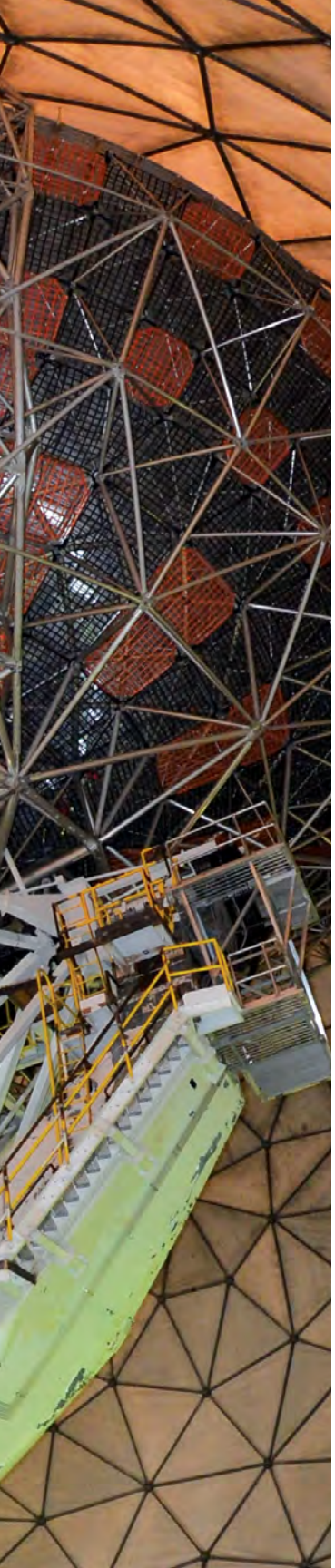
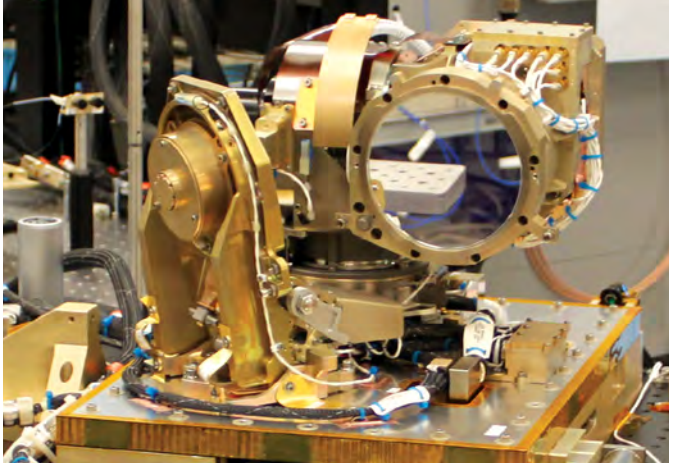


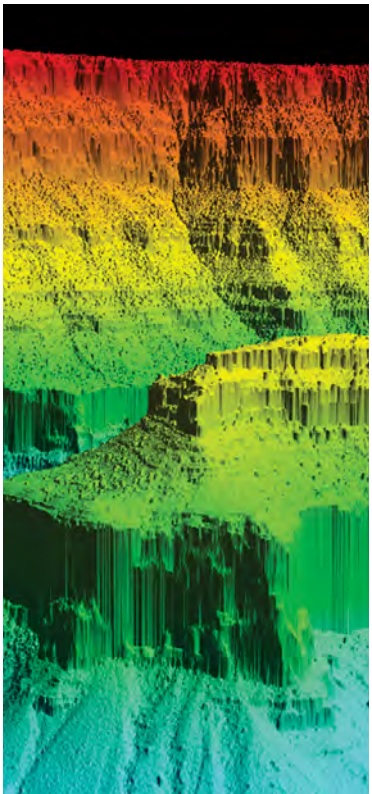




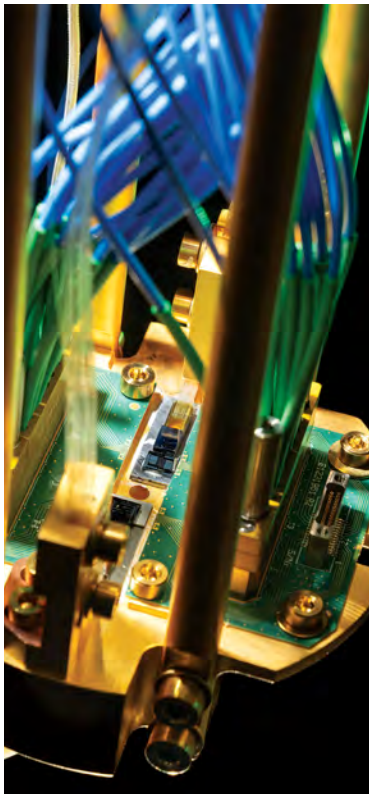
R&D 100 Awards

111
MIT LINCOLN LABORATORY

technologies recognized as among the best innovations of each year, 2010–2026









Technology for National Security

MIT Lincoln Laboratory researches and develops a broad array of advanced technologies to meet critical national security needs. What sets us apart from many national R&D laboratories is our focus on building operational prototypes of the unique systems we design.

Our ability to turn concepts into field-worthy systems is supported by state-of-the-art facilities, such as a world-class semiconductor research and fabrication laboratory, a flight facility with aircraft customized for field-testing airborne systems, and New England's fastest, most powerful supercomputing center.

Behind our innovative R&D are people with exceptional technical abilities and creativity, working in cross-disciplinary teams to develop advanced technologies for diverse needs—for example, defending against missile threats, providing secure communications, monitoring activity in space, and even inventing biomedical devices.

Quick Facts

MIT Lincoln Laboratory is a Department of War federally funded research and development center

Established
1951

Location
Lexington, Massachusetts

Research areas

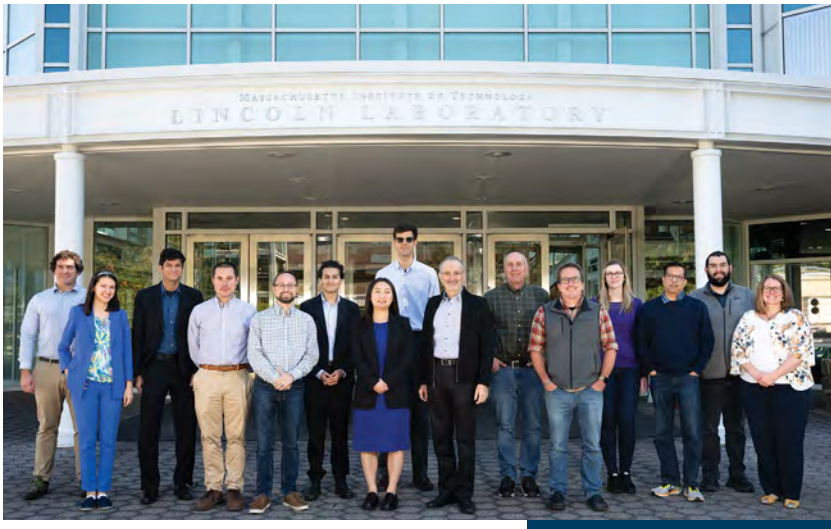
- Sensor systems
- Communications
- Advanced imaging
- Cybersecurity
- Artificial Intelligence
- Data analytics
- Microelectronics
- Bioengineering
- Air and missile defense
- Space systems

WWW.LL.MIT.EDU

Letter from the Director

R&D 100 Award Winners

Each year, R&D 100 Awards are awarded to the 100 most innovative technologies transitioned during the year for use in real systems or applications. The awards are selected by a panel of technical editors and subject-matter experts, and they represent a cross section of work from across the research and development community. MIT Lincoln Laboratory is honored to have been selected for 111 of these awards—including two R&D Editor's Choice Awards and one Special Recognition Silver Medal—since 2010.



Principal investigators and team members of Lincoln Laboratory's 2026 R&D 100 Award winning technologies.

Our recognized technologies reflect the wide range of research and development in which Lincoln Laboratory is engaged across our mission areas. Some of the winners come from our long-standing work on radar technology, chemical threat detection, and satellite communications, while others represent emerging areas such as 3D chip integration and superconducting electronics. Many of the technologies began as projects supported by funding from the Under Secretary of War for Research and Engineering for investigations into new technology that supports important, new defense capabilities.

This booklet was produced not only to recognize our award-winning technologies but also to applaud the work of the teams behind each of these awardees. Some of the teams collaborated with sponsoring agencies, academic partners, and industry. Many of these teams worked with dozens of contributors for several years to mature their technologies for transition to real systems. These projects represent the commitment of the entire Lincoln Laboratory to technical excellence in support of national security.



Melissa G. Choi
Director

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R&D 100 AWARD WINNERS

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5G Interference Cancellation Algorithm / Magnetite – Secure-by-Design Real-Time Operating System / Quantum Microsystems /

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Bumpless Integration of Chiplets to AI-Optimized Fabric / Lincoln Laboratory Radio Frequency Situational Awareness Model / Modular, Agile, Scalable Optical Terminal / Protected Anti-jam Tactical SATCOM Key Management System Prototype / Quantum Diamond Magnetic Cryomicroscope / Tactical Optical Spherical Sensor for Interrogating Threats / Wideband Selective Propagation Radar /

8 2024

Autonomous Sparse-Aperture Multibeam Echo Sounder / Electrooculography and Balance Blast Overpressure Monitoring System / Engineered Substrates for Rapid Advanced Imaging Sensor Development / FocusNet / Heat Injury Prevention System / In-Band Full-Duplex Wireless System with Advanced Interference Mitigation / Low-Temperature Additive Manufacturing of Glass Composites / Megachip / Mixture Deconvolution Pipeline for Forensic Investigative Genetic Genealogy / Nanocomposite Inks for 3D Printing Radio-Frequency (RF) Devices and Radiation Shielding / Neuron Tracing and Active Learning Environment / Portable Aircraft Derived Weather Observation System / Precision Photon Synchronization System for Quantum Networking / Superconductive Many-State Memory and Comparison Logic / Tunable Knitted Stem Cell Scaffolds /

14 2023

Joint Communication Architecture for Unmanned Systems Security/Cyber Module End Cryptographic Unit / Noncontact Laser Ultrasound for Medical Imaging / Puckboard / Scalable Photonic Quantum Memory Module /

16 2022

Airborne Collision Avoidance System sXu / Constrained Communications and Radar Dual-Use / Embedded Microjet Cooling for High-Power Electronics / Timely Address Space Randomization / Toroidal Propeller / TROPICS Pathfinder Satellite /

18 2021

Field-Programmable Imaging Array / Free-Space Quantum Network Link Architecture / Global Synthetic Weather Radar / Guided Ultrasound Intervention Device / Microhydraulic Motors / Monolithic Fiber Array Launcher / Motion Under Rubble Measured Using Radar / Spectrally Efficient Digital Logic / Traffic Flow Impact Tool /

21 2020

Cyber Sensing for Power Outage Detection / Defensive Wire Routing for Untrusted Integrated Circuit Fabrication / Forensic Video Exploitation and Analysis / Keylime / Large-Scale Vulnerability Addition / Reconnaissance of Influence Operations / TeraByte InfraRed Delivery / Timely Randomization Applied to Commodity Executables at Runtime /

Contents

R&D 100 AWARD WINNERS

24 2019

Aperture-Level Simultaneous Transmit and Receive Phased Array / Dual-Mode Imaging Receiver / ArtGut / Gas Mapping LiDAR™ / Lightweight Deployable Array Panels for Space / Mobility and Biomechanics Insert for Load Evaluation / Rapid Convective Growth Detector / Tactical Microgrid Standard Open Architecture / Targeted Acoustic Laser Communication / Visibility Estimation through Image Analytics /

28 2018

Dynamic Flow Isolation / Human-Machine Collaborative Optimization via Apprenticeship Scheduling / Immersive Imaging System / Intelligent Power Distribution / Multirate Differential Phase Shift Keying Optical Communications / Peregrine: Network Navigation / Photonic Lantern Adaptive Spatial Mode Control / Ultrafast Computational Methods for Searching DNA Databases / Very Large-Scale Integration Process for Superconducting Electronics / Web-Based HURREVAC /

32 2017

CO_2/O_2 Breath and Respiration Analyzer / Ground-Based Sense-and-Avoid System for Unmanned Aircraft Systems / Polarimetric Co-location Layering / Presymptomatic Agent Exposure Detection / Pulse-to-Pulse Phase Diversity Processing for Interference Suppression and Range Disambiguation / Wide-Area Infrared System for Persistent Surveillance /

34 2016

Airborne Collision Avoidance System for Unmanned Aircraft / Broadband Magnetometry and Temperature Sensing with a Light-Trapping Diamond Waveguide / EnteroPhone™ / Laserscope / Offshore Precipitation Capability / Small Airport Surveillance Sensor /

37 2015

Platform for Architecture-Neutral Dynamic Analysis / Self-Defense Distributed Engagement Coordinator / Video Content Summarization Tool /

38 2014

Airborne Sense-and-Avoid Radar Panel / Curled Microelectromechanical Switch / Haystack Ultrawideband Satellite Imaging Radar / Localizing Ground-Penetrating Radar / Lunar Laser Communication System / Wide-Area Chemical Sensor /

41 2013

Photoacoustic Sensing of Explosives / Structured Knowledge Space /

42 2012

Lincoln Open Cryptographic Key Management Architecture / Route Availability Planning Tool / Wide Field-of-View Curved Focal Plane Array / Wavelength Beam-Combining Fiber-Coupled Diode Laser /

44 2011

Airborne Ladar Imaging Research Testbed / Multifunction Phased Array Radar Panel / Parallel Vector Tile Optimizing Library / Pathogen Analyzer for Threatening Environmental Releases /

