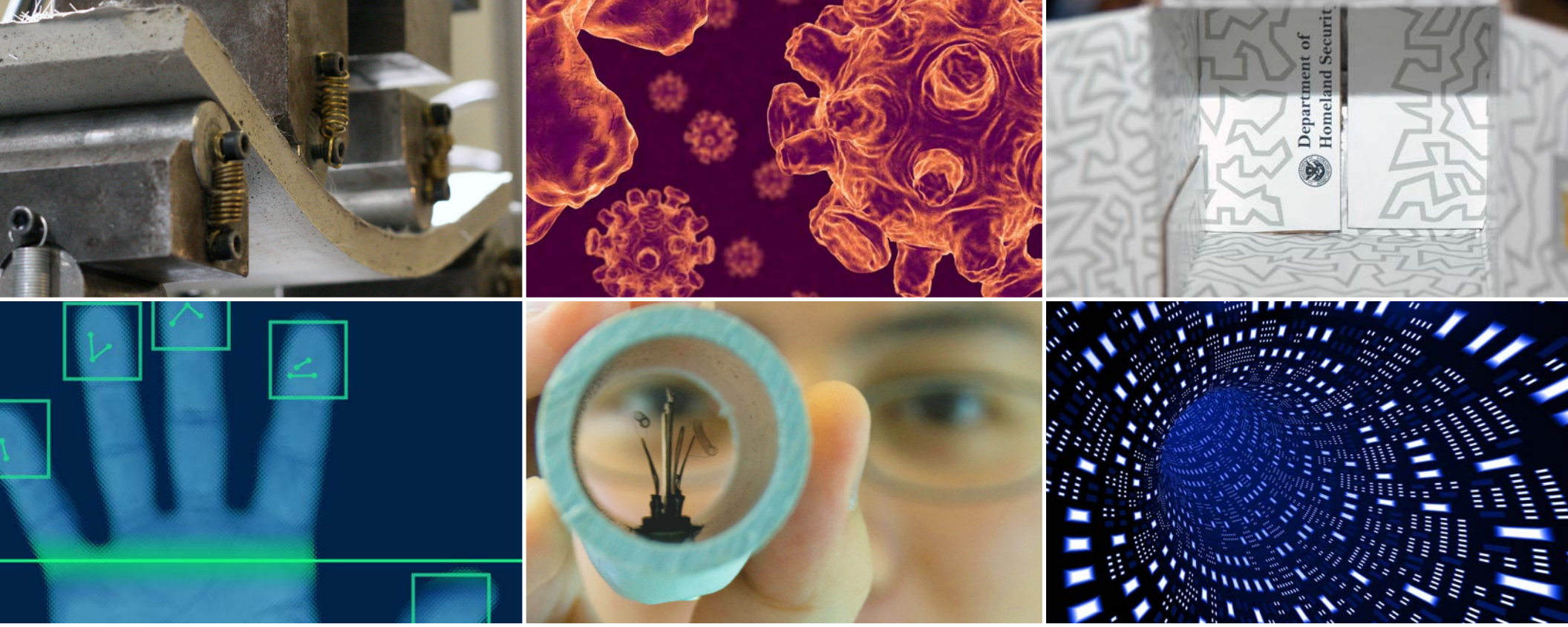

Basic Research Focus Areas

May 2009

Homeland Security

Science and Technology

Version 1.0

from the

Under Secretary for Science & Technology

The Science and Technology Directorate invests in basic research to enable future paradigm changes, primarily through university fundamental research and government laboratory discovery and invention. Through long-term support, these breakthroughs will generate a platform from which future technologies and information can be developed, refined and specialized for use by the Department of Homeland Security customers and our Nation's first responders.

This booklet summarizes the focus areas identified by S&T's Research Council, with input from our customers and the research community, for fundamental work to support the future needs for protection of our Nation. I've included contact information for my key leadership.

Thanks for all you do to keep the Nation safer. I hope you find this booklet useful.

Bradley I. Buswell
Under Secretary (acting)
Science and Technology Directorate
U.S. Department of Homeland Security


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contents

S&T DIRECTOR OF RESEARCH:

The Department of Homeland Security (DHS) Science and Technology Directorate's (S&T) Basic Research Portfolio creates fundamental knowledge for enhancing homeland security, normally at a time frame exceeding eight years. These efforts emphasize (but are not limited to) university fundamental research and governmental lab discovery and invention. Basic Research programs are executed in the six technical Divisions, facilitated by the Office of National Laboratories and the Office of University Programs, and closely coordinated with other government agencies.

Typically, the basic research efforts at S&T are motivated by one or more of the following:

1. The research addresses an important DHS issue (such as a High-Priority Technology Need) without a near-term solution.
2. The research pursues a creative solution that addresses a unique, long-term DHS need that is not addressed elsewhere.
3. The research exploits new scientific breakthroughs (e.g., from universities, laboratories, or industry) that could strengthen homeland security.

