



NITRD News Brief

We are pleased to continue NITRD's News Brief that offers insight into the activities NITRD's member agencies are conducting to achieve the Nation's priorities through the lens of the public-facing news sources. These are divided into networking and information technology topics that have been identified as of great importance for improving Americans' daily lives.

For ease of access, under NITRD's logo, the title of each section is listed as a link to that section. The titles of the articles under the section's heading are links that provide immediate access to the news article listed. We hope you find this informative and helpful in your daily activities.

Do you know someone who would like to receive NITRD's weekly news brief? They can email NITRD's IT aficionados at nco@nitrd.gov and voilà they will receive the news brief with the cool technology articles each week!

WOMEN'S HISTORY MONTH: Women in STEM & IT

Ada Lovelace: The World's First Computer Programmer Who Predicted Artificial Intelligence

...NIST researcher Justyna Zwolak is teaching her young daughter about important women in science and math, including Ada Lovelace. ... During Women's History Month, I am remembering Lovelace's contributions to the field and thinking about the impact she had on me as a scientist and mathematician. Today, computers are such an integral part of our daily lives; we can't imagine not being able to use them to solve nearly any problem or answer any question. The idea that computing machines can go beyond just calculating numbers and be used to perform any abstract operation is the defining phenomenon of our technology. However, not everyone knows that this idea of universal computation dates to long before the first programmable, general-purpose digital computer was introduced in the 1940s. This concept goes back to the 1800s, thanks to Lovelace, a pioneer in mathematics and computing. So how did Lovelace's work contribute to computer science as we know it today? Her contributions to the field of computer science did not gain recognition until 1953. That year, Bertram Vivian Bowden, a British nuclear physicist, published *Faster Than Thought: A Symposium on Digital Computing Machines*. In this book, Bowden reintroduced Lovelace's contribution to the development of computing. Today, her notes are perceived as the earliest and most comprehensive

account of computers. Lovelace predated modern examples by almost a century! Her creative critical skills not only laid the groundwork for her ability to write the first computer program but also to correctly predict the future of computing...
National Institute of Standards and Technology - Mar 22, 2023

Sarah Dvorak: Manufacturing is for Anyone Who Wants to Solve Problems and Serve Customers

...This blog is part of a series for Women's History Month to highlight women who are making an impact on the manufacturing industry. Sarah Dvorak didn't originally plan on a career in manufacturing, but the opportunity to be part of a volunteer focus team brainstorming ways to reduce scrap and rework at a manufacturing plant led her in a new direction. Dvorak is currently the Director of Assembly and Test at Danfoss Power Solutions, a global manufacturer of hydraulic pumps and motors located in Ames, Iowa. She also serves on the advisory board of the Center for Industrial Research and Service, the Iowa MEP Center. What Dvorak likes most about working in manufacturing is "the excitement of seeing the product you make go down an assembly line and ship to a customer. With the right support, Dvorak thinks there is no reason for women to not pursue a career in manufacturing. "Manufacturing is for anyone who wants to solve problems, serve customers, make improvements and know what we do matters every day," Dvorak says...

National Institute of Standards and Technology - Mar 16, 2023

Women's History Month

...The Defense Department honors the contributions of women serving in the military and DOD civilian forces, celebrating the richness and diversity of their achievements in March and throughout the year...

U.S. Department of Defense - Mar 23, 2023

Women's History Month: Driving Change and Modernization in Information Technology Systems

...Debbie Stephens is the Deputy Chief Information Officer (DCIO) for the Commerce Department's U.S. Patent and Trademark Office (USPTO), where she has served for over 30 years in multiple leadership roles. She has worked to improve the automated tools and informational resources that facilitate electronic processing of patent applications. In her current role, she is the principal advisor to the Chief Information Officer (CIO) and responsible for managing day-to-day Office of the Chief Information (OCIO) operations with significant oversight on information technology (IT) stabilization and modernization efforts. She guides teams towards continual improvements in IT delivery for maximum value to all stakeholders. ... Women's History Month is meaningful in that it causes us to take a moment to acknowledge and reflect on the contributions that women have had towards the growth and prosperity of our country. The intellectual property community supported here at the USPTO has always had a fair share of smart and creative and industrious women that saw a need for a new way of doing things. These women were often granted patents and trademarks for inventions, businesses, and brands that contributed to the commerce and advancement of the U.S...

U.S. Department of Commerce - Mar 7, 2023

HPC

NSF-funded researcher increases computer learning speed and reliability

...Dr. Abdullah Muzahid, at Texas A&M University, was awarded a grant from the National Science Foundation to research the robustness of deep neural networks (DNN) and improve the reliability of machine decision-making. DNNs are complex computer algorithms that are modeled after the functioning of the human brain and aid in the computer learning process. Muzahid's research focuses on how computer hardware impacts machine learning. Unfortunately, machine learning will not be accurate 100% of the time because there is no way to prepare a machine for every possible situation using an infinite number of variables. Machine learning is time and energy intensive because of the complex calculations a computer must complete. Muzahid has developed a method that doubles the speed and efficiency of the process by enabling computer algorithms to use the same computations for similar pieces of data. Muzahid and his team hope to create a method for a machine to check the reliability of its learning. If the reliability is low, the device will alert the user so that the user can confirm or correct the machine's decisions. Muzahid's research shows that enabling machines to use the same computation for similar input data saves a significant amount of time...

