

# Harnessing Science and Technology in Homeland Security: A Conversation with Dr. Reginald Brothers, Under Secretary for Science and Technology, U.S. Department of Homeland Security

By Michael J. Keegan

The pace of technological advancement is accelerating while the pace of the adoption of technology is increasing. This breakneck pace brings risks and opportunities. As we advance through the age of the “internet-of-things” and autonomous cyber-physical systems, the nation becomes more vulnerable to adversaries. Given the current and projected threat environments, technology and R&D are the bridge to the future of homeland security. Science and technology are essential to fulfilling the Department of Homeland Security’s (DHS) missions effectively, efficiently, and safely and addressing emerging challenges and opportunities. From border security to biological defense to cybersecurity to explosives detection, DHS’ Science and Technology Directorate (S&T) is at the forefront of integrating R&D across public and private sectors and the international community to meet homeland security mission needs.

Dr. Reginald Brothers, Under Secretary for Science and Technology, U.S. Department of Homeland Security, joined me on *The Business of Government Hour* to discuss topics including strategic priorities for DHS’ Science and Technology Directorate, the purpose of the national conversation on homeland security technology, and the importance of making connections and harnessing innovation. The following is an edited excerpt of our discussion, complemented with additional research.

## On the Mission of the Science and Technology Directorate

Our mission is to use the tools of technology and those of science to help make our country, people, communities, and homeland secure.

As DHS’s primary research and development (R&D) arm, S&T manages science and technology research, from development through transition, for the department’s operational components and the nation’s first responders. S&T’s engineers, scientists, and researchers work closely with industry and academic partners to ensure R&D investments address the



high-priority needs of today and the growing demands of the future. Our mission pivots to reflect and be in sync with the way we do research in this country, and the way we innovate in this country has fundamentally changed over time.

From border security and biological defense to cybersecurity and explosives detection, S&T is at the forefront of integrating R&D across the public and private sectors and the international community. By working directly with responders and component partners across the nation, S&T strives to provide advanced capabilities and analytics to better prevent, respond to, and recover from all hazards and homeland security threats. We have an annual research and development budget of about \$450 million with a staff of about a thousand people. While many of our staff are located here in the D.C. area, we have laboratories and universities across the country.

## On Managing the Science and Technology Directorate

I am the science advisor to the secretary and deputy secretary of Homeland Security. I am responsible for oversight and management of the department's research and development portfolio, which includes basic and applied research, development, demonstration, testing, and evaluation with the purpose of helping DHS's operational elements and the nation's first responders achieve their missions in the most effective, most efficient, and safest manner possible. We have 11 centers of excellence and 13 bilateral relationships with international partners. We oversee the Safety Act. We work in export controls. There is a tremendous variety of things that we do and we start thinking about the range, the diversity, the scope of the missions defined for the department.

## On Challenges

It's challenging working with the different time constants and response times that are very threat dependent. For example, certain research efforts, such as developing different types of phenomenologies for detecting explosives, involve a longer time commitment. Suddenly, a gyrocopter lands on White House ground and we have to respond to what I call "pop-ups." If you have an investment portfolio, you have resources, you have people that are working on these longer term research and development projects and suddenly something happens. How do we develop that flex capacity? This is one of my biggest challenges.

My other challenge is properly prioritizing S&T research. It is figuring out with the information we have the relative impact of different types of threats and the probability of these threats occurring. How do you determine what we should invest in? Given the ever evolving threat environment we face, it is a constant challenge ensuring you have the capacity to pivot your response to meet pop-up threats while also allocating limited resources on R&D that will have the most efficacious application.

There are these so-called "black swan" events. These are unexpected events with significant impact that one should probably have realized would actually happen in hindsight. With the advance of drone technology and the advent of the Internet of Things, we are trying to track, and in some way anticipate, what potential black swan events could arise from these phenomena. The pace of technological advancement and adoption is a constant challenge for us.

## On Leadership

Before coming to DHS, I was at the U.S. Department of Defense as Deputy Assistant Secretary of Defense for



Source: S&T Strategic Plan 2015-2019

Research. I had oversight over DoD's research portfolio as well as its laboratory enterprise. Before DoD, I was in industry. I worked at BAE Systems. I came to industry from Defense Advanced Research Projects Agency (DARPA). I have also worked at Draper Laboratory and at some start-ups. I have seen all parts of the S&T ecosystem. A leader needs vision and must chart a course to achieve that vision. One of the first things I did when I came to DHS was to start talking about visionary goals. When Dr. George Heilmeier, one of the great technology leaders of our time, was director of DARPA the organization and its stakeholders were invigorated by his articulation of visionary goals, what he called his "silver bullets." They helped orient the organization and inspired stakeholders. I was inspired by this and I thought, why not apply it to DHS S&T.

Once you have set goals, a leader needs to empower the workforce. It's essential. How do we make sure that the excellent people that we have feel empowered to do their jobs? Senior leadership doesn't have all of the answers. How do we best empower our great people to do their jobs and be enthused and innovate in the best ways they can?

