MATRIX MONITOR

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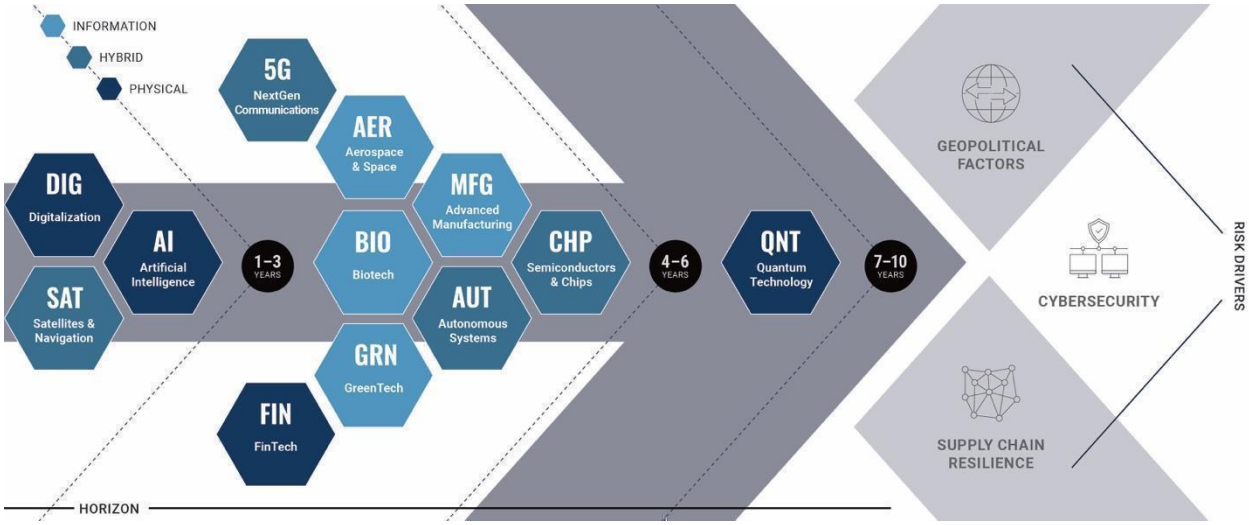
The only source dedicated exclusively to the emerging technologies shaping the future of business and national security.



This week's Next5 Matrix Monitor features a Russian spy satellite shadowing a US counterpart, privacy-preserving imaging with AI, China's drones for domestic surveillance, Roscosmos's plans for a new space station, plans to leverage genetic engineering to resurrect an extinct species, China's purported launch of the world's most powerful magnet for scientific research, a Chinese technology firm's claim to have released a chip that broke computing records, and new US export controls on advanced chip technologies.