46 2010

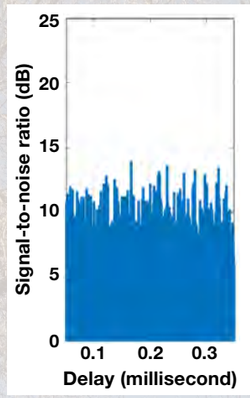
Digital-Pixel Focal Plane Array / Geiger-Mode Avalanche Photodiode Detector Focal Plane Array / Miniaturized Radio-Frequency Four-Channel Receiver / Runway Status Lights / Subwavelength-Separated Superconducting Nanowire Single-Photon Detector Array /

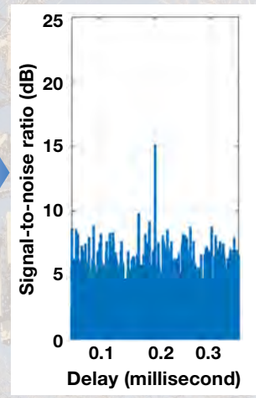
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2026

R&D 100 AWARD WINNERS





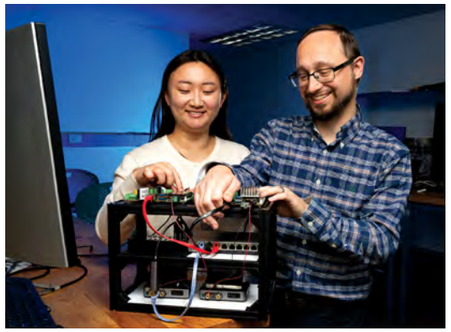


5G Interference Cancellation Algorithm

An algorithm that exploits features in the 5G downlink waveform to cancel interference imposed on co-channel RF systems used by government and commercial entities /

Magnetite – Secure-by-Design Real-Time Operating System

A Rust-based operating system, built on the seL4 microkernel, that compartmentalizes services to contain cyberattacks and sustain mission-critical functions on satellite and tactical platforms /



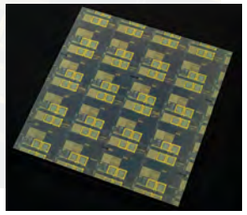


Quantum Microsystems

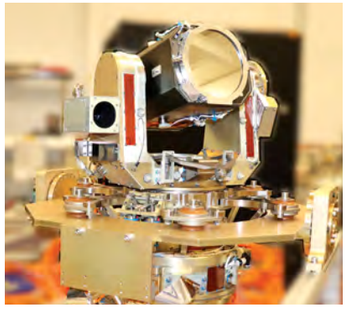
A computing platform that integrates superconductor and semiconductor chips within a single module, enabling scalable quantum, AI, and high-performance computing systems /

Bumpless Integration of Chiplets to AI-Optimized Fabric

A fabrication approach that enables a 3D circuit integrated with a massive number of specialized chips for improved data-processing speed and power efficiency /



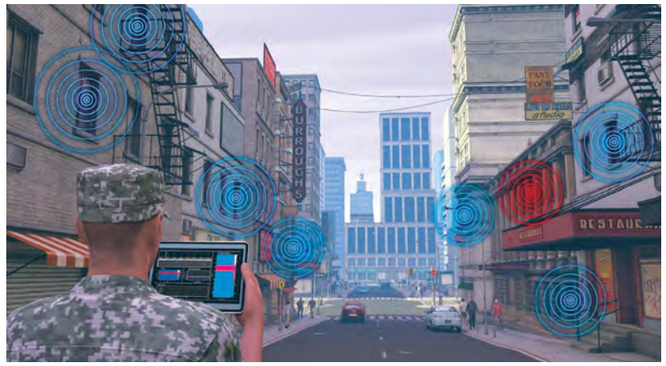
Modular, Agile, Scalable Optical Terminal



A next-generation laser communications terminal architecture that streamlines technology development with industry partners /

Lincoln Laboratory Radio Frequency Situational Awareness Model

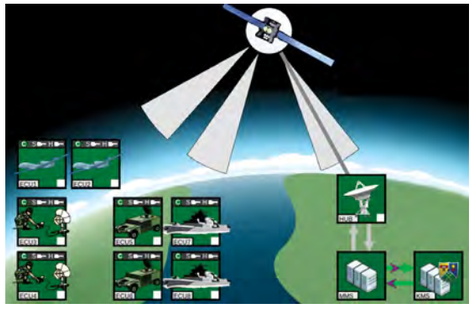
A spectrum sensing and classification model that provides users with information on nearby waveforms and their originating devices /



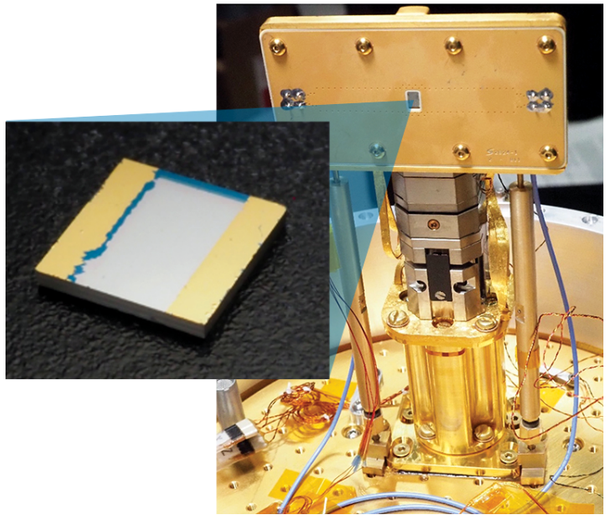
Protected Anti-jam Tactical SATCOM Key Management System Prototype

A cryptographic server that keeps warfighters connected during satellite communication (SATCOM) terminal rekeying, compromise, or jamming /

CODEVELOPERS: PERSONNEL FROM THE U.S. SPACE FORCE SPACE SYSTEMS COMMAND



2025
R&D 100 AWARD WINNERS



Quantum Diamond Magnetic Cryomicroscope

An instrument that leverages nitrogen-vacancy color centers in diamond to achieve high-sensitivity magnetic field imaging at cryogenic temperatures /

Tactical Optical Spherical Sensor for Interrogating Threats



A baseball-sized chemical sensor that can be thrown or launched into an area to remotely detect hazardous vapors or aerosols /

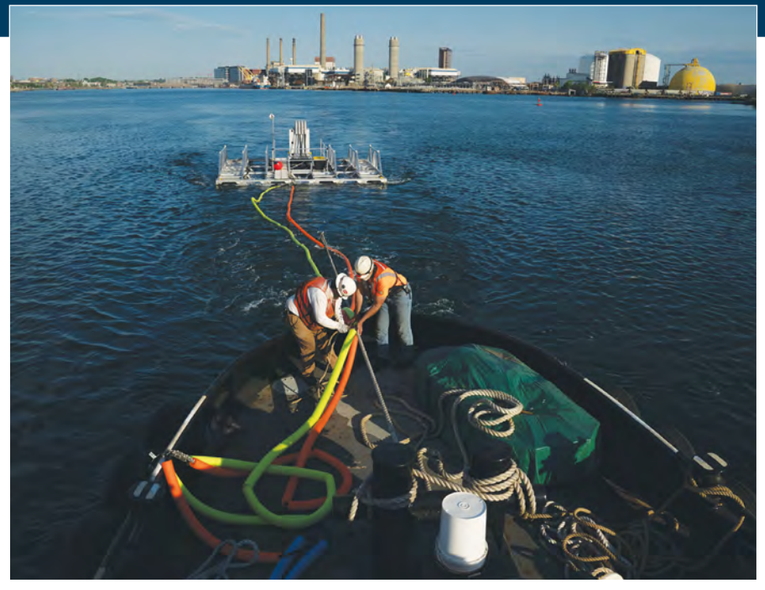
Wideband Selective Propagation Radar

A millimeter-wave radar that protects U.S. Army armored vehicles from kinetic threats while enabling covert communications /



2024
R&D 100 AWARD WINNERS

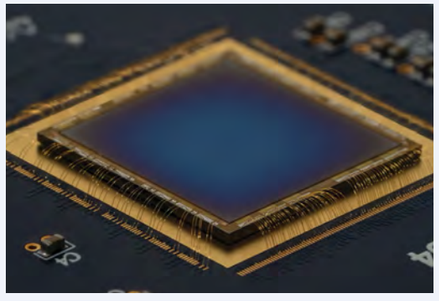
Autonomous Sparse-Aperture Multibeam Echo Sounder



A large sonar array, comprising a swarm of autonomous surface vessels, that uses estimation algorithms and acoustic signal processing techniques to rapidly generate high-resolution seabed maps /

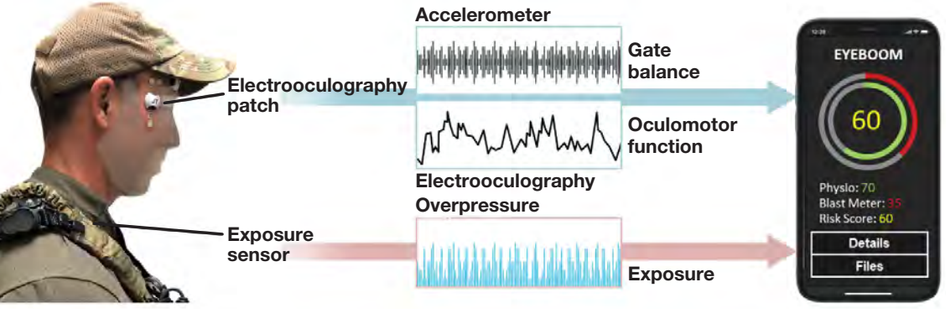
CODEVELOPERS: RESEARCHERS IN THE MIT DEPARTMENT OF MECHANICAL ENGINEERING

Engineered Substrates for Rapid Advanced Imaging Sensor Development



A fabrication process that reduces the development time and cost of advanced silicon imaging sensors by enabling a straightforward back-illumination process and uniform thinning on small batches of detectors /

Electrooculography and Balance Blast Overpressure Monitoring System



A wearable blast- and cognitive-monitoring system that provides early warning of blast-exposure risk for cognitive injury /

CODEVELOPERS: STAFF FROM CREARE LLC AND LIFELENS LLC

FocusNet

A machine learning architecture that performs context-driven automatic feature recognition and semantic segmentation of airborne ground-mapping lidar data /



Heat Injury Prevention System



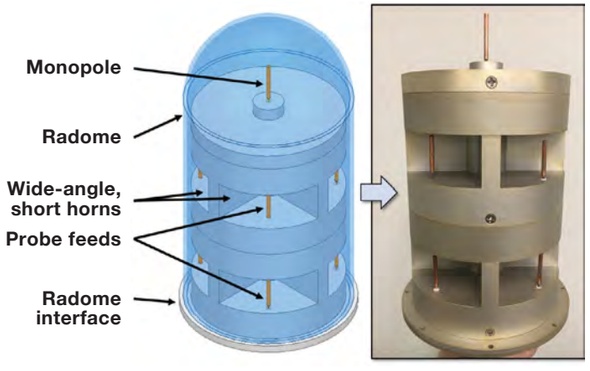
A rugged, easy-to-use wearable sensor system that monitors for heat-injury risk, employing algorithms for estimating body temperature, gait instability, and adaptive physiological strain index /

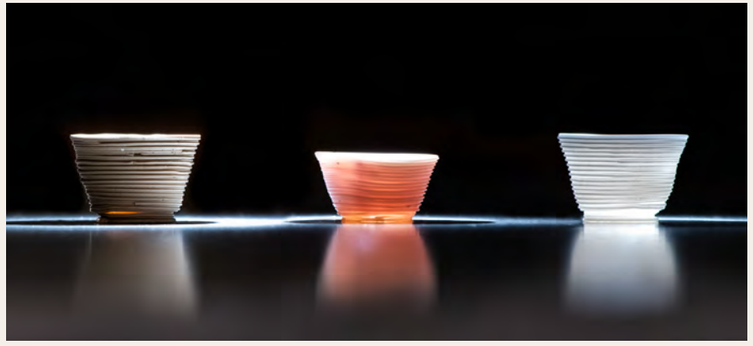
2024 winners continue on page 10 »

2024
R&D 100 AWARD WINNERS

In-Band Full-Duplex Wireless System with Advanced Interference Mitigation

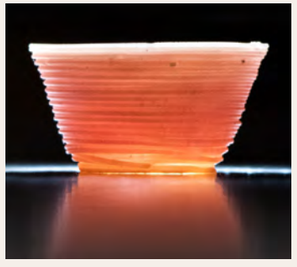
A wireless system that enables the mitigation of multiple interference sources, increasing the number of devices supported, their data rate, and their communications range /





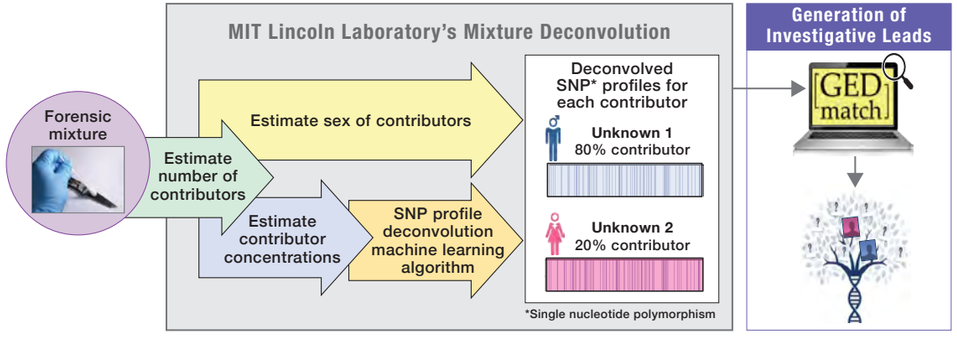
Low-Temperature Additive Manufacturing of Glass Composites

An approach that uses a direct-ink-writing technique to extrude multimaterial glass ink into a desired form at room temperature /