Texas A&M University College of Engineering - Mar 23, 2023

Artificial Intelligence / Machine Learning

Episode 66: How to Create AI Technology We Can Trust

...At a time when the race to create the best artificial intelligence-enabled technology is at its fiercest, experts at DARPA say we need to recalibrate the direction of research in the field. One of the research thrusts focuses on proficient artificial intelligence (AI), which DARPA's Information Innovation Office defines as how to build AI-enabled systems that we can trust with our lives and not be foolish to do so. This episode of Voices from DARPA delves into the topic of trustworthy AI for adversarial environments and what it will take to create technology that is more than a tool but rather a true partner to people...

DARPA - Mar 16, 2023

Chatbots, deepfakes, and voice clones: AI deception for sale

...The AI fake problem is a deeper, emerging threat that companies across the digital ecosystem need to address. Thanks to AI tools that create "synthetic media" or otherwise generate content, a growing percentage of what we're looking at is not authentic, and it's getting more difficult to tell the difference. Generative AI and synthetic media are colloquial terms used to refer to chatbots developed from large language models and to technology that simulates human activity, such as software that creates deepfake videos and voice clones. Evidence already exists that fraudsters can use these tools to generate realistic but fake content quickly and cheaply, disseminating it to large groups or targeting certain communities or specific individuals. They can use chatbots to generate spear-phishing emails, fake websites, fake posts, fake profiles, and fake consumer reviews, or to help create malware, ransomware, and prompt injection attacks. They can use deepfakes and voice clones to facilitate imposter scams, extortion, and financial fraud. And that's very much a non-exhaustive list. The FTC Act's prohibition on deceptive or unfair conduct can apply if you make, sell, or use a tool that is effectively designed to deceive – even if that's not its intended or sole purpose...

Federal Trade Commission - Mar 20, 2023

Robotics / Autonomous Vehicles

NSF-funded researchers develop click beetle-inspired robots that use elastic energy to jump

...National Science Foundation-funded researchers at the University of Illinois Urbana-Champaign developed insect-sized jumping robots that are a series of click beetle-sized robots small enough to fit into tight spaces, powerful enough to maneuver over obstacles and fast enough to match an insect's rapid escape time. The new study is based on how the click beetle uses muscles to bend its body and locks in that stored elastic energy with an anatomical structure called a thoracic hinge. When the beetle needs, for example, to escape a predator, it unlatches the hinge, allowing its body to unbend rapidly and propel it into the air many times higher than its body length. Actuators are to robots what muscles are for animals — they are the components that enable movement by converting energy into mechanical force. A rapid shape change, called snap buckling, is triggered to suddenly release the stored energy, causing the beam to sharply strike the ground and propel the robot upward. In the beetle-sized robots are tiny, coiled actuators gradually compress a beam, causing it to slowly bend and store elastic energy. Guided by biological evolution and mathematical models, the team built and tested four device variations, landing on two configurations that can successfully jump without manual intervention. The team envisions these robots accessing tight spaces to help perform maintenance on large machines...

National Science Foundation - Mar 20, 2023

Anderson lands prestigious NSF CAREER research award to study human-autonomy interactions

...A 2023 National Science Foundation CAREER Award will allow Allie Anderson, at the University of Colorado Boulder, to investigate an area of increasing importance for society – how humans work over time with autonomous systems – with a specific focus on trust. Anderson is probing how people use autonomous systems over a longer period and in something closer to a real-world environment. The study will explore two different industries that already use autonomous systems: package distribution centers and general aviation. Anderson has partnered with Amazon to conduct interviews and simulations with employees at the company's distribution centers where package procurement is done with human-robot teams. The aviation component will focus on small plane pilots using upgraded avionics systems to provide guidance and navigation during flight. Wearable sensor technology, especially in aerospace applications, has long been a focus of Anderson's work. She has conducted numerous investigations into human health and performance with an aim to developing technologies to measure and improve the body's adaptations to extreme stressors, like those experienced in space. This new research has could help manufacturers develop better autonomous systems in the future...

CU Boulder Today - Mar 16, 2023

Quantum

NASA grant to support team of NIST & multi-university scientists build quantum sensors in space

...A multi-university research team will build technology and tools to improve measurement of important climate factors by observing atoms in outer space. The new Quantum Pathways Institute is led by the University of Texas at Austin, and scientists from the University of California, Santa Barbara, California Institute of Technology and the U.S. National Institute for Standards and Technology (NIST) are also participating. The researchers received \$15 million in funding from NASA over five years for the institute. They will focus on the concept of quantum sensing, which involves observing how atoms react to small changes in their environment, and using that to infer the time-variations in the gravity field of the Earth. This will enable scientists to improve how accurately several important climate processes can be measured, such as the sea level rise, the rate of ice melt, the changes in land water resources and ocean heat storage changes...

CU Boulder Today - Mar 16, 2023

Cybersecurity / Privacy

Is Your Cybersecurity Strategy Falling Victim to These 6 Common Pitfalls?