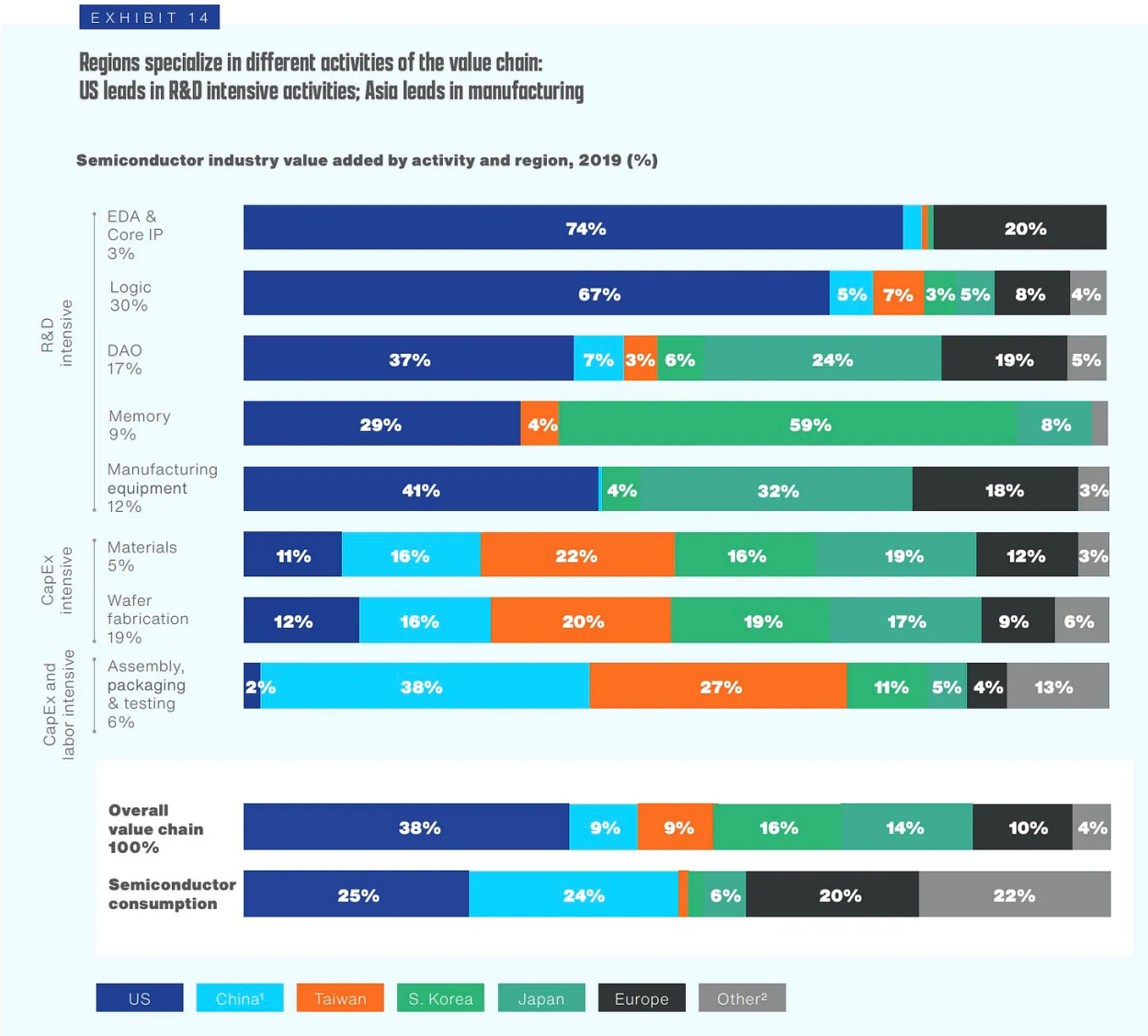
NEXT5 NEWS & AMPLIFICATIONS

→ **The Cipher Brief hosted the Cyber Initiatives Group (CIG) Summer Summit on August 17. LookingGlass' top takeaways:**

- ODNI's CTIIC (Cyber Threat Intelligence Integration Center) Director Laura Galante noted cryptocurrency as an area to watch. It is not being adopted in the US the way it is in other parts of the world, and it will increasingly be associated with emerging threats. It is also a challenging space to understand as its decentralized concept is relatively new and the IC must adapt.
- LT General Michael Groen, former Director of the JAIC, spoke about the Chinese Communist Party's strong organizational skills that they have translated into effective cyber operations. He argued that the US must take the innovative environment that exists between American universities and Silicon Valley to become a highly organized opponent to China.
- Accenture's Jim Guinn compared financial services to the water sector. He noted that financial players have global assets they need to protect while water districts are small. Water service providers may serve thousands of residents or hospitals, among other infrastructure. And these small districts may be served by small groups of people that don't have strong cyber understanding. He also said that regulation is not the answer as it creates a culture of "bare minimums" that maintains a low barrier for threat actors to hurdle. It should be more about collaboration and independence.
- A panel with David Sanger, Microsoft's Kelly Bissel, and Recorded Future's Stuart Solomon concluded that technological decoupling with China is continuing to increase.
- On Ukraine, Sue Gordon, former PDDNI, said the conflict demonstrates the role information warfare plays in today's wars. And the IC is finding a balance between protecting and sharing intelligence. She said we are seeing a trend where protecting intelligence historically dominated but sharing intelligence really started when the IC publicly released intelligence about Russian intervention in the 2016 election. And publicly sharing intelligence about the Russian invasion of Ukraine was critical. This transparency will likely remain a trend.
- Dmitri Alperovich assessed Taiwan's window of maximum vulnerability to Chinese threats is 5-10 years out; not in the next year or two. And Taiwan is not adequately equipped with weapons and systems to defend against a Chinese invasion. He also noted that China has not mastered semiconductor technology and still has to leverage western expertise - this is where the US has leverage. And we should not allow Xi's strategic mission to become semiconductor dependent. He also said the US needs to reduce reliance on China and Taiwan; the recent CHIPS Act is only a drop in the bucket. #Cybersecurity #SCRM #CHN #UKR #RUS #USA #Geopolitics #CHP #AI

→ **Should the Taiwanese chip industry be destroyed due to war or embargo, the consequences for the rest of the world would be immediate and dramatic.** Global production would fall to early 2000s levels for an estimated 15 years as the lag in production of fabs and tools, technical know-how, would take decades to reacquire. A Goldman Sachs report

estimated that 169 industries were impacted by the recent chip shortage. And according to Secretary Raimondo, American companies were only holding 5 days worth of semiconductor inventory when the shortage hit. Taiwan is key because it is home to TSMC, which makes over half of the world's semiconductors. It gets two-thirds of contracts for semiconductor manufacturing, is one of the two companies in the world that can make 5nm transistors, and will be, for the foreseeable future, the only company to make 3nm chips. TSMC is not the only Taiwanese company that holds a monopoly in the chip production process in other subsectors. #TWN #CHN #USA #CHP #SCRM #Geopolitics ChinaTalk



→ **Ten years ago, US scientists made a breakthrough battery discovery, but the US government gave the technology to China.** US scientists in Washington state built a vanadium redox flow battery based on designs from a government lab which cost taxpayers $15M in R&D. The batteries were about the size of a refrigerator, held enough energy to power a house, and could be used for decades. Now a Chinese company, Dalian Rongke Power Co.