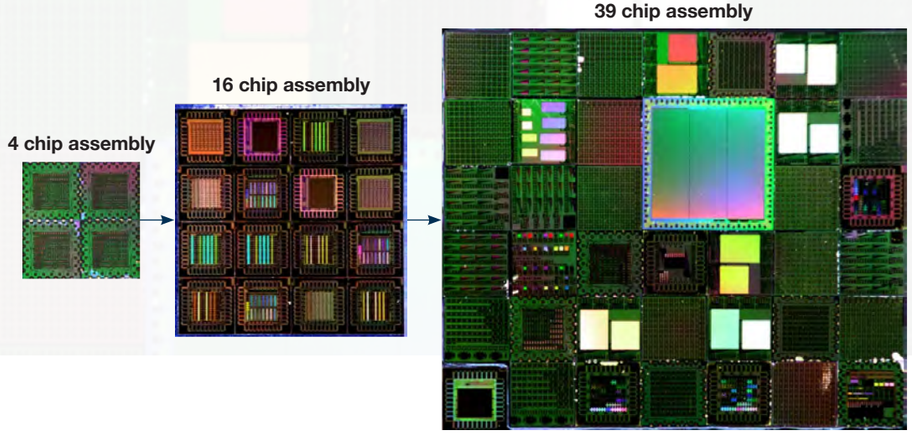
Mixture Deconvolution Pipeline for Forensic Investigative Genetic Genealogy

Software that allows analysts to decipher forensic samples containing DNA from two contributors without matching to reference profiles, enabling search in commercial genealogical databases /



Megachip

A chip-tiling approach that interconnects small specialized chips into a monolithic integrated circuit, capable of containing billions of transistors and reducing latency and energy costs for processing artificial intelligence data /



Nanocomposite Inks for 3D Printing Radio-Frequency (RF) Devices and Radiation Shielding

A materials system and process that use specially tailored nanocomposite inks to additively manufacture RF devices with graded dielectric properties /

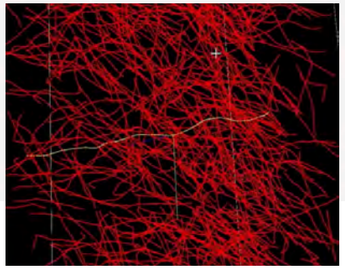
CODEVELOPERS: RESEARCHERS AT HARVARD UNIVERSITY



2024 winners continue on page 12›

Neuron Tracing and Active Learning Environment

An end-to-end software pipeline that generates segmentations of neurons from large brain imaging datasets and allows expert validation from a web browser to enable semi-automated brain mapping /



CODEVELOPERS: RESEARCHERS FROM THE MIT CHUNG LAB

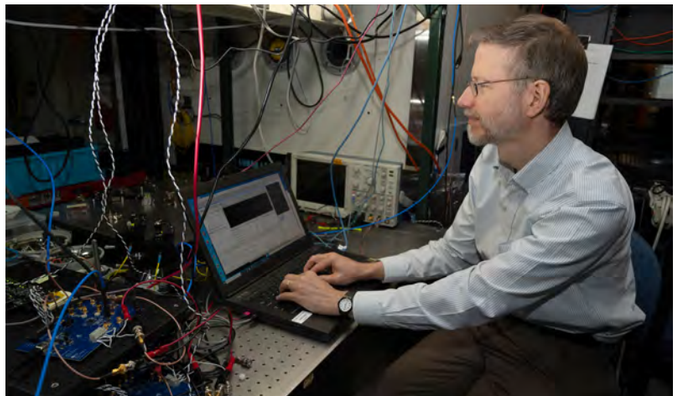
Portable Aircraft Derived Weather Observation System

A system that significantly increases the number and quality of real-time wind and temperature observations from aircraft, enabling improved weather forecasts and climate monitoring /

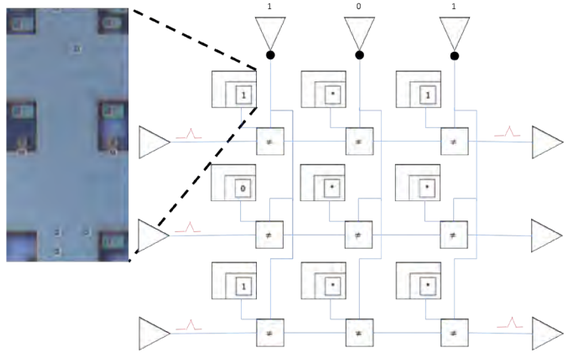


Precision Photon Synchronization System for Quantum Networking

A system that precisely synchronizes photons for long-distance free-space quantum entanglement distribution between different ground sites via an intermediary satellite /



2024
R&D 100 AWARD WINNERS



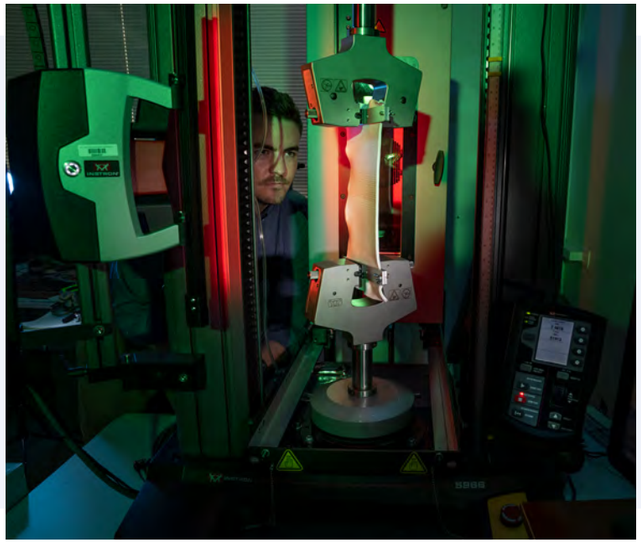
Superconductive Many-State Memory and Comparison Logic

Superconductive circuits that natively store and compare greater than two discrete states, without significantly increasing the number of devices or surface area of the circuits /

Tunable Knitted Stem Cell Scaffolds

Biocompatible knitted material (scaffold) that advances cell regeneration by mimicking the mechanics of soft tissue to allow more successful stem cell therapy with fewer complications than achieved with current stiff scaffolds /

CODEVELOPERS: RESEARCHERS IN THE MIT DEPARTMENT OF MECHANICAL ENGINEERING



2023
R&D 100 AWARD WINNERS

Joint Communication Architecture for Unmanned Systems Security/Cyber Module End Cryptographic Unit

A compact, National Security Agency–certified device that secures tactical datalinks of unmanned systems processing sensitive information /

CODEVELOPERS: STAFF FROM NAVAL INFORMATION WARFARE CENTER PACIFIC



Noncontact Laser Ultrasound for Medical Imaging

A portable system that uses an eye- and skin-safe laser to acquire interior images of human tissue without touching the patient /

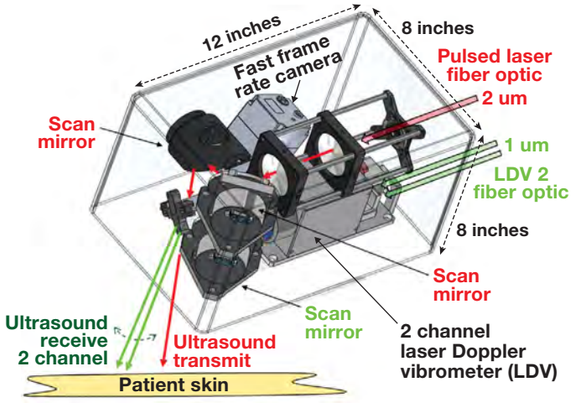
CODEVELOPERS: STAFF FROM MASSACHUSETTS GENERAL HOSPITAL CENTER FOR ULTRASOUND RESEARCH TRANSLATION AND SOUND & BRIGHT, LLC



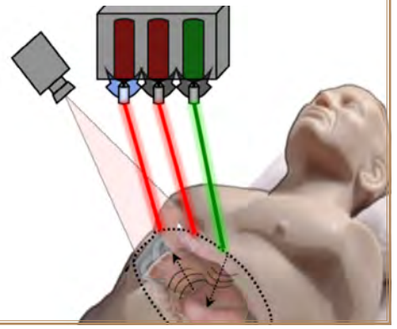
Silver Medal for Special Recognition, Market Disruptor–Products

This technology was also the winner of an R&D 100 Silver Medal in the Market Disruptor category recognizing industry-changing products

2023 R&D 100 SILVER



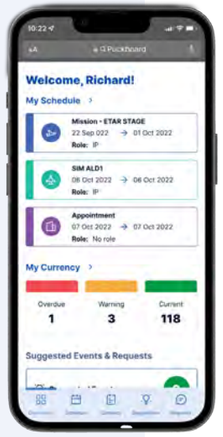




Puckboard

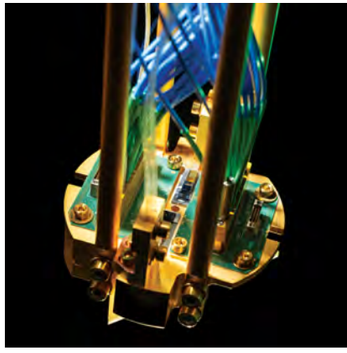
A web-based software application that uses artificial intelligence to optimize scheduling U.S. Air Force aircrews to mission and training flights /

CODEVELOPERS: RESEARCHERS FROM REVACOMM, DEPARTMENT OF THE AIR FORCE–MIT AI ACCELERATOR, MIT, 15TH WING, 60TH AIR MOBILITY WING, 437TH AIRLIFT WING, HEADQUARTERS AIR MOBILITY COMMAND, AIR FORCE RESEARCH LABORATORY, ASSISTANT SECRETARY OF THE AIR FORCE (INSTALLATIONS, ENVIRONMENT, AND ENERGY), RAYTHEON-BBN



Scalable Photonic Quantum Memory Module

A single unit that combines a photonic interface, loss-error correction, and an architecture accommodating multiple memory modules to enable high-rate, high-efficiency quantum networking for computing and distributed sensing /



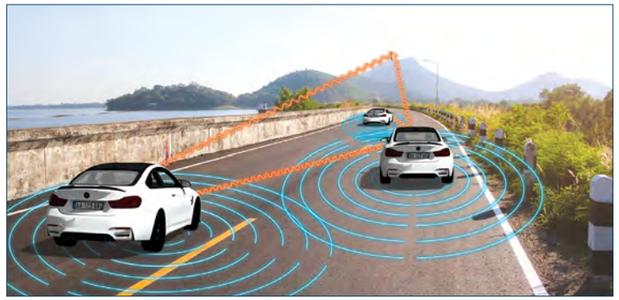
Airborne Collision Avoidance System sXu

A system that allows small uncrewed aircraft systems to detect nearby aircraft and maneuver away to avoid a potential midair collision /

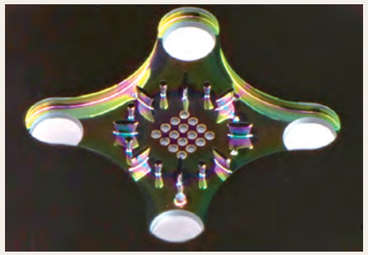
CODEVELOPERS: RESEARCHERS FROM THE FEDERAL AVIATION ADMINISTRATION, MITRE, AND JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY



Constrained Communications and Radar Dual-Use



A method of designing waveforms that can perform both radar and communications tasks simultaneously, using the same transmitter and receiver /

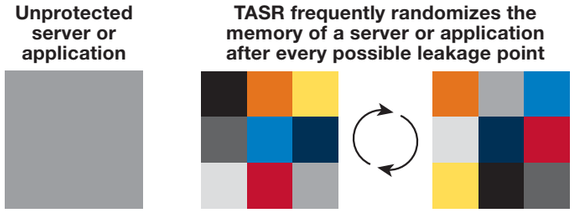


Embedded Microjet Cooling for High-Power Electronics

A device that uses arrays of micron-scale fluid jets, embedded directly into the device at the chip level, to drastically improve heat transfer in electronics /

Timely Address Space Randomization

Software that prevents memory corruption by automatically shuffling, or rerandomizing, the location of code in memory every time the software observes an output from an application /



Toroidal Propeller



A propeller designed for commercial drones that is significantly quieter than common multirotor propellers /



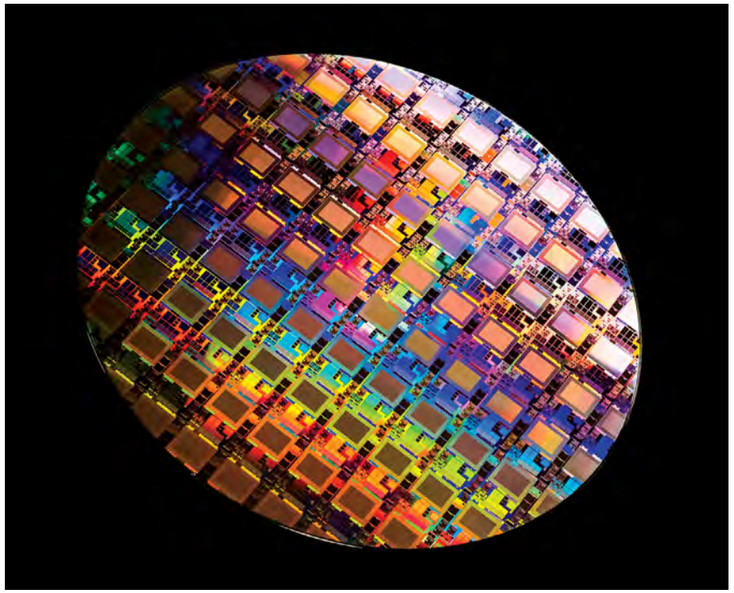
TROPICS Pathfinder Satellite

A small satellite, or CubeSat, that uses a novel, miniaturized microwave sounder to provide high-resolution weather data over the Earth's tropical belt /

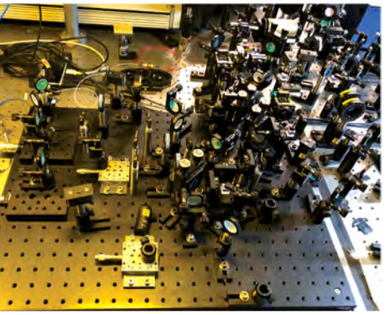
CODEVELOPERS: RESEARCHERS FROM NASA AND BLUE CANYON TECHNOLOGIES

Field-Programmable Imaging Array

A universal digital back end for camera systems that, when hybridized to an image detector array, results in a flexible and powerful digital processing system-in-package /