The Basic Research Focus Areas described in the next several pages were generated by the Research Leads in S&T's six divisions with input from our customers and the research community and vetted through S&T's Research Council. These focus areas represent the technological areas in which S&T seeks to create and/or exploit new scientific breakthroughs and help guide the direction of the S&T research portfolio, within resource constraints, to provide long-term science and technology advances for the benefit of homeland security.

S&T RESEARCH COUNCIL:

The S&T Research Council supports, facilitates, and promotes collaboration across the Directorate on basic research-related matters to ensure a comprehensive, integrated basic research portfolio while maintaining the appropriate flexibility for its member organizations. The Research Council is an advisory body to the Director of Research and to its members.

The Council is chaired by the Deputy Director of Research and includes representatives from the following:

- Research Leads representing each of the six divisions,
- the Office of University Programs (UP),
- the Office of National Laboratories (ONL),
- the Program Executive Office – Counter Improvised Explosives Devices [PEO (C-IED)],
- the International Cooperative Programs Office

The Research Council provides a forum for the members to work together, share ideas, understand one another's portfolios, integrate and coordinate efforts, and collaborate on efforts of mutual interest. Through the Research Council, members are made aware of best practices implemented by their colleagues in the execution of their research portfolios. These best practices are vetted through the Research Council and then codified in the *Basic Research Strategic Plan*. The efforts of the Research Council emphasize integration, coordination, collaboration, facilitation, and (as appropriate) consistency of approach.

S&T'S SIX TECHNICAL DIVISIONS:

The mission of DHS is to prevent and deter terrorist attacks, protect against and respond to threats and hazards to the Nation, and secure our national borders while welcoming lawful immigrants, visitors, and trade. The strategies S&T will use to support this mission and make the Nation safer are:

The S&T **Explosives Division** promotes the development of effective techniques to protect our citizens and our country's infrastructure against the devastating effects of explosives by seeking innovative approaches in detection and in countermeasures. The division provides the concepts, science, technologies and systems that increase protection from explosives and promotes the development of field equipment, technologies, and procedures to interdict suicide bombers, car and truck bombs, and shoulder-fired missiles before they can reach their targets.

The S&T **Chemical/Biological Division** seeks out the science needed to reduce the probability and potential consequences of a biological pathogen or a chemical attack on the Nation's civilian population, its infrastructure, or its agricultural system. The division develops and implements early detection and warning systems for attack characterization. Priorities include research and development efforts on urban monitoring, detection technologies, bioassays, a bioforensics capability, and restoration and response tools and technologies.

The attack on 9/11 demonstrated profoundly the danger to first responders and the public when those responding to emergencies cannot communicate effectively. The ability to talk across disciplines and jurisdictions, exchanging voice and/or data on demand, in real time, when authorized, is critically important, as is having disaster management plans to deal with crises. The S&T **Command, Control, and Interoperability Division** addresses the intricately related issues of reliable day-to-day public safety communications, as well as the security of our cyber world.

EXD CBD CID BMD HFD IGD

The S&T **Borders and Maritime Security Division** focuses on preventing the entry of illegals and terrorists while ensuring an efficient flow of lawful commerce, visitors, and citizens. It looks at technologies to protect and strengthen our ports of entry, technologies that can prescreen all high-risk entities coming into the country, and entry/exit tracking capabilities. It also looks at new technologies for detecting, identifying, and classifying high-interest vessels, and capabilities for wide-area monitoring of maritime traffic.

The Directorate looks at biometrics, motivation and intent, hostile intent, human factors engineering, and the social/behavioral/economic sciences to improve detection, analysis, and understanding of threats posed by individuals, groups, and radical movements. The efforts of the S&T **Human Factors/Behavioral Sciences Division** support the preparedness, response, and recovery of communities affected by catastrophic events.

The need to protect the country's 18 areas of critical infrastructure from acts of terrorism, natural disasters, and accident, is also paramount, but so are state and local preparedness and response. The S&T **Infrastructure/Geophysical Division** addresses physical, cyber, and human elements of our Nation's vulnerable infrastructure, focusing on capabilities, needs, gaps, and known threats.