BACK TO TOP

Ltd. is making the batteries in China. An NPR investigation found the federal agency allowed the tech and jobs to move overseas, in violation of its own licensing rules while failing to intervene on behalf of US workers in multiple instances. Now China is investing millions into the cutting edge green technology that was supposed to keep the US economy out front. The US Department of Energy gave this technology to the company first in 2017 as part of a sublicense,and later, in 2021, as part of a license transfer. This happened after Gary Yang, the lead scientist on the US project, could not get any American investors to back the technology and take it to market while the patents would still be owned by the government. Dalian Rongke Power however, jumped at a chance to invest and manufacture the batteries. Over time, the majority of manufacturing shifted away from the Yang's company and into Dalian Rongke Power. In 2017, Yang formalized the relationship and granted the Chinese company a sublicense. In a written statement, DOE said it is now conducting an internal review of the licensing of vanadium battery technology and whether this license - and others - have violated US manufacturing requirements. Several US companies are still trying to get a license to make the batteries, but have been waiting for approval for over a year in some cases. #CHN #USA #Geopolitics #GRN NPR

DIGITALIZATION

→ **The US government's $42.5B plan to expand internet service to underserved communities is on hold nearly nine months after approval because authorities still don't know where gaps need to be filled.** The broadband plan, part of the $1T infrastructure bill signed by President Biden last November, stipulates that money to improve service can't be doled out until the Federal Communications Commission completes new maps showing where homes and businesses lack fast service. Lawmakers demanded new maps after flawed data in past subsidy programs caused construction projects across the country to bypass many of the Americans that they were supposed to serve. However, officials warn that getting the mapping right will take time, which could mean a delay in the expansion of service to people struggling with slow internet. The new maps are supposed to improve on old ones by recording service at a more granular level—location by location, rather than census block by census block. To develop the data needed for the new maps, the FCC signed a contract of up to $45M with CostQuest Associates, a Cincinnati consulting firm. The Commerce Department's National Telecommunications and Information Administration will allocate funds to each state based on the FCC maps' tally of unserved locations. The maps are expected to be ready for this purpose sometime in the first half of 2023. #DIG #USA WSJ

→ **China's internet giants, including Tencent and ByteDance, have shared details of their prized algorithms with Beijing for the first time**, an unprecedented move aimed at curbing data abuse that may end up compromising closely guarded corporate secrets. China's internet watchdog on Friday, August 12, published a list describing 30 algorithms that firms employ to gather data on users, tailor personal recommendations, and deliver content. The algorithm list is confined to short descriptions of how they work and the product and use cases where they apply. For example, ByteDance says its algorithm discerns a user's likes and dislikes to

recommend content on apps including short-video platform Douyin, TikTok's Chinese counterpart. The algorithms that decide which TikTok videos, WeChat posts, and Instagram photos users see drive many online services and are critical in capturing user attention and creating growth. In March, China adopted regulations that require internet firms to disclose such tools, an effort to address complaints about data abuse that also helps regulators control internet firms' activities. #DIG #CHN Bloomberg

→ **Companies are leveraging haptics to enable people to feel virtual objects, creating immersive experiences across a range of scenarios.** Simulated surgery, for example, provides varying levels of feedback to surgeons working on virtual bone or flesh. London-based FundamentalVR designs immersive surgery simulation software to run on VR headsets and hand-held haptics tools allowing users to experience the look and feel of surgery. The company is part of a healthcare simulation market projected to reach $3.4B by 2026, according to market research platform MarketsandMarkets. Other companies have also leveraged advances in haptics and virtual reality for the medical field, although most offer experiences through large, stationary hardware. FundamentalVR aims to stand apart by focusing on the software that enables experiences. According to the company, its surgical simulation platform is currently in use in 30 countries and customers include medical device makers and pharmaceutical manufacturers, including Novartis AG, that are typically responsible for training practicing surgeons on new surgery devices they bring to market.

London-based FundamentalVR's software produces realistic sensations during surgery training.
PHOTO: FUNDAMENTALVR

BACK TO TOP

#DIG #BIO #GBR WSJ

SATELLITES & NAVIGATION

→ **The Pentagon is speaking out against Russia's launch of a spy satellite believed to be shadowing one of its American counterparts in the same orbit.** The Russian satellite, known as Kosmos 2558, launched on August 1 and appears to have been placed in nearly the same orbit as a classified American reconnaissance satellite that launched on February 2. According to Netherlands-based satellite tracker Marco Langbroek, as of August 2, Kosmos 2558 is mirroring the American satellite's orbit with a difference of just 0.04 degrees and a separation of 37 miles. General James H. Dickinson, Commander of US Space Command (SPACECOM) called the Russian activity "irresponsible" in a report released by NBC Nightly News with Lester Holt. Kosmos 2558 is rumored to be a so-called "inspector satellite" capable of maneuvering close to other spacecraft, relatively speaking – Other Russian satellites have been observed in the past displaying the same behaviors. #SAT #USA #RUS Space.com