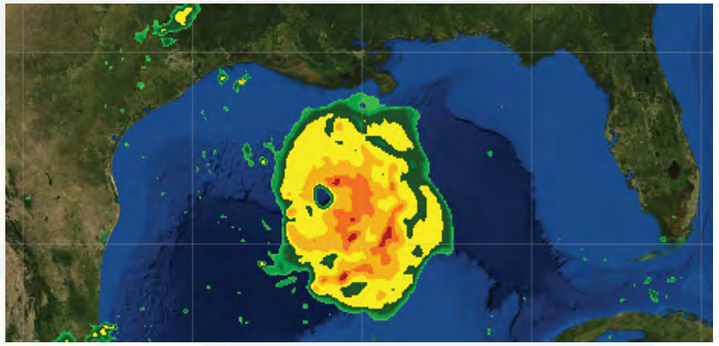
Free-Space Quantum Network Link Architecture



A system that enables the generation, distribution, and remote interaction of entangled photons across free-space links /

Global Synthetic Weather Radar

A technology that provides radar-like weather imagery and radar-forward forecasts in global regions where actual weather radar are not deployed or available /





Guided Ultrasound Intervention Device

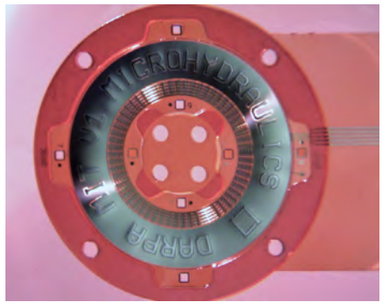
A handheld tool, utilizing real-time artificial intelligence software, that enables a medic to rapidly and accurately catheterize a central vein or artery in a prehospital environment /

CODEVELOPERS: RESEARCHERS AT MASSACHUSETTS GENERAL HOSPITAL

2021
R&D 100 AWARD WINNERS

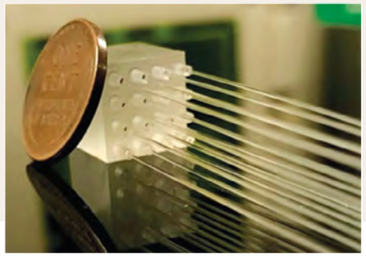
Microhydraulic Motors

A scalable, electrowetting-based actuation platform that has a torque density two orders of magnitude higher than that of electric motors /



Monolithic Fiber Array Launcher

An all-glass, monolithic fiber array launcher that is smaller and more robust than standard arrays /



2021 winners continue on page 20 »

Motion Under Rubble Measured Using Radar

A lightweight, portable life-detection radar that rapidly senses, ranges, and characterizes survivors trapped beneath rubble /



Spectrally Efficient Digital Logic

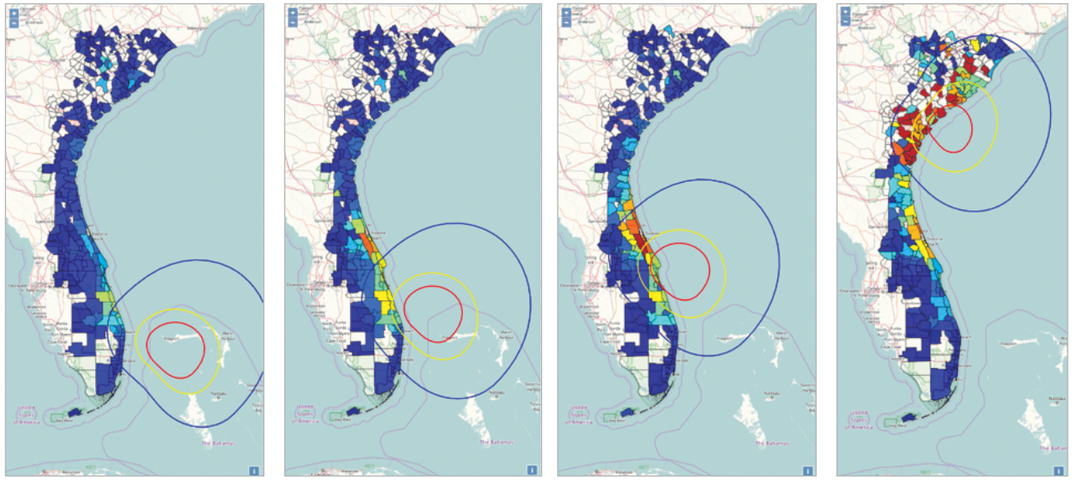
A set of digital logic families that operate with intrinsically low electromagnetic interference emissions /



Traffic Flow Impact Tool

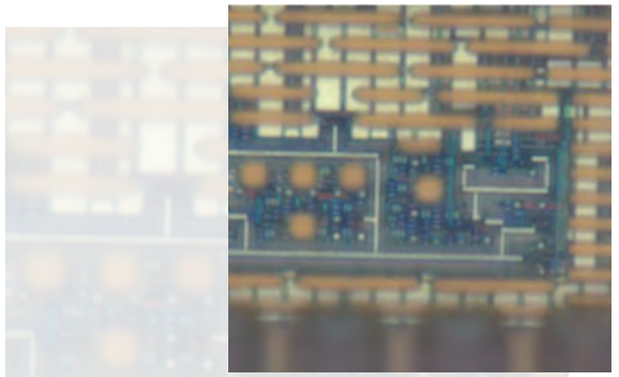
A tool for air traffic control managers that predicts and displays impacts to airspace capacities and traffic flow rates during convective weather /





Cyber Sensing for Power Outage Detection

A system that uses data on internet traffic to rapidly estimate and map the extent and location of power outages across geographic boundaries /



Defensive Wire Routing for Untrusted Integrated Circuit Fabrication

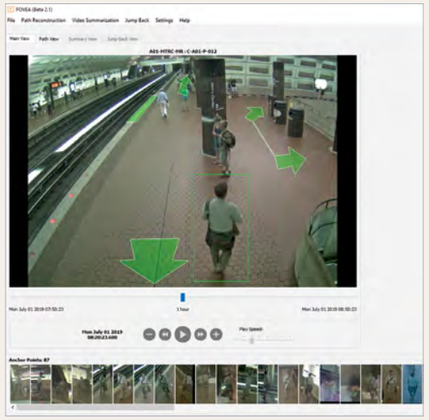
Techniques that deter an outsourced foundry from maliciously tampering with or modifying the security-critical components of a digital circuit design /

2020 winners continue on page 22 »

2020
R&D 100 AWARD WINNERS

Forensic Video Exploitation and Analysis

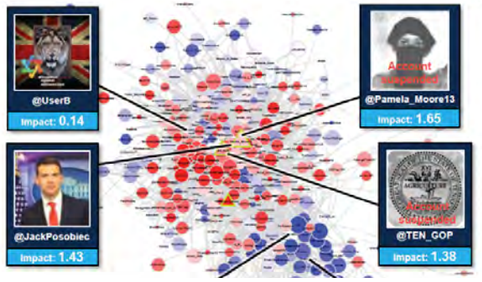
A suite of tools that enables users to efficiently analyze video captured by existing large-scale closed-circuit television systems /



Keylime

An open-source key bootstrapping and integrity management software architecture that is designed to increase the security and privacy of edge, cloud, and Internet of Things (IoT) devices /





Reconnaissance of Influence Operations

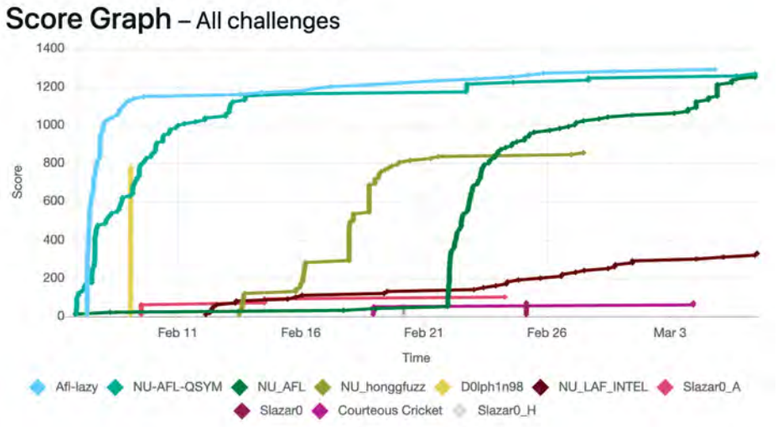
A software system that automates the detection of disinformation narratives, networks, and influential actors to address the growing threat posed by adversaries using social media for political objectives /

CODEVELOPERS: RESEARCHERS FROM HARVARD UNIVERSITY

Large-Scale Vulnerability Addition

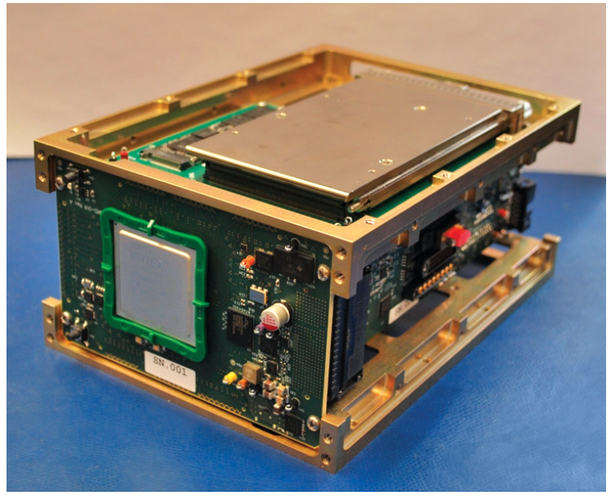
A technique that injects numerous bugs into a program at known locations and constructs triggering inputs for each to create ground truth for evaluating bug-finding systems /

CODEVELOPERS: STAFF FROM NEW YORK UNIVERSITY, NORTHEASTERN UNIVERSITY, AND U.S. ARMY



TeraByte InfraRed Delivery

An optical communications technology that enables error-free transmission of data from low Earth–orbiting satellites at a rate of 200 gigabits per second /



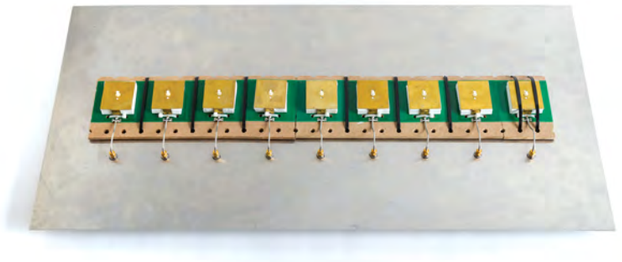
Timely Randomization Applied to Commodity Executables at Runtime

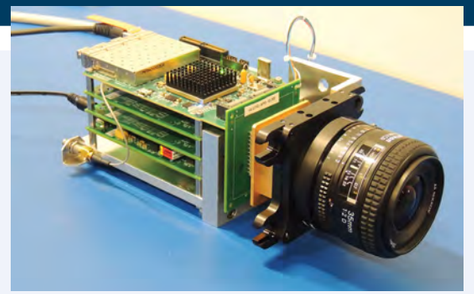
A technique that protects Windows applications against cyberattacks by automatically and transparently re-randomizing the applications' sensitive internal data and layout every time an output is generated /



Aperture-Level Simultaneous Transmit and Receive Phased Array

The first-ever demonstration of a phased array antenna system that has sufficient isolation to enable practical multibeam full-duplex communication /



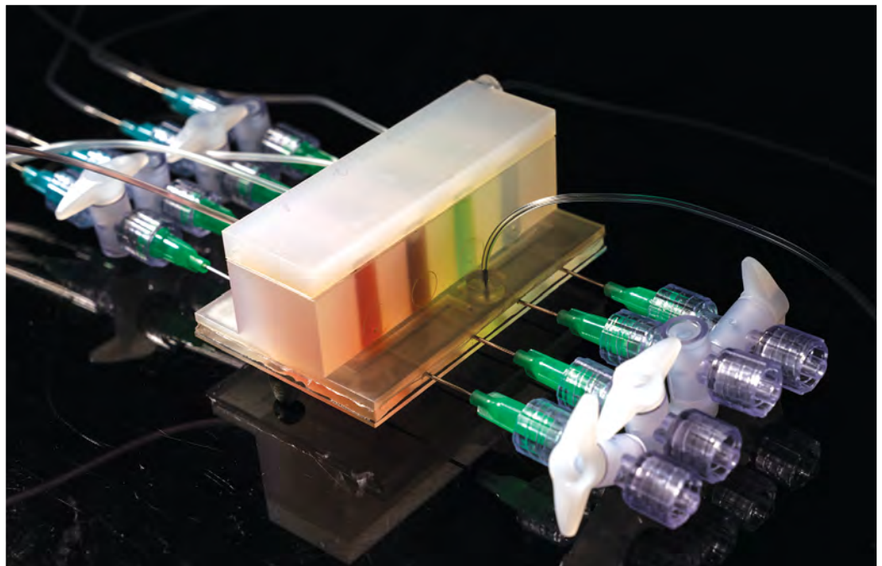


Dual-Mode Imaging Receiver

A camera that integrates the previously disparate functions of high-frame-rate photon-counting imaging and single-photon-sensitive communications into a single optical receiver /

ArtGut

The first in vitro platform that enables researchers to perform high-resolution, physiologically relevant gut microbiome studies /

