

KIET School of Computer Applications (KSOCA)

TechEdge Technical Newsletter

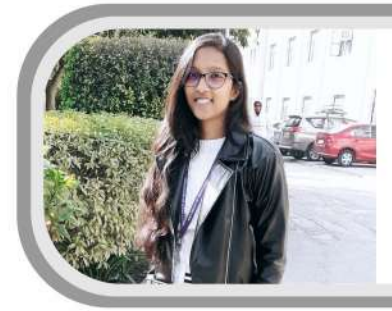
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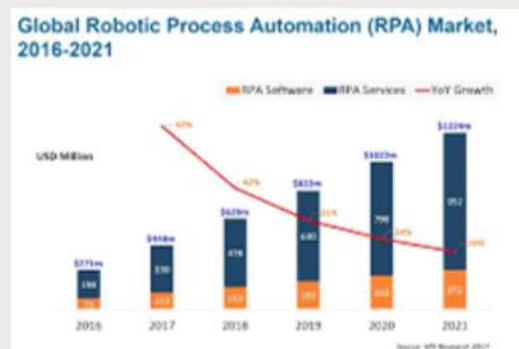
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Robotic Process Automation(RPA)

What is RPA?

RPA stands for Robotic Process Automation. It is a critical component of the future of technology. This technology deals with the process of automating complex and redundant business tasks using Artificial Intelligence and Machine Learning algorithms. It provides software the capabilities to allow machines to work on any website or application in the same manner as humans. It helps maintain records, calculations, queries, and business transactions. Almost every industry has implemented RPA in its business in order to improve efficiency and reduce human labour. This is why industries require RPA Developers who can help in implementing automated systems.



What are the benefits of RPA?

RPA has various benefits based on improving the efficiency of a business. Some of these benefits include the following:

- Services of high quality with better customer service and accuracy
- Increase in the speed of process completion
- Flexibility in business resources
- Improvement in business efficiency due to auditing and digitizing of business data
- Reduction in the cost of manual labor as it helps complete redundant tasks that were earlier done by humans
- Increase in the productivity of employees

Demand & Scope:

The world is moving toward technological advancements every day. All the tech giants are looking for ways to automate every process with the help of robots and software. This sudden increase in the need for automation has increased the requirement of highly skilled professionals.

They create a perfect bridge between technology and human actions that is the need of the world. Therefore, RPA developers are highly required in today's world to take the technologies even further. They connect the software with the hardware for easy processing and performing repetitive processes that can enhance the productivity as well as the efficiency of the organization. By the end of 2027, the RPA market is predicted to reach a market of \$10.7 billion, and it can only be reached with the help of highly skilled RPA developers. A lead developer in any organization could earn up to \$150,000 per year. The scope for RPA developers is very broad. They are almost required in every industry which does work on a production basis. They are required in every industry consisting of machinery as an integral part of the production process.

RPA Using UiPath

UiPath is one of the most commonly used RPA tools. It is used to automate redundant tasks in Windows desktop by eliminating human interference. It uses the function of drag and drop to perform the necessary tasks required for the automation process. It has a standard version called UiPath Studio that has a 60-day trial period. Besides, this tool comes with a community edition that you can use and access throughout a lifetime for free. It contains most of the functionalities of the UiPath Studio version.

UiPath components can be divided into two parts:

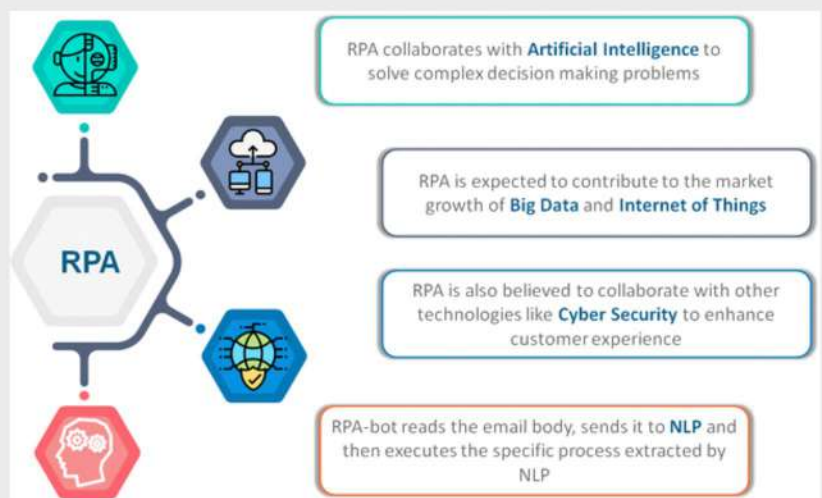
- UiPath Platform components
- UiPath Studio components