DHS S&T BASIC RESEARCH FOCUS AREAS

EXD	CBD		
	Surveillance and Detection	Bioforensics (Microbial Forensics)	Agriculture
Advanced Imaging Algorithm Development	Improved Informatics and Design for Biological and Chemical Analysis	Improved Sample Recovery and Collection	Host-Pathogen Interactions
Fundamental Particle Physics	Improved Sampling	Improved Sample Preparation	Bioinformatics
Homemade Explosives Characterization	Sample Preparation	Physical and Chemical Analysis	Biotherapeutics
Materials Science Research C-IED Detection and Response	Assays	Molecular Signature Analysis	
Basic Research in Support of Improved Explosives Detection	Instruments	Bacterial Population Genetics	
Explosives Center of Excellence (COE) Core Program	Data Analysis, Storage, Interoperability, and Preservation	Viral Genetic Stability	
	Informatics and Decision Tools	Response and Recovery Research	
	Response and Recovery Research		

CID	BMD	HFD	IGD
Dynamic, On-Demand Data Processing and Visualization	Renewable Energy (RE) Sources and Power Management	Biometrics and Credentialing	Advanced Materials Research
Hypothesis-Driven Analysis	Intelligence-Driven Operations Incorporating Non-Traditional Data	Community Preparedness and Resilience	Blast/Projectile Analysis and Design of Protective Measures
Visualization of Structured, Unstructured, and Streaming Data	Modeling and Simulation for Secure Border Initiative (SBI) Systems	Countering IED Attacks	Resilient and Sustainable Infrastructure
Mathematics of Discrete and Visual Analytics	Radio-Frequency Identification (RFID) Improvements and Alternatives	Human systems integration	Physics and Mitigation of Natural Hazards
Scalable Filtering and Dissemination		Suspicious Behavior Detection	Modeling and Simulation for Decision Support Systems
Visualization and Simulation of Data		Technology Acceptance and Integration	Advanced Technologies for Emergency Management and First Responders
Mobile and Light-Weight Information Analytics and Sharing		Violent Radicalization, Motivation and Intent	Advanced Surveillance and Control Technologies
Cyber Security Research			Cyber-physical Systems

EXD

EXPLOSIVES DIVISION

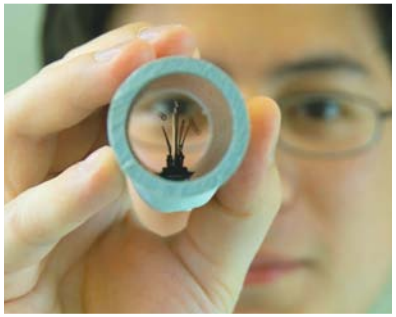
Advanced Imaging Algorithm Development—Multiyear research and analysis of raw images (e.g., X-ray, terahertz, millimeter wave, whole body imaging). Research is directed to development of advanced algorithms that can extract discriminating details from raw data to improve detection, reduce nuisance alarms, increase throughput, and enhance screener effectiveness. Reconstruction algorithms, automated detection algorithms, and features to assist operators—e.g., common image formats—are included within the research focus. Outputs of the research will be combined with advanced hardware designs through an interface standard that permits the "best" hardware and "best" software—quite probably from different vendor sources—to be combined.

Fundamental Particle Physics—Physics research directed toward improving sampling, detection, and characterization of explosives threats. Topics include measurement of work functions to remove particles of different characteristics from different surfaces and the determination of best methods to improve trace collection. Measurement of physical properties of energetic materials of interest will assist in the design of improved detection equipment.

Homemade Explosives Characterization—Multiphase homemade explosives chemical characterization to determine the detonability and performance of a large class of non-ideal energetic materials. The research supports how safely to deal with such materials and predict their performance and damage potential to support threat and detection system requirements.

Materials Science Research—Fundamental materials science research directed toward improved understanding of the relative importance and cumulative effect of aging, stress history, corrosion cracking, materials manufacturing variability, and threats on critical infrastructure materials. The program includes development of a materials testbed to examine materials with electron microscopy at the grain boundary level of detail. It also will support development of new materials to improve the resilience of the built environment and development of improved explosives detection at nanoscale levels of detection.

C-IED Detection and Response—Focus area includes research directed toward improved detection capability at standoff ranges for explosives threats of particular interest in C-IED, namely the Vehicle Borne Improvised Explosive Device. It also



includes policy research at the Mineta Transportation Institute, part of the Transportation Security Center of Excellent (COE), in support of improved prevention and response measures for application in surface transportation. Parallel work at the National Laboratories and the Explosives COE is directed toward the definition and roadmapping of a multiyear, comprehensive basic science research agenda to counter the domestic IED threat.

Basic Research in Support of Improved Explosives Detection—Research directed toward the development of ambitious requirements standards for the Transportation Security Administration (TSA) in support of obtaining the best capabilities from X-ray and other detection systems. Parallel research is being directed toward improved, next-generation sensors—e.g., carbon nanotube X-ray sources; advanced associated particle imaging (API) concepts for cargo application; spectroscopic cascade laser systems for standoff detection; and plant sentinels that exploit highly sensitive biological species discriminatory characteristics at the gene level.

Explosives Center of Excellence Core Program—Fundamental research in energetic materials characterization, detection, sensor fusion, and mitigation conducted in partnership by Northeastern University and the University of Rhode Island. Educational programs to support graduate student research and secondary school teacher preparation in the Science, Technology, Engineering, and Mathematics (STEM) disciplines is included within this focus area.