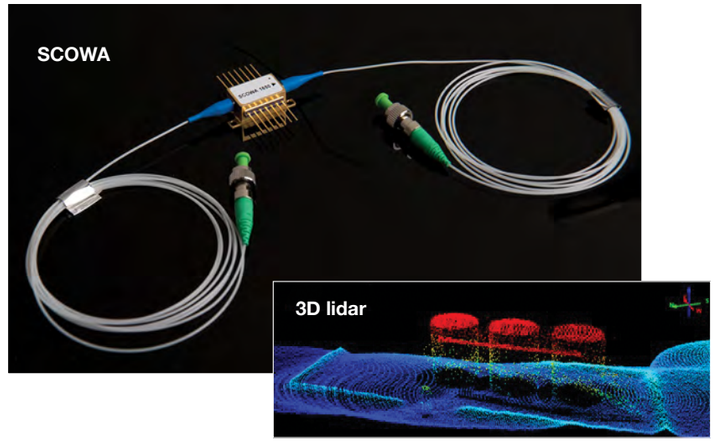


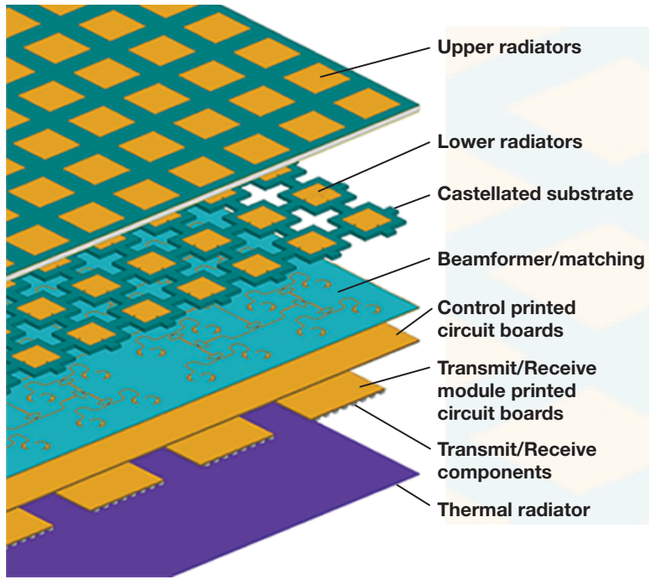
2019
R&D 100 AWARD WINNERS

Gas Mapping LiDAR™

A sensor, built by Bridger Photonics and enabled by Lincoln Laboratory's slab-coupled optical waveguide amplifier (SCOWA), that remotely detects, locates, and quantifies methane leaks and oil and gas infrastructure status /

CODEVELOPERS: STAFF FROM BRIDGER PHOTONICS





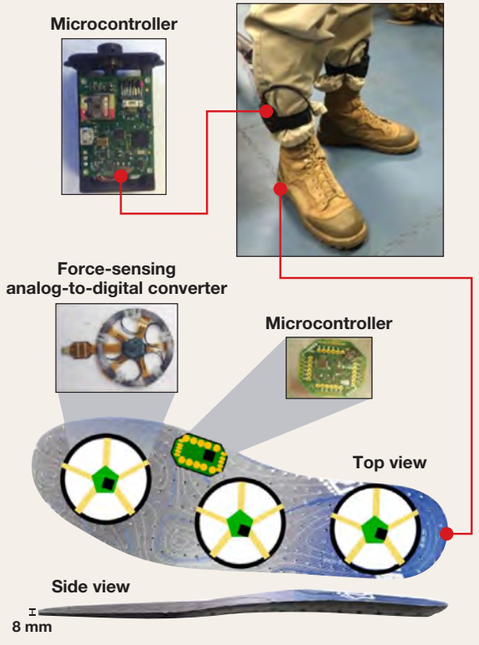
Lightweight Deployable Array Panels for Space

Panels for space-based communications and remote-sensing systems that have minimized weight and size to lower launch costs by reducing fuel needs and increasing capacity to accommodate more systems per launch /

2019 winners continue on page 26 »

Mobility and Biomechanics Insert for Load Evaluation

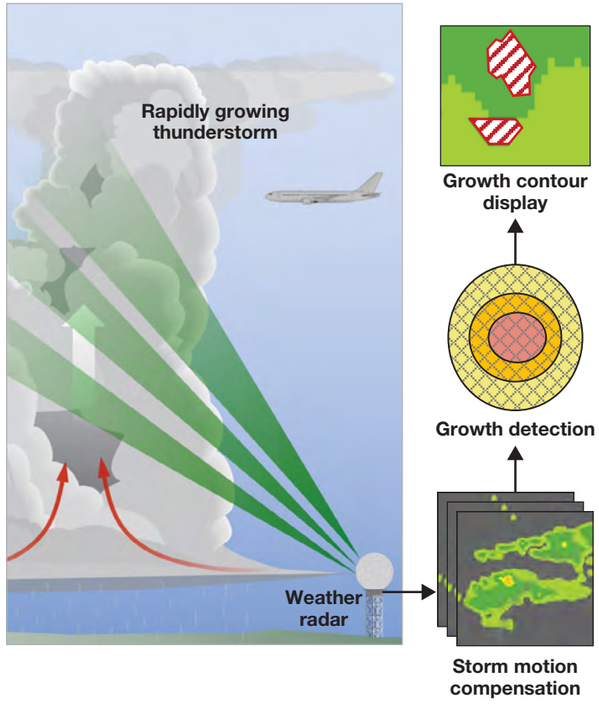
Biomechanical sensors that are built into a shoe insert and small ankle package to measure a user's weight and lower leg movements to help guide decisions about load-bearing and gait /



Rapid Convective Growth Detector

A system that uses tilt-by-tilt processing of weather radar data to identify and display regions of hazardous storm growth 10 times faster than other weather sensors /

CODEVELOPERS: STAFF FROM THE FEDERAL AVIATION ADMINISTRATION





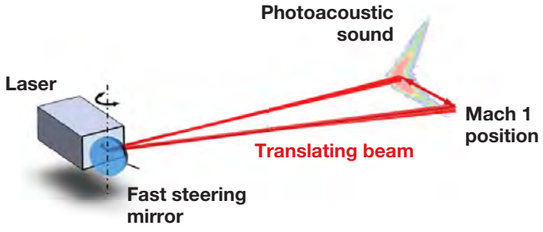
Tactical Microgrid Standard Open Architecture

An architecture that was developed by a Department of Defense–led consortium of government, industry, and academic partners to provide an interoperability standard for highly modular, resilient, scalable, and mission-specific microgrid solutions /

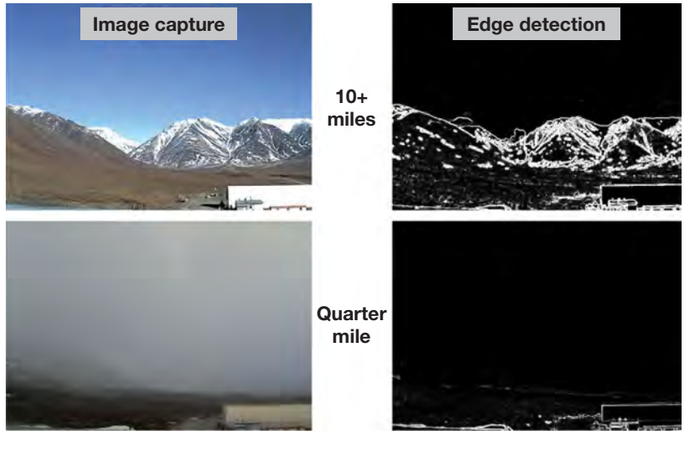
CODEVELOPERS: STAFF FROM HG ENGINEERS, PARSONS, SCHWEITZER ENGINEERING LABS, U.S. ARMY, AND U.S. MARINE CORPS

Targeted Acoustic Laser Communication

A system that uses laser photoacoustics to create audible messages in a person's ear, enabling secure and remote communications with the individual of interest and no one else /



Visibility Estimation through Image Analytics

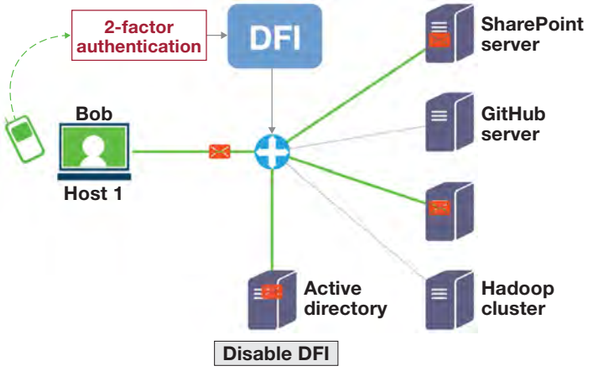


A software system that provides air traffic managers and pilots with an inexpensive, yet effective, way to automatically extract from camera images vital data about meteorological visibility /

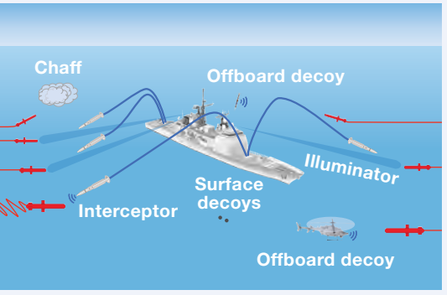
CODEVELOPERS: STAFF FROM THE FEDERAL AVIATION ADMINISTRATION

Dynamic Flow Isolation

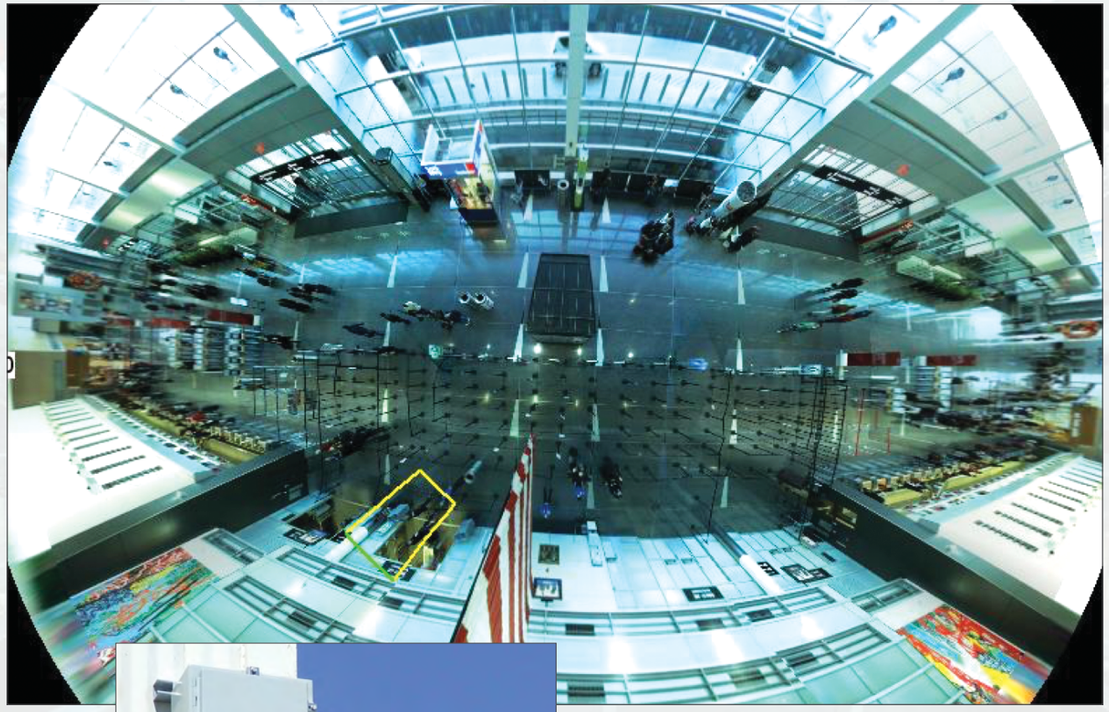
A technique that reduces unauthorized access to networks by restricting user privileges to only the computer resources users need /



Human-Machine Collaborative Optimization via Apprenticeship Scheduling



A machine learning algorithm that provides real-time decision support by applying heuristics learned from the observed behavior of human experts /





Immersive Imaging System

A wide-area video surveillance system that provides very high-resolution images and 360-degree coverage from a single vantage point /

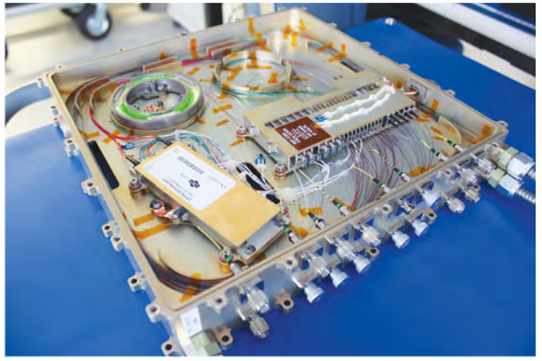
2018
R&D 100 AWARD WINNERS

Intelligent Power Distribution

An electrical box that improves the efficiency and resiliency of a microgrid operating in austere conditions by coordinating the microgrid's energy resources and loads /



Multirate Differential Phase Shift Keying Optical Communications

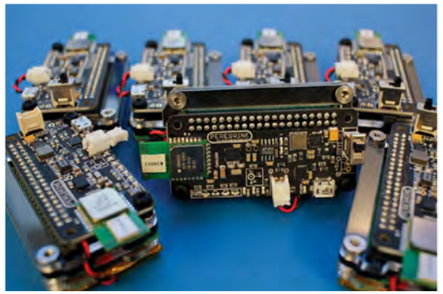


A format that enables efficient free-space laser communications over a wide range of data rates by using a single easy-to-implement transmitter and receiver design /

2018 winners continue on page 30 »

2018
R&D 100 AWARD WINNERS

Peregrine: Network Navigation

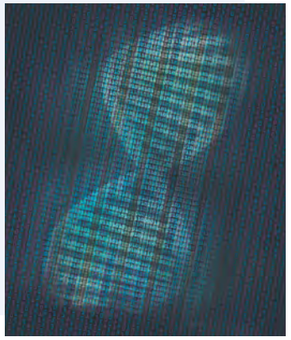


A system of networked deployable devices, powered by cooperative algorithms, that enables highly accurate navigation in environments where GPS is not available, reliable, or precise /