...A recent article by National Institute of Standards and Technology (NIST) computer scientist Julie Haney highlights a pervasive problem within the world of computer security: Many security specialists harbor misconceptions about lay users of information technology, and these misconceptions can increase an organization's risk of cybersecurity breaches. These issues include ineffective communications to lay users and inadequately incorporating user feedback on security system usability. The human element refers to the individual and social factors impacting users' security adoption, including their perceptions of security tools. A security tool or approach may be powerful in principle, but if users perceive it to be a hindrance and try to circumvent it, risk levels can increase. The paper details six pitfalls that threaten security professionals: (1) Assuming users are clueless. (2) Not tailoring communications to the audience. (3) Unintentionally creating insider threats due to poor usability. (4) Having too much security. (5) Depending on punitive measures or negative messaging to get users to comply. (6) Not considering user-centered measures of effectiveness...

National Institute of Standards and Technology - Mar 20, 2023

DHS and Republic of Korea Sign Agreement for Homeland Security Research and Development

...The U.S. Department of Homeland Security (DHS) Science and Technology Directorate (S&T) and the Republic of Korea's (ROK) Ministry of National Defense Acquisition Program Administration (DAPA) signed a Memorandum of Understanding (MOU) focused on enhancing domestic security capabilities through the exchange of information and applications of emerging technologies. The MOU is a significant achievement that enables DHS S&T and its counterparts in the ROK to establish technical exchanges on future-oriented and advanced science and technology to counter weapons of mass destruction and cyber threats...

Homeland Security - Mar 20, 2023

Uncovering the unheard: Researchers reveal inaudible remote cyber-attacks on voice assistant devices

...Guenevere Chen, an associate professor at UTSA, demonstrated a novel inaudible voice trojan attack to exploit vulnerabilities of smart device microphones and voice assistants — like Siri, Google Assistant, Alexa or Amazon's Echo and Microsoft Cortana — and provide defense mechanisms for users. The researchers developed Near-Ultrasound Inaudible Trojan, or NUIT (French for "nighttime") to study how hackers exploit speakers and attack voice assistants remotely and silently through the internet. The researchers used NUIT to attack different types of smart devices from smart phones to smart home devices. The results of their demonstrations show that NUIT is effective in maliciously controlling the voice interfaces of popular tech products and that those tech products, despite being on the market, have vulnerabilities. NUIT can silence Siri's response to achieve an unnoticeable attack as the iPhone's volume of the response and the volume of the media are separately controlled. With these vulnerabilities identified, Chen and team are offering potential lines of defense for consumers. Awareness is the best defense. Chen recommends users authenticate their voice assistants and exercise caution when they are clicking links and grant microphone permissions. She also advises the use of earphones in lieu of speakers. Using earphones sets a limitation where the sound from earphones is too low to transmit to the microphone. If the microphone cannot receive the inaudible malicious command, the underlying voice assistant can't be maliciously activated by NUIT. Research toward the development of NUIT was partially funded by a grant from the Department of Energy National Nuclear Security Administration's (NNSA) Minority Serving Institutions Partnership Program (MSIPP). The \$5 million grant supports research by the Consortium On National Critical Infrastructure Security (CONCISE) and allows the creation of certification related to leveraging Artificial Intelligence (AI) and block-chain technology to enhance critical infrastructure cybersecurity posture...

The University of Texas at San Antonio - Mar 20, 2023

5G, Wireless Spectrum, Networking & Communications

NRL achieves 65-year milestone in space satellite exploration

...The U.S. Naval Research Laboratory conducted the first American satellite program, named Project Vanguard, between 1955 and 1959, becoming the prototype for much of what developed as the U.S. space program. Vanguard I was the second artificial satellite successfully placed into Earth orbit by the United States and although communication with the satellite ceased in 1964, it remains the oldest man-made satellite in orbit today. The U.S. Army launched the first U.S. satellite, Explorer I, on Jan. 31, 1958. Like the Soviet satellites Sputnik I and II, Explorer I has fallen out of orbit. The Satellite Techniques Branch staff concentrated on the engineering hardware — referred to as the satellite bus — and was responsible for the structure, power supply, command, telemetry and coordination of a satellite, along with its interface with the launch vehicle. Additionally, the team managed special circuitry needed to support satellite payloads. ... In 2024, NRL anticipates the launch of the Robotic Servicing of Geosynchronous Satellites (RSGS) vehicle, which is designed to inspect and service satellites in geosynchronous Earth orbit (GEO). The RSGS program is a public-private partnership between the Defense Advanced Research Projects Agency (DARPA) and SpaceLogistics — a wholly owned subsidiary of Northrop Grumman — with NRL developing the robotic servicing payload. Once in orbit, the RSGS robotic servicing vehicle will inspect and service satellites in GEO, where hundreds of satellites provide communications, monitor weather, support national security missions, and other vital functions. The RSGS payload includes flight hardware components, robotic control algorithms, multiple highly customized electronics designs, and flight software running on five single-board computers...

Department of the Navy Chief Information Officer - Mar 16, 2023

NROL Patch Descriptions for Patch Madness, Sweet 16

...NRO Launch (NROL) patches are a highlight of every mission. Every patch meaning has a story and is unique to each launch. Starting March 21, NRO will conduct the first Patch Madness competition. Like March Madness, there will be head-to-head matches to reveal which patch is the most beloved. There will be daily polls on Twitter (@natreconofc) where you can vote for your favorite NROL patch. As some patches are from years ago, a detailed look at each NROL patch that will be a part of this year's Patch Madness is provided...

