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Industry, Academic Leaders Advocate Basic Research in Physical Sciences

Concerned leaders from industry and academia unveiled an advocacy campaign at an April 20 press conference in Washington, D.C., to emphasize the importance of basic research to the future of U.S. innovation, economic growth, and job creation. Targeted at policymakers and the general public, the initiative seeks to reverse a decline in federal investment in basic research in the physical sciences and engineering, using paid advertising, traditional lobbying, and outreach to legislators on Capitol Hill.

The initiative is sponsored by the Task Force on the Future of American Innovation. Specifically, the task force is calling on the federal government to grow the budgets of key research agencies by 10–12% over the next 5–7 years. These agencies include the National Institute for Standards and Technology, the National Science Foundation, the Department of Energy's Department of Science, and the Department of Defense's research accounts.

According to the Task Force, basic research in the United States over the last few decades has led to a multitude of breakthrough technologies that in turn create jobs. The semiconductor industry alone has created 226,000 jobs with worldwide sales of \$166 billion. Basic research at U.S. universities has created 4000 spin-off companies with an estimated 1.1 million employees and annual worldwide sales of \$232 billion. And according to Robert Solow, a Nobel Laureate in economics, at least 50% of the nation's economic growth over the last 50 years has come from technological innovation.

Yet U.S. federal investment in basic research continues to decline, according to the Task Force. While the gross domestic product (GDP) has nearly doubled from \$6 trillion to \$12 trillion since 1980, federal investment in R&D in the physical and mathematical sciences and engineering

decreased by 37%. President Bush's FY05 budget request continues the trend of previous administrations. The overall research budget would be down 1.8%, apart from a 0.6% increase for the Department of Health and Human Services. Two days after the announcement, the American Association for the Advancement of Science issued an analysis showing that the proposed Bush administration's budget for the next five years would cut funding for basic research at 21 of 24 federal agencies.

Deborah Wince-Smith, president of the Council on Competitiveness, said that the United States' technological leadership faces greater competition from abroad as developing economies increase the number of scientists with PhD degrees in engineering and physical sciences and create new incentives for scientists and engineers to work outside the United States. Other nations are rapidly replicating the structural advantages that historically have made the United States the center of innovation: investing in education and job skills, building modern network infrastructures, financing new ventures, and opening their markets to global trade (see also "U.K. Promotes International Collaboration in 10-Year Strategic Plan for Science").

"Our basic message is, 'Don't flat-line our innovation future by underfunding basic and applied research,'" said Craig Barrett, CEO of Intel Corporation and chair of the Computer Systems Policy Project. "We can choose to continue to invest in the industries of the 19th century and allow innovation to atrophy, or we can build on our past strengths and go forward to maintain our competitiveness."

Richard Smalley, a professor at Rice University and recipient of the 1996 Nobel Prize in chemistry for the discovery of buckyballs, emphasized the importance of universities to innovation, noting that his own field of buckyballs and carbon nanotubes has propelled the development of nanotechnology. Smalley co-founded Carbon Nanotechnologies, Inc. in 2000.

"Our workforce is not flat-lining, it's in

decay. The U.S. has been on a downward slide in supporting physical sciences and engineering for more than a decade," Smalley said. "We've been living off the past. If we don't change course, we will leave our children a very poor legacy."

JENNIFER OUELLETTE

U.K. Promotes International Collaboration in 10-Year Strategic Plan for Science

The United Kingdom is launching a major effort to encourage increased collaboration and investment in scientific enterprises, with an eye toward creating a thriving center of scientific inquiry, according to Paul Boateng, a member of Parliament and chief secretary to the Treasury. Boateng spoke at a briefing held at the new National Academy of Sciences Koshland Science Museum in Washington, D.C., on May 4, aimed at leading policymakers, scientific and academic organizations, funding agencies, and research institutions in the area.

Boateng was in Washington to promote the forthcoming report of a study launched earlier this year by U.K. finance minister Gordon Brown. The study is intended to compile the views of international business leaders, researchers, and policymakers about the current state and future needs of science and innovation in Great Britain, and to develop a 10-year strategic plan to make Britain "one of the most competitive locations for science, research, innovation, and development," said Boateng.

The formal report will be released this summer. Priorities of the U.K.'s planned investment strategy include a commitment to world-class research to meet the needs of the economic and public services, ensure thriving academic institutions, encourage business investment in research and development, and maintain a steady supply of scientists and engineers for future workforce needs. In particular, the British government will seek to encourage innovation by developing a science base that takes advantage of interdisciplinary research.

"We need to break down the barriers between traditional disciplines, attract the best scientists and engineers, and encourage links between universities and the business community," said Boateng. To that end, the United Kingdom has established new university centers that combine the expertise of physical science and social science departments.

British leaders would also like to make better commercial use of the country's university-based research by promoting technology transfer.

U.S. Basic Energy Sciences Advisory Committee Seeks Testimony

The U.S. Department of Energy's Basic Energy Sciences Advisory Committee (BESAC) has been directed by the head of the Office of Science to produce a report on "Challenges and Opportunities in Theory and Computation" in basic energy sciences. The head of the Office of Basic Energy Sciences, Pat Dehmer, expects this report to have a significant impact on future directions and support for the entire theory portfolio in both materials science and chemistry at DOE.