CHEMICAL/BIOLOGICAL DIVISION

SURVEILLANCE AND DETECTION FOCUS AREAS

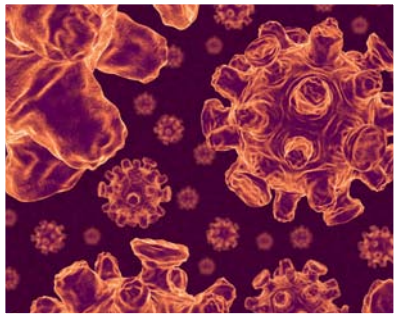
Improved Informatics and Design for Biological and Chemical Analysis—In particular, (1) bioinformatics research that leads to higher success rates for assay design, and (2) chemical data analysis research to allow information integration with other systems of analysis—e.g., biological detection.

Improved Sampling—In particular, (1) research in the areas of biological particle capture and on-the-fly analysis to support future development of technology that distinguishes between putative threat and nonthreat agents; (2) research that develops fundamental understandings of sample pre-preparation in the context of sample collection; and (3) research that improves transfer efficiency of agents to detectors or instruments.

Sample Preparation—In particular, (1) research that improves the ratio of analyte of interest to background contaminant (AoI:BC) for both chemical and biological threats; (2) research that enhances understanding of the factors that contribute to speed of analysis, especially where biological analysis is concerned; and (3) research that helps to improve and define the quality of samples that emerge from sample preparation in ways that are substantive to either instrumental or assay style analysis.

Assays—In particular, research to develop fundamental understandings and methodologies (assays) that address the full spectrum of biological agents: (1) traditional threat agents; (2) agents that have been enhanced with known biological content; (3) agents that have emerged via natural selection; and (4) agents that are purely synthetic in nature. Ultimately, this research should allow comparisons against highly flexible databases of information that uniquely identify threat agents. Research that improves the tolerance of various assay types to common environmental contaminants and defines the input requirements for these assays is also of interest.

Instruments—In particular, (1) research on chemical detection technology that improves the number of toxic industrial chemicals and chemical warfare agents that can be detected at relevant concentrations; (2) research that improves the speed, cost, and depth of biological analysis—e.g., analysis down to the single DNA-base-resolved level; and (3) research for the improved detection and identification of toxins. Research on methods for the maintenance of viability is also of interest.



Data Analysis, Storage, Interoperability, and Preservation—In particular, research to improve the depth and speed of data analysis and enhance access to (and indexing of) large datasets.

Informatics and Decision Tools—In particular, research to enhance automated and flexible tools for decision makers where different levels of detail are needed for different operational circumstances. This research should support command and control decision makers with convenient and appropriate level information, displayed in an informative way. Ultimately, these tools should allow decision makers to act with confidence in the threat environment and should be of value to decision makers possessing many different levels of expertise.

Response and Recovery Research—In particular, research aimed at enhanced understandings of chemical mechanisms that will allow affordable and effective decontamination of chemical and biological agents over wide areas.

BIOFORENSICS (MICROBIAL FORENSICS) FOCUS AREAS

Improved Sample Recovery and Collection—Biological samples have a relatively short half-life if not properly stabilized, resulting in only trace amounts being recoverable from a crime scene. Methods are needed to recover a wide range of human and agricultural microbial agents from a broad range of common surfaces, matrix types, and sample collection devices.

Improved Sample Preparation—Since only trace amounts of biological materials are often recovered from a crime scene, improved methods to increase the efficiency of extraction and concentration of analytes from the samples are needed. Furthermore, the analytes will most likely need to be extracted from complex environmental matrices, requiring methods designed to remove inhibitors to downstream analytical processes, such as PCR and sequencing.

Physical and Chemical Analysis—The sample matrix and trace materials associated with an agent in question can also be characterized to determine media components, growth conditions, production methods, and/or delivery matrix composition. Research needs in this area include elemental

and isotopic analysis of both organic and inorganic components, improved imaging technology, and better understanding of signatures of production.

Molecular Signature Analysis—Development of sensitive microbiological culture, molecular (nucleic acid–based/protein-based) and immunological detection assays for the identification, characterization, and comparison of all identified human and agricultural biothreat pathogens and toxins. Genotyping methods are required that provide drill-down specificity to the substrain level for the bacterial agents. Forensic assay development for both DNA- and RNA-based viral select agents is also required.

Bacterial Population Genetics—Implementation of a comprehensive research program on population genetics of bacterial select agents. This is critical to the development of analytical tools for phylogenetic representation, measuring relatedness and building statistical inference. The focus of research is on the forensics implications of bacterial population dynamics, environmental effects, host–pathogen interactions, genomic stability, mutation rates, and other relevant effects.

