



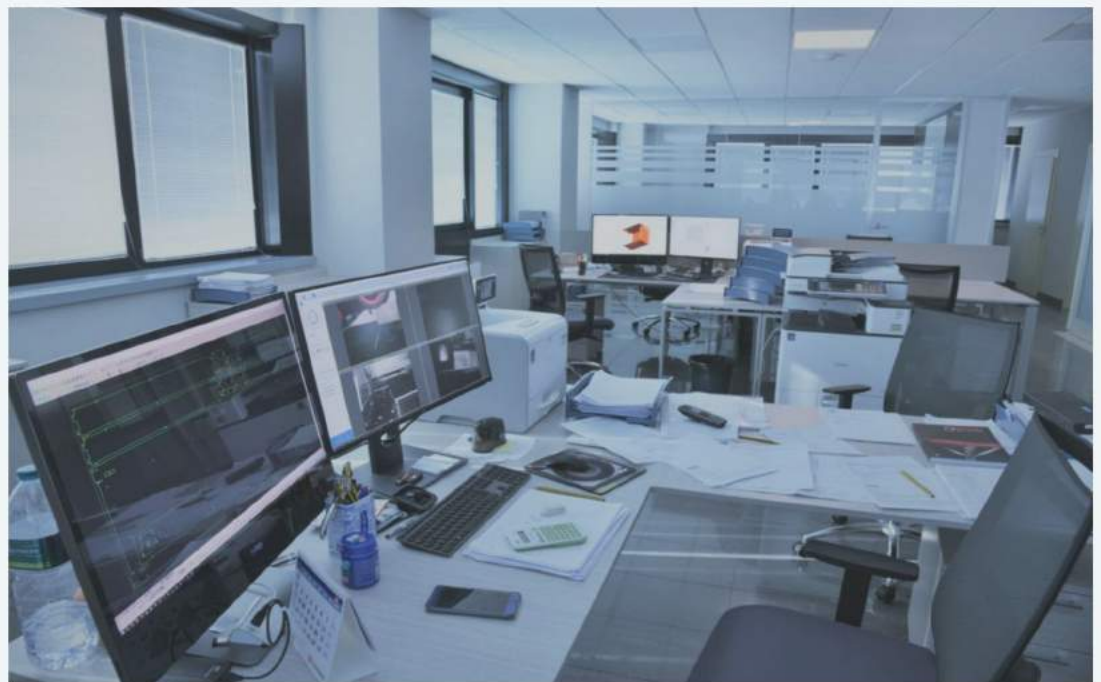
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Newsletter

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Alumni section

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Cyber security fundamentals

What Is Cyber Security?

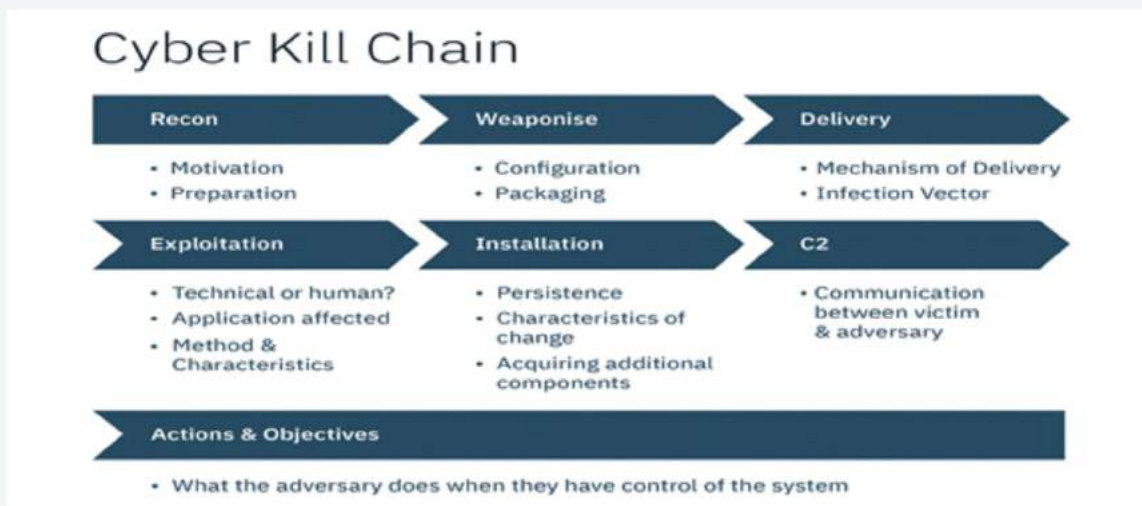
Cyber Security is the practice of protecting systems, networks, and programs from digital attacks. The cyberattacks are usually aimed at accessing, changing, or destroying sensitive information; extorting money from users; or interrupting normal business processes.