UiPath Platform components:

- UiPath Robot
- UiPath Studio
- UiPath Orchestrator

UiPath Studio components:

- Control Pane
- Activity Pane
- Properties Pane
- Ribbon



Future of Robotic Process Automation (RPA)

The automation industry has evolved tremendously throughout the world. Imagine if someone told you 20 years ago, that all of your regular, mundane, or everyday tasks will be done by a robot, which you can control. At the moment, it would seem like a mere joke, but who knew this would be the future of automation. There is no debate about the fact that automation has achieved exponential pace in creation and creativity and has eased and proved to be a blessing to the industry that adopts it.

With the help of RPA tools, we would be able to see an incoming new wave towards RPA implementation in various industries. These implementations would not only restrict to big industries but also small and medium scale industries as well. It is also predicted that this adaptation would lead to the industries establishing their own IT teams. The demand for RPA certified and the ones holding any kind of RPA skills or experience is to be high in demand.

Many of the businesses would even adopt RPA as there is a reduction in cyber threats as RPA would help in safe keeping from all the cyber threats and eliminate them.

It can also be said that RPA would open new and trending career opportunities and at the same time it will also give a boost to the present one. The role of business analytics could be taken as an example where, the people with such roles would experience a growth with the adoption of RPA as businesses would need somebody to review the software and tools and make sure it is providing the said results. The impact of RPA would also be seen not just externally with the customers but also internally within the employees as well.

In future, it is also expected that RPA would soon merge with other technologies or software for that matter. RPA alone may or may not give us the desired results if we stand alone, and it would be a smart move by companies if they make use of this adoption with their other technologies or software.

A new tiny robot can lift a thousand times its own weight with artificial muscles

A team of researchers from the Italian Institute of Technology has developed a new class of high-strength artificial muscles that can stretch and contract like a human muscle in a way that has never been done before. According to a recent research paper, the muscles perform with a level of versatility and grace closely matched to life-like movements and provide a boost in the development of three-dimensional functional devices such as artificial body parts.

1000 times their weight

The artificial muscles are known as actuators- or more specifically- GeometRy-based Actuators that Contract and Elongate (GRACE). Pneumatic in nature, GRACE is driven by the influence of gas, or compressed air, and could lift to 1000 times their weight. Upon combining 18 of these novel actuators, the researchers were able to create an 8-gram (0.01 pounds) robot hand which could lift up 8 kilograms (17 pounds).

And that's not all. The new mathematical model behind the design allows for a novel level of flexibility too. The robot hand can bend its fingers and make realistic human movements when pressure is applied to the different actuator muscles. Up to now, resins of this kind were relatively stiff.