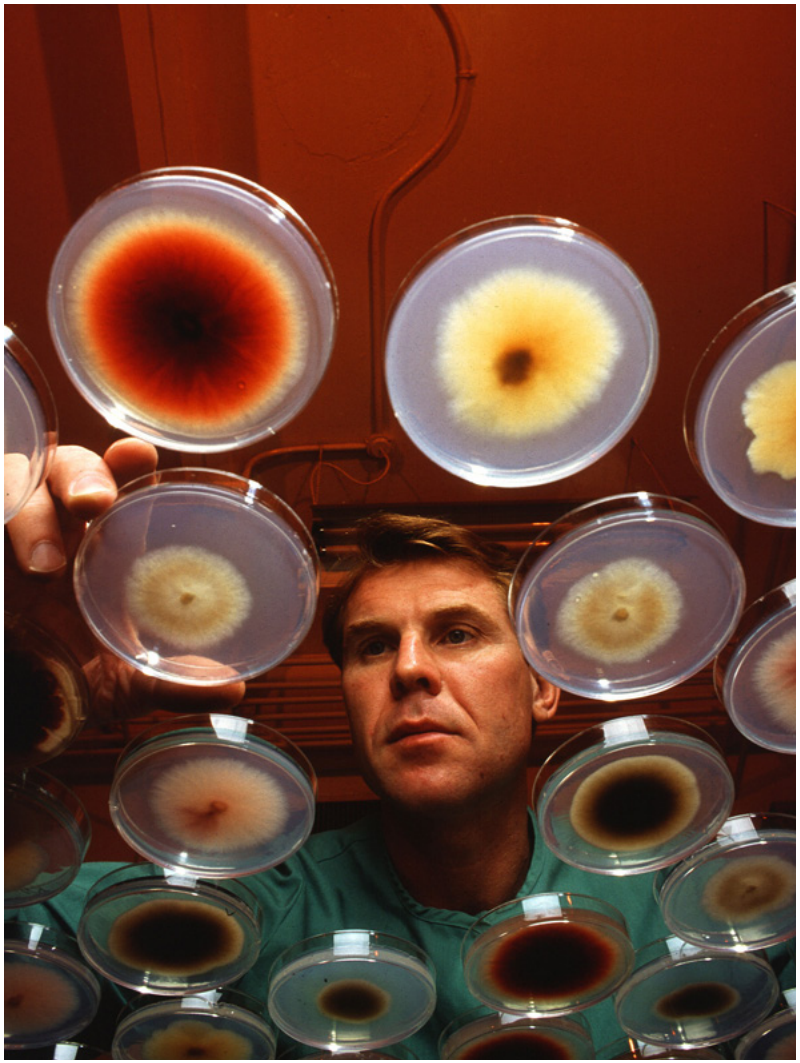
Viral Genetic Stability—Implementation of a comprehensive research program on the forensic implications of viral genetic stability to attribution analysis. There are substantial forensics challenges when addressing the genetic issues related to interpretation of viral population structures. The focus of research is on mutation and recombination rates, fitness constraints on genetic drift, host preferences and effects, and the extent of natural variation within globally circulating strains. A better understanding of the underlying genomic and population dynamics of viruses is critical to the development of analytical tools to measure the statistical significance of relatedness.

AG FOCUS AREAS

Host–Pathogen Interactions—Improved understanding of high-priority Foreign Animal Disease (FAD) disease mechanisms and host defense responses.

Bioinformatics—The application of bioinformatic approaches, or the derivation of knowledge from computer analysis of biological data, to address knowledge gaps for countermeasures and diagnostic technologies for high-consequence foreign animal diseases (FADs).

Biotherapeutics—Rapid-acting biological countermeasures (biotherapeutics) to help control a foreign animal disease (FAD) outbreak by closing the "window of susceptibility" gap between vaccination and onset of protective immunity.



CID

COMMAND, CONTROL, AND INTEROPERABILITY DIVISION

Dynamic, On-Demand Data Processing and Visualization— Capability for real-time management, analysis, and visualization of selected data in multiple forms and from multiple, diverse sources. Such techniques would automatically select, rank, and correlate only those data relevant for purpose-driven decision making.

Hypothesis-driven Analysis—This capability would include three elements: (1) automated retrospective analysis of collected or extant data, using pre-selected hypotheses; (2) automated generation of alternative hypotheses by constant updating of data; and (3) prospective analysis of potential risks and threats using data-derived hypotheses.

Visualization of Structured, Unstructured, and Streaming Data—Capability for integrated visual analysis of free text, database records, audio, video, imagery, transactional data, geographical data, and sensor information. The focus on this effort would be twofold: development of a single, scalable framework for visual analytics and establishment and validation of reliable performance metrics for visual processing of data.