CODEVELOPERS: RESEARCHERS FROM MIT

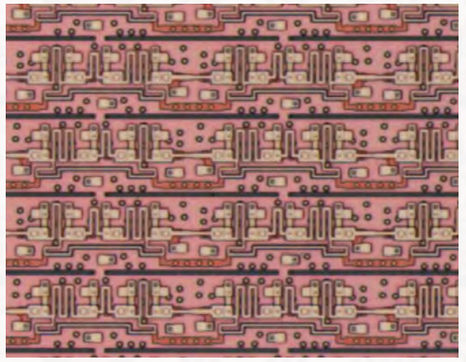
Ultrafast Computational Methods for Searching DNA Databases

Algorithms that drastically reduce the compute time required to compare a large number of unknown DNA profiles against a large dataset of millions of reference DNA profiles /



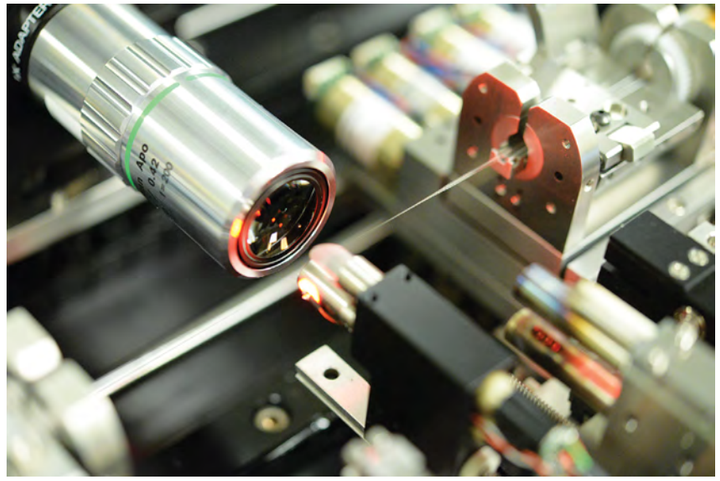
Very Large-Scale Integration Process for Superconducting Electronics

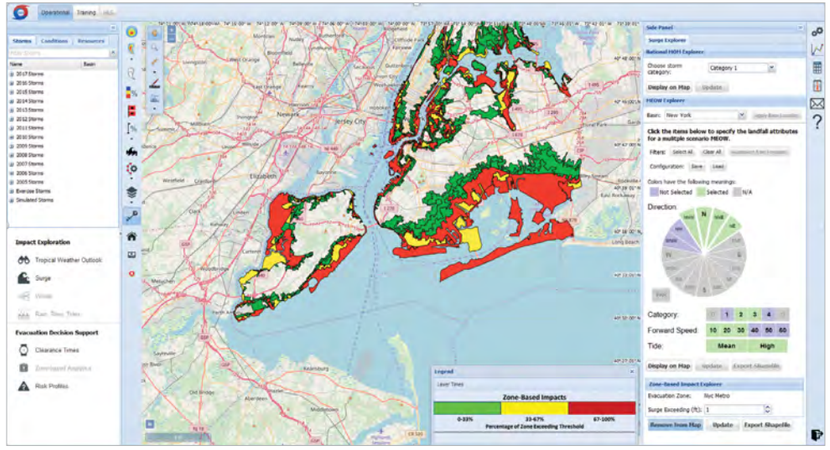
A fabrication process that taps into superconductivity to provide fast, energy-efficient integrated circuits for advanced computing, digital signal processing, quantum metrology, and sensing /



Photonic Lantern Adaptive Spatial Mode Control

A technology that provides the ability to steer and shape a laser beam, as well as scale its power, in the presence of optical disturbances and turbulence /

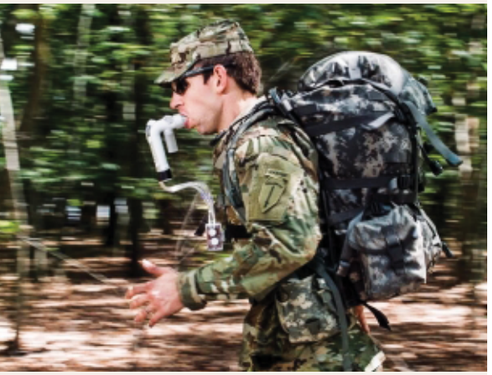




Web-Based HURREVAC

An open-source decision support platform that enables emergency managers to plan, train for, and make accurate hurricane evacuation decisions /

CO_2/O_2 Breath and Respiration Analyzer



A wireless, low-cost sensor that determines from a person's breath the fraction of metabolic energy produced by carbohydrate versus fat oxidation, providing information to guide weight loss and training /

CODEVELOPERS: STAFF FROM THE U.S. ARMY RESEARCH INSTITUTE OF ENVIRONMENTAL MEDICINE



Ground-Based Sense-and-Avoid System for Unmanned Aircraft Systems



A first-in-production ground radar system that enables unmanned aircraft to see and avoid other aircraft /

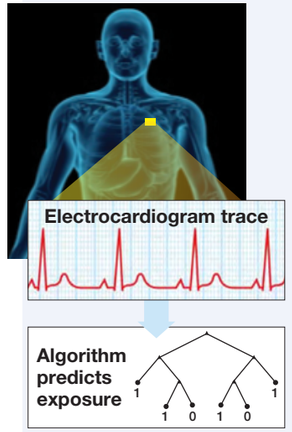
CODEVELOPERS: STAFF FROM THE U.S. ARMY, SRC INC., AND KUTTA TECHNOLOGIES

Polarimetric Co-location Layering

A novel algorithm that leverages polarimetry in maritime radar to mitigate the high false-alarm rate caused by radar returns from the sea surface /



Presymptomatic Agent Exposure Detection

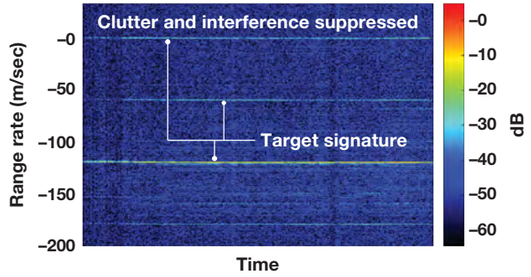


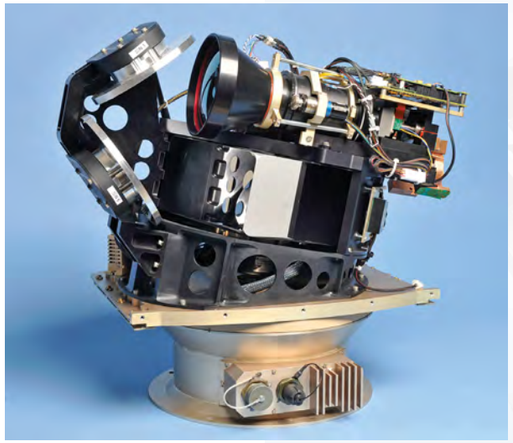
An algorithm that exploits data from noninvasive wearable medical sensors to detect if a person had been exposed to viruses or bacteria several days before overt symptoms, such as fever, appear /

CODEVELOPERS: STAFF FROM THE NATIONAL INSTITUTES OF HEALTH AND U.S. ARMY MEDICAL RESEARCH INSTITUTE OF INFECTIOUS DISEASES

Pulse-to-Pulse Phase Diversity Processing for Interference Suppression and Range Disambiguation

A low-cost technique that uses phase-diverse waveforms and specialized processing to help mitigate the interference that wind turbines can impose on radars that track aircraft and weather /





Wide-Area Infrared System for Persistent Surveillance

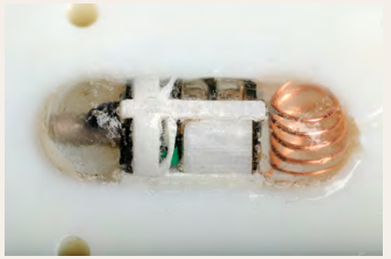
A portable system that detects and alerts operators to all moving objects in a monitored area during both day and night surveillance /

Airborne Collision Avoidance System for Unmanned Aircraft

A system that processes multisensor data to allow unmanned aircraft to detect and track nearby aircraft and to enable ground operators to direct safe separation between unmanned vehicles and other air traffic /

CODEVELOPERS: STAFF FROM THE FEDERAL AVIATION ADMINISTRATION, STANFORD UNIVERSITY, JOHNS HOPKINS APPLIED PHYSICS LABORATORY, AND MITRE







EnteroPhone™

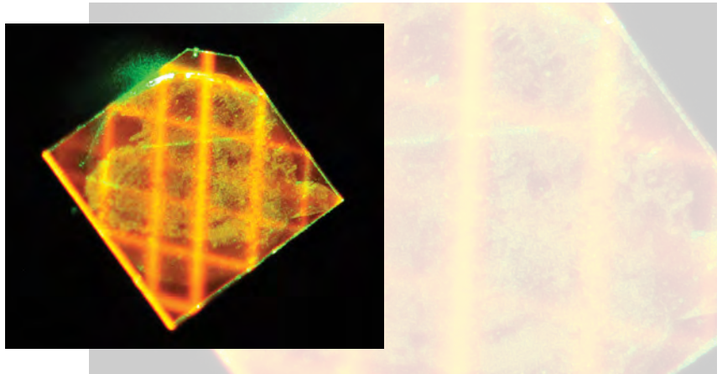
A wireless, ingestible device that monitors heart and breathing rates by listening to the body's sounds and that senses core temperature, all from within the gastrointestinal tract /

CODEVELOPERS: RESEARCHERS FROM MIT

Broadband Magnetometry and Temperature Sensing with a Light-Trapping Diamond Waveguide

An ultrasensitive magnetic-field detector and temperature sensor that is 1,000 times more energy-efficient than previous diamond-based magnetometers /

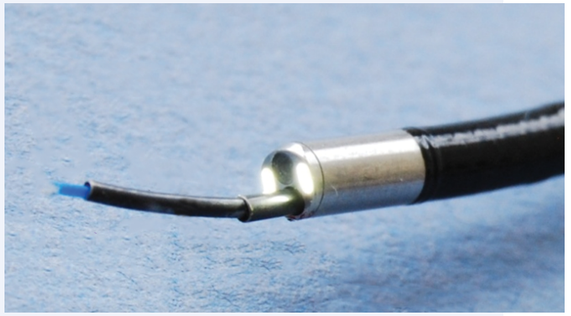
CODEVELOPERS: RESEARCHERS FROM MIT



Laserscope

A tool set that offers surgical navigation and precise laser targeting within the spinal cavity to enable treatment of back pain with an outpatient procedure instead of with open back surgery /

CODEVELOPERS: STAFF FROM MASSACHUSETTS GENERAL HOSPITAL AND DUKE UNIVERSITY

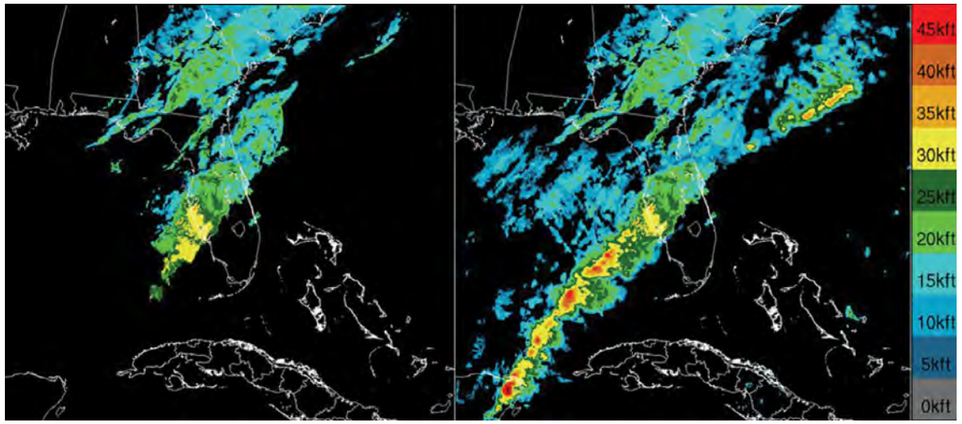


2016 winners continue on page 36 »

Offshore Precipitation Capability

A system that provides weather information for air traffic controllers by generating “radar-like” depictions of storms in offshore regions that are outside radar coverage /

CODEVELOPERS: STAFF FROM THE FEDERAL AVIATION ADMINISTRATION

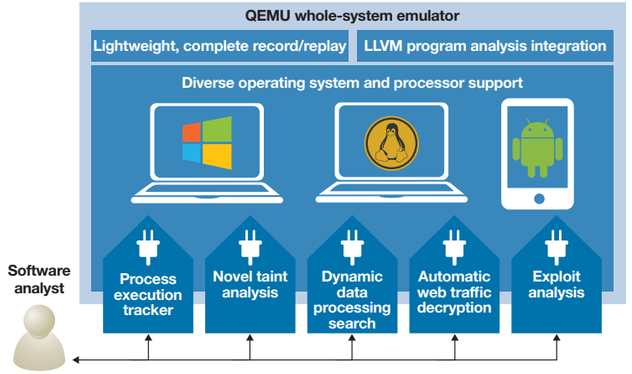




Small Airport Surveillance Sensor

A low-cost secondary surveillance system that provides airport tower controllers with situational awareness of aircraft on the airport surface and in nearby airspace /

CODEVELOPERS: STAFF FROM THE FEDERAL AVIATION ADMINISTRATION



Platform for Architecture-Neutral Dynamic Analysis

An open-source, plug-in software analysis framework that enables computer engineers to observe code as a program executes so they can understand and mitigate vulnerabilities or faults in the code /

CODEVELOPERS: RESEARCHERS FROM NEW YORK UNIVERSITY’S TANDON SCHOOL OF ENGINEERING, GEORGIA INSTITUTE OF TECHNOLOGY, AND NORTHEASTERN UNIVERSITY