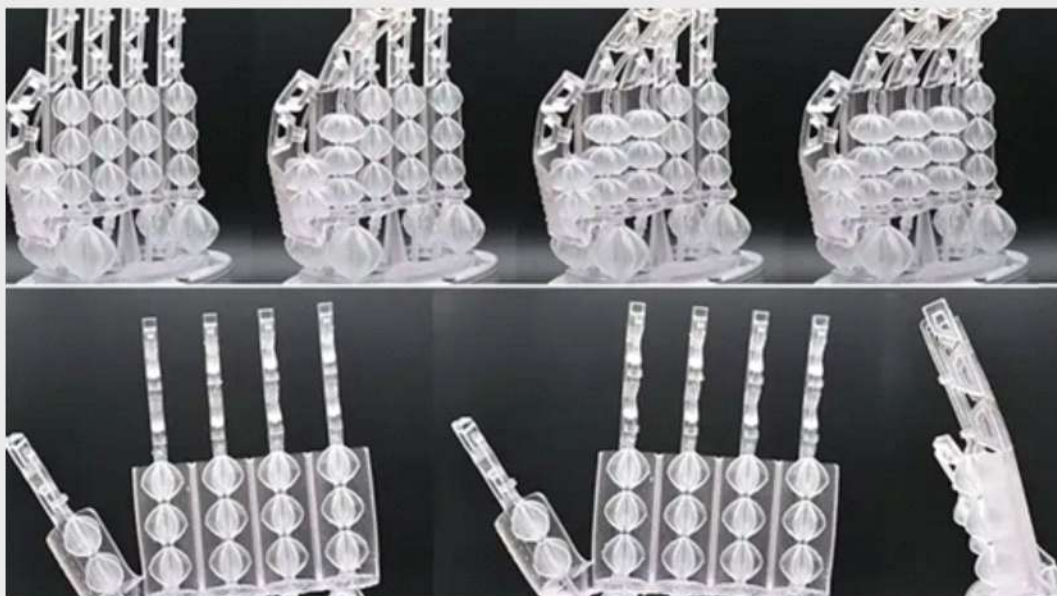
A novel pleated design for flexibility

GRACE is made from a 3D printed resin but what's unusual about its design is that it is a pleated one. This means that when the muscles are inflated with gas, energy is then converted into movement, and the stretching and contraction results in high strength and flexibility for the fully three-dimensional devices printed using them.

The term often used to describe machines that mimic biological processes is biomimicry. While developments in this technology stretch to all kinds of nature, why do we really want machines to look like us?

Well, in the context of artificial muscles, GRACE could be significant for rehabilitation and the replacement of body parts after a loss. So then, what's with all the humanoids? Who really knows? The answer could lay in us feeling more comfortable around a heavy-weight giant humanoid simply because the familiarity of it brings about a sense of friendliness.

Whatever the reason, it is clear developments in biomimetics, and their application to real social and environmental situations are never too far away.



The world's first-ever international holographic teleportation has just been conducted



The coronavirus pandemic pushed the digitalization of many day-to-day functions of our lives. An important one among them was meeting people. Instead of having to commute to the office or travel across the oceans for a meeting, one could simply connect via an online video call and get the work done. Even after two years, virtual meetings haven't been able to completely replicate the ease of an in-person meeting, something that researchers are hoping holographic teleportation can solve. A combination of hologram and teleport, the technology is fondly called holoport and allows one to instantly beam the hologram of a person to a far-off location, much like the Star Trek universe.

How does holoporting work?

Making the fictional Star Trek technology a reality required a few companies to come together. Tech major Microsoft has been working on its HoloLens for quite some time to bring in mixed reality for business and gaming applications.

Houston-based Aexa Aerospace provides the software that enables a special camera to create holographic images of the subject and his environment, which can be seen using the HoloLens. Last year, NASA holoported flight surgeon Dr. Josef Schmid using Aexa's technology.

Researchers at Western, in collaboration with a Canadian company, Leap Biosystems, are now working with Aexa to figure out the medical applications of this technology. If both the subject and the user wear the HoloLens, they can interact in their environments as if they are physically present in the same room. To demonstrate this, the researchers at the Western Institute for Space Exploration (Western Space) conducted the first international holographic teleportation on July 27.

"We transported one person from Alabama to London, Ontario, and then each of the students here on the project were able to instantly holoport themselves in holographic form down to Huntsville, Alabama," said Adam Sirek, a faculty member at Western Space.

What happens next?

The team, comprising largely of medical students, is keen to use this technology to facilitate medical examinations in remote areas and believes this could be a game changer for rural healthcare.

While the setup can help transmit images and voices across, currently, that is where its capabilities end. Physicians rely on a large range of parameters, such as blood pressure, heart rate, oxygen saturation, etc., while making their diagnosis. Additionally, physical touch is a big part of medical examination, something holograms cannot replicate.

Researchers develop bioengineered cornea that can restore sight to the blind and visually impaired

A bioengineered cornea has restored vision to people with impaired eyesight, including those who were blind before they received the implant.

