

WebMemo



Published by The Heritage Foundation

No. 1166
July 18, 2006

Nanotechnology: Changing the Face of National Security

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On March 29, 2006, the Heritage Foundation held an event titled "Nanotechnology: Changing the Face of National Security." The event, part of the 2006 Competitive Technology for National Security Policy series, brought together researchers and members of government to discuss nanotechnology and its role in national security.

There are different scale sizes among different technologies. Nano-structures measure from one Angstrom (1×10^{-10} m) to 100 nanometers ($1 \text{ nanometer} = 1 \times 10^{-9}$ m), and many larger devices, such as nanoelectromechanical systems (NEMS) are in the several hundred nanometer range.

Dr. John Parmentola, Director for Research and Laboratory Management, Office of the Assistant Secretary of the Army (Acquisition, Logistics, and Technology) discussed transformational nanotechnologies for the Army. The Army wants to use the advantages of nanotechnology to create improved networks, more precise strikes, better signature management of equipment, and faster "Identify Friend or Foe" devices.

The Army is currently using nanotechnology to create better energy-absorbing and armor materials. Limbs are the most vulnerable part of a soldier's body, but the weight and bulk of armor for extremities makes it impracticable. However, Kevlar treated with shear-thickening liquids shows promise in a proposed uniform that would not only protect the wearer, but provide medical telemetry and possibly even treat wounds.

Dr. Ravi Athale, principal communications engineer for the Center for Innovative Computing at the MITRE Corporation, discussed photonics and nanophotonics. Photonics is the science and technology of controlling photons for the purpose of carrying, processing, storing, or displaying information. Well-known applications of photonics include fiber optic cable, television screens, computer displays, and laser and imaging systems. Military applications of photonics include night vision/thermal imaging devices, fiber optically-guided missiles, laser range finders/designators, and optical links between satellites.

Nanophotonics uses control of the structure of materials to create devices and effects that were previously impossible. Nanophotonics is not simply the scaling-down of existing systems; rather it utilizes different physics, different functionalities, and different design strategies than regular photonics. It forms a platform for new technologies that can deal with challenges such as the shrinking size of sensor platforms, the shortening of information-processing timelines, and hard-to-detect threats—such as chemical or biological weapons—by creat-

This paper, in its entirety, can be found at:
www.heritage.org/research/nationalsecurity/wm1166.cfm

Produced by the Kathryn and Shelby Cullom Davis
Institute for International Studies

Published by The Heritage Foundation
214 Massachusetts Avenue, NE
Washington, DC 20002-4999
(202) 546-4400 • heritage.org

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ing compact, low-power, adaptive sensors, and integrating sense-process-control-communications systems into a single package.

The Naval Research Laboratory's Dr. James Murday, who also serves as executive secretary of the Nanoscale Science and Technology Subcommittee of the National Science and Technology Council, discussed the public policy and nanotechnology.

Funding for nanotechnology within the U.S. government has increased over four-fold in the five years since the establishment of the National Nanotechnology Initiative. Also, government agencies with no science and technology research budgets are becoming increasingly involved in the nanotechnology arena., especially in matters of policy, commerce, health, safety, and even workforce and educational aspects.

Within the Department of Defense, the amount of money for "applied research" in nanotechnology

is growing. Congress has been adding to the Department of Defense's budget for nanotechnology to help get these technologies out of the lab and into industries and the hands of soldiers.

Dr. Murday warned that U.S. expenditures only amount to one-quarter of the money spent worldwide on nanotechnology, and so the U.S. cannot expect to dominate the field. The U.S. government will need to make decisions on research policies, clarify the health and environmental issues associated with nanotechnology, and encourage and develop domestic science education if the country is to remain competitive on both a technology and national security level.

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