Video Content Summarization Tool

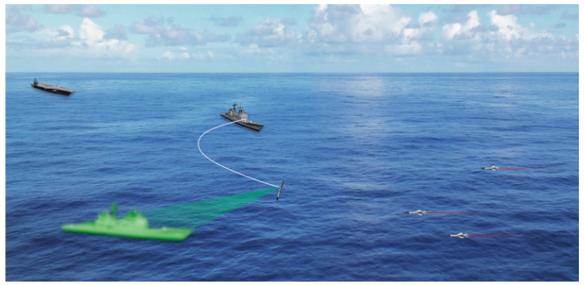


A software application that creates summary views of long-duration surveillance videos so analysts can quickly identify activity of interest /

Self-Defense Distributed Engagement Coordinator

An automated decision support tool that guides naval personnel on how to efficiently allocate resources in response to anti-ship missile threats /

CODEVELOPERS: RESEARCHERS FROM MIT



Airborne Sense-and-Avoid Radar Panel

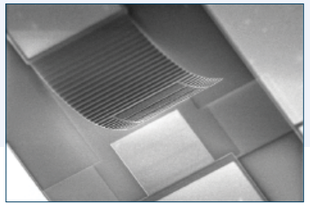
A novel stepped-notch antenna array that supports aircraft and weather detection and tracking modes in a single multifunction aperture /

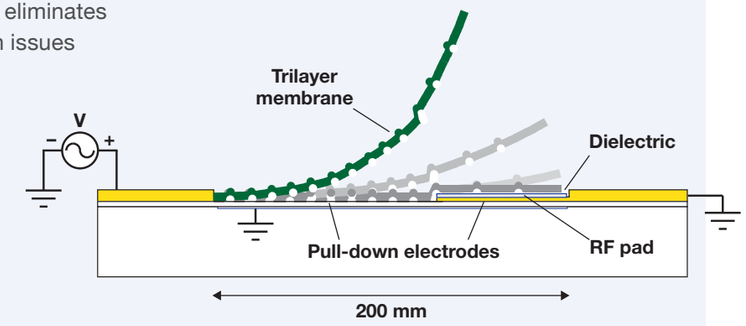


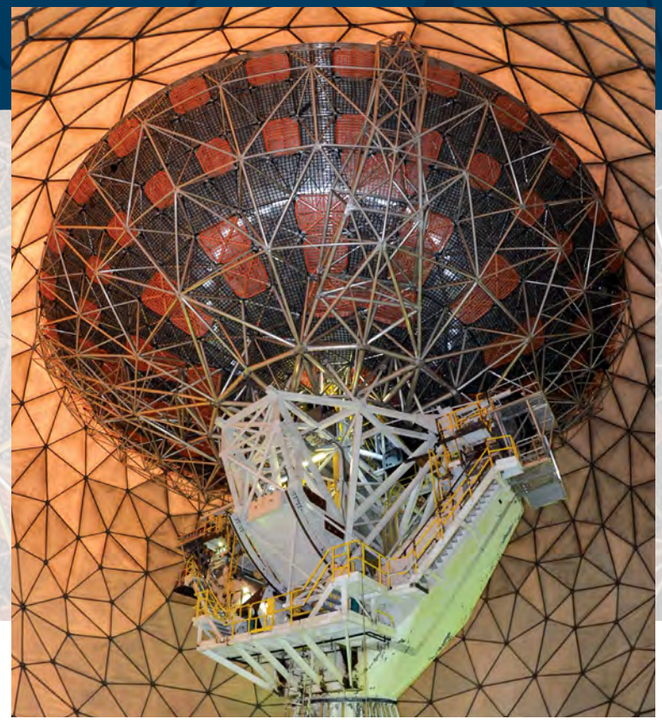
Curled Microelectromechanical Switch

A curled-electrode switch that eliminates the sticking and contamination issues inherent in traditional electromechanical switches /

CODEVELOPERS: STAFF FROM INNOVATIVE MICRO TECHNOLOGY



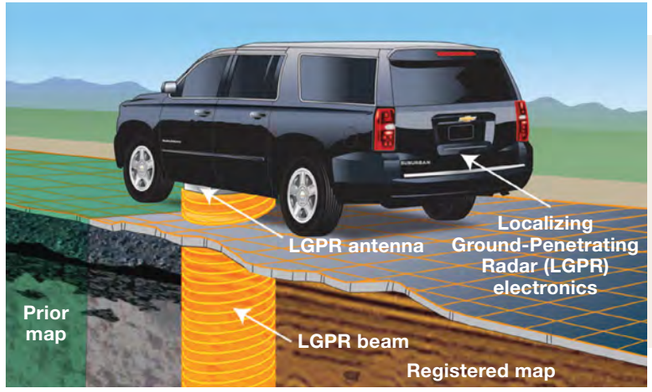


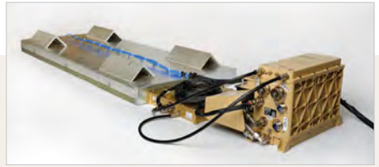


Haystack Ultrawideband Satellite Imaging Radar

A ground-based, dual X- and W-band sensor that can produce very high-resolution images of objects orbiting Earth /

CODEVELOPERS: STAFF FROM SIMPSON, GUMPERTZ, AND HEGER, AND COMMUNICATIONS AND POWER INDUSTRIES





Localizing Ground-Penetrating Radar

A robust sensor that provides highly accurate, real-time vehicular position estimates based on prior mapping of subsurface features /

2014 winners continue on page 40 »

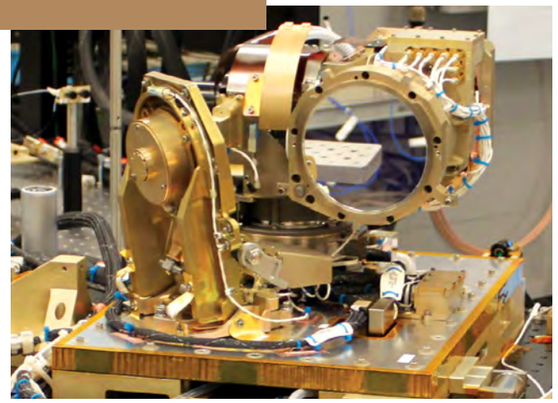
EDITOR'S CHOICE AWARD WINNER

This technology was also the winner of an R&D Editor's Choice Award, which is given to the three R&D 100 Award winners that the magazine's editors believe are the most innovative and impactful

Lunar Laser Communication System

An optical system that achieves very high uplink and downlink data rates between an Earth terminal and a distant satellite /

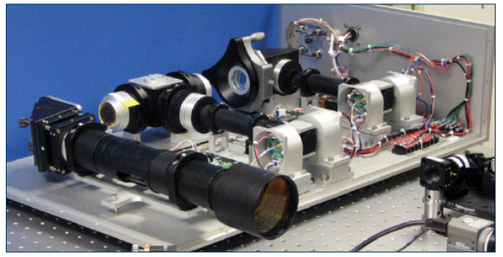
CODEVELOPERS: STAFF FROM NASA'S GODDARD SPACE FLIGHT CENTER AND NASA'S SPACE COMMUNICATIONS AND NAVIGATION PROGRAM OFFICE





Wide-Area Chemical Sensor

A highly precise, self-referencing spectrometer that measures the concentrations of specified target gases within the atmosphere /



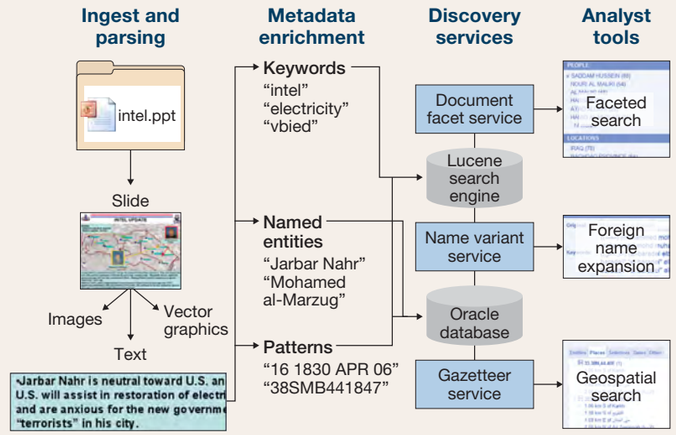


Photoacoustic Sensing of Explosives

A system that detects and discriminates trace amounts of explosives from significant standoff distances /

Structured Knowledge Space

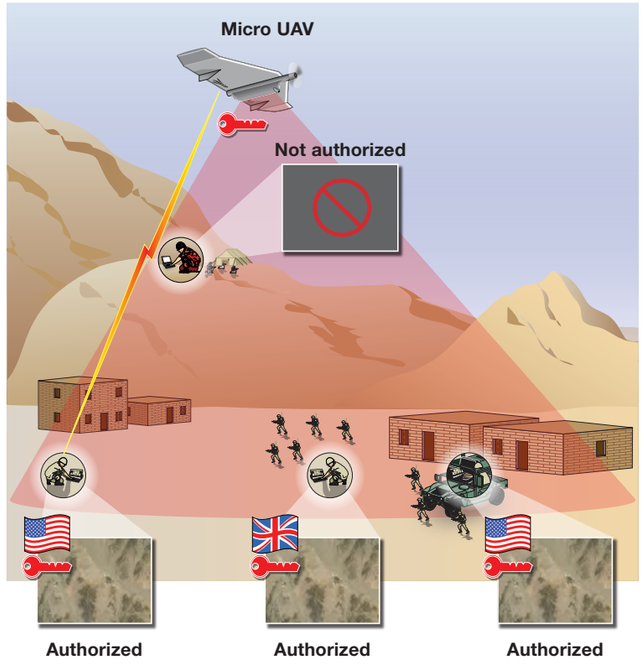
A software and information system that enables analysts to mine the vast store of intelligence reports available to government decision makers /

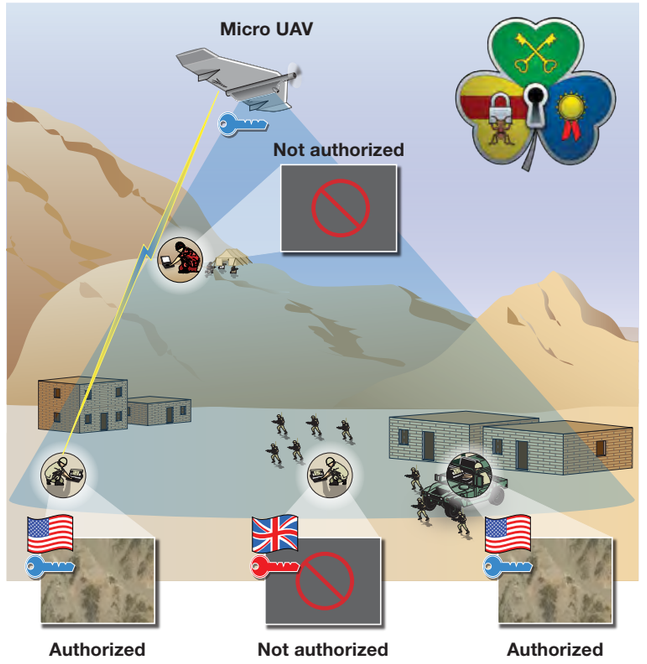


2012
R&D 100 AWARD WINNERS

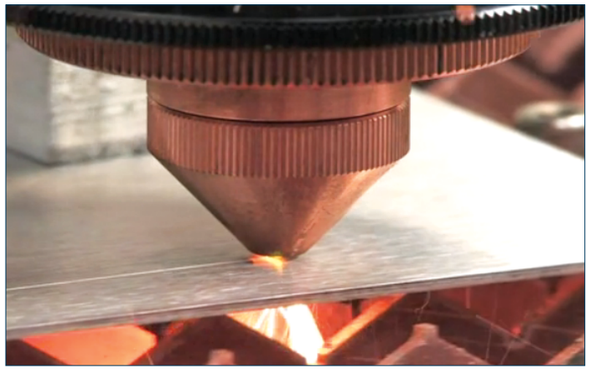
Lincoln Open Cryptographic Key Management Architecture

A highly portable software library that enables cryptographic protection for communication devices /





Wavelength Beam-Combining Fiber-Coupled Diode Laser



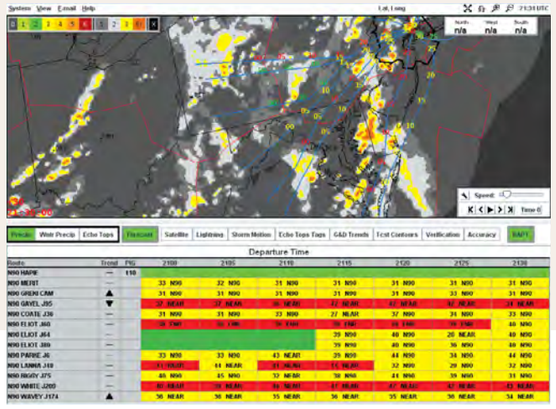
A high-intensity diode laser that combines unprecedented brightness, efficiency, and reliability /

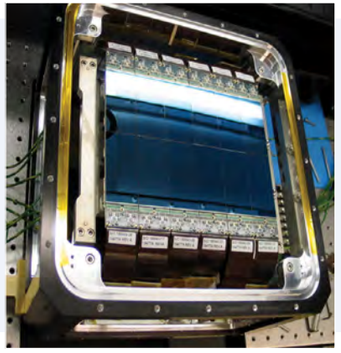
CODEVELOPERS: STAFF FROM TERADIODE

Route Availability Planning Tool

An automated decision support tool that predicts the availability of air traffic routes during thunderstorms /

CODEVELOPERS: STAFF FROM THE FEDERAL AVIATION ADMINISTRATION





Wide Field-of-View Curved Focal Plane Array

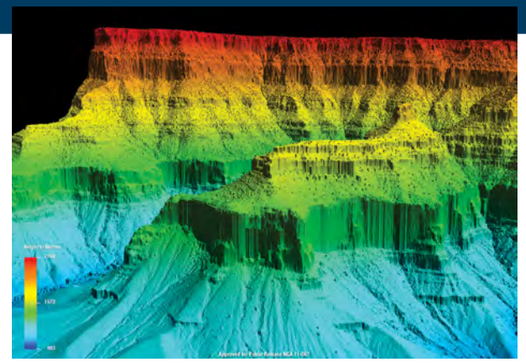
A curved, charge-coupled device that corrects for inherent aberrations of the mirrors and lenses in optical systems /