Implementing effective cybersecurity measures is particularly challenging today because there are more devices than people, and attackers are becoming more innovative.

A successful cybersecurity approach has multiple layers of protection spread across the computers, networks, programs, or data that one intends to keep safe. In an organization, the people, processes, and technology must all complement one another to create an effective defence from cyber-attacks.

Cyber Kill Chain

The cyber-attack chain (also referred to as the cyber kill chain) is a way to understand the sequence of events involved in an external attack on an organization's IT environment. Understanding the cyber-attack chain model can help IT security teams put strategies and technologies in place to “kill” or contain the attack at various stages, and better protect the IT ecosystem.



- **Reconnaissance:** Intruder picks a target, researches it, and looks for vulnerabilities.
- **Weaponization:** Intruder develops malware designed to exploit the vulnerability.
- **Delivery:** Intruder transmits the malware via a phishing email or another medium.
- **Exploitation:** The malware begins executing on the target system.
- **Installation:** The malware installs a backdoor or other ingress accessible to the attacker.
- **Command and Control:** The intruder gains persistent access to the victim's systems/network.
- **Actions on Objective:** Intruder initiates end goal actions, such as data theft, data corruption, or data destruction.

Top Cyber Security Threats

A cyber security threat refers to any possible malicious attack that seeks to unlawfully access data, disrupt digital operations, or damage information. Cyber threats can originate from various actors, including corporate spies, hacktivists, terrorist groups, hostile nation-states, criminal organizations, lone hackers, and disgruntled employees.

Top Cyber Security Tips:

Here is the list of top Cyber Security tips for anyone on the Internet should keep in mind:

- Realize that you are an attractive target to attackers, and it can happen to anyone, anytime, anywhere, on any device. Don't ever say "It won't happen to me."
- Practice good password management. Use a strong mix of characters, and don't use the same password for multiple sites.
- Never leave your devices unattended. If you need to leave your computer, phone, or tablet for any length of time — no matter how short — lock the screen so no one can use it while you're gone.
- Always be careful when clicking on attachments or links in email. If an email is unexpected or suspicious for any reason, don't click on it. Even if it seems like it's from your company CEO!
- Sensitive browsing, such as banking or shopping, should only be done on a device that belongs to you, on a network that you trust. Whether you're using a friend's phone, a public computer, or free Wi-Fi at a coffee shop — your data could be copied or stolen.
- Back up your data regularly. Make sure your antivirus software is always turned on and up to date.
- Be conscientious of what you plug in to your computer. Malware can be spread through infected flash drives, external hard drives, and even smartphones.
- Watch what you're sharing on social networks. Criminals can find you and easily gain access to a shocking amount of information — where you go to school, where you work, when you're on vacation — that could help them gain access to more valuable data.
- Be wary of social engineering, where someone attempts to gain information from you through manipulation. If someone calls or emails you asking for sensitive information like login information or passwords, it's okay to say no.
- Be sure to monitor your accounts for any suspicious activity. If you see something unfamiliar, it could be a sign that you've been compromised.

Cyber Security Career:

Jobs in cyber security are blooming across the country. While there is a dire need in the marketplace for cyber security professionals, the skill and experience required to fill these roles are lacking. This means that if you have a professional degree and want to pursue a career in this field, you are going to need a blend of both technical and non-technical cyber security training.

Common Positions in field of Cyber Security

- Forensics Expert
- Intrusion Analyst
- Network Engineer
- Threat Hunter
- Incident Responder
- Penetration Tester
- Security Analyst
- Security Architect
- Security Software Developer
- Source Code Auditor
- Vulnerability Assessor

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US offshore wind energy: A new era of equity is blowing in

As offshore wind energy expands on the East Coast and beyond, advocates see it not only as a cleaner power resource and burgeoning new industry, but also as a 21st century model to deliver environmental and economic justice to nearby communities that have not benefited—and are even at risk—from past energy investments in their midst.