National Reconnaissance Office (NRO) - Mar 20, 2023

NRL to launch first in-space laser power beaming experiment

...The U.S. Naval Research Laboratory is set to launch the Space Wireless Energy Laser Link (SWELL) to demonstrate laser power beaming in space as part of the scheduled U.S. Department of Defense Space Test Program (STP) H9 mission to the International Space Station (ISS) March 15. SWELL is one of several experiments that will launch aboard the SpaceX Dragon cargo vehicle to the ISS for the yearlong mission to collect data during a laser power beaming link in space conditions. The experiment, which is sponsored by the Office of the Under Secretary of Defense for Acquisition & Sustainment (OUSD (A&S)) and supported by the Operational Energy Capability Improvement Fund (OECIF), will explore challenges for power beaming's viability for space applications, and also highlight the possibilities for using power beaming to address energy challenges on Earth...

Department of the Navy Chief Information Officer - Mar 16, 2023

Advanced Manufacturing

NASA Awardees to Develop Sustainable Aviation Composite Tech

...NASA has issued \$50 million in awards to 14 organizations to develop manufacturing processes and advanced composite materials for aircraft structures. These green technologies hold the potential to help reduce aviation carbon emissions. The awards are from NASA's Hi-Rate Composite Aircraft Manufacturing (HiCAM) project, which seeks to reduce the cost and increase the production rate of composite structures made in the U.S. With more lightweight, composite airframes in service, airlines will save fuel and reduce emissions, making commercial aviation more sustainable. Sustainability, cost, and aircraft production rate drive U.S. competitiveness in the commercial aircraft industry...

National Aeronautics and Space Administration - Mar 16, 2023

Microelectronics

Commerce Department Outlines Proposed National Security Guardrails for CHIPS for America Incentives Program

...The U.S. Department of Commerce today released a Notice of Proposed Rulemaking for the guardrails included in the CHIPS Incentives Program to advance America's technological and national security. The national security guardrails are intended to ensure technology and innovation funded by the CHIPS and Science Act is not used for malign purposes by adversarial countries against the United States or its allies and partners. The proposed rule offers additional details on national security measures applicable

to the CHIPS Incentives Program included in the CHIPS and Science Act, limiting recipients of funding from investing in the expansion of semiconductor manufacturing in foreign countries of concern. The statute significantly restricts recipients of CHIPS incentives funds from investing in most semiconductor manufacturing in foreign countries of concern for 10 years after the date of award. The proposed rule will: * Establish Standards to Restrict Advanced Facility Expansion in Foreign Countries of Concern; * Classify Semiconductors as Critical to National Security; * Reinforce U.S. Export Controls...
U.S. Department of Commerce - Mar 21, 2023

NIST/NSF/DARPA-funded researchers create breakthrough spintronics manufacturing process that could revolutionize the electronics industry

...University of Minnesota researchers, along with a team at the National Institute of Standards and Technology (NIST), developed a breakthrough process for making spintronic devices that has the potential to become the new industry standard for semiconductor chips that are essential to computers, smartphones and many other electronics. The new process will allow for faster, more efficient spintronic devices that can be scaled down smaller than ever before. The industry standard spintronic material, cobalt iron boron, has reached a limit in its scalability. The researchers circumvented this problem by showing that iron palladium, an alternative material that requires less energy and has the potential for more data storage, can be scaled down to much smaller sizes. Minnesota has been leading this effort for more than 10 years with strong support by the Semiconductor Research Corporation (SRC), Defense Advanced Research Projects Agency (DARPA) and the National Science Foundation (NSF). This research was funded by a grant from DARPA and in part by NIST; SMART, one of seven centers of nCORE, an SRC program; and NSF...
University of Minnesota Twin Cities - Mar 20, 2023

Climate Change / Green Energy & IT

Statement by OSTP Director Arati Prabhakar on the Intergovernmental Panel on Climate Change (IPCC) Synthesis Report

...The IPCC's summary report makes clear that the Earth's future is not predetermined. It underscores the urgent need for leaders in every sector and every country to step up and take bold climate action. This report is a call to action for the nation's science, technology and innovation ecosystem to step up and accelerate solutions that combat climate change, mitigate and manage its impacts, and build resilience...
The White House - Mar 20, 2023

FACT SHEET: The White House Office of Science and Technology Policy Releases New Resources to Advance Climate Science and Support Decision Making

...The White House Office of Science and Technology Policy (OSTP) is releasing new resources to advance climate science and knowledge, and to support leaders at every level of government in managing the impacts of climate change and building climate resilience in communities. The Intergovernmental Panel on Climate Change released a new report this week that underscored the urgent need for action to address the climate crisis and respond to its impacts. The resources being released today will empower communities, businesses, and policymakers with the latest scientific information on climate change, so they can develop science-informed plans and responses. New resources include: * A new report with the best available science on current and future flood risk; * A new guide for applying climate science information in federal agency climate adaptation planning; * An action plan to make federal climate information and tools more accessible; * A framework to use science and technology to strengthen community resilience; * A report on recent advances in federal global change research...
The White House - Mar 22, 2023