CODEVELOPERS: STAFF FROM GL SCIENTIFIC

Airborne Ladar Imaging Research Testbed

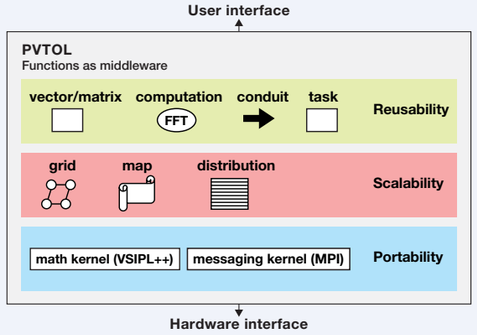
An airborne laser radar that rapidly collects high-resolution three-dimensional imagery of wide-area terrains /

CODEVELOPERS: STAFF FROM SUNSHINE AERO INDUSTRIES



Parallel Vector Tile Optimizing Library

A real-time signal processing library that enables cross-platform portability of programs without sacrificing high performance /



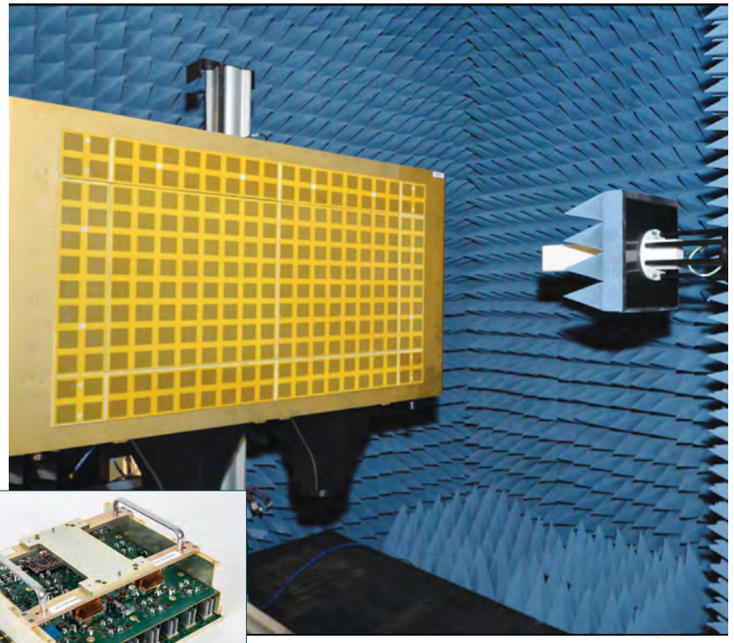
EDITOR'S CHOICE AWARD WINNER

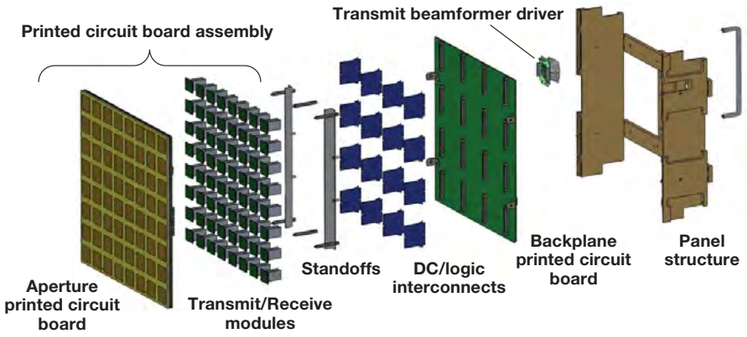
This technology was also the winner of an R&D Editor's Choice Award, which is given to the three R&D 100 Award winners that the magazine's editors believe are the most innovative and impactful

Multifunction Phased Array Radar Panel

A panel of phased arrays that exploits dual polarization and digital beamforming to provide efficient radar detection and tracking of aircraft and weather targets /

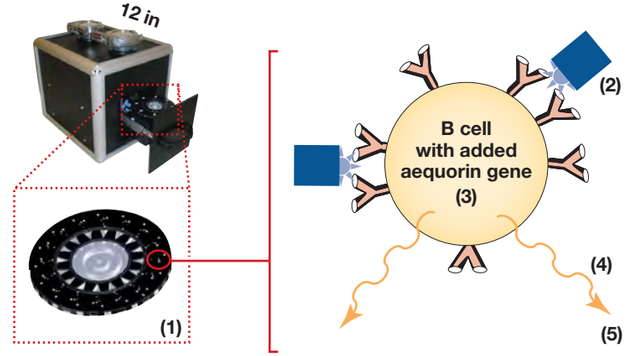
CODEVELOPERS: STAFF FROM M/A-COM TECHNOLOGY SOLUTIONS





Pathogen Analyzer for Threatening Environmental Releases

A highly sensitive sensor that uses genetically modified white blood cells to rapidly detect and identify pathogens and toxins /



Detection Process

1) Bioagent-containing aerosol is collected; disc is spun after collection to release B cells

(2) Pathogens crosslink antibodies

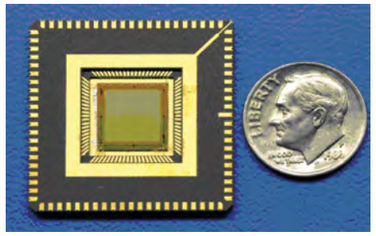
(3) Biochemical signal amplification releases Ca^{2+}

(4) Ca^{2+} prompts aequorin to emit photons

5) Photons are detected by sensor

2010
R&D 100 AWARD WINNERS

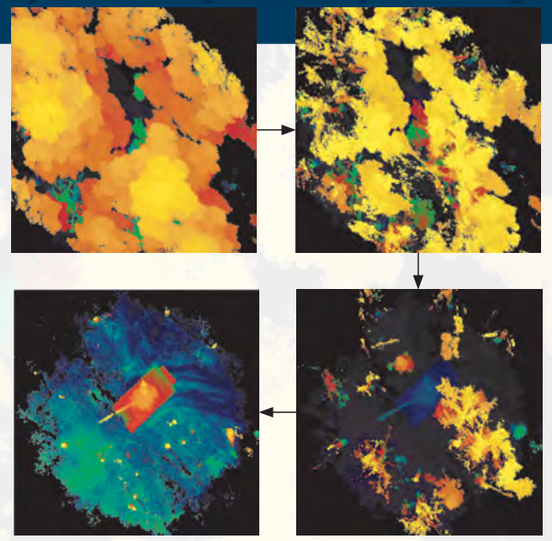
Digital-Pixel Focal Plane Array



A complementary metal-oxide semiconductor readout integrated circuit for infrared imaging that is capable of an extreme dynamic range /

Geiger-Mode Avalanche Photodiode Detector Focal Plane Array

A two-dimensional array of ultrasensitive solid-state photodetectors, each of which can measure the arrival time of single photons /



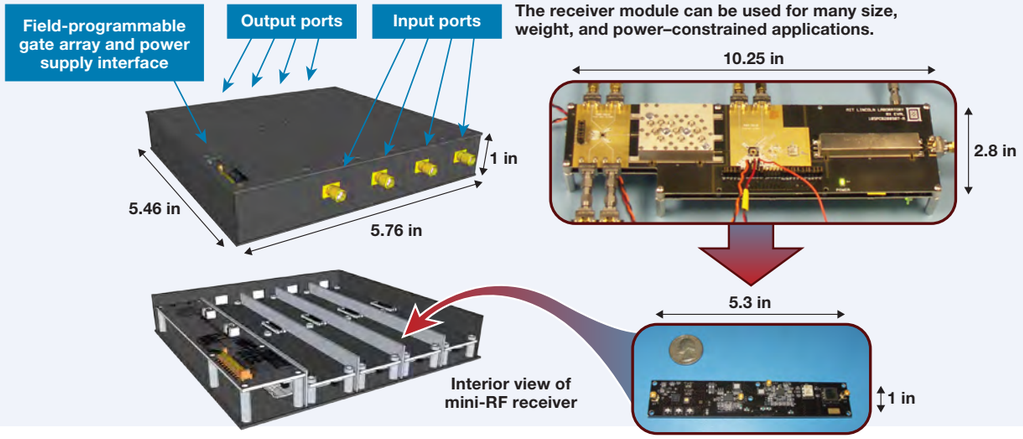
Runway Status Lights



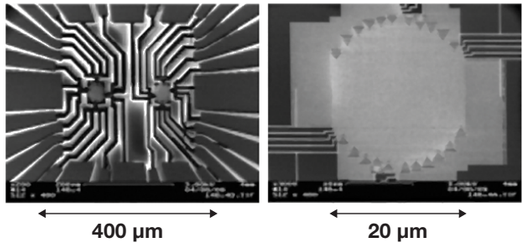
A system integrating data from airport surveillance sources to control in-pavement lights that directly alert pilots to potential runway incursions /

Miniaturized Radio-Frequency Four-Channel Receiver

The smallest, least power-demanding receiver that can detect frequencies over a six-octave range /



Subwavelength-Separated Superconducting Nanowire Single-Photon Detector Array



A component in an optical detection system that enables broadband single-photon detection with high efficiency and low noise at rates exceeding one billion photons per second /

CODEVELOPERS: RESEARCHERS FROM MIT



Earlier R&D 100 Award Winners

In addition, Lincoln Laboratory received two earlier R&D 100 Awards:

1998 jointly with Cyra Technologies and Los Alamos National Laboratory for a three-dimensional laser mapping and imaging system

1995 for a technology that determines a plane's position by using GPS

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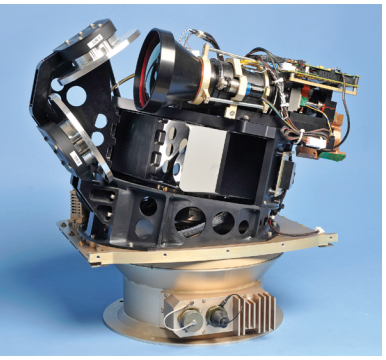
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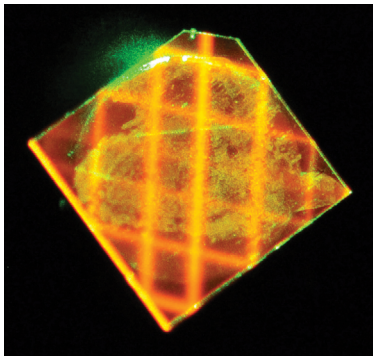
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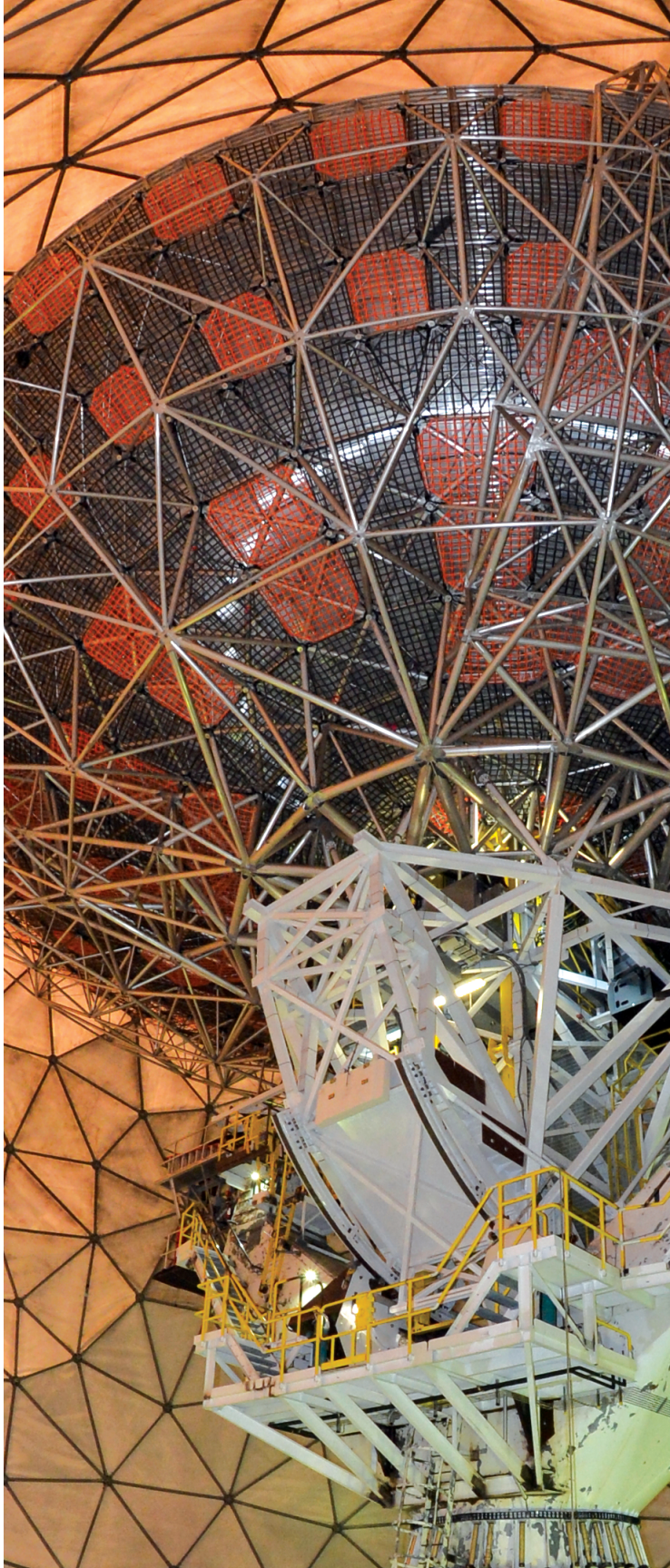






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