With more than 35,000 MW of offshore wind at various development levels, says the U.S. Energy Dept., and a Biden administration goal to deploy 30,000 MW by 2030, low-income and heavily minority communities are at ground zero as construction of supporting facilities and infrastructure get under way.

Manufacturing will generate 80% of full-time equivalent job-years in offshore wind in the next decade, says the American Clean Power Association.

“U.S. offshore wind energy deployment represents a unique opportunity to right longstanding wrongs as we act on climate, rebuild our economy and confront systemic racism in our daily life,” says Paula García, the Union of Concerned Scientists' senior bilingual energy analyst. “Engaging the environmental justice community in decision-making is a cornerstone to ensuring that issues such as electricity affordability, siting, workforce and port development are informed by people who will likely be impacted most.”



Templating approach stabilizes 'ideal' material for alternative solar cells

Researchers have developed a method to stabilize a promising material known as perovskite for cheap solar cells, without compromising its near-perfect performance. The researchers, from the University of Cambridge, used an organic molecule as a 'template' to guide perovskite films into the desired phase as they form. Their results are reported in the journal *Science*. Perovskite materials offer a cheaper alternative to silicon for producing optoelectronic devices such as solar cells and LEDs.

There are many different perovskites, resulting from different combinations of elements, but one of the most promising to emerge in recent years is the formamidine (FA)-based FAPbI_3 crystal. The compound is thermally stable and its inherent 'bandgap' – the property most closely linked to the energy output of the device—is not far off ideal for photovoltaic applications.

For these reasons, it has been the focus of efforts to develop commercially available perovskite solar cells. However, the compound can exist in two slightly different phases, with one phase leading to excellent photovoltaic performance, and the other resulting in very little energy output. "A big problem with FAPbI_3 is that the phase that you want is only stable at temperatures above 150 degrees Celsius," said co-author Tiernan Doherty from Cambridge's Cavendish Laboratory. "At room temperature it transitions into another phase, which is really bad for photovoltaics."

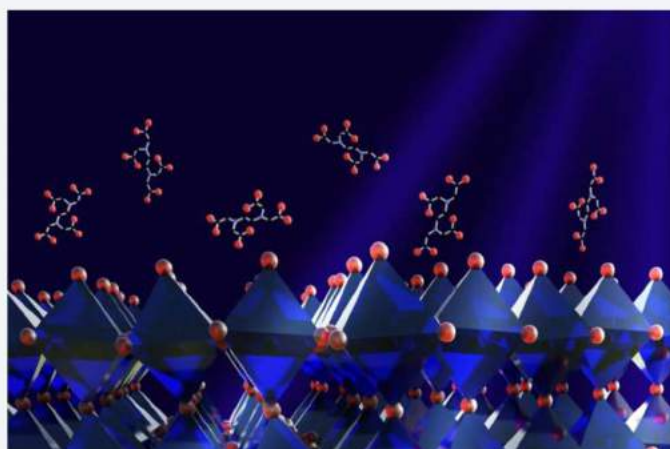
Recent solutions to keep the material in its desired phase at lower temperatures have involved adding different positive and negative ions into the compound. "That's been successful and has led to record photovoltaic devices but there are still local power losses that occur," said Doherty. "You end up with local regions in the film that aren't in the right phase. "Little was known about why the additions of these ions improved stability overall, or even what the resulting perovskite structure looked like.

"There was this common consensus that when people stabilize these materials, they're an ideal cubic structure," said Doherty. "But what we've shown is that by adding all these other things, they're not cubic at all, they're very slightly distorted. There's a very subtle structural distortion that gives some inherent stability at room temperature. "The distortion is so minor that it had previously gone undetected, until Doherty and colleagues used sensitive structural measurement techniques that have not been widely used on perovskite materials.

The team used scanning electron diffraction nano-X-ray diffraction and nuclear material resistance to see, for the first time, what this stable phase really looked like. "Once we figured out that it was the slight structural distortion giving this stability, we looked for ways to achieve this in the film preparation without adding any other elements into the mix."

