tion Ave. NW, Lockbox 285, Washington, DC 20055; 800-624-6242; website http://www.nap.edu/newbooks/index.html.

DOE Lab Directors Highlight Pathways to Reduce Greenhouse Gas Emissions

The United States has many options for reducing greenhouse gas emissions through new, cleaner energy technologies, the directors of 11 of the Department of Energy's national laboratories conclude in a study released in April. The directors' report, *Technology Opportunities to Reduce U.S. Greenhouse Gas Emissions*, outlines nearly 50 technology pathways that could eliminate the emissions of hundreds of millions of tons of carbon per year. These include such near-term practical technologies as electric hybrid vehicles, high-efficiency lighting, super-insulating windows, and passive solar heating and cooling of buildings. They also include mid-term to longer term technologies that need further development, such as fuel cells for transportation, microturbines, broad use of biomass fuels, and hydrogen-fueled energy systems.

The laboratory directors recommend that the federal government lead a vigorous national push to develop energy technologies during the next three decades to achieve a major reduction in the risk of global warming.

The study is at website http://www.ornl.gov/climate_change. The files are in PDF format and can be read in Acrobat Reader.

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PUBLIC AFFAIRS FORUM

An analysis of public policy issues and how they affect MRS members and the materials community...

NRC Forum Aims to Narrow Gap Between Government-Funded Basic Research and Industry's Need for "Ready" Materials

The Academy Industry Program of the National Research Council (NRC) sponsored a two-day Forum on "The Promise and Dilemma of New Materials" on May 28–29, 1998 at the Arnold and Mabel Beckman Center in Irvine, CA. This Forum brought together technologists and practitioners with experience in new materials development for the purpose of mutually informing one another and creating new knowledge and ideas. A primary objective was to achieve cross-fertilization among individuals working across technical and applications boundaries in industry, academe, and the federal government. The Forum was organized by a program committee of outstanding academic researchers and senior industrial research managers under the chairship of Jaques A. Bodelle, Vice President Research and Development, Elf Aquitaine, Inc.

The "promise" is the use of new materials (e.g., electronics grade Ge-Si, polymeric structural elements for automobiles and aircraft, and catalysts) to generate new products and hence economic growth. The "dilemma" is the long development cycles for products embodying new materials, and hence the increasing reluctance of industry to invest in developing new materials to the point of economic utility. Moreover, this reluctance is occurring at precisely the time that the federal government is significantly curtailing its investment in advanced development of materials for defense and other applications. The development of new materials for medical applications encounter an extra barrier in the lengthy Federal Drug Administration approval process. Thus, a gap has opened between government-funded "basic" research on materials and commercial firms' increasing insistence on sourcing "ready" materials technologies for their products. This Forum was designed to explore the origins of that gap and approaches to narrow it.

Within the context of exploring the promises, hurdles, and pitfalls in the development of new materials, the Forum reviewed several frontiers in materials science, specifically surface materials, new forms of carbon, adhesives, bioengineered materials, intelligent materials, and thin-film magnetic materials. Gabor Somorjai presented his MRS 1997 Von Hippel address "From Surface Materials to Surface Technologies" (*MRS Bulletin*, May 1998, p. 11). Several case histories of new materials innovation were examined in detail, including the pursuit of Si-Ge thin films for fast Si-based microelectronics, the development of polymeric materials for drug delivery and tissue generation, the commercialization of Surlyn™ and Kevlar™, efforts to commercialize high-temperature superconductors, nickel metal hydride batteries, Xerographic materials, thin-film magnetic memories based on the exploitation of the giant magnetoresistance effect, and the selection of materials for the Mars Pathfinder.

Breakout sessions were held to stimulate discussion of several central questions in new materials commercialization: How can the interface between the basic research in materials and the needs of industry be improved? What lessons can be learned from the way familiar materials have been upgraded to provide greater functionality and/or lower cost? How does one speed up the empirical process of finding new materials and expedite their development, manufacturability, and commercialization?

Special events included a preview of the forthcoming NRC report on the *International Benchmarking of U.S. Materials Science and Engineering Research* (a prepublication copy can be found at website http://www.nap.edu/readingroom/) and an entertaining after-dinner presentation by Ivan Amato on his recent book *Stuff: The Materials the World is Made Of.*

While the gap between the promise and dilemma of new materials was not resolved, the Forum did highlight some amazing economically significant commercialization successes in microelectronics, rotating memories, specialty polymers, and Xerographic materials. It also drove home the significant and increasing gap in U.S. policy between the concensus on government support of basic research and the globalization-induced disinvestment of many if not most commercial firms in the advanced development needed to convert the fruits of that basic research into commercially viable new products. Many of the success stories examined at the Forum were judged to be improbable if not impossible in today's political and economic climate. Dealing effectively with this gap is likely to be an essential ingredient in turning the amazing U.S. jobs machine into a comparable machine for increasing the productivity of the U.S. workforce.

CHARLES B. DUKE

***Charles B. Duke** is Vice President and Senior Fellow, Xerox Corporate Research and Technology. He delivered a presentation at the NRC Forum on the central role of new materials innovation in the commercial successes of Xerographic devices for copying and printing.*

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