Leaders also need to break down barriers to communication. Once you've set your goal, once you've tried to give your people empowerment, it's important to allow them to communicate. In any large organization, you have silos, stovepipes, or whatever you want to call them. A leader's job is to breakdown those barriers. Lastly, a leader needs to get out of the way. Once staff know your vision, are empowered, are held accountable, and are given the resources to succeed, a leader needs to let them do their jobs and get out of way.



Source: S&T Strategic Plan 2015–2019

## On Developing Visionary Goals to Guide S&T

I wanted to develop visionary goals and an actionable strategy that would lead to these visionary goals. In the past, S&T had a very operational focus in helping to bridge capability gaps identified by component partners and stakeholders. In mid-2014, that organizational outlook shifted to include a strategic viewpoint as well. While S&T continues to work with component partners, first responders, and other stakeholders on current issues, the organization began creating comprehensive, far-reaching visionary goals that look 20 or more years into the future. These visionary goals will serve as our strategic direction and will ultimately improve DHS's capabilities and make our nation more secure.

Developing these goals was a collaborative process that included S&T, DHS components, industry and academic partners, and other stakeholders, including the American public. The response drove new goals that will guide S&T in developing innovative solutions, while increasing efficiencies, and empowering stakeholders to capitalize on technological advancements. They will also lay the foundation for a new strategic plan, which looks five to 10 years out and further describes S&T's desired future.

Based on today's threats and technologies, what should the homeland security environment look like in 20 to 30 years? What challenges will DHS components, responders, and other end users face? How should the homeland security community change in order to best respond to these challenges? What should S&T plan for now to ensure the nation is more resilient and secure in the future? These are the questions S&T wants to answer. These are the questions we posed to the larger stakeholder community to develop visionary goals that will address the homeland security challenges ahead. I'll provide a brief description of these goals:

- **Screening at Speed: Security that Matches the Pace of Life.** Noninvasive screening at speed will provide for comprehensive threat protection while adapting security to the pace of life rather than life to security. Unobtrusive screening of people, baggage, or cargo will enable the seamless detection of threats while respecting privacy, with minimal impact to the pace of travel and speed of commerce.
- **Trusted Cyber Future: Protecting Privacy, Commerce, and Community.** In a future of increasing cyber connections, underlying digital infrastructure will be self-detecting, self-protecting, and self-healing. Users will trust that information is protected, illegal use is deterred, and privacy is not compromised. Security will operate seamlessly in the background.
- **Enable the Decision Maker: Actionable Information at the Speed of Thought.** Predictive analytics, risk analysis, and modeling and simulation systems will enable critical and proactive decisions to be made based on the most relevant information, transforming data into actionable information. Even in the face of uncertain environments involving chemical, biological, radiological, or nuclear incidents, accurate, credible, and context-based information will empower the aware decision maker to take instant actions to improve critical outcomes.
- **Responder of the Future: Protected, Connected, and Fully Aware.** The responder of the future is threat-adaptive and cross-functional. Armed with comprehensive physical protection, interoperable tools, and networked threat detection and mitigation capabilities, responders of the future will be better able to serve their communities.
- **Resilient Communities: Disaster-Proofing Society.** Critical infrastructure of the future will be designed, built, and maintained to withstand naturally occurring and man-made disasters. Decision makers will know when a disaster is coming, anticipate the effects, and use already-in-place or rapidly deployed countermeasures to shield communities from negative consequences. Resilient communities struck by disasters will not only bounce back, but bounce forward.

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— Dr. Reginald Brothers



As threats and security challenges evolve, S&T is poised to address them with programs that not only bridge current capability gaps, but also implement concepts and visionary goals that look 20 to 30 years ahead. S&T is forging paths that will help transport the nation to a more secure, resilient future.

### **On the S&T National Conversation on Homeland Security Technology**

The National Conversation is our way to crowdsource innovative ideas about how to improve a variety of challenges we face in today's world of increasing security and public safety concerns—everything from equipment for first responders to cybersecurity to making airport security easier to navigate. The inaugural year of the National Conversation tackled S&T's five visionary goals in addition to other emerging topics. The emerging topics include: bio/agro security innovation; mass transit security: protecting our railways and subways; and transforming airport borders: ensuring secure and efficient airport border operations.

From suggestions to concerns to complaints, we read them all. We got a lot of useful input that will positively impact our outlook for years to come. For example, the *Enable the Decision Maker* dialogue yielded the following recommendations for S&T, calling for efforts related to:

- Testing and evaluating predictive analytics capabilities as part of S&T pilots and exercises
- Continuing to foster industry partnerships best positioned to design, test, and offer basic analytics capabilities
- Investing in R&D efforts focused on technology that can scan information sent to decision makers for potential privacy concerns

The *Screening at Speed* dialogue recommended that S&T continue its efforts in:

- Partnering with other federal agencies to conduct R&D on joint screening at speed technologies
- Developing a common framework for coordinating airport, border, and maritime owners and operators to integrate and upgrade screening systems
- Expanding research efforts on reconfigurable technology

I'm inspired by the passion that came through the feedback, and I appreciate it. Through this input, we were able to establish dialogues that matter to our communities and the people who serve them. The best part is that these conversations were only just the beginning. On a broader level, the National Conversation illustrated the need for S&T to change the way we conduct R&D. In order to do that, we first have to change the way we talk about the issues, and it's amazing what can be accomplished once you talk it out. The government can sometimes lose the message while navigating through the process. This can complicate how we communicate today's challenges, translate today's needs, and design tomorrow's solutions. In a nutshell, we need to talk more—and be more specific—about what S&T needs to know, and more importantly, why we need to know it. This year, armed with your input, we're doing just that.