BESAC formed a subcommittee to write the report, which is to base its conclusions on testimony given by members of the theory/computation community. A Web site has been created to receive written testimony addressing a set of six general questions to help identify opportunities, needs, and possible future directions for the community: <https://besac.nersc.gov>.

"An immediate problem is that U.K. businesses invest proportionally less in R&D than our major international competitors," said Boateng. As an extra incentive, the government has extended tax breaks worth over 500 million pounds per year for businesses investing in R&D. A number of major companies are already in discussion with the U.K. government about how best to collaborate and combine investment resources, including Glaxo-SmithKline, AstraZeneca, Shell, Vodafone, Amersham, and Rolls-Royce. Brown has promised to make science a key theme and protect the \$5.4 billion (USD) already earmarked for 2005–2006, as well as fight for increased funding in the future.

JENNIFER OUELLETTE

Canada's "Hydrogen Highway" Fueled by Upcoming Olympic Games

Seizing an opportunity to highlight its efforts in hydrogen fuel research and development, the government of Canada has initiated the Hydrogen Highway, a program that consists of seven nodes to be built from the Vancouver Airport to Whistler, British Columbia, in time for the 2010 Olympic Winter Games in Vancouver. Prime Minister Paul Martin made the announcement April 1 at GLOBE 2004, a trade fair and conference on environmental technology and management.

The nodes—each with plans for its own sustainable microcosm with a hydrogen fueling infrastructure—will be located at the Vancouver Airport and the University of British Columbia, as well as in Victoria, Surrey, Vancouver, North Vancouver, and Whistler.

One of the first of the seven nodes to be built is a new \$15 million (CAD) research facility and technology center that will house Canada's National Research Council Institute for Fuel Cell Innovation (NRC-IFCI) on the campus of the University of British Columbia in Vancouver. Plans for this facility were unveiled on May 18.

"We are committed to the development and commercialization of Canada's hydrogen and fuel-cell technologies industry," said Lucienne Robillard, minister of industry. "The Hydrogen Highway and NRC will help deliver the economic and environmental benefits of the hydrogen economy to all Canadians."

Research at NRC-IFCI is aimed at advancing fuel-cell science and technology and facilitating the commercialization of fuel cells, including a focus on polymer electrolyte membrane fuel cells (PEMFC) and solid-oxide fuel cells.

The Hydrogen Highway concept began as early as mid-2002 when Methanex Corporation, BC Hydro, and NRC-IFCI first coined the term. Last summer, it was announced that Whistler would host the 2010 Winter Olympics and that the Games would have a strong focus on environmental sustainability. This set the stage to increase the profile of this project and turn it into an international showcase.

Since then, the government of Canada, through Industry Canada and Natural Resources Canada, has committed substantial funding toward fuel-cell and hydrogen research and demonstration projects. Also, British Columbia has become a champion of the concept, viewing it as a metaphor for the transition to the hydrogen economy as well as a practical approach for building it.

With opportunities for public support in place, Methanex Corp., BC Hydro, and the NRC agreed to transfer the trademarked Hydrogen Highway logo and management of the program to Fuel Cells Canada to encourage widespread industry participation. Firoz Rasul, chair of Ballard Power Systems, has agreed to champion the program, providing his expertise, profile, and energy.

Last fall, Allan Rock, then minister of industry, and Herb Dhaliwal, then minister of natural resources, announced a \$215 million (CAD) investment to capitalize on the use of hydrogen and fuel cells. The investment is directed by three strategic priorities:

- Early adoption of hydrogen technologies through integrated demonstration projects undertaken by partnerships that will showcase a working model of the hydrogen economy in real-world settings;
- Improving the performance and reducing the costs of hydrogen technologies and extending Canadian leadership through R&D of innovative new applications in strategic areas of the hydrogen value chain; and
- Developing initiatives to establish a hydrogen infrastructure through Sus-

tainable Development Technology Canada, building on the foundation's success in establishing successful partnership projects.

To achieve the early adoption of hydrogen technologies, projects will focus on technologies for producing, storing, and distributing hydrogen, as well as working prototypes of hydrogen-based applications. Eligible technologies also include those that produce hydrogen from the full range of renewable energy sources, including wind and solar energy.

The Canadian government will review proposals, administered by the Technology Partnerships Canada agency, from coalitions of two or more partners based on their ability to successfully demonstrate hydrogen applications in integrated real-world settings. Not only will this program test new applications and technologies in the real world, it will also serve to raise public awareness and showcase the viability of hydrogen-based solutions, according to Industry Canada.

S&T in India Needs More Funding and Incentives

India's new minister for science and technology and ocean development, Shri Kapil Sibal, said that science and technology (S&T) needs more funding and incentives to make it more productive and useful for societal development. According to Sibal, no field can grow or develop without the intervention or application of S&T; in fact, he said, after holding brainstorming sessions with various departments on his first day in office in May, the scientific agencies that are core to development of the country, its economy, and its industry must be made more visible.

Sibal examined the needs of the Department of Science and Technology, the Department of Scientific and Industrial Research, the Council of Scientific and Industrial Research, and the Department of Ocean Development. He urged the heads of the departments to compose a list of items that need immediate attention. He said solutions would be found within three months and that priority will be given to those regulatory items that currently hinder the development of S&T. He wants the involvement of industry in research and development and he also spoke of public-private partnerships. □

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