Mathematics of Discrete and Visual Analytics—Development of the mathematical foundations for discrete processing and simulation and for visual analytics. This will provide a rigorous scientific basis for future algorithm development.

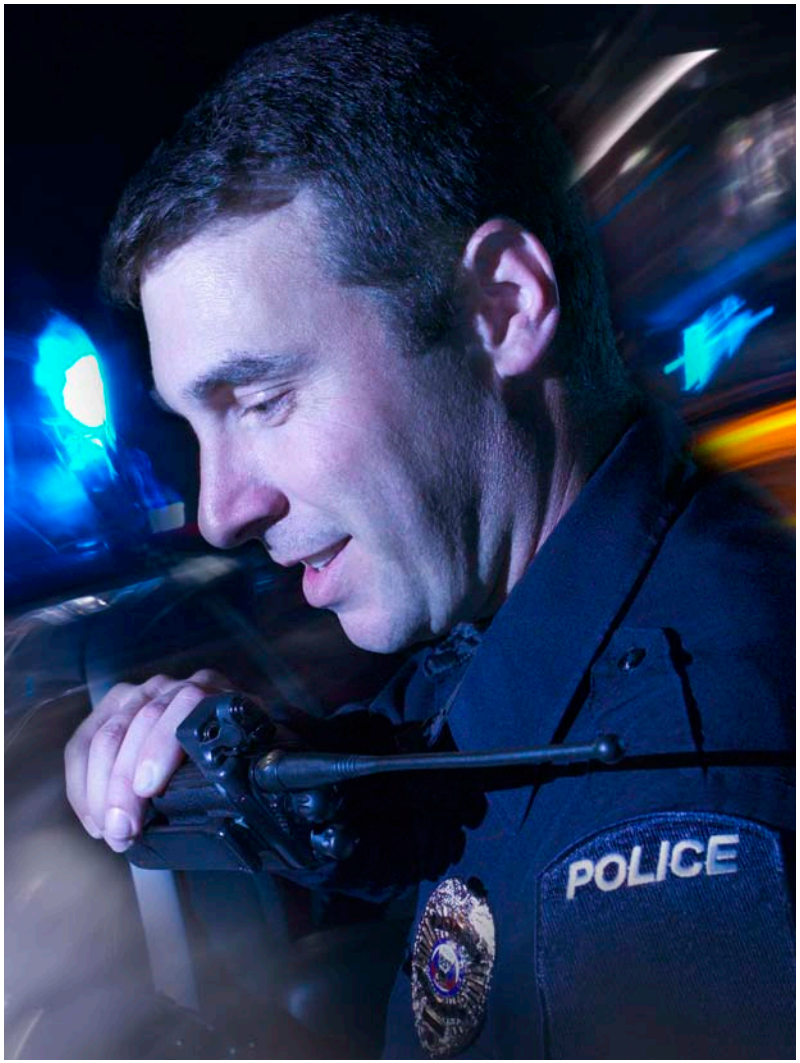
Scalable Filtering and Dissemination—Techniques for secure, privacy-aware identification and dissemination of information among international, Federal, state, tribal, and local agencies. This would include advanced methods, processes, and procedures that ensure sharing of information for immediate decision making by multiple partners under a range of technical, political, and organizational parameters.

Visualization and Simulation of Data—Application of visualization techniques, discrete mathematics methods, and game theory to diverse information, including development of new approaches to simulating multiple threats or disasters.

Mobile and Light-Weight Information Analytics and Sharing— Information discovery, dissemination, and decision-making tools capable of being tailored for diverse homeland security applications and software architectures. These techniques

need to focus on a range of law enforcement, public safety, public health, and emergency response applications.

Cyber Security Research—The Experimental Research Testbed and the Research Data Repository provide a testbed with sufficient topological complexity to emulate a scaled-down, but functionally accurate, representative of the real Internet, and access to computer and network operational data for use in cyber defense research and development initiatives. The data and testbeds allow research partners to pursue and test technical solutions to protect the public and private information infrastructure. Cyber Security Research also addresses secure protocols; process control systems; botnets and malware detection and mitigation; cyber forensics; wireless security; denial of service; and similar cyber security technology topics.



IGD

INFRASTRUCTURE AND GEOPHYSICAL DIVISION

Advanced Materials Research—Advanced materials to renew the infrastructure of the present and construct the infrastructure of the future to be resistant to many hazards and have sustainable properties. Hazards include blast; projectiles; fire; earthquakes; wind; flooding; deterioration and aging; corrosion; and combinations of these design challenges. Sustainable properties include self-healing, self-diagnosing, self-reporting, generating or conserving energy, minimal drain on nonrenewable resources, conserving water, long life, and affordability.

