

LEADERSHIP

A New Chapter

DARPA is working to create the future



By Robin Roemer

CREATED IN RESPONSE TO Russia's launch of Sputnik into space in 1957, the Defense Advanced Research Projects Agency (DARPA) makes a mission of ensuring that the United States — in the agency's own words — is "the initiator and not the victim of strategic technological surprises."

DARPA's six technical offices oversee roughly 250 research and development

CONTINUED »

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programs that advance and inform a wide range of fields, including stealth technology, quantum computing, machine learning and artificial intelligence.

While DARPA's key focus is promoting U.S. national security through cutting-edge scientific research, the agency's work has transformed lives for everyday Americans as well, thanks to its role in the conceptual development of the internet, microelectronics, drone technology and more.

In September, the agency named Victoria Coleman as its new director. Coleman joins DARPA after holding senior positions at companies including Yahoo, Hewlett-Packard, Samsung and Intel. She shares her thoughts on the agency, its mission and its world-changing work.

Q What about the directorship at DARPA most appealed to you?

COLEMAN: DARPA frequently is at the vanguard of science and technology in this nation and around the globe. I'm honored to be the director at this time in particular, when incremental improvements are inadequate to achieve our national security mission. For me, the challenge, and what is most appealing about this position, is not just new ideas and novel technologies. The kind of technology breakthroughs DARPA is working on promise new capabilities to our defense and national security enterprise that can shape the future of war and lead to greater peace — frequently with an enormous bonus of delivering value to our civilian economy and broader society.

Do you feel DARPA's mission has shifted over the course of the agency's history or largely stayed the same?

DARPA's mission and philosophy have held steady and yielded breakthrough technologies for six decades, even as the world has changed dramatically, because the agency always targets the future. Today, the rate at which those changes are arriving and affecting national security has accelerated. What had been a fairly well-defined global order punctuated by occasional surprises has transformed into an ever-shifting, complex and less certain security picture. We are experiencing multiple disturbing technological, social, economic and geopolitical



Victoria Coleman

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movements that pose threats to U.S. pre-eminence and stability. These trends, and how they may affect U.S. national security needs into the next decade and beyond, inform DARPA's determination of its strategic priorities for the next several years. As those threats change, so too will the agency's priorities, because DARPA does more than plan for and adjust to the future. DARPA aims to drive the technological advances and capabilities that will determine the future, with the nation's security always as the first and foremost goal.

How would you describe DARPA's far-reaching impact?

DARPA focuses every day on assuring the success of its individual programs. But the ultimate objective of the agency's work is the achievement of major, unexpected advances in national security capabilities. DARPA's record in this regard is unrivaled. Precision-guided munitions, stealth technology, unmanned systems, advanced ISR (intelligence, surveillance and reconnaissance) and infrared night vision have — individually and together — induced remarkable changes in how

U.S. forces fight and win. At the same time, the enabling technologies behind these military capabilities — new materials, navigation and timing devices, specialized microelectronics, advanced networking and artificial intelligence, among others — helped lay a foundation for private-sector investments that extended far beyond the battlefield, to create products and services that have changed how people live and work. I look forward to leading the agency and working with others in government to see that DARPA remains true to its mission and, in concert with the broader scientific and military establishments, continually delivers game-changing national security capabilities.

CUTTING-EDGE RESEARCH

According to DARPA Director Victoria Coleman, in the coming years, the agency will prioritize investment in areas including hypersonics, microelectronics and artificial intelligence/machine learning. "DARPA already is pursuing, or soon will direct significant attention to other opportunities in national security, including infectious disease, space and cybersecurity," Coleman says. The agency's current priority areas include:



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AI Next. DARPA has been a leader in artificial intelligence since the 1960s. "We played key roles in realizing the first and second waves of AI (first rule-based, then statistical-learning-based) and now we are working to realize the third wave, which can be described as contextual adaptation," says Coleman. To better define a path forward, DARPA announced in September 2018 a multiyear investment of more than \$2 billion in new and existing programs called the "AI Next" campaign.

VOICES FROM DARPA

Learn about the agency's frontier-shaping work from the scientists themselves in the popular podcast series *Voices from DARPA*, available at arpa.mil/about-us/podcast.

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Hypersonics. Hypersonic flight at velocities more than five times the speed of sound offers major strategic advantages, especially for conducting military operations from longer ranges, with shorter response times and with enhanced effectiveness compared with current military systems, says Coleman.



GETTY IMAGES

Electronics Resurgence Initiative. In June 2017, DARPA announced the Electronics Resurgence Initiative (ERI) as a bold response to several technical and economic trends in the microelectronics sector. The U.S. now stands ready to collaboratively innovate a fourth wave of electronics progress, Coleman says. DARPA envisions four key areas of development: 3D heterogeneous integration, new materials and devices, specialized functions and design as well as security, each of which have been central to ERI since its inception.



Curbing Infectious Disease. In 2012, through the ADEPT (Autonomous Diagnostics to Enable Prevention and Therapeutics): PROTECT program, DARPA began investing in the development of gene-encoded vaccines, a new category of preventive measures based on DNA or RNA. In this approach, genes that encode immune stimulating antigens are delivered directly to a recipient's body, directing the body's own cells to elicit an immune response to the virus. ADEPT and its follow-on program, the Pandemic Prevention Platform, are part of a comprehensive portfolio of DARPA programs that "stand a chance of delivering a technology framework that could quash just about any outbreak of a known or emerging infectious disease before it could grow into a pandemic," Coleman says.