NOAA's FY 2024 budget: Building a climate-ready nation

...The FY 2024 Budget will allow NOAA to continue enhancing all aspects of our science and service delivery — from strengthening our observational infrastructure to working with vulnerable communities on resilience planning — while supporting sustainable economic growth through innovation and collaboration. For FY 2024, the NOAA requests \$6.8 billion in discretionary appropriations, an increase of \$450.5 million from the FY 2023 enacted budget. With this budget increase, NOAA will build a climate-ready nation by providing actionable environmental information that shapes smart policy and decision-making; continue to foster environmental stewardship and inform sustainable economic development, with a particular focus on the New Blue Economy. In FY 2024, NOAA will focus research on precipitation predictions across weather and climate timescales, develop tools for decision makers facing acute climate impacts in the Arctic and advance the use of climate science in fisheries assessments and management. In FY 2024, NOAA requests an increase of \$81.4 million to bolster economic development through the expansion of offshore wind energy, the National Seafood Strategy, ocean and coastal mapping and charting, and the development of key information systems in our tsunami, weather and space observations infrastructure. The FY 2024 budget requests an increase of \$363.2 million for NOAA's observational infrastructure, and underscores NOAA's commitment to making time-sensitive, and cost-effective investments to ensure that the nation's next-generation satellite systems expand the delivery of essential earth system observations to meet the evolving needs of a climate-ready nation...
National Oceanic and Atmospheric Administration - Mar 16, 2023

NASA Uses 30-Year Satellite Record to Track and Project Rising Seas

...The average global sea level rose by 0.11 inches (0.27 centimeters) from 2021 to 2022, according to a NASA analysis of satellite data. That's the equivalent of adding water from a million Olympic-size swimming pools to the ocean every day for a year, and is part of a multidecade trend of rising seas. Since satellites began observing sea surface height in 1993 with the U.S.-French TOPEX/Poseidon mission, the average global sea level has increased by 3.6 inches (9.1 centimeters), according to NASA's Sea Level Change science team. Based on the long-term satellite measurements, the projected rate of sea level rise will hit 0.26 inches (0.66 centimeters) per year by 2050. "The 30-year satellite record allows us to see through the shorter-term shifts that happen naturally in the ocean and helps us identify the trends that tell us where sea level is headed," said JPL's Ben Hamlington, a sea level researcher who leads NASA's Sea Level Change science team. Scientific and technical innovations by NASA and other space agencies have given researchers a better understanding of the current state of the ocean on a global scale. Specifically, radar altimeters have helped produce ever-more precise measurements of sea level around the world. To calculate sea level height, they bounce microwave signals off the ocean's surface and record the time the signal takes to travel from a satellite to Earth and back, as well as the strength of the return signal...

National Aeronautics and Space Administration - Mar 17, 2023

DOE Releases New Reports on Pathways to Commercial Liftoff to Accelerate Clean Energy Technologies

...The U.S. Department of Energy (DOE) announced the launch of its Pathways to Commercial Liftoff, a set of reports that represent a new department-wide initiative to strengthen engagement between the public and private sectors to accelerate the commercialization and deployment of key clean energy technologies. The reports provide the private sector and other industry partners a valuable, engagement-driven resource on how and when certain technologies—beginning with clean hydrogen, advanced nuclear, and long duration energy storage—can reach full scale deployment. The new initiative underscores the critical role that DOE plays in enabling widespread commercial adoption of the clean energy technologies. By 2030, the reports concluded that cumulative investments must increase from approximately \$40 billion to \$300 billion across the hydrogen, nuclear, and long duration energy storage sectors, with continued acceleration until 2050 required to stay on track to realize long-term decarbonization targets...

Department of Energy - Mar 21, 2023

Research collaboration between UChicago and Argonne boosts development of sustainable technology

...A collaboration between the University of Chicago and the U.S. Department of Energy's (DOE) Argonne National Laboratory has combined theory, experimentation and artificial intelligence to optimize catalysts for materials called metal-organic frameworks (MOFs). MOFs can be functionalized to act like sponges with high adsorption power — allowing them to house gas, collect water from air or even enhance chemical reactions. The group used machine learning algorithms combined with high-throughput experimentation to screen different metals, temperatures and pressures applied to the MOF NU-1000 for catalytic activity. The researchers involved are members of the Catalyst Design for Decarbonization Center, funded by the DOE as part of its Energy Frontier Research Center program. The center's mission is to discover new catalysts for the decarbonization energy transition and to optimize the key catalytic reactions involved...