Blast/Projectile Analysis and Design of Protective Measures—Understanding the basic physics of blast effects on types of infrastructure that have not received extensive past testing and analysis (dams, levees, tunnels, bridges), improved understanding and modeling of blast effects on critical components of the infrastructure systems (towers, cables, submerged infrastructure), and design of protective measures to limit damage (i.e., articulated concrete mats installed externally to seal off damage to underwater tunnels, multilayered liners for interior protection of tunnels) or expeditious means to shore up damaged infrastructure to protect against further loss of life, such as safe entry for first responders.

Resilient and Sustainable Infrastructure—Infrastructure designed in such a way that reduces the consumption of energy, consumption of clean water, and emission of pollutants, and aims at resource conservation over the life of the project. It should use high-performance green materials that are self-monitoring, are self-healing, and stand the test of time. It should resist blast, earthquake, floods, and wind. Developing infrastructure that is sustainable means thinking differently about how we build, what we build, and whether we build at all. It means designing and maintaining infrastructures that are both highly efficient and all-hazard–resistant.

Physics and Mitigation of Natural Hazards—By better understanding the physics that drive the internal processes and severity of natural hazards, we are better positioned to develop innovative, effective protective measures to reduce damages from natural hazards and more quickly recover from them. Example hazards include hurricanes and the heat engine processes that control their intensity and resulting storm surge; high winds, erosion, and flooding; wildfires; and processes driven by high winds and drought, protective design and rapidly deployable protective measures, such as the “fire-proof house envelope” developed in the SAFE program; and earthquakes,

including an ability to interpret signals from the earth to estimate the timing, location, and severity of an earthquake.

Modeling and Simulation for Decision Support Systems— Modeling tools for a wide range of decision makers ,from local law enforcement to governors to the White House, to evaluate alternative policies and actions to deal with emergencies and anticipate cascading effects across interdependent systems. Tools for real-time decision support in emergencies capable of integrating and assimilating multiple types of information and processing that information and presenting it in a manner useful to decision makers.

Advanced Technologies for Emergency Management and First Responders—Technologies that will fully enable emergency managers and first responders to effectively cope with multihazard emergencies—technologies such as advanced materials for protective clothing that report on the health of the first responder; decision support systems that provide real-time logistical tracking and management of emergency supplies, equipment, and personnel; and advanced 3-D tracking technologies

Advanced Surveillance and Control Technologies—Integration of multiple types of sensing technologies and intelligent algorithms to interpret the sensed data and detect and report only actual anomalous activities.

Cyber-Physical Systems—Cyber-physical systems (CPS), which are emerging trend across the globe, are characterized by tight coupling, coordination, and interconnections among sensing, communications, computational, and physical resources. CPS are exhibited in many application areas, including industrial control systems, and are prevalent in almost every critical infrastructure sector, including water, gas, electricity, transportation, chemical, and healthcare. Such interconnections form a complex system of systems. For example, the electric power grid of today forms one of the largest and most complex system of power generation, transmission, and distribution systems at local, regional, and national level. It is envisioned that the complexity of the cyber-physical systems of the future will far exceed that of today's. Such a complexity poses several research challenges related to resiliency, vulnerability, threat, and recovery assessment issues. There is a need for models, theories, methods, and tools to address the security of cyber-physical systems taking into account the cyber and physical components of a system in an integrated and unified way and realizing the discrete and continuous aspects of the system.

HFD

HUMAN FACTORS/BEHAVIORAL SCIENCES DIVISION

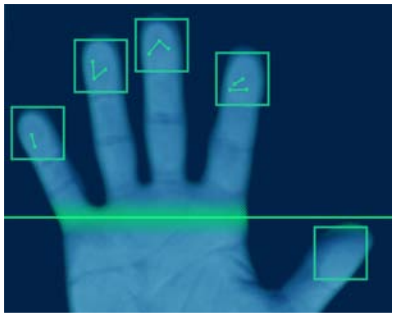
Biometrics and Credentialing—Research to establish multimodal biometrics, improve biometric sensor acquisition, increase the accuracy of biometric identification, improve biometrics system security, enable mobile biometrics, and develop nontraditional biometric modalities. Research in this area will enable easier and more secure credentialing and will allow the identification of otherwise unknown persons whose biometrics have been previously acquired.

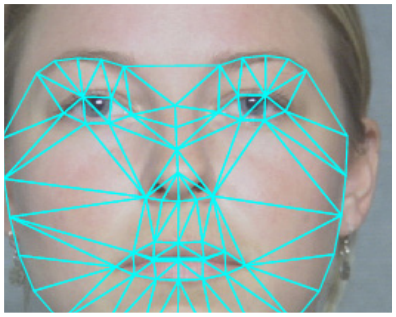
Community Preparedness and Resilience—Research to help the government and public prepare for the possibility of catastrophic events, avoid dangers through timely, comprehensible and credible warning systems, and mitigate impacts during emergencies and in their aftermath. Important concerns are identifying and ameliorating the impacts of catastrophes on persons, businesses, and communities, and establishing links that promote preparedness and resilience between the governmental and private sectors.