Co-author Satyawan Nagane used an organic molecule called Ethylenediaminetetraacetic acid (EDTA) as an additive in the perovskite precursor solution, which acts as a templating agent, guiding the perovskite into the desired phase as it forms. The EDTA binds to the FAPbI_3 surface to give a structure-directing effect but does not incorporate into the FAPbI_3 structure itself.

"With this method, we can achieve that desired band gap because we're not adding anything extra into the material, it's just a template to guide the formation of a film with the distorted structure—and the resulting film is extremely stable," said Nagane.



Study finds electric vehicles provide lower carbon emissions through additional channels

With new major spending packages investing billions of dollars in electric vehicles in the U.S., some analysts have raised concerns over how green the electric vehicle industry is, focusing particularly on indirect emissions caused within the supply chains of the vehicle components and the fuels used to power electricity that charges the vehicles.

But a recent study from the Yale School of the Environment published in *Nature Communications* found that the total indirect emissions from electric vehicles pale in comparison to the indirect emissions from fossil fuel-powered vehicles. This is in addition to the direct emissions from combusting fossil fuel—either at the tailpipe for conventional vehicles or at the power plant smokestack for electricity generation—showing electric vehicles have a clear advantage emissions-wise over conventional vehicle. “The surprising element was how much lower the emissions of electric vehicles were,” says postdoctoral associate Stephanie Weber. “The supply chain for combustion vehicles is just so dirty that electric vehicles can’t surpass them, even when you factor in indirect emissions.”

Weber was part of the study led by Paul Wolfram '21 Ph.D.—now a postdoc with the Joint Global Change Research Institute at the University of Maryland—and that included YSE economics professor Ken Gillingham and Edgar Hertwich, an industrial ecologist from the Norwegian University of Science and Technology and a former YSE faculty member. The research team combined concepts from energy economics and industrial ecology—carbon pricing life cycle assessment, and modeling energy system—to find if carbon emission were still reduced when indirect emissions from the electric vehicle supply chain were factored in.

“A major concern about electric vehicles is that the supply chain, including the mining and processing of raw materials and the manufacturing of batteries, is far from clean,” says Gillingham. “So, if we priced the carbon embodied in these processes, the expectation is electric vehicles would be exorbitantly expensive. It turns out that’s not the case; if you level the playing field by also pricing the carbon in the fossil fuel vehicle supply chain, electric vehicles sales would actually increase.”



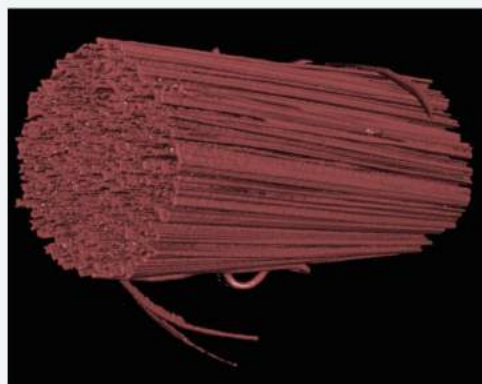
A bicycle riser bar made from jute fiber reinforced polymer composite materials

To meet the demand for alternative low-cost, sustainable, light weight and strong materials for two wheelers, Dr. JS Binoj from Sree Vidyanikethan Engineering College India has led a multi-national team to successfully develop a novel riser bar made from jute fiber reinforcing isophthalic polymer composite material.

The team comprised researchers hailing from Sree Buddha College of Engineering (Drs JB Sajin, MS Senthil Saravanan), Hindustan Institute of Technology and Science (R Christu Paul), Sri Ramakrishna Engineering College (Dr. B Brailson Mansingh), St Xavier's Catholic College of Engineering (M Gerald Arul Selvan), Noorul Islam Centre of Higher Education (Dr. RS Rimal Isaac) and Newcastle University (Dr. Kheng Lim Goh).

The novelty of the composite bar involves a new and effective way of tailoring the length of the jute fibers as well as the interfacial bonding interactions between the jute fibers and the isophthalic polymer, which functioned as the matrix phase for the composite material. Conventionally, riser bar is made from aluminum (which is inexpensive); more advanced ones are made from scandium and carbon fiber reinforced composites (which are expensive). More importantly the environmental impact of these materials could be contentious.