Argonne National Laboratory - Mar 21, 2023

NSF-funded WVU lab's game-changing high-performance semiconductor material could help slash heat emissions that are a major contributor to climate change

...Researchers at West Virginia University received \$639,784 from the National Science Foundation to engineer a material with the potential to dramatically cut the amount of heat power plants release into the atmosphere. A team has created an oxide ceramic material that solves a longstanding efficiency problem plaguing thermoelectric generators. Those devices can generate electricity from heat, including power plant heat emissions, which contribute to global warming. Oxide ceramics have "polycrystalline" structures composed of multiple connected crystals. Engineers run into trouble with large-scale thermoelectric applications for those materials since the "grain boundaries," the places where those crystals meet, block the current and electron flow that powers thermoelectric generators. The researchers turned the unavoidable and detrimental grain boundaries into electricity-conducting pathways, significantly improving thermoelectric performance. The research responds to the growing problem of waste heat, a contributor to climate change and byproduct of most operations that convert fuel into power. Thermoelectric generators are a promising technology for waste heat recovery in part because they are simple to operate and maintain. A powerful thermoelectric generator could capture a significant portion of a power plant's waste heat. aligns with the U.S. Department of Energy's Industrial Heat Shot initiative to develop cost-competitive industrial heat decarbonization technologies with at least 85% lower greenhouse gas emissions by 2035.

WVU - Mar 16, 2023

Digital Health

Lurking Beneath the Surface: Hidden Impacts of Pixel Tracking as Shown with Two Digital Healthcare Platforms

...The Federal Trade Commission recently took enforcement action against GoodRx and BetterHelp, two digital healthcare platforms, for allegedly sharing user health data with third parties for advertising. Both cases highlighted the use of third-party tracking pixels, which enable platforms to amass, analyze, and infer information about user activity. Tracking pixels have evolved from tiny, pixel-sized images on web pages for tracking purposes to include a broad range of HTML and JavaScript embedded in web sites (and email). Tracking pixels can be hidden from sight and can track and send all sorts of personal data such as how a user interacts with a web page including specific items a user has purchased or information users have typed within a form while on the site. Many consumers may not realize that tracking pixels exist because they're invisibly embedded within web pages that users might interact with. Some pixel tracking methods ostensibly attempt to remove personal information but may in fact still leak enough information to identify an individual. For instance, some tracking pixels "hash" personal information to scramble personally identifiable information such as names or email, which the FTC has said may be inadequate in some cases, because hashes can be reversed or used to link data across different databases...
Federal Trade Commission - Mar 16, 2023

DOD/NSF/DOE fund machine learning research to develop synthetic polymers that will mimic the body's natural proteins

...Most life on Earth is based on polymers of 20 amino acids that have evolved into hundreds of thousands of different, highly specialized proteins. Ting Xu, a University of California, Berkeley, polymer scientist has developed a way to mimic specific functions of natural proteins using only two, four or six different building blocks — ones currently used in plastics — and found that these alternative polymers work as well as the real protein and are a lot easier to synthesize than trying to replicate nature's design. Her design method is based on machine learning to synthesize polymers that mimic blood plasma. The artificial biological fluid kept natural protein biomarkers intact without refrigeration and even made the natural proteins more resistant to high temperatures — an improvement over real blood plasma. Drug delivery of small molecules that mimic natural human proteins is one hot research field. AI could pick the right number, type and arrangement of plastic building blocks, similar to those used in dental fillings, to mimic the desired function of a protein, and simple polymer chemistry could be used to make it. The researchers developed deep learning methods to match natural protein properties with plastic polymer properties in order to design an artificial polymer that functions similarly, but not identically, to the natural protein. The design platform opens the door to hybrid systems of natural and synthetic polymers, but also suggests ways to more easily make biocompatible materials, from artificial tears or cartilage to coatings that can be used to deliver drugs. The work was funded by the U.S. Department of Defense, the National Science Foundation, and the Department of Energy's Office of Science...
Berkeley News - Mar 20, 2023

NIH funds cool sensor tech: DART VADAR harnesses the force of enzymes for better RNA drugs

...NIH-funded team demonstrates ability to combine preexisting biological components into a completely new engineered technology that has the potential to make the treatment of a wide range of diseases faster and easier is a great example of how synthetic biology can change the world for the better. New, easy-to-design RNA-based sensor can detect and automatically respond to molecular triggers within cells. Researchers at the Wyss Institute at Harvard University and MIT developed a novel RNA sense-and-respond circuit they call Detection and Amplification of RNA Triggers via ADAR, or DART VADAR. Taking advantage of an enzyme that edits RNA in the human body, DART VADAR allows researchers to easily design RNA circuits carrying protein-coding information that are only translated in the presence of a specific molecular marker of disease and/or cell type. This ability broadens the scope of conditions that can be addressed with RNA-based therapeutics and enables the development of highly specific treatments for a variety of diseases. ADARs are enzymes that bind to double-stranded RNA (dsRNA) molecules and make a specific base edit, converting a mismatched adenosine (A) molecule into inosine (I). This change destabilizes the dsRNA structure, and is thought to be involved in cells' responses to different viruses. The researchers reasoned that they could use the natural dsRNA-editing ability of ADARs to create a new kind of responsive RNA sensor. The team engineered their sensor so that the A of the UAG sequence (which signals to "stop") would "mismatch" with a cytosine (C) in the target strand, rather than its rightful partner of U. This mismatch essentially frees up the A to be found and converted to I by ADAR, and the resulting UIG sequence is no longer a "stop" codon, allowing translation to occur. Thus, the green fluorescent protein is produced, signaling that the sensor has found and bound to its target. [really cool tech!] To ensure that the sensor could work in different cell types, they added the sequence of the ADAR gene to their sensors. Now, activation of the sensor by ADAR naturally present in a cell could stimulate the production of more ADAR, creating a positive feedback loop that amplifies the sensor's activity. ...
The team designed a DART VADAR sensor to detect the p53 mutant and introduced it into a line of human cells along with plasmids expressing either the normal or the mutant version of the gene. They found that the sensor did indeed register the presence of the aberrant genetic sequence with high specificity. This work was supported by NIH.
Wyss Institute - Mar 20, 2023