→ **Satellite ground stations that for decades have been operated by the US Army were officially handed over to the Space Force on August 15.** The Space Force took control of the Wideband Global Satcom and Defense Satellite Communications System constellations of military satellites. The satellites were built and launched by the US Air Force but the Army controlled the payloads. The Pentagon approved the transfer last year to consolidate space programs under the new military branch, which is responsible for providing satellite-based services to DoD and allies. "This transfer will mark the first time all Department of Defense military satellite communication functions have been consolidated under a single military service," the Space Force said in a news release. #SAT #USA Space News

ARTIFICIAL INTELLIGENCE

→ **The National Institute of Standards and Technology released a new playbook to help public and private entities mitigate algorithmic biases and other risks to AI systems.** The playbook is meant to act as a companion guide to NIST's Risk Management Framework, the final version of which will be submitted to Congress in early 2023. Some of the recommendations intended to help private and public groups include fostering a robust governance structure with clear individual roles and responsibilities, as well as fostering a professional culture that supports critical thinking and transparent feedback on AI technologies and products. One implicit aspect of many AI algorithms the playbook looks to prevent is systemic bias, where a business or operating process contributes to a consistently skewed decision. According to Reva Schwartz, a research scientist and principal AI investigator at NIST, all harmful, discriminatory biases need to be prevented, but systemic risks tend to sneak into

systems because they don't receive the attention given to statistical or cognitive biases. #AI #USA Nextgov

→ **A new research paper published in eLight demonstrated a new paradigm to achieve privacy-preserving imaging by building a fundamentally new type of imager designed by AI.** In their paper, UCLA researchers presented a smart camera design that images only certain types of desired objects, while instantaneously erasing other types of objects from its images without requiring any digital processing. Since the characteristic information of undesired classes of objects is all-optically erased at the camera output through light diffraction, this AI-designed camera never records their direct images. Therefore, the protection of privacy is maximized since an adversarial attack that has access to the recorded images of this camera cannot bring the information back. This feature can also reduce cameras' data storage and transmission load since the images of undesired objects are not recorded. #AI #USA Tech Xplore

NEXT GENERATION COMMUNICATIONS

→ **Omnispace, based in Tysons, Virginia, wants to be the first company to deliver a global 5G non-terrestrial network with connectivity directly to mobile devices from its low-earth orbit (LEO) satellites.** The company believes the future of communications is hybrid – where satellites extend and augment terrestrial mobile networks. Omnispace earlier this year completed the launch of two satellites through its Omnispace Spark program, and plans for its satellite networks to be combined with terrestrial mobile networks to provide ubiquitous mobile device connectivity. On Wednesday, August 17, Omnispace announced a partnership with the Philippine wireless company Smart Communications. The Philippine operator is interested in use cases such as 5G connectivity in remote areas, incorporating IoT and sensors for use in monitoring weather disturbances and natural disasters, and augmenting network coverage for disaster relief. #5G #USA #PHL Fierce Wireless

FINANCIAL TECHNOLOGY

→ **The United Nations Conference on Trade and Development (UNCTAD) urged authorities in developing countries worldwide to take action to prevent the widespread use of cryptocurrencies last week.** The group noted that cryptocurrencies can facilitate remittances, but they may also enable tax evasion. “In this way, cryptocurrencies may also curb the effectiveness of capital controls, a key instrument for developing countries to preserve their policy space and macroeconomic stability.” The trade body explained that it has released three related policy briefs. One, published on June 13, outlines the high cost of leaving cryptocurrencies unregulated. Another, published on June 22, discusses public payment systems in response to the financial stability and security risks of cryptocurrencies. The third brief, published on August 10, focuses on how cryptocurrencies can undermine domestic resource mobilization in developing countries. UNCTAD has recommended the following policy actions to curb the expansion of cryptocurrencies in developing countries:

1. Ensure comprehensive financial regulation of cryptocurrencies through regulating crypto exchanges, digital wallets, and decentralized finance, and banning regulated financial institutions from holding cryptocurrencies (including stablecoins) or offering related products to clients.
2. Restrict advertisements related to cryptocurrencies.
3. Provide a safe, reliable, and affordable public payment system adapted to the digital era.
4. Agree and implement global tax coordination regarding cryptocurrency tax treatments, regulation, and information sharing."
5. Redesign capital controls to take account of the decentralized, borderless, and pseudonymous features of cryptocurrencies.

#FIN Bitcoin.com

→ **The US Federal Reserve on Tuesday, August 16, issued additional guidance for banks considering activities involving cryptocurrencies**, emphasizing that firms must notify the Fed beforehand and make sure whatever they do is legally permitted. According to a statement by the Fed, while cryptocurrencies could present "potential opportunities" to banks, firms needed to make sure they had systems in place to ensure the volatile assets did not threaten safety and soundness or consumer protections. Banks should also notify the Fed before engaging in any crypto-related activities, and any banks that had already pursued crypto initiatives should notify the Fed about their involvement in the digital asset space, the agency said. Banks should also have adequate risk management systems and controls in place before getting involved in crypto to ensure that any endeavors were conducted in a safe and sound manner and were compliant with relevant consumer protection statutes. #FIN #USA Reuters

