## U.S. Rejoins International Fusion Program

In January, U.S. Energy Secretary Spencer Abraham announced that the United States will rejoin the negotiations for the construction and operation of an international magnetic fusion research project known as ITER (International Thermonuclear Experimental Reactor). The project's mission is to demonstrate the scientific and technological feasibility of fusion energy.

The United States established the reactor effort in cooperation with other countries in the late 1980s, but ended its participation in 1998, citing high cost estimates. Canada, the European Union, Japan, and the Russian Federation are the current members of the collaboration and have been negotiating ITER construction and operation since last year. China has recently joined the negotiations, and South Korea has expressed interest as well.

Murray J. Stewart, who is CEO and president of Iter Canada, welcomed Abraham's announcement. Stewart said, "The U.S. was instrumental in the establishment of ITER in 1987. Its scientists have made tremendous strides in the development of fusion technology both as members of the ITER design team in the 1990s as well as in the fusion research projects under way in the United States."

In welcoming the U.S. announcement, European Commissioner for Research Philippe Busquin said, "Pooled with the expertise and resources of Europe and of other international partners, U.S. participation will make a significant contribution to the success of ITER, while further sharing costs."

Abraham announced the decision after receiving three reports, one from a National Academy Review Panel, one from a Fusion Energy Sciences Advisory Committee confirming the role of ITER in achieving fusion power production, and the "Lehman" Review of the ITER project costs and management processes. All three studies, commissioned by the Department of Energy's Office of Science, endorsed U.S. participation.

ITER will use the tokamak concept—a toroidal configuration—to create and maintain the conditions for controlled fusion reactions. In ITER, superconducting magnet coils around a toroidal vessel will confine and control the plasma, and induce an electrical current through it. Fusion reactions will take place when the plasma is hot enough, dense enough, and contained long enough for the atomic nuclei in the plasma to start fusing together. ITER will provide 500 MW of fusion power for 500 s or longer during each individual fusion experiment. The fusion power produced in the ITER plasma will be 10 times greater than the external power added to the plasma.

The construction cost for ITER, including buildings, hardware, installation, and personnel, is estimated to be approximately €4.6 billion ($5 billion) in constant 2002 euros over 10 years, and cost of operation will be around the same amount over a period of 20 years, totaling around €10 billion over 30 years. Since the cost will be shared among all of the parties, who will provide most of the components in kind, the actual construction cost will be a combination of different amounts in different currencies. The United States' share of the construction cost is expected to be about 10% of the total. A total of €750 million, representing the largest share of the European Union's budget of €1.250 billion for the European Atomic Energy Community (Euratom) Framework Programme (2003–2006), will go toward the project.

Busquin's office expects that the Framework Programme will create conditions to launch construction of the ITER facility within the next few years. According to the U.S. Department of Energy, ITER could begin construction in 2006, be operational in 2014, and conduct fusion research for up to 20 years.

Negotiation is underway to determine which country will host ITER. Sites have been proposed in Canada, France, Spain, and Japan.

Robert Aymar, director of ITER since July 2001, has been appointed director general of CERN. He will remain in his position at ITER until the end of June 2003, when his responsibilities will be assumed by Yasuo Shimomura, currently international team co-leader. The ITER Web site can be accessed at www.iter.org.

## U.S. President's FY04 Budget Proposes Moderate Increase in Basic Research

President George W. Bush released his budget request in February for fiscal year 2004 (FY04), designating the Department of Homeland Security (DHS) as a major source of funding for research and development (R&D). According to a statement from the White House, "The fastest growing major category of discretionary spending is homeland security at 5.5% [over 2003 levels]. Defense grows at 4.2%. The total of all other discretionary spending grows at 3.8%." Energy and the environment are listed as important priorities in other discretionary spending.

The president's proposal calls for $1.7 billion over the next five years for the hydrogen-fuel initiative and FreedomCAR programs for hydrogen fuel-cell R&D. The proposal also continues to give priority to the National Nanotechnology Initiative (NNI). According to a preliminary analysis by the American Association for the Advancement of Science (AAAS) of R&D in the FY04 budget, the request for NNI is increased by 9.4% over FY03, with the National Science Foundation (NSF) maintaining its position as the lead contributor in this interagency initiative, with an increase of 11.8% over FY03.

Overall, however, NSF did not fare as well as expected. Last December, the president signed into law an authorization bill calling for a doubling of the NSF budget by 2007 (see the March 2002 issue of *MRS Bulletin*, page 160). This would mean an increase for FY04 in the range of 13.1–15.5%, but the request falls far short of that, at 8.6%. According to the AAAS preliminary analysis, the materials research division in NSF shows an increase from $219 million to $246 million, or a 12.2% difference.

While the total budget request for DHS R&D shows an increase of 31.5% over 2003, there is no increase in funding for basic research, according to the AAAS preliminary analysis. DHS figures are adjusted to include programs to be transferred to the department from other agencies. Furthermore, for funding in basic research, the AAAS preliminary analysis shows a 1.9% increase in the Department of Energy, a 9.7% increase in the National Institute of Standards and Technology, and a decrease of 7.6% in the Department of Defense. The total basic research request shows an increase of 4.7% over 2003 levels. Updates in the AAAS analysis can be accessed at Web site www.aaas.org/spp/rd.