TRISH research on Axiom's Ax-2 Mission to examine effects of spaceflight on humans

...The Translational Research Institute for Space Health (TRISH) at Baylor College of Medicine in consortium with the California Institute of Technology (Caltech) and the Massachusetts Institute of Technology (MIT) announced several human health and performance research projects to be conducted aboard Axiom Mission 2 (Ax-2) to the International Space Station (ISS). Empowered by NASA's Human Research Program, TRISH finds and funds disruptive, innovative technologies and research with the goal of protecting human health in space. Increasing human health and performance research on commercial spaceflight is the objective of TRISH's EXPAND (Enhancing eXploration Platforms and ANalog Definition) program. The TRISH-sponsored research projects aboard the mission will assess important aspects of the human experience in space, including space motion sickness, sleep disturbance, genome alterations and changes to cognitive function, eye and brain health and more...
Baylor College of Medicine - Mar 20, 2023

NASA funds first wearable health sensor for monitoring muscle atrophy

...Building on prior health sensor work for NASA, researchers at Ohio State University have fabricated the first wearable sensor designed to detect and monitor muscle atrophy, which involves loss of skeletal muscle mass and strength. This new study suggests that an electromagnetic sensor made out of conductive “e-threads” could be used as an alternative to frequent monitoring using MRI. To validate their work, researchers fabricated 3D-printed limb molds and filled them with ground beef to simulate the calf tissue of an average-sized human subject. Their findings showed that they were able to demonstrate the sensor could measure small-scale volume changes in overall limb size, and monitor muscle loss of up to 51%. This NASA-funded study was inspired by the goal of finding solutions to health issues facing astronauts...

Ohio State News - Mar 17, 2023

Other IT Related

ICYMI: Op-Ed by President Biden’s Chief Science and Technology Advisor: Let’s Change What’s Possible

...America’s science, technology, and innovation ecosystem is a powerful engine for progress, but it was conceived in the last century for last century’s goals. Today, the nation’s aspirations have never been bigger: robust health and ample opportunity for everyone, tackling the climate crisis and using it to reimagine infrastructure and humanity’s relationship with nature, global security and stability, a competitive economy that creates good-paying jobs, and a strong, thriving democracy. The purpose of science and technology is to open the doors that make these aspirations possible. One step is to continue current federal R&D investments, including those in basic research. It’s time to renew the vibrancy of research, open participation to a more diverse community of people and institutions, and recommit to the many national purposes behind public R&D spending, including improving health outcomes, creating more economic opportunity and industries of the future, and strengthening national security. Another step is addressing the gap between the country’s excellent research and the societal impact we seek: tangible benefits for people in every community to live better lives. To get there, research must translate into new products and services, new industries and jobs, new policies and regulations, and new standards and practices. In this vein, the National Science Foundation’s Directorate for Technology, Innovation and Partnerships is helping universities move basic research into commercialization and is boosting regional innovation. Efforts in the Department of Education and the Department of Transportation are now exploring new R&D investments that can achieve better outcomes for their missions...

The White House - Mar 16, 2023

FACT SHEET: Biden-Harris Administration Announces New Bold Goals and Priorities to Advance American Biotechnology and Biomanufacturing

...The Biden-Harris Administration is announcing new bold goals and priorities that will catalyze action inside and outside of government to advance American biotechnology and biomanufacturing. Biomanufacturing – or the use of biological systems to produce goods and services at commercial scale – has the potential to drive new sustainable alternatives across industries, including plastics, fuels, and medicines. These innovations can unlock new solutions in health, climate change, energy, food security, agriculture, supply chain resilience, and national and economic security. The White House Office of Science and Technology Policy (OSTP) is releasing a new report outlining a vision for what is possible with the power of biotechnology and biomanufacturing, and R&D needs to achieve this ambitious vision. The Department of Defense (DoD) is releasing its Biomanufacturing Strategy to guide these investments, and its broader efforts in this critical technology field. This strategy, which will guide research efforts and collaboration with the private sector and allies, sets three key priorities: establishing the customers within DoD that stand to benefit from early-stage innovations, advancing biomanufacturing capabilities through innovation, and mapping the biomanufacturing ecosystem and tracking metrics that support future efforts...

The White House - Mar 22, 2023

US-Ireland research program celebrates 17 years with landmark \$21 million investment

...The U.S. National Science Foundation announced a joint overall investment of approximately \$21 million through a tripartite research and development partnership between the U.S., the Republic of Ireland and Northern Ireland. Through the investment, 12 awards that span 27 research institutions will receive funding for projects that include research in the areas of wearable health diagnostics, robotics, 5G communications and quantum networks, among others...