These corneas, described in *Nature Biotechnology* today, could help restore sight to people in countries where human cornea transplants are in short supply, and for a lower price. Unlike human corneas, which must be transplanted within two weeks, the bioengineered implants can be stored for up to two years, which could help with shipping them to those who need them the most.

The cornea implant is made from collagen protein extracted from pig skin, which has a similar structure to human skin. Purified collagen molecules were processed to ensure that no animal tissues or biological components remained. The team, from Linköping University in Sweden, then stabilized the loose molecules into a hydrogel scaffold designed to mimic the human cornea, which was robust enough to be implanted into an eye.

Surgeons in Iran and India conducted a pilot trial of 20 people who were either blind or close to losing their sight from advanced keratoconus. This disease thins the cornea, the outermost transparent layer of the eye, and prevents the eye from focusing properly. The implant restored the cornea's thickness and curvature. 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.

While human cornea transplants in patients with keratoconus are traditionally sewn in using sutures, the team experimented with a new surgical method that's simpler and potentially safer. They used a laser to make an incision in the middle of the existing cornea before inserting the implant, which helped the wound heal more quickly and created little to no inflammation afterwards. Consequently, the patients only needed to use immunosuppressant eye drops for eight weeks, while recipients of traditional transplants usually need to take immunosuppressants for at least a year.

One unexpected bonus was that the implant changed the shape of the cornea enough for its recipients to wear contact lenses for the best possible vision, even though they had been previously unable to tolerate them.

The cornea helps focus light rays on the retina at the back of the eye and protects the eye from dirt and germs. When damaged by infection or injury, it can prevent light from reaching the retina, making it difficult to see.

Corneal blindness is a big problem: around 12.7 million people are estimated to be affected by the condition, and cases are rising at a rate of around a million each year. Iran, India, China, and various countries in Africa have particularly high levels of corneal blindness, and specifically keratoconus.

Because pig skin is a by-product of the food industry, using this bioengineered implant should cost fraction as much as transplanting a human donor cornea, said Neil Lagali, a professor at the Department of Biomedical and Clinical Sciences at Linköping University, one of the researchers behind the study.



3D-printed electrodes could help cut battery costs and increase performance

According to Tohoku University, high-performance and easy-to-manufactured carbon microlattice electrodes could be used in the future to make cheaper batteries powered by available sodium ions. The study, led by researchers from Tohoku University, was published in the journal **Small**.

Lithium-ion batteries are preferred in smartphones, electric cars, and many electronic devices due to their durability, high performance, and energy storage. Although we use these batteries in many areas of our lives, their production is quite costly, and metal reserves are rapidly depleting and highly harmful to the environment.

Tohoku University materials scientist Akira Kudo, a Ph.D. student at the University of California Los Angeles, Yuto Katsuyama, and colleagues are looking at ways to achieve high-performance, low-cost batteries. So they decided to make more effective sodium-ion batteries.

Although this will reduce the use of inactive materials used to connect multiple cells, it will limit the movement of ions within the newly produced battery. Kudo and his team have addressed this by developing an approach that fabricates micro-architected, high performing negatively charged (anode) electrodes.

The project uses 3D technology

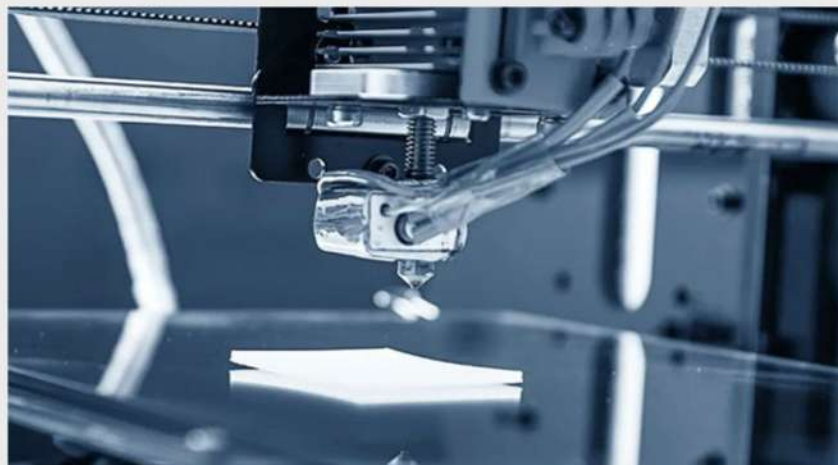
Researchers use 3D stereolithography to make this new battery. 3D microlattices made from resin are then carbonized and shrunk in a process called pyrolysis. The resulting hard carbon anodes allowed fast transportation of energy-generating ions. Alongside all these improvements, the researchers also increased the lattice structure.