AEROSPACE & SPACE

→ **A district in Shanghai has been using drones to detect whether residents disobey Covid-19 policies, leading to online fury about the potential abuse of surveillance technology.** A local authority in Shanghai's Yangpu district started to deploy drones for aerial inspections of neighborhoods, according to a post last week from the district government's official account on Tencent Holdings' WeChat. The inspections include monitoring of shops, residential areas, river woodlands, parks, and construction sites to "consolidate the results of epidemic prevention and control" in the city which has "entered a stage of normalization." Yang Futao, director of the Xinjiangwancheng neighborhood, said drones will focus on monitoring people who enter business districts and communities, and those who wait in line to take nucleic acid tests. If people gather together or do not scan the health code, the megaphone on the drone will try to dissuade them, and ground forces will be linked in real-time, according to Yang. A post on the microblogging platform Weibo related to Yangpu's drone policy drew thousands of comments, with many questioning whether the district's policy was a valid use of the technology. #AER #CHN SCMP

→ **Roscosmos has announced plans for a new space station in the wake of Moscow pulling out of the International Space Station (ISS).** According to state-affiliated news agency Tass, Roskosmos's Energia Rocket and Space Corporation unveiled a model of a Russian orbital station at the Army-2022 forum, which included multiple research modules, a service platform, and a docked prospective Oryol spacecraft. This comes after Yuri Borisov, the director general of Roscosmos, announced in July that Russia was withdrawing from the ISS after 2024 and was planning to build its own station. However, whether Russia will actually withdraw has become increasingly unclear. After Borisov's announcement, Roscosmos released a blueprint for its planned Russian space station on social media, but the Army-2022 forum is the first time that a physical mock-up has been displayed.

#AER #RUS Newsweek

BIOTECHNOLOGY

→ **Researchers and entrepreneurs have created an implant resembling the human cornea out of collagen protein derived from pig skin.** The implant restored vision to 20 people with diseased corneas in a pilot study, the majority of whom were blind before receiving the implant. All 14 of the participants who had been blind before the operation had their vision restored, with

three of them achieving perfect 20/20 vision. This new surgical method eliminates the need for stitches. The incision in the cornea can be made with high precision using an advanced laser, but it can also be done by hand using simple surgical instruments when necessary. The procedure was first tested on pigs and was discovered to be simpler and potentially safer than a traditional cornea transplant. One unexpected benefit was that the implant altered the shape of the cornea sufficiently to allow recipients to wear contact lenses for the best possible vision, even if they had previously been unable to tolerate them. Additionally, because pig skin is a by-product of the food industry, using this bioengineered implant should cost a fraction of what it would cost to transplant a human donor cornea, according to one of the researchers behind the study. The team is hoping to run a larger clinical trial of at least 100 patients in Europe and the US. In the meantime, they plan to kick-start the regulatory process required for the US Food and Drug Administration to eventually approve the device for the market. #BIO #SWE ScienceDaily MIT Technology Review

→ **Scientists want to use genetic engineering to resurrect the Tasmanian tiger, officially known as a thylacine, which has been extinct since 1936.** Colossal Biosciences, a Texas-based de-extinction company that made headlines last September when it revealed plans to resurrect the woolly mammoth, announced on Tuesday, August 16, that its second project will be resurrecting the thylacine. The biotech firm is collaborating with Andrew Pask of the University of Melbourne, who has already sequenced the majority of the thylacine genome. With this collaboration in place, Pask believes it is reasonable to expect a de-extincted thylacine in a decade. Colossal's ultimate goal is to release a viable, genetically diverse population of perhaps 100 proxy thylacines into the wild after many years of monitoring the engineered animals in a large enclosed area. The first task for the thylacine is to finish sequencing the animal's genome. The researchers will then compare the thylacine's genome to that of one of its closest living relatives, the fat-tailed dunnart, a mouse-sized marsupial that is abundant and does well in captivity. The scientists will use CRISPR gene-editing technology to modify the dunnart's genome to resemble that of a thylacine. The researchers have already figured out how to reprogram dunnart skin cells into stem cells and are currently testing them to see if they can generate an entire embryo — something that hasn't yet been done in marsupials, which develop differently than placental mammals like humans and mice. They'll be able to use the stem cells to create a gene-edited living embryo that they can insert into either a dunnart mother or an artificial marsupial womb that they'll have to invent. According to Pask, these new marsupial reproductive technologies could become critical tools for the conservation of extant species like koalas and numbats.