Countering IED Attacks—Research that focuses on humans as perpetrators and victims of improvised explosive device (IED) attacks. Some efforts focus on getting "to the left of the boom" and forestalling danger by countering violent extremism and enabling the prediction and prevention of likely planned attacks. Other efforts focus on responding to IED attacks in progress or completed and on promoting resilience in the face of completed attacks.

Human–systems integration—Research into how to design and implement technology and performance protocols in ways that maximize the effectiveness of human, and hence total system, performance. Included is research into the effects of stressors like the task repetition confronting Transportation Security Administration (TSA) screeners, work on cognition in security-relevant tasks, and research on more effective ways to train homeland security workers.

Suspicious Behavior Detection—Research to detect behavior correlated with an elevated likelihood of intent to cause harm. The goal is to increase the chance that those intending harm will be stopped at the Nation's borders and transportation hubs while allowing those with legitimate business to more easily and quickly pass checkpoints. Related research is aimed at identifying organizational insiders who take advantage of their





position to do harm. Other work seeks to train security officials in protocols and procedures that will allow them to better identify people who merit intensive screening.

Technology Acceptance and Integration—Research to enhance the safety, effectiveness, and usability of technology by systematically incorporating user and public input. This research proceeds by bringing together citizen panels to review and respond to technologies at various stages of S&T development. The panels typically pay special attention to health, privacy, civil liberty, and usability concerns.

Violent Radicalization, Motivation, and Intent—Research focused on terrorist motivation, intent, recruitment, mobilization, and operation to help understand whether radical groups are likely to engage in violence and what ideological, organizational, and contextual factors may influence violent intent or spark action. Goals include identifying, collecting, and analyzing information that sheds light on these matters and building computerized tools and models that allow a more effective assessment of the dangers that different individuals and groups pose.

BMD

BORDERS AND MARITIME SECURITY DIVISION

Renewable Energy (RE) Sources and Power Management— RE sources and power management that will reduce routine maintenance and operations in varying operational environments (northern and southern)—in particular, alternative power solutions for sensors, including unattended ground sensors. Additionally, power management coupled with renewable energy to increase the effectiveness and efficiency of electronics used in border/maritime areas, including: radars, cooled infrared (IR) cameras, communications devices.

Intelligence-Driven Operations Incorporating Non-Traditional Data—In particular, combine and process traditional data (such as intelligence information, sensor data, Federal information, and state and local law-enforcement information) with nontraditional data (such as a country's state of the economy or its unemployment level) to aid decision makers in assessment and prediction.

Modeling and Simulation for Secure Border Initiative (SBI) Systems

Radio-Frequency Identification (RFID) Improvements and Alternatives—In particular, RFID or alternative to RFID that can be easily read/transmitted/tracked when RFID'd cargo is shipped in pallet form.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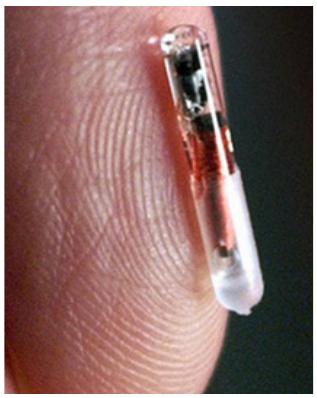

DOING BUSINESS WITH DHS S&T:

U.S. Government business opportunities can be found at: www.fedbizopps.gov.

Opportunities specifically with DHS S&T can also be found at the following DHS S&T- sponsored Web sites:

- **DHS S&T Solicitations Portal:** The Department of Homeland Security Science and Technology Directorate's active Solicitations on a broad range of topics are arranged by solicitation number in the left hand navigation section at its Broad Agency Announcement (BAA) website. **https://baa.st.dhs.gov/**

- **Small Business Innovation Research (SBIR):** SBIR's goal is to increase the participation of innovative and creative small businesses in Federal Research/Research and Development (R/R&D) programs and challenge industry to bring innovative homeland security solutions to reality. **http://www.sbir.dhs.gov**

- **SAFETY Act:** The SAFETY Act enables the development and deployment of qualified anti-terrorism technologies and provides important legal liability protections for manufacturers and sellers of effective technologies. **https://www.safetyact.gov/**

- **Commercialization:** The mission of S&T's commercialization efforts is to identify, evaluate, and commercialize technologies that meet the specific operational requirements of DHS operating components and first responder communities. **S&T-Commercialization@dhs.gov**

Additional information about the Basic Research Portfolio, the six technical divisions, and other S&T-related information can be found on the DHS Web site under Science & Technology. **http://www.dhs.gov/xabout/structure/editorial_0531.shtm**

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