SCIENCE POLICY

Incorporating WASHINGTON NEWS and policy news from around the world.

Reports Warn of U.S. Decline in Innovation, R&D Investment

The United States is facing significant challenges to its leadership role in science and innovation, and is in danger of being eclipsed by other countries, according to two separate reports released over the last few months. In December 2004, the Council on Competitiveness released the final report of the National Innovation Initiative (NNI), a bipartisan study involving the country's leading technologists and industrialists, focusing on ways to re-energize U.S. competitiveness. And in February, the Task Force on the Future of American Innovation released its report detailing numerous troubling trends which indicate that the United States is losing ground in several key areas, including education, workforce, knowledge creation, and research and development (R&D) investment.

Titled "Innovate America: Thriving in a World of Challenge and Change," the NNI report defines innovation as the intersection of invention with the marketplace, specifically, how new technologies and ideas find their way into commercial applications.

"Innovation fosters the new ideas, technologies, and processes that lead to better jobs, higher wages and a higher standard of living," the report states. "For advanced industrial nations no longer able to compete on cost, the capacity to innovate is the most critical element in sustaining competitiveness."

Materials research plays a big role as a key enabling technology for innovation, particularly in nanotechnology and custom manufacturing, according to G. Wayne Clough, president of the Georgia Institute of Technology and an NNI co-chair.

"We've shifted into a new era in terms of the adaptability of materials," Clough said, where customers want to request composite materials with properties tailored to specific applications. The other issue is whether those materials will be manufactured in the United States or manufactured in other countries and shipped to the United States.

"If the U.S. doesn't have the right infrastructure for innovation, the talent, the venture capital environment, and the right facilities, this kind of manufacturing will happen elsewhere, and we'll become a consumer nation instead of a producer," he said.

Although the NNI report calls for increased federal funding for R&D, Clough said that this is only part of the solution to the problem.

"It is going to take a multi-pronged effort with the government, industry, the universities, and the nonprofit sector all working together to address these issues," he said. That is why the NNI study divided its findings into three broad categories: talent, investment, and infrastructure.

Specific recommendations range from expanding professional master's degree programs, and expediting visa and immigration processes, to strengthening the U.S. manufacturing capacity and creating regional innovation "hot spots" like Silicon Valley. Other recommendations include doubling the budget of the National Science Foundation (NSF) and allocating 3% of all federal agency R&D budgets toward grants for novel, high-risk, and exploratory research. The council is in the midst of an ambitious three-year effort to implement those recommendations.

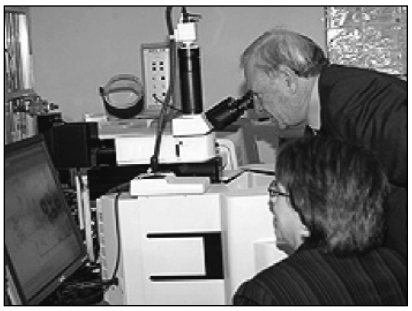
Not surprisingly, workforce issues emerged as a critical concern; talent is identified as the nation's key innovation asset.

"Unless the U.S. takes swift action, the demand for science and engineering talent will far outstrip supply," the report states. "The number of jobs requiring technical training is growing at five times the rate of other occupations." In fact, approximately 60% of the CEOs of the Fortune 100 hold science or engineering degrees.

At a time when understanding the technological foundations of growth are becoming ever more critical, however, the number of U.S. doctorate degrees awarded has been flat or declining for decades. As a result, U.S. companies have become increasingly dependent on the supply of non-U.S. doctoral candidates studying in the United States. That solution is becoming less viable as the competition for scientific talent intensifies as the hiring pool shrinks and other countries catch up to the United States in technological and industrial development. Furthermore, visa difficulties are dissuading many U.S. companies from pursuing hires from outside the country.

Tougher visa restrictions are one factor that may be adversely impacting incoming graduate students. A recent study by the American Institute of Physics conducted in 2003 found a 10% decline in non-U.S.-born physics graduate students from

Prime Minister of Canada Visits National Institute for Nanotechnology



Canadian Prime Minister Paul Martin peers through a Raman imaging spectrometer at the National Institute for Nanotechnology. In the foreground is Deputy Prime Minister Anne McLellan.

Prime Minister Paul Martin of Canada got an up-close look at the world of the very small during a recent visit to the National Institute for Nanotechnology (NINT), located at the University of Alberta campus in Edmonton. In April, Martin and Deputy Prime Minister Anne McLellan toured laboratories in the country, met researchers and students, and had a wide ranging discussion about the research done at NINT and the commercialization potential for nanotechnology.

The prime minister was curious about the capabilities of the various kinds of microscopes and surface science instruments. A stop at NINT's chemical analysis laboratory gave Martin a chance to view styrene beads using Raman spectrometry, including a specially tooled display of beads that spelled out "Bienvenue PM Martin."

During a roundtable discussion with nanotechnology researchers, the prime minister learned about the partnership at NINT, where group leaders are both National Research Council researchers and University of Alberta professors. He also heard about the local business community's robust support for NINT's cluster development efforts. Chris Lumb, CEO of Micralyne Inc. and a member of NINT's advisory board, told Martin of the importance of NINT's research programs and technology discoveries to growing the small tech sector in Edmonton.

The prime minister inquired about how many people might be employed in the region a decade from now as a direct consequence of current investments. Also discussed was the strategic role of Canada's nanotechnology efforts in relation to international developments in the field.

https://doi.org/10.1557/mrs2005.136 Published online by Cambridge University Press

2000–2002. Fully two-thirds of the physics departments responding indicated that there were some visa denials for students accepted for admission to U.S. graduate programs that prevented them from attending.

