

# Science and Technology: The Key to the Future Army

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**I**n the face of global competition for resources, talent, and technology, the Army science and technology (S&T) community must maintain its edge with the latest research and development, to ensure that our Nation's warfighters have the decisive edge in combat and can adapt rapidly to any operational situation.

The Army must make a critical shift in the S&T development process to keep technology relevant and get it into Soldiers' hands faster, according to senior leaders. (U.S. Army photo.)



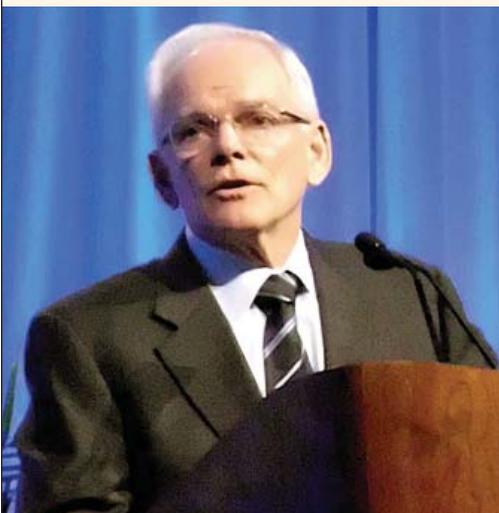
The job of the S&T community is to maintain our S&T engineering and mathematics skills, knowledge, experience, and expertise and to use these to give our warfighters the most reliable, effective equipment and tools for conducting their diverse missions to make them the decisive edge.

— Dr. Marilyn Miller Freeman,  
Deputy Assistant Secretary of the Army for Research and Technology

This was the overarching message from Army leaders at the 27th Army Science Conference in November 2010.

“Our Soldiers must have a wide range of advanced and new capabilities,” said Dr. Marilyn Miller Freeman, Deputy Assistant Secretary of the Army for Research and Technology (See Q&A, Page 7). “These capabilities grow out of a broad spectrum of technologies for near-, mid-, and far-term applications. The job of the S&T community is to maintain our S&T engineering and mathematics skills, knowledge, experience, and expertise and to use these to give our warfighters the most reliable, effective equipment and tools for conducting their diverse missions to make them the decisive edge.”

The acquisition community must provide capabilities on time and within budget, according to Dr. Malcolm Ross O’Neill, Assistant Secretary of the



Army for Acquisition, Logistics, and Technology. “Our environment has to be open, transparent, and supportive, and we must support the Soldier as our most important customer,” he said. “Soldiers are our most precious asset.

“We have got to have something that our potential adversaries don’t have,” O’Neill said. “It is up to us to provide materiel that has an inherent advantage.”

### A Changing Environment

Freeman explained that the environment she entered as a young scientist 30 years ago differed greatly from what she sees today. “When I entered, I was told that I didn’t need to be so aggressive, that I didn’t need to be in such a hurry to develop anything in my lab because it would be 20 or 30 years before anything I did in S&T would ever touch the hands of Soldiers,” she said. “Not so today. I never accepted that premise, and I still don’t, and you shouldn’t either. Scientists and engineers today don’t sit at their computers all the time. They go into the field, and they interact with warfighters in theater



to share our solutions that provide the advantage we promise. Like our Soldiers, Army S&T must adapt.”

Included in that adaptation is what Freeman calls “reinventing Army S&T.” “We need to step back and take a look at ourselves in this environment, and figure out what we should keep, how we should do business better, what we should throw out, and what in particular is the most important aspect of our job,” she said.

“We need to get more knowledge earlier in the [acquisition] process,” said LTG Michael A. Vane, Deputy Commanding General, Futures, and Director, Army Capabilities Integration Center, U.S. Army Training and Doctrine Command (TRADOC). “More knowledge from across our various elements of acquisition, ... from testers, PMs, engineers, and users who represent not only TRADOC but actual returning Soldiers from various activities” (See related article, Page 14).

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In the acquisition process, S&T comes before Milestone A, leading many involved in the acquisition process to think, “We don’t count toward acquisition” said Freeman. “We support this whole acquisition process, but we’re not perceived as supporting it. We are an integral part of the acquisition process. ... It’s not about the color of the money. It’s about the contribution and result,” she said.

New metrics may help the S&T community prove its value. Measuring aptitude in the technical capabilities S&T provides to warfighters, the data and information S&T provides to decision makers, and the quality of the research, development, and engineering conducted in S&T laboratories and centers will show that S&T is a vital part of the acquisition process supporting Soldiers, said Freeman.

This will be imperative during budget discussions, Freeman said.

### Faster and Affordable Acquisition

On the topic of ensuring that the acquisition process keeps pace with current technology, Vice Chief of Staff of the Army GEN Peter W. Chiarelli cited the development of the new

ground combat vehicle as an example of acquisition innovation. “The ground combat vehicle represents one of the most important combat and acquisition decisions we’ll make over the next seven years,” he said. “We are building a vehicle that will be capable of operating in all environments, across the full spectrum. ... How we’re trying to build it will also make it revolutionary.”