## France Invests in Nanotechnology

French laboratories have a significant role to play in helping to develop the European Research Area, said Claudie Haigneré, French Minister for Research and New Technologies, as she announced a plan in February that earmarks €50 million for research in nanotechnology. The plan calls for €12 million to set up a research program that focuses entirely on nanotechnologies. Funds will be set aside for training, and part of the funding will be used to help create networks of excellence and prepare for integrated projects, two of the new funding instruments for the European Union's Sixth Framework Programme.

In France, about €30 million will be allocated to developing four existing technology centers for research as well as



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creating eight specific centers, which are expected to further strengthen France's poles of excellence in microelectronics. In relation to SMEs (small- and medium-sized enterprises) and start-ups, €8 million will be invested to create a "micro/nanotechnology network."

This plan was developed in direct response to a recent report by France's Parliamentary Office for the Evaluation of Scientific and Technological Choices that noted a low level of investment in nanotechnology research and development in France and Europe as compared with the United States and Japan. The report recommends that industrial research should be stimulated and the role of research foundations strengthened.

### India, Iran Sign S&T Agreement

During a meeting in New Delhi in January, Iran's Minister for Science, Research, and Technology, Dr. Mustafa Moin, and India's Minister for Human Resource Development and Science and Technology, Dr. Murli Manohar Joshi, signed a science and technology agreement. The agreement includes cooperation in information and communication technology, energy, environment, metallurgy, and alternative sources of energy. Describing the agreement as a landmark in Indo-Iranian relations, the two ministers agreed to quickly set up a joint committee for the smooth implementation of the accord.

### China Displays Prototype Car Operated by Hydrogen Fuel

China's Ministry of Science and Technology announced in the January 10 issue of its newsletter the debut of an electric-car prototype, Super I, on the campus of Tongji University in Shanghai. Powered by a hydrogen-fuel battery, the prototype discharges purified water without any tailpipe emission. The electric vehicle is one of the most important science and technology projects listed by the ministry in the 10th Five-Year Plan period. The prototype is the product of a joint research and development group appointed at the end of 2001 consisting of several research enterprises in Shanghai, including Shanghai Auto and Tongji University.

### China Announces Progress in Magnesium Alloy Project

At a press conference held in December on the development and applications of magnesium alloy, China's Ministry of Science and Technology described progress on its magnesium alloy project since the project's launch in August 2001. Reporting in the December 30, 2002, issue of its newsletter, the ministry identifies this as one of the key technology projects in China's 10th Five-Year Plan.

The ministry reported, "The project has...preliminarily established an R&D system for magnesium alloy development and associated manufacturing technologies and achieved breakthroughs in a number of cutting-edge core technologies and key industrial processes."

Applications for 33 patents have been generated from this project, 15 of which are for inventions. The project has also started to develop a standard specification system for magnesium alloys.

### Germany Funds Collaborative Research in Materials Science

The German Ministry of Education and Research released a report titled "Public Support for Research and Innovation Activities of Businesses in Germany," carried out by the center for European economic research for the ministry. Materials research is among the fields in which nearly all projects are undertaken on a collaborative basis. According to the report, businesses invest more than one euro in research and development for every euro they receive from the ministry. The study looked at businesses that received funding for basic research and high-risk projects and discovered that two-thirds of funding goes to collaborative (public–private) projects, whereas 20 years ago, funding for such collaborations was the exception.

### Sri Lankan Science Foundation Announces Deadlines for Grants and Awards

The National Science Foundation of Sri Lanka announced deadlines for traveling grants and fellowship awards from the Commonwealth Science Council (CSC). Special attention will be given to activities contributing to the national priorities in current CSC programs, including renewable energy and mineral resources. The deadlines are listed in the January 2003 issue of the Foundation's newsletter: April 30, 2003, for events occurring in July/August; June 30 for September/October; and August 31 for November/December. CSC is an international organization consisting of ministers and permanent secretaries responsible for science and technology. More information can be accessed at Web site www.comsci.org.

### Russian, U.S. Science Academies Issue Recommendations on Nuclear Nonproliferation Issues

Nikolai P. Laverov, vice president of the Russian Academy of Sciences, and John P. Holdren, chair of the Committee on International Security and Arms Control of the U.S. National Academy of Sciences, released a report in December 2002 from their joint committee on U.S.–Russian Cooperation on Nuclear Nonproliferation. The committee completed the first phase of its work and made recommendations for the next phase. These include the appointment of a high-level official in each government to overcome impediments to the project and a study of joint U.S.–Russian efforts to accelerate the blend-down of highly enriched uranium to enrichment levels unusable in weapons. Furthermore, the committee recommends that the countries promote the use of the less-enriched fuel in research reactors worldwide. The report and full list of recommendations can be accessed on the National Academies Web site at http://nationalacademies.org/.

### Materials Science Opportunities Identified in Joint Meeting on Climate Change S&T Research

The United States and the European Union held a bilateral "U.S.–EU Joint Meeting on Climate Change Science and Technology Research" in Washington, D.C., on February 5–6. The participants identified cooperative research activities in six areas, including materials-related projects in hydrogen technology and infrastructure, carbon capture and storage, aerosol-climate interactions, and carbon-cycle research.

According to a statement from the U.S. State Department, specific topics of potential cooperation in the area of hydrogen technology cover precompetitive research and development on critical enabling technologies, including polymer electrolyte membrane fuel cells, nonprecious metal catalysts, high-temperature membranes, solid-oxide fuel cells, hydrogen-storage concepts (e.g., carbon nanostructures and complex metal hydrides), refueling technologies and procedures, and hydrogen production.

The participants agreed to review the progress of their cooperation at the next joint meeting, which may take place in Italy later this year. □





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