In February, similar findings were reported by the Task Force on the Future of American Innovation, a consortium of 14 organizations associated with business and academia. Its members include the Council on Competitiveness as well as the National Association of Manufacturers, the Semiconductor Industry Association, and major corporations such as Intel, IBM, Texas Instruments, and Hewlett Packard.

Among the most troubling trends is the fact that the U.S. share of high-tech exports has been in a 20-year decline. The task force also found that U.S. patent applications from Asian countries grew 759% from 1989 to 2001, compared to only 116% growth in patent applications from within the United States. And from 1994 to 2001, graduate science and engineering enrollment in the United States declined by 10% for U.S. citizens, but increased 25% for non-U.S.-born students.

Like the NNI report, the task force report called for increased federal spending on basic research in the physical sciences and engineering, including budget increases for such key research agencies as the NSF, the Department of Energy, and the Department of Defense. Yet its release coincided with the release of President George W. Bush's FY2006 budget proposal, which contained cuts in many areas of R&D and left the overall federal R&D budget nearly flat. In fact, according to the report, as a percentage of the gross domestic product (GDP), funding for physical science research in the United States has been declining for the past 30 years. China, by comparison, according to the report, has doubled the percentage of its GDP invested in R&D.

JENNIFER OUELLETTE

Statement on Hydrogen Energy Technology in India Released

Vilas Muttemwar, Indian Minister of State for Non-Conventional Energy Sources, announced that non-Indian companies are permitted to set up 100%-owned subsidiaries or joint ventures with Indian partners for financial and/or technical collaboration in new and renewable energy sources, including hydrogen energy, in India. Non-Indian companies can also set up new and renewable energy projects on a "build, own, and operate" basis. Muttemwar's statement was released on April 27 in the Council of States in the Indian parliament.

Muttemwar said that hydrogen energy technology is in a nascent stage of development, with 23 research and development (R&D) projects under implementation in different institutions across the country. In order to prepare a national hydrogen energy roadmap for the country and to oversee its implementation, the Ministry of Non-Conventional Energy Sources has constituted a National Hydrogen Energy Board, comprising representatives from government, industry, academia, research institutions, and exporters. Muttemwar further said that R&D thrust areas are hydrogen production, transport, storage, and delivery, and applications for hydrogen in portable and stationary modes.

The minister reported that the three competing alternate fuels—hydrogen, bio-fuels, and synthetic fuels—are still in the development stage. The scientific and technical challenge is to make them and their applications commercially competitive. Alternate fuels, including hydrogen, are expected to play a dominant role in the future, he said.

European Hydrogen and Fuel Cell Industry Sets Out Its Blueprint

Jeremy Bentham: "One thing's for sure—nothing remains static in the fast-moving world of hydrogen and fuel cell technology."

On March 17 and 18, the second annual event of the European Hydrogen and Fuel Cell Technology Platform (HFP) gathered more than 500 experts and high-level executives to discuss the development and deployment of hydrogen and fuel cells for carrying and converting energy cleanly. Two HFP documents for the medium- and long-term development of hydrogen and fuel cells, the "Strategic Research Agenda" and "Deployment Strategy," were presented and debated, receiving strong support from the stakeholders.

Jeremy Bentham, chair of the HFP Advisory Council, said, "It is crucial that the cumulative [research, technology, and development] spending, including from a European JTI [joint technology initiative], the member states, and regions at least matches current funding levels of major global competitors—especially the USA and Japan—corresponding to at least €250 million per year, meaning at least doubling the present effort."

The documents propose a highly focused, 10-year research, development, and deployment program to acquire world-class technology aimed at the following goals:

- reducing fuel cell system costs by a factor of 10 (up to 100 for transport applications);
- enhancing the performance and durability of current fuel cell systems by a factor of 2 or more for the various applications;
- reducing the costs of hydrogen delivery (compared to current fossil-based carriers) by a factor of 3 or more;
- and achieving competitive hydrogen storage densities consistent with vehicle operating range and design requirements.

Participants of this event came from industry, finance, research, politics, and the general public.

South Africa's CSIR Strengthened with Appointment of R&D Executive

Phil Mjwara

In line with its focus on excellence in research and development (R&D), the CSIR in South Africa has appointed Phil Mjwara to its new top leadership structure as group executive responsible for R&D. Mjwara is currently the head of the CSIR National Laser Centre (NLC), where he has been instrumental in growing the center's activities since its inception in 2001 and in creating a network of laser centers in Africa.

Mjwara said, "I see this as an opportunity to reenergize the science and research agenda within the CSIR in order to contribute to repositioning South Africa's science system to a global status. We hope to create opportunities for researchers, both young and older, to conduct cutting-edge research in emerging fields such as nanotechnology, biophotonics, and molecular electronics."

Before becoming the first head of the NLC in 2001, Mjwara was a director of technology development at the then Department of Arts, Culture, Science, and Technology of the South African government. He was a member of the core team responsible for developing scenarios for South Africa (1999–2010) through the first technology foresight project. Mjwara was recently asked by the office of the State President to participate in the development of scenarios for South Africa for 2004 to 2014.

Mjwara serves on various advisory councils and review boards, including the Centre of Excellence, focused on strong materials, located at the University of the Witwatersrand. □

https://doi.org/10.1557/mrs2005.136 Published online by Cambridge University Press