#BIO #USA #AUS CNN Scientific American

GREEN TECHNOLOGY

→ According to a study published August 10 in *Nature*, **a perovskite solar cell developed by engineers at the University of California San Diego brings researchers closer to breaking the ceiling on solar cell efficiency.** The new solar cell is a lead-free low-dimensional perovskite material with a superlattice crystal structure – a first in the field. Due to its specific structure, this new type of superlattice solar cell reaches an efficiency of 12.36%, which is the highest reported for lead-free low-dimensional perovskite solar cells (the previous record holder's efficiency is 8.82%). The new solar cell also has an unusual open-circuit voltage of 0.967 V, which is higher than the theoretical limit of 0.802 V. Both results have been independently certified. The open-circuit voltage is a solar cell property that contributes to its efficiency, so this new solar cell could break the theoretical limit of current solar cells, according to the study's senior author Sheng Xu, a professor of nanoengineering at UC San Diego. In the future, this technology could enable higher efficiency with more electricity from existing solar panels or generate the same amount of electricity from smaller solar panels at lower costs, according to Xu. #GRN #USA Tech Xplore

→ **China reportedly launched the world's most powerful magnet for scientific research at a laboratory in the southeastern city of Hefei**. The magnet is said to be roughly the size of a coin, with a diameter of 33mm. It creates a stable magnetic field of 45.22 tesla, which is more

than a million times stronger than the Earth's magnetic field. Generating such powerful magnetic fields requires a large amount of energy, though the rewards could have a positive impact on the energy industry. Researchers worldwide are developing incredibly powerful magnets — strong enough to lift aircraft carriers — in a bid to harness the great potential of nuclear fusion energy, which could reduce the world's reliance on fossil fuels. Last month, the US Department of Energy's (DOE) Princeton Plasma Physics Laboratory (PPPL) announced it had found a way to build powerful magnets much smaller than before. While those magnets did not display world record-breaking strength, they will potentially allow fusion tokamak reactors to be built in new, more efficient ways. These innovations in magnet power and size could unleash nuclear fusion and revolutionize the energy industry. #DRN #USA #CHN Interesting Engineering

ADVANCED MANUFACTURING

→ 3D printing enables economies to produce goods locally, leading some to believe it would reduce international trade; however, **new University of California San Diego and World Bank research presents evidence that 3D printing expanded trade.** The paper finds that 3D printing changed production processes, but supply chains remained intact. The study is the first to examine the impact of 3D printing on trade. Published in the Journal of International Economics, the paper looks at the production of hearing aids – a good most commonly produced by 3D printing. The results reveal that the shift to 3D printing led to a doubling or near doubling in producers' exports after five years and the technology was the main cause for the rise in exports. The researchers also examined 35 other products, such as running shoes, aircraft parts, and prosthetic limbs that are increasingly being 3D printed and found similar patterns. One reason behind the expansion is that printing hearing aids in high volumes requires a large investment in technology and machinery. The countries that were early innovators – Denmark, Switzerland, and Singapore – dominate exports of the good, while middle-income economies such as China, Mexico and Vietnam also have been able to substantially increase their market shares. In addition, hearing aids are lightweight products, which makes them cheap to ship internationally. The same is true for the other products the authors examined – lighter products are associated with more trade growth. #MFG #USA #DNK #CHE #SGP #CHN #MEX #VNM Science Daily

→ **Boeing and Northrop Grumman are joining a White House-backed compact to help smaller US-based suppliers increase the use of 3D printing and other advanced manufacturing technologies.** The voluntary program, unveiled by President Joe Biden in May, seeks to boost suppliers' use of additive manufacturing (AM). The program, Additive Manufacturing Forward (AM Forward) is organized by non-profit Applied Science & Technology Research Organization of America (ASTRO America). GE Aviation, Siemens Energy, Raytheon Technologies, Honeywell, and Lockheed Martin were the initial companies to make commitments. The manufacturers say they will purchase additively produced parts from smaller US suppliers, train supplier workers on new additive technologies, provide technical assistance, and engage in standards development and certification. Boeing and Northrop Grumman both aim to increase the number of small- and medium-sized suppliers competing over quote

packages for products using additive manufacturing. Boeing will also aim to increase its qualified small and medium supplier capacity by 30% and provide technical guidance to meet qualification requirements. Such technologies can reduce part lead times and material costs by 90% and cut energy use in half. #MFG #USA Reuters

AUTONOMOUS SYSTEMS

→ **Motional, an Aptiv-Hyundai joint venture working to commercialize autonomous driving technology, has launched its new all-electric IONIQ 5-based robotaxi in Las Vegas for driverless ride-hail operations on the Lyft network.** A Motional AV can be requested by any Lyft rider in Las Vegas. In the front seats, there will be two vehicle operators: one behind the steering wheel in case a human is required to take over, and one in the passenger seat to record data and observations. The service route focuses on high-traffic and popular destinations along the Vegas strip and will only be available during the day. #AUT #GRN #USA TechCrunch

→ **Russia's military has praised civilian-grade Chinese-made DJI drones and robots for their performance on the battlefield, prompting DJI manufacturers to emphasize that the equipment is not intended or sold for military use.** DJI is already sanctioned in the US, and it has tried to repair its reputation by suspending operations in Russia and Ukraine. “The Mavic quadcopter drone made by China's DJI has in principle become a symbol of modern warfare,” said the Russian embassy's Weibo post in Chinese, quoting Army General Yuri Baluyevsky. “Most of the products are designed for civilian purposes,” responded DJI in Chinese to the Weibo post, adding “DJI products are not suitable or meet the needs of military use, we do not support military applications.” The Weibo post has since been deleted. However, it was captured in a screenshot and posted on Twitter. #AUT #Geopolitics #CHN #RUS #UKR #USA The Register