National Science Foundation - Mar 17, 2023

Fiscal Year 2023 Research Funding Awards

...The DoD announced \$220 million in awards for basic research projects as part of the Multidisciplinary University Research Initiative (MURI) Program. At an average award amount of \$7.1 million over five years, these competitive grants will support 31 teams located at 61 U.S. academic institutions, subject to satisfactory research progress and the availability of funds. The highly competitive MURI program, which complements the Department’s single-investigator basic research grants, has made immense contributions to current and future military capabilities and resulted in multiple commercial sector applications. Notable MURI achievements include breakthroughs in cold atom quantum methods with potential applications in quantum sensing and communication as well as advances in pulsed magnetic field propagation and Doppler radar detection leading to new detection physics for landmines...

STEM / Workforce & IT

The White House Task Force on Worker Organizing and Empowerment: Update on Implementation of Approved Actions

...A guiding principle of the White House Task Force on Worker Organizing and Empowerment is the Biden-Harris Administration's commitment to worker rights, including the right to a free and fair choice to join a union and to dignity in the workplace. While the Task Force has been focused on its work within the Executive Branch, the country has seen significant momentum in worker organizing, spread across multiple industries, including in industries with a history of low union density, such as digital programming and testing, and previously unorganized retail. Often, private sector workers who work on federal property or in a federal building face additional and unnecessary barriers to organizing. Four Task Force agencies – the Departments of Defense and Interior, the General Services Administration, and the Office of Personnel Management (OPM) – committed to securely and safely make it easier for union representatives to reach potential or current union members to discuss their rights. A fifth agency – the Department of Homeland Security – has since taken action to facilitate access at airports through the work of the Transportation Security Administration. The Task Force will continue to provide a powerful platform for the Biden-Harris Administration to meet this moment of worker empowerment...

The White House - Mar 17, 2023

L.A. Youth Robotics Competition Leaves Student Teams Energized

...NASA's Jet Propulsion Laboratory sponsored several of the 44 competing teams and supported the 23rd annual FIRST Robotics Competition Los Angeles Regional. The event is one of many taking place across the country under the umbrella of FIRST (For Inspiration and Recognition of Science and Technology). The nonprofit organization pairs students with STEM professionals for hands-on engineering experience and practice with problem-solving, team building, fundraising, and promotion, among other skills. Teams in the FIRST Robotics Competition receive technical specifications and game rules in January and have just weeks to design, build, and test their wheeled robots. For about two decades, NASA's Robotics Alliance Project has supported youth robotics teams through agency centers across the country and at JPL, aiming to inspire students to pursue careers in aerospace while helping them build the skills they'll need to succeed. JPL's Dave Brinza, assistant mission assurance manager for NASA's Europa Clipper mission said, "We often say the real trophies aren't the blue banners and the things you put on a shelf, it's the kids who go on and have successful careers."...

National Aeronautics and Space Administration - Mar 20, 2023

STEM / Workforce Resources & Opportunities

R&D WORKFORCE TRAINING: FEDERAL AGENCIES' STEM INTERNSHIPS, SCHOLARSHIPS, AND TRAINING OPPORTUNITIES

...Increasing the availability of STEM opportunities is a priority in the Biden-Harris Administration. To help facilitate this, the team at NITRD developed a STEM Portal that allows anyone to search for internships and other training opportunities at Federal agencies. The NITRD STEM PORTAL is a searchable database that includes a description, link, and contact information for each program listing. Government-sponsored internships and training programs are competitive, but there are many Federal opportunities and the NITRD STEM Portal is here to help...

The Networking and Information Technology Research and Development (NITRD) Program - Mar 9, 2023

Federal Internship Portal

...If you are looking for an internship with the federal government, you can now easily search for them on the new USAJOBS intern portal. This portal will let you search for federal internships in one place. A multitude of opportunities are available, including paid internships, offering the possibility to contribute in countless ways. There are postings from agencies across the federal government and the country, both in person and remote. You can also find more information on federal internship programs, the internship application process, and some frequently asked questions at www.usajobs.gov/Help/working-in-government/unique-hiring-paths/students/

USAJOBS - Mar 21, 2023

USAJOBS Help Center | Students & recent graduates

...The Pathways Program offers federal internship and employment opportunities for current students, recent graduates and those with an advanced degree. The Internship Program is for current students. If you're a current student in high school, college, trade school or another qualifying educational institution, you may be eligible. This program offers paid opportunities to work in federal agencies and explore federal careers while completing your education...

Federal Register: Request for Information (RFI)

National Spectrum Strategy (NSS) Listening Session

...The National Telecommunications and Information Administration (NTIA) will hold two public listening sessions to assist in its preparation of a National Spectrum Strategy (NSS) for the United States. NTIA is seeking input from the public as it develops a Strategy that identifies the actions needed to maximize the potential of our nation's spectrum resources. Access to spectrum contributes to technological innovation and economic growth and is critical to national security, public safety, and other national priorities. The listening sessions will be held on: Thursday, March 30, 2023, from 1:00 p.m. to 4:00 p.m., Eastern Daylight Time; and Tuesday, April 11, 2023, from 1:00 p.m. to 3:30 p.m., Eastern Daylight Time...

Federal Register - Mar 16, 2023

Note: Any mention in the text of commercial, non-profit, academic partners, or their products, or references is for information only; it does not imply endorsement or recommendation by any U.S. Government agency.

Innovation Through NITRD Coordination

Networking and Information Technology Research and Development - National Coordination Office, Washington, DC USA

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