On the other hand, the new isophthalic polymer-based composite material reinforced by jute fibers revealed mechanical strength stiffness, extensibility and toughness that are comparable to conventional materials. Isophthalic polymer is a low-cost, durable material that is used for construction in civil engineering. With the proof-of-concept demonstrated, the team is now looking for investors and new collaborators to support further development to bring the technology readiness level from 4 to 9.



Sea turtles return to Thailand's shores during pandemic

After laying eggs on a deserted Thai beach, a green sea turtle dives back into the turquoise-colored waters of the Andaman Sea—a welcome sight for biologists who say the absence of tourists spurred the marine animal's return. The turtle's nesting was spotted in November by scientists. In about two months, the 100 eggs will hatch, and babies will slide towards the sea, guided by the moonlight.

Pre-pandemic, millions of tourists thronged to the white sand beaches of southern Thailand, ferried to the islands by tour boats which dissuaded the skittish creatures from venturing ashore.

But with almost 20 months of covid travel restrictions in place, several different species of sea turtles have returned to nesting around Phuket, an ultra-popular beach destination before the pandemic.

Between October 2020 and February 2021, 18 nests of leatherback turtles— which can grow up to 400 kilograms as an adult and are the largest species of sea turtles—were found in Phuket. “Their nesting has improved in the last two years thanks to the absence of tourists, noise and light pollution,” Kongkiat Kittiwatanawong, director of the Phuket Marine Biological Center, told AFP. “We had never seen such a number in 20 years.”

Although chances of survival are very low—about one egg hatched out of 1,000 will reach adulthood—Kongkiat said the increase in nesting is a positive sign for efforts to preserve endangered species. In Thailand—as in many other countries—the turtles' future is threatened by global warming, which harms coral reefs and increases temperatures of waters.

A nest of the olive ridley sea turtle was also spotted—the first time in two decades. Other species that live in the warm waters around Thailand include leatherback, hawksbill, green and loggerhead turtles.

No long-term reprieve

But as Thailand tentatively begins to reopen its doors to fully vaccinated international tourists, scientists have tempered their optimism.

“The pandemic may offer sea turtles a welcome break,” Thon Thamrongnawasawat from Kasetsart University in Bangkok said.

“But they live long and are a highly migratory species. Without effective policies to protect them, we can't expect many long-term benefits to population recovery.”

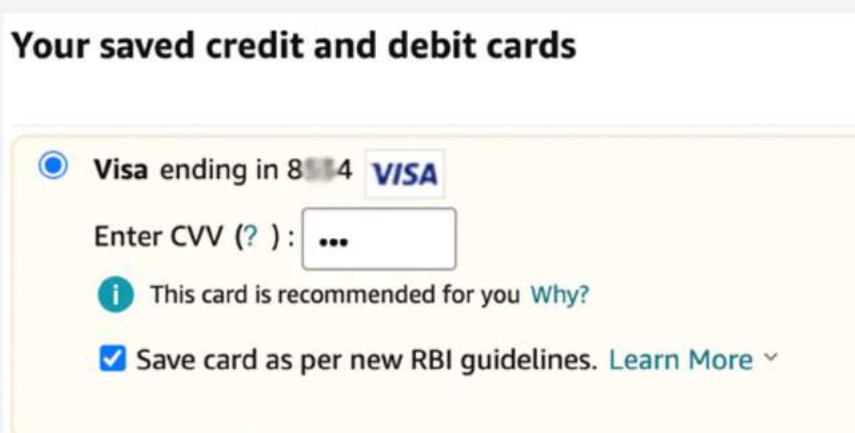


New RBI rules on online card transactions to now take effect from July 1, 2022

To avoid the repeated hassle, customers can provide their consent to tokenize their cards.

Starting July 1, 2022, e-commerce companies such as Amazon and Flipkart or online delivery aggregators such as Zomato won't be able to save card information on their platforms, under new guidelines from the Reserve Bank of India (RBI). As per the new rules, customers carrying out an online transaction on any e-commerce platform will need to enter their debit or credit card details each time starting next year. However, customers can avoid the hassle and choose to provide consent to the platforms to tokenize their cards.