SEMICONDUCTORS & CHIPS

→ **A Chinese technology firm has released a new 7nm GPU chip that it claims has broken computing records.** Biren Technology said in a statement that the peak performance of its BR100 chip, which was released last week, was three times that of comparable market products. The chip will be used in cloud-based artificial intelligence training on a large scale, according to the tech firm. The company intends to accelerate computing scenarios in data centers by collaborating with companies such as Inspur, one of China's largest server providers. The Biren chip is manufactured by TSMC, according to Shanghai-based news site *Guancha*. As a result, Biren Technology may face US sanctions in the future. Biren attributes the performance of its new chip to an innovative design and compatibility with new technologies. Earlier this year, the company hired Yang Chaoyuan, the former GM of Nvidia Shanghai, as its VP. The new chip is an adaptation of TSMC's advanced “chiplet design,” one chip is built with two compute tiles on a silicon interposer with a high communication speed. The design incorporates 77B transistors. In comparison, Nvidia's newly released 4nm GPU chip H100 has 80B transistors. Biren's design has pushed the boundaries of a single chip's surface area, it spans 1k sq mm, compared to 814 sq mm for the H100. #CHP #DIG #SCRM #Geopolitics #CHN #TWN #USA SCMP

→ **Gang Chen, a China-born MIT professor whose name was cleared earlier this year after a high-profile investigation into his alleged China ties, led a team that claimed to have discovered the best semiconductor ever discovered.** Chen and colleagues reported in the journal *Science* that a material known as cubic boron arsenide could conduct heat 10 times better than silicon, the most commonly used semiconductor. The new material's exceptional thermal conductivity makes it a promising candidate for next-generation electronics. It also outperforms silicon in terms of electron hole mobility, a critical property for conductivity. While the material appears to be an ideal semiconductor, Chen stated that other properties of cubic boron arsenide, such as long-term stability, needed to be tested. According to the release, they also hope to figure out how to produce and purify it so that it can one day partially replace the ubiquitous silicon in industrial applications. #CHP #CHN #USA SCMP

QUANTUM TECHNOLOGY

→ **Financial firms are looking into quantum computing to see if it may be used to better predict and possibly avert economic downturns.** The Bank of Canada recently collaborated with Multiverse Computing on a proof of concept aiming to put an existing quantum method to the test in a simulation of a complex, developing economic network. It simulated the adoption of cryptocurrency payment by up to ten enterprises at the same time. Economists have created a macroeconomic modeling method but lacked the processing power to run it on significant problems. For this intractable problem, a quantum algorithm was built, and the modeling yielded valuable insights. The model will improve much more as more powerful devices become available. This advanced technology will eventually provide governments with more advanced macroeconomic tools for monitoring vulnerabilities, predicting market stability concerns, and minimizing the effects of major economic shocks, according to Multiverse CTO Sam Mugel. As tools for modeling complex networks improve over the next decade, central banks and financial institutions will be much better positioned to strengthen economic resilience. Insights on vulnerabilities will help to shield financial institutions and entities such as pension funds from the shock of unusual events that are expected to occur during the portfolio's lifetime. It will also assist central banks in defending themselves against future attempts to weaponize the economy. #QNT #FIN #CAN Forbes

GEOPOLITICS

→ **New US export controls on advanced chip technologies, which went into effect on Monday, August 15, have created a significant impediment to China's semiconductor ambitions, according to analysts.** The Bureau of Industry and Security (BIS) of the US Department of Commerce announced export controls for national security reasons. Three of the four restricted technologies are electronic CAD (computer-aided design) software, which is used to create next-generation chips with gate-all-around (GAA) field-effect transistor structures, and two substrates of ultra-wide bandgap semiconductors, gallium oxide and diamond, which operate at significantly higher voltages, frequencies, and temperatures than conventional chip materials such as silicon. The new export restrictions alarmed Chinese semiconductor industry insiders because the domestic chip industry relies on advanced US electronic design

automation (EDA) software supplied to China by Cadence Design Systems, Synopsys, and Mentor Graphics. Chinese software providers, such as Empyrean Technology, are still attempting to catch up to what US firms offer. China's semiconductor development has not progressed to the point where design software for chips with complex GAA transistor structures is required. However, such software will be required if China achieves the 3nm process in semiconductor manufacturing, according to a Chinese EDA software company executive, who declined to be identified because he is not allowed to speak to the media. #Geopolitics #CHP #SCRM #USA #CHN SCMP The Bureau of Industry and Security (BIS)