### **On S&T Centers of Excellence (COEs)**

The DHS S&T Centers of Excellence develop multidisciplinary, customer-driven homeland security science and technology solutions and help train the next generation of homeland security experts. The COE network is an extended consortium of hundreds of universities conducting groundbreaking research to address homeland security challenges. Sponsored by the Office of University Programs, which has done a wonderful job, the COEs work closely with the homeland security community to develop customer-driven, innovative tools and technologies to solve real-world challenges. COE partners include academic institutions; industry; national laboratories; DHS operational components; S&T



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divisions; other federal agencies; state, local, tribal, and territorial homeland security agencies; and first responders. These partners work in concert to develop critical technologies and analyses to secure the nation.

I invite folks to check out the virtual showcase: [showcase.hsuniversityprograms.org/technologies/](http://showcase.hsuniversityprograms.org/technologies/). This site provides a virtual exhibition of tools, technologies, and knowledge products developed by the Department of Homeland Security Centers of Excellence.

### On Making Connections and Harnessing Innovation

We in government need to operate at the pace of innovation and become a stronger partner in the digital age. The only way we can operate at the pace of innovation is to be part of it and to be part of the community that is innovating. That is why I was talking so much about outreach to all of the sectors, all of the parts of the S&T ecosystem.

For the second year in a row, S&T participated in SXSUW (South by Southwest) Interactive. I had discussions with innovators and community leaders. A consistent theme at SXSUW circled back to how local governments are investing in smart technologies to draw the best talent, reduce costs, keep commerce running, and serve as innovation hubs for their region. Awareness is rising of how S&T is reaching out to creative entrepreneurs who see opportunities and solutions when they hear about complex security problems. This kind of support from innovative thinkers, creators, and makers is important if we are going to meet the highly technical security challenges facing our future. The recognition of how technology is changing the way we think about communications, do business, and provide security is itself changing how governments operate and prepare for a future of increased connectivity and mobility. As new capabilities become more integrated into our lives and services become more mobile and connected, S&T is using the knowledge of science and tools of technology to enhance the resiliency of services and systems such as transportation, water, utilities, and public safety. Over the next few months, many of us from S&T will be back on the road meeting with entrepreneurs and governmental leaders to share ideas and discuss the individual roles we can each play in ensuring our communities are smart, safe, and secure. Are you ready to think differently about the role science and technology plays in your community? S&T wants to work with you!

We have two other important initiatives, the opening of the DHS Silicon Valley Office (SVO), which is out in full force, and the release of the first call focused on securing the Internet of Things (IoT). The call was issued under the SVO's Innovation Other Transaction Solicitation (OTS). The goal of the Innovation OTS is to engage start-ups, incubators, and those who historically have been atypical partners for government to consider the department as a viable customer and transition partner. With this solicitation, we're not reinventing the wheel but are using existing procurement authorities to mirror the process and pace of Silicon Valley and other innovative investment communities. We are looking to connect with start-ups developing concepts for commercial applications and have the potential to tackle tough mission challenges. This first call seeks novel ideas and technologies to improve situational awareness and security for protecting IoT domains, including the 16 critical infrastructure sectors monitored by DHS.

Partnerships matter more than ever. We know the key to success is understanding the capability needs across the Homeland Security Enterprise and then working with industry to bring solutions to bear in the marketplace.

We have a broad range of security challenges. Threats today cross traditional fields, new threats emerge regularly, and it seems that with more and more of our activities becoming online, the need for cybersecurity grows daily. All of this calls for new thinking in how we do business and build new partnerships. That's why we constantly are on the lookout for new ways to reach out, communicate, and connect with innovators, startups, and industry. ■

To learn more about the DHS' Science and Technology Directorate, go to <https://www.dhs.gov/science-and-technology>.



To hear *The Business of Government Hour* interview with Dr. Reginald Brothers, go to the Center's website at [www.businessofgovernment.org](http://www.businessofgovernment.org).



To download the show as a podcast on your computer or MP3 player, from the Center's website at [www.businessofgovernment.org](http://www.businessofgovernment.org), right click on an audio segment, select Save Target As, and save the file.



To read the full transcript of *The Business of Government Hour* interview with Dr. Reginald Brothers, visit the Center's website at [www.businessofgovernment.org](http://www.businessofgovernment.org).