Back in March 2020, RBI issued guidelines which restricted merchants from saving customers' card details in order to boost security. In September this year, the regulatory body enhanced its guidelines on card tokenization services in order to improve the safety and security. "The tokenization of card data shall be done with explicit customer consent requiring Additional Factor of Authentication (AFA)," RBI had said in a press release. To note, the deadline for merchants and other payment aggregators for storing card data was first set as June 30, 2021, then extended to December 31, 2021, and now, has been extended to June 30, 2022. Tokenization helps replace card details with a unique algorithm-generated code, or token, which allows online purchases to go through without exposing card details.



So, what does this mean for a regular customer? Here are 10 quick takeaways:

1. Starting July 1, 2022, customers will not be able to save their debit or credit card details on any e-commerce platform.
2. Customers will have to re-enter card details every time they conduct an online transaction.
3. To avoid the repeated hassle, customers can provide their consent to e-commerce companies to "tokenize" their cards. After receiving a customer's consent, e-commerce platforms will ask the card network to encrypt details with additional factor authentication as needed.
4. Once the e-commerce platform receives the encrypted details, customers can save that card for future transactions.
5. For now, only Mastercard and Visa-provided cards can be tokenized by most leading ecommerce platforms. It is expected that cards from other financial services should be able to be tokenized soon.
6. The new RBI guidelines must be adhered to for both credit and debit cards.
7. The new guidelines are not applicable to international transactions. Only domestic cards and transactions fall under the gamut of the new RBI guidelines.
8. Customers won't need to pay any extra charge for tokenization of cards.
9. E-commerce platforms will show the last four digits of tokenized cards for customers to easily identify them, along with the issuing bank and card network name.
10. Lastly, tokenization of cards is not mandatory. Customers can choose to tokenize their cards to carry out quick transactions or enter card details otherwise.

Taste the TV: Japan professor develops lickable screen prototype

Taste the TV uses a carousel of flavour canisters to imitate food flavours in order to enable a multi-sensory experience.

A Japanese professor has developed a prototype lickable TV screen that can imitate food flavours, another step towards creating a multi-sensory viewing experience.

The device, called Taste the TV (TTTV), uses a carousel of 10 flavour canisters that spray in combination to create the taste of a particular food. The flavour sample then rolls on hygienic film over a flat TV screen for the viewer to try.

In the covid-19 era, this kind of technology can enhance the way people connect and interact with the outside world, said Meiji University professor Homei Miyashita.

"The goal is to make it possible for people to have the experience of something like eating at a restaurant on the other side of the world, even while staying at home," he said.

Miyashita works with a team of about 30 students that has produced a variety of flavour-related devices, including a fork that makes food taste richer. He said he built the TTTV prototype himself over the past year and that a commercial version would cost about JPY 100,000 (roughly Rs. 65,810) to make.

Potential applications include distance learning for sommeliers and cooks, and tasting games and quizzes, he said.

Miyashita has also been in talks with companies about using his spray technology for applications like a device that can apply a pizza or chocolate taste to a slice of toasted bread.

Meiji student Yuki Hou, 22, demonstrated TTTV for reporters, telling the screen she wanted to taste sweet chocolate. After a few tries, an automated voice repeated the order and flavour jets spritzed a sample onto a plastic sheet.

"It's kind of like milk chocolate," she said. "It's sweet like a chocolate sauce."



Wear and tear in vulnerable brain areas lead to lesions linked to cognitive decline in aging

Researchers at Stevens Institute of Technology show that strain on ventricular walls explains where lesions develop in the aging brain.

As our brains age, small lesions begin to pop up in the bundles of white matter that carry messages between our neurons. The lesions can damage this white matter and lead to cognitive deficits. Now, researchers at Stevens Institute of Technology and colleagues not only provide an explanation for the location of these lesions but also how they develop in the first place.

The work, led by Johannes Weickenmeier, an assistant professor of mechanical engineering at Stevens, highlights the importance of viewing the brain as more than neural circuitry that underpins how thoughts are formed, and memories created. It's also a physical object that's prone to glitches and mechanical failures. "The brain is susceptible to wear and tear in vulnerable areas," Weickenmeier said. "Especially in an aging brain, we need to look at its biomechanical properties to better understand how things can start to go wrong."