The team aims to use the same approach to make positively charged (cathode) electrodes for the next phase of the research. The aim is to create high-performance, cost-effective sodium-ion batteries and to use these fine-structured electrodes to be produced.

Understanding lithium-ion batteries

A lithium-ion battery or Li-ion battery can be recharged repeatedly, and lithium ions can pass from the negative electrode to the positive electrode in an electrolyte during discharge. Li-ion cells use an intercalated lithium compound as the material at the positive electrode and typically graphite at the negative electrode.

In the 1970s, M. Stanley Whittingham firstly discovered the concept of intercalation electrodes and invented the first rechargeable lithium-ion battery that was based on a titanium disulfide cathode and a lithium-aluminum anode, patented in 1977. John Goodenough expanded on this work in 1980 by using lithium cobalt oxide as a cathode.



Scientists entangled two different quantum nodes 12.5 km apart from each

Quantum computers have the power to work and process information more powerfully than the classical computers used today. Lately, some researchers have also been finding out to set up quantum internet, which allows quantum devices to exchange information as classical computing devices do.

Researchers at the University of Science and Technology of China and Jinan Institute of Quantum Technology have recently demonstrated quantum entanglement between two memory devices located 41010 feet (12.5 km) apart from each other within an urban environment. The research has been published in **Physical Review Letters**.

"In 2020, we published a paper in which we demonstrate the entanglement of two quantum memories via a fiber link of 50 km (164041 feet)," said Xiao-Hui Bao, one of the researchers who carried out the study.

"In that experiment, both two memories we used were located within one lab and thus not fully independent. The next step in our research was to make the two memories fully independent while placing a long distance between them."

Two different nodes were introduced to different locations in the town

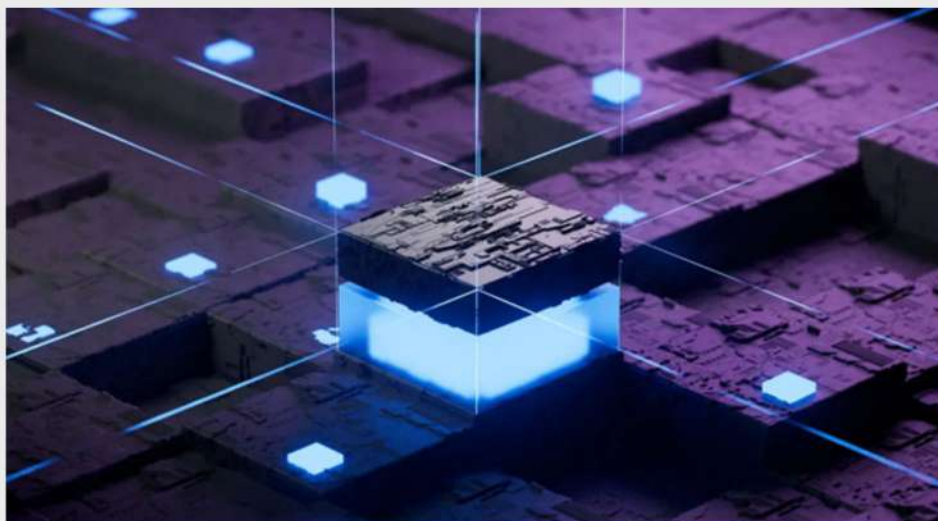
In experiments by Bao and colleagues, two different quantum nodes in an urban environment were placed 41010 feet (12.5 km) apart. In the first node, dubbed node A, they entangled their first quantum memory with a single photon. This single photon was then sent to node B and stored within the second quantum memory.

