, the Materials Centers of Excellence (MCEs), would support groups of interdisciplinary researchers, education and outreach activities, industry relations, and state-of-the-art facilities.

The second mechanism, Materials Research Groups, would support interdisciplinary groups engaged in research only. These groups would not have separately mandated education and industrial activities or facilities responsibilities. The value-added activities would be centralized at the MCEs.

Advances in materials research often result from small research collaborations, and the committee said that the MRSEC program needs to invest in these groups to stay on the cutting edge of research. They said that a two-tiered program like this would enable the program to concentrate on key topics and still support a large spectrum of activities.

Another key to making the program more effective, cites the report, is cooperation among MRSECs. The report notes that the centers operate more like discrete sites than a national network that takes advantage of the tools and talents distributed throughout the program.

NSF is currently working with MRSEC directors to encourage greater levels of cooperation, said Haworth, and they have seen promising results. In addition, he said, NSF is carefully considering the other recommendations in the report, such as restructuring the funding mechanism.

Examining the structure and effectiveness of the MRSEC program is a long-term challenge, Haworth said. "In the meantime we will continue to work with the materials community to ensure that proper balance is maintained across the spectrum of the Department of Materials Research support for the national materials research and education enterprise." This includes awards for individuals, groups, centers, institutes and partnerships, user facilities, and instrumentation.

NSF started the MRSEC program as a way to support multidisciplinary research focused on materials. Many exciting discoveries occur at the boundaries between traditional fields, and the MRSEC program aims to increase the likelihood of such discoveries.

The program was designed to support research, shared facilities, education and outreach, dialogues between the basic and applied research communities, and diversity within the materials-related fields. "It's a critical component of NSF's overall support for materials research, a key to American competitiveness, and a flagship program for DMR," said Haworth.

The report, titled *NSF's MRSEC Program: Looking Back, Moving Forward*, was released in June and can be downloaded from the National Academies website, www.nap.org.

KENDRA RAND

Research for the Future of an Aging Society: Science and Technology Policy in Japan

One of the most remarkable economic stories of the 20th century is Japan's recovery after World War II. The country quickly transformed itself into one of the world's richest and most technologically advanced nations. This was due in no small part to significant government investment in science and technology. Today Japan faces a new set of challenges: its median age is seven years higher and its birth rate is 40% lower than in the United States, while its life expectancy is 82 years, the highest in the world. As Japan ages, government investment in science and technology, including materials science, will have to respond.

The Japanese Ministry of Education, Culture, Sports, Science and Technology has articulated how publicly funded science is meeting this challenge in its 2006 *White Paper on Science and Technology*. Subtitled *Challenges for Building a Future Society—the Role of Science and Technology in an Aging Society with Fewer Children*, the *White Paper* was written shortly after the adoption of Japan's Third Science and Technology Basic Plan, which set the goal of investing 25 trillion yen (US$215 billion) in public funds in science and technology (S&T) from 2006 to 2010—roughly twice the rate of public S&T funding in the United States, normalized to Gross Domestic Product (GDP). While only a small fraction of these funds will go to materials research, materials play a key enabling role in a number of areas. For example, one of the policy goals in the *White Paper* is to more fully utilize the shrinking labor force by allowing alternative work styles. To that end, the government is funding research into IT- and networking-relevant materials, including new display technologies based on molecular self-organization and novel optical materials for photonics and telecommunications applications. Materials research is also enabling advances in both general and geriatric medicine: a number of Japanese researchers are investigating biomaterials such as fibroin, a silk protein that can combat the blood-clotting disease thrombosis, and the Biomaterials Center at the National Institute for Materials Science in collaboration with

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the University of Tokyo is conducting research into biocompatible nanostructured materials for artificial bones, ligaments and organs, and ceramic materials for sustained-release drug delivery. Concern about environmental sustainability is a repeated theme in the White Paper, and research into biomass recycling systems, garbage-to-biodegradable plastics conversion, and recycling of construction materials are all cited as important avenues to reduce the ecological impact of one of the world's most densely populated societies.

The *White Paper* is also explicit about increasing global economic competitiveness, and looks to materials for help in maintaining Japan's manufacturing strength. The Ministry of Economy, Trade and Industry funds a number of materials research programs, including work in advanced titanium alloys, nanomaterials, novel superconducting materials, semiconductors for UV light-emitting devices, nanoscale coatings, and ceramics.

With a clear set of demographic challenges facing it in the 21st century, Japan is turning to science and technology, including materials science, to provide solutions that will maintain its high standard of living and strengthen its aging society.

COLIN MCCORMICK

European Commission Adopts New Guidelines for Coal and Steel Research

The European Commission announced in July its adoption of a proposal for a Council Decision on the revised guidelines for spending funds on coal and steel research. The Research Fund for Coal and Steel (RFCS) has an annual budget of about €60 million for research in these two areas, financed by interest on the assets of the now expired European Coal and Steel Community Treaty. The RFCS program is a separate, complementary program to the Research Framework program and covers all aspects of coal and steel, from production processes to application, looking at the utilization and conversion of resources, safety at work, and environmental protection by improving the use of coal as a clean energy source and reducing CO_2 emissions from coal use and steel production.

"This proposed revision of the technical guidelines looks to further the good results already achieved to date. In our view no major overhaul is needed, but we are keen to make the program as straightforward for its participants as possible," said Janez Potočnik, European Commissioner for Science and Research.

The proposed decision simplifies some administrative procedures, such as increasing financial support by 40–50% for pilot and demonstration projects, and allow dedicated calls on identified priorities that converge with the 7th Research Framework Program and dovetail with the Strategic Research Agendas of the relevant European Technology Platforms.

Proposals can be submitted any time with a cut-off date of September 15 each year. There is no ceiling for the project budget or for the number of participating partners in each project. Third countries may participate, but do not receive European financial support. Projects are evaluated by external experts and selected based on the quality of the research proposed. The monitoring of projects is done according to an annual "peer review" process.

It has also been necessary to make some changes to the rules governing membership of the Advisory Groups and the role of Member States in the Coal and Steel Program Committee, particularly in the light of recent enlargements of the European Union.

This revision is required by the legislative Decision that created the RFCS. In the Commission's view the RFCS has so far worked well and so a major overhaul is not required.

Examples of on-going projects include ULCOS, an ambitious project to find innovative and breakthrough solutions for reducing the steel industry's CO_2 emissions in a post-Kyoto era. Its ultimate objective is to build a pilot plant for producing steel at much reduced CO_2 emission levels, thus promoting the preservation of the ecosystem in relation to steelmaking. The project involves 47 partners across Europe. It has been broken down into two major components, with funding of about €9.6 million from the RFCS and €20 million from the 6th Research Framework Program contributing to an overall project budget of around €50 million.

COMTES 700, a project for Clean Coal Technologies, aims to improve the overall efficiency by 50% of coal fired power plants over and above levels currently possible. Achieving this objective will lead to meaningful progress in sustainable coal usage which is less harmful to the environment. The research consortium is composed of a group of major European power producers and other players in the field of power generation. The total budget amounts to €15.2 million, 57% from power producers, 3% from equipment suppliers, and 40% (€6 million) from the RFCS.

Further information on the RFCS, including information on projects, can be found on http://cordis.europa.eu/coal-steel-rtd/home.html. □

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