Chiarelli said that the Army is aiming to accelerate the timeline of the ground combat vehicle from the traditional 10- to 12-year cycle to 5-7 years, recognizing that the key to doing so is designing a platform that is versatile, able to accommodate a wide range of configuration and capability changes and incremental improvements over time.

Cost and schedule constraints should be established early for all programs, said Vane. There are advantages, he said, to “buying fewer, more often”—purchasing for a deploying unit and targeting the next increment for the next deployments two to three years later. This approach allows for technology improvements and changes in threat and political leadership along the way, Vane said. “If we were to account for that, perhaps we could get ahead of where we’re at in developing systems.”

DOD’s Efficiency Initiatives, which require that the Army save 2-3 percent by “doing more without more,” are another way DOD will save money. The savings will then be used for capability, O’Neill said.

### The Global Picture

Key S&T concerns include cyber warfare, biotechnology, bionics, and nanotechnology. Cyber crime is a threat not only to the U.S. economy, but also to the Nation as a whole. “Biotechnology, bionics, and pharmacology create massive potential for convergence and bio-interfacing between humans, enhanced computers, and cognitive power,” said Vane. “Nanotechnology offers revolutionary capabilities in materiel, medicine, manufacturing, and food production. Technology can make flawed, injured brains work better.

“Humans are our most adaptive systems,” Vane said. “They adjust, they gain advantages, and they want to survive. ... How can we help to get that human to have the overmatch advantage needed on the battlefield of tomorrow in this era of persistent conflict?”

S&T development is vital to addressing these challenges, “not only to make that human more efficient and effective, but also across the board to maintain the overmatch if our country wants to retain the position it has within the world in areas of diplomatic, informational, military, and economic power,” he said.

Vane emphasized the importance of knowing not only what our enemies are developing in S&T, but also what our allies are developing.

Based on global trends and operational lessons learned, TRADOC produced



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S&T is an integral part of everything we do, all the programs we're working on. It is critical for increasing knowledge, and we must have the right S&T investments to link to program outcomes better than we have in the past.

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Deputy Commanding General, Futures, and Director, Army Capabilities  
Integration Center, U.S. Army Training and Doctrine Command



the Army Capstone Concept (<http://www.tradoc.army.mil/tpubs/pams/tp525-3-0.pdf>) in December 2009, describing what the Army needs to do. The Army Operating Concept (<http://www.tradoc.army.mil/tpubs/pams/tp525-3-1.pdf>), released in August 2010, describes Army forces from 2016 to 2028, emphasizing the operational and tactical levels of war.

“The key to realizing this concept includes decentralized operations through mission command and developing situations through action, not just passively or trying to sense through technology,” Vane explained. “We must do that to act faster than the enemy.”

### Competitive Education

One of the biggest challenges is understanding human activity and performance, Vane said. Proficiency in S&T areas among the Nation's youth is necessary for future development of the Nation's S&T scientists and engineers.

“According to 2006 data from the U.S. Department of Education, the math literacy scores of 15-year-olds in the United States are lower than average scores in 23 of 29 Organisation for Economic Co-operation and Development [OECD] countries,” Vane said. Science literacy is lower than the average scores in 16 of 29 OECD countries. “With a decline in student scores in math and science, does that give us a weak signal we should be tracking? Is that a leading or lagging

indicator or metric ... and how that might be directed at S&T?”

Vane also said that while the United States is making progress in S&T developments, “we are not necessarily keeping pace with the leaders in the international community.” Between 1989 and 2001, patent applications in the United States grew by 116 percent, but in East Asia (including China, India, Singapore, South Korea, and Taiwan), they grew by 750 percent, he said. The U.S. high-tech sector also doubled during that time, growing from \$423 billion to \$940 billion, but that of China grew more than eight times, from \$30 billion to \$257 billion, according to a February 2005 report from the Task Force on the Future of American Innovation, titled “The Knowledge Economy: Is the United States Losing Its Competitive Edge?” (available at <http://www.futureofinnovation.org/PDF/Benchmarks.pdf>).

### Conclusion

Global trends for S&T include increasingly mobile networks, declining education levels, secure energy sources, and continuous information flow, 24/7. To adapt to these trends, Army S&T must produce integrated products, not stovepipe solutions, by focusing on the five warfighter outcomes, Vane said:

- Training
- Mission command
- Countering improvised explosive devices

- Power and energy
- The human dimension

Vane stressed the importance of making a critical shift in the S&T development process to keep technology relevant and get it into Soldiers' hands when they need it. “S&T is an integral part of everything we do, all the programs we're working on,” he said. “It is critical for increasing knowledge, and we must have the right S&T investments to link to program outcomes better than we have in the past.”

*Presentations from the Army Science Conference are available at <http://www.armyscienceconference.com>. Audio speeches are available at [http://www.youtube.com/view\\_play\\_list?p=2398CDA824AC2470](http://www.youtube.com/view_play_list?p=2398CDA824AC2470).*

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