"In this way, we entangle the two remote quantum memories," Bao explained. "Since the photon emitted from our memory is near infrared (795 nm), being not suitable for low-loss transmission in fiber, we make use of the quantum frequency conversion technique to shift the photon's wavelength to 1342 nm instead, which improves the overall transmission efficiency significantly."

"The main achievement of our recent work is that we realized the longest distance of entanglement distribution with quantum memories," Bao said. "Such entanglement is the fundamental resource to build a quantum network and quantum repeaters."

This latest work by Bao and colleagues, the research focusing on quantum technology and the establishment of the quantum internet, sheds light on the research that will follow in this area.

"In the current experiment, the remote entanglement generated is not heralded yet, limiting its further applications," Bao added. "In the near future, we plan to implement a heralded version, meanwhile we plan to extend a number of nodes as well."



This spine-like wave energy generator claims to beat fossil fuels on price



A unique spine-like floating device designed by a startup based in Cyprus promises to harness the energy of the waves and convert it into electricity.

The world is looking for ways renewable sources can be used to meet our increasing energy demands. With the goal of reducing carbon emissions, the major question remains as to why sea and ocean waves have not been tapped into yet.

Various approaches have been attempted to do so. From floating buoys to underwater generators that look into tap into pressure differences, all have failed to deliver a technology that can be scaled up. However, of late, there has been some success. Earlier this month, we reported how an Australian company has been powering homes with its unique wave energy converter for over a year now.

The Waveline Magnet

Cyprus-based Sea Wave Energy Limited (SWEL) has been working on its technology to capture energy from the waves for over a decade now. Earlier this year, the company unveiled the prototype called the Waveline Magnet, which comprises several floating platforms linked to each other to give it a floating-spine-like appearance.

The modular and flexible system is designed so that the energy generator can seamlessly follow the movement of the waves. This, according to the company, allows the device control over how much energy is extracted from the wave in a controlled and non-disruptive manner.

Additionally, the device can be manufactured using plastic and reinforced plastics that do not require specialized lines of production, thereby reducing the cost of making them. Not only can the device be manufactured and deployed quickly, but its repair and maintenance costs are also low.

Under the right conditions, a single wave energy converter can generate as much as 100 MW of power, the company claims, and its low cost of energy production puts it at par with fossil fuels already.

Road to commercialization

The prototype has largely been tested in controlled environments. It was only last year that the device was taken out to Larnaca Bay in Cyprus for its open-sea trials.

It needs to be further validated, and there is still room for improvement in the technology. With regards to survivability at sea, the company is confident that the spine-like mobility of the device will allow it to move with the waves rather than oppose them, increasing the life of the device.

Since the device can also be made using recycled materials, it will also not be a burden to the environment like the solar panels or wind turbines are proving to be. The plastic used in the device is also reinforced plastic, which will not only give waste plastic a second life but also help tap into a less-explored renewable energy source.

This tiny floating artificial leaf converts sunlight into fuel

Recently, Cambridge was witness to leaves floating on River Cam, near iconic Cambridge sites, including the Bridge of Sighs, the Wren Library, and King's College Chapel. Pretty normal, you might think. But these leaves were 'artificial,' converting sunlight into fuels as efficiently as plant leaves.

Researchers from the University of Cambridge developed these floating 'artificial leaves,' inspired by photosynthesis to generate clean fuels from sunlight and water. The ultra-thin, flexible, autonomous devices are light enough to float and could be a great, sustainable alternative to petrol without taking up space on land.

This is the first time that clean fuel has been generated on water. If scaled up, the artificial leaves could be used on polluted waterways, in ports, or even at sea and could help reduce the global shipping industry's reliance on **fossil fuels**.

The results are reported in the journal *Nature*.

Can lower the cost of sustainable fuel production

For several years, Professor Erwin Reisner's **research group in Cambridge** has been working to develop sustainable solutions to petrol based on the principle of photosynthesis. But existing technology has been either inefficient or so heavy that it had to be confined to land, where space was an issue.

To illustrate, in 2019, researchers developed an artificial leaf that makes syngas from sunlight, carbon dioxide, and water. Though it generated fuel by combining two light absorbers with suitable catalysts, it incorporated thick glass substrates and moisture-protective coatings, resulting in a bulky device.