These lesions — known as deep and periventricular white matter hyperintensities because they show up as bright white patches on MRI scans — are poorly understood. But they are not uncommon: most people have some by the time they reach their 60s, and changes only increase with age. The more lesions that accumulate and the faster they grow, the more prone we become to cognitive impairments ranging from memory problems to motor disorders.

Using MRI scans from eight healthy subjects, Weickenmeier worked with Valery Visser, now a doctorate student at the University of Zurich, and Henry Rusinek, a radiologist at NYU Grossman School of Medicine, to develop an individualized computer model of each subject's brain. The team mapped the strain placed on ventricular walls, the linings of fluid-filled chambers deep in the brain, as waves of pressure pulse through the subject's cerebral spinal fluid, or CSF. They found that hyperintensities tend to occur near areas that must stretch more to accommodate pressure changes of the circulating CSF because, as such areas wear thin, CSF can leak into the brain and cause lesions.

"The cell wall that lines the ventricles wears out over time, like a balloon that's repeatedly blown up and deflated," said Weickenmeier. "And the stresses aren't uniform — they're defined by the geometry of the ventricle, so we can predict where these failures will occur."

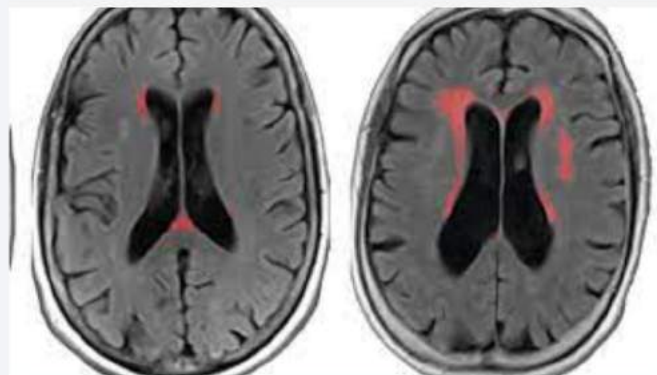
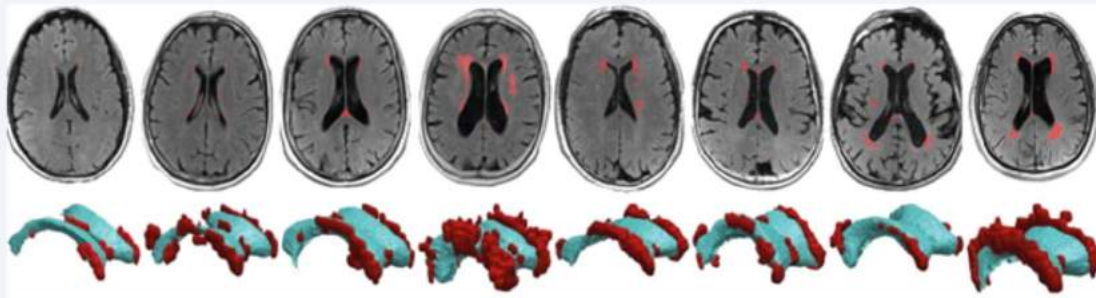
The model provides a simple, physics-based explanation for the locations of these lesions, revealing that mechanical loads "must be a major contributor to the onset of disease," said Weickenmeier.

The team's research, published recently in *Scientific Reports*, used 2D imaging showing a cross-section of the brain, but Weickenmeier's team has since expanded its research to a full 3D model of the brain. Next, Weickenmeier hopes to use advanced MRI technologies developed at Stevens to study the movement of the ventricle wall directly.

In the long term, the team's findings might enable the development of new treatments for lesions. Ordinarily, pharmaceutical treatments struggle to cross the blood-brain barrier and reach affected areas, but the new

research suggests that it might be possible to channel drugs to lesions directly through leaks in the ventricular wall. “That’s still a long way off, and we didn’t study it directly,” Weickenmeier cautioned. “But it’s an intriguing possibility.”

The broader takeaway from the team’s research, explained Weickenmeier, is that the brain’s aging process is mediated by physical processes, including the pressure of circulating blood and CSF. That underscores the need for healthy behaviors — such as getting enough exercise and avoiding harmful substances — that can reduce those strains on the brain.



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