→ **A Commerce Department-led process that reviews US technology exports to China approves almost all requests and has resulted in increased sales of some critical technologies, according to an analysis of trade data.** Officials required a license for less than half of the US' total $125B in exports to China in 2020, according to Commerce Department data. The agency approved 94%, or 2,652, of those applications for technology exports to China in 2020. The approval rate fell to 88% in 2021, according to the analysis, but differences in data compilation methods between the two years make comparisons difficult. The high rate of approvals for licenses to sell technology with potential military applications is evidence of significant policy failure, according to an analyst. Tighter restrictions on US technology sales to China, according to some, will backfire because allies such as Germany, Japan, and South Korea will step in to fill the void. The National Security Council, the Pentagon, and the Energy Department all expressed support for the export-controls process, describing it as critical to national security. Kharon, a Washington, DC-based research and data-analytics firm, claims to have identified tens of thousands of Chinese entities that may meet US criteria for military end-user export restrictions, despite the fact that the Commerce Department currently lists only about 70. Furthermore, the US export list does not prohibit US companies from selling to its members. They only need to apply for licenses, which are frequently granted. The Commerce Department issued more than $100B in export licenses to suppliers of banned Chinese firms Huawei and SMIC between November 9, 2020, and April 20, 2021. In some cases, US companies are able to sell technology to Chinese customers on the entity list without even applying for licenses, according to the regulations. US companies can also often freely sell technology to entity-listed companies in China by producing the goods in overseas factories, the rules state. #Geopolitics #SCRM #USA #CHN WSJ

CYBERSECURITY

→ **The Pentagon plans to deploy microgrids, or local, self-contained power grids, to 134 Army bases in May 2023, but first, they tested the system at DEF CON to identify potential vulnerabilities and better anticipate cyberattacks.** The collaboration took place this past weekend in Las Vegas, where more than 1.7k DEF CON attendees took part in the Pentagon's microgrid hacking challenge, with many of them successfully shutting down the mock grid. In one scenario, an ethical hacker short-circuited the Pentagon's model microgrid after several minutes of trying different attacks. Microgrids are vulnerable to a wide range of attacks because they rely on advanced technology to connect various components that provide intelligence and automation. DEF CON hackers experimented with a variety of creative ways to

disrupt the grid. One of the most successful involved injecting malicious code into National Oceanic and Atmospheric Administration weather forecasts, on which microgrids rely. Other DEF CON hackers were able to disable a wind turbine and solar panels that powered the game's brightly lit model neighborhood. When a hacker won the challenge, the lights in the neighborhood flickered on and off, and the miniature wind turbine turned red, smoked, and came to a halt. Officials said that seeing the various inventive ways the DEF CON attendees found to manipulate the forecast data on which the model microgrid relied on was valuable to DDS (Defense Digital Service). In another scenario, a teenager discovered that because microgrids operate on the Kelvin temperature scale, which does not allow for negative values, she could insert negative numbers into the grid's forecast models and crash the system. According to Nick Ashworth, the technical architect at DDS who works on microgrid resilience, the hack was one that no one at DDS had considered. #Cybersecurity #USA CyberScoop

→ **Facial recognition technologies that use a specific user-detection method are highly vulnerable to deepfake-based attacks, which could lead to significant security concerns for users and applications, according to new research.** It is the first systemic study on the security of facial liveness verification in real-world settings. The researchers found that most APIs that use facial liveness verification do not always detect deep fakes, which are digitally altered photos or videos made to look like a live version of someone else. Applications that use these detection measures are also less effective than the app provider claims. In the study, the researchers created LiveBugger, a deep fake-powered attack framework that automates facial liveness verification. They tested six popular facial liveness APIs. The researchers stated flaws in these products could spread to other apps that use them, putting millions of users at risk. LiveBugger tried to fool apps' facial liveness verification by using deepfake images and videos. Methods include analyzing static or video images of a user's face, listening to their voice, or measuring their response to a command. The researchers found that all four common verification methods were easy to bypass. In addition to showing how their framework circumvented these methods, they made recommendations to improve the technology's security, such as avoiding verification methods that only analyze a static image of a user's face and matching lip movements with a user's voice in audio and video methods. The researchers reported their findings to the vendors whose apps were used in the study, and one recently announced plans to launch a deepfake detection project. #Cybersecurity #DIG #USA Tech Xplore

SUPPLY CHAINS

→ **After a brief rebound in previous months, China's semiconductor output fell in July, as the country's supply chain struggled to meet strict Covid-19 control measures.** According to data released by the National Bureau of Statistics on Monday, August 15, integrated circuit (IC) production fell 16.6% YoY last month to 27.2B units, reflecting disrupted production and an oversupply of low-end semiconductor products. The July performance brought an end to China's brief rebound in May and June, when the country reported 27.5B and 28.8B units, respectively. It was slightly higher than the year's low of 25.9B units in April, when Covid-19 lockdowns and travel restrictions disrupted manufacturing activities in the Yangtze River Delta, which is home to

Shanghai and a major chip manufacturing base. The chip data came against a backdrop of robust downstream production, with China's automobile volume output up 31.5% YoY in July, with new-energy vehicle output more than doubling. Meanwhile, China's smartphone output fell 9.1% in July to 89M units, according to the statistics agency. China recorded a total output of 193.8B units for chip production in the first seven months of 2022, an 8% decrease from the same period last year, according to official data. China's overall industrial production fell short of expectations in July, growing at 3.8% YoY, down from 3.9% in June, owing to the ongoing impact of strict Covid-19 policies. #SCRM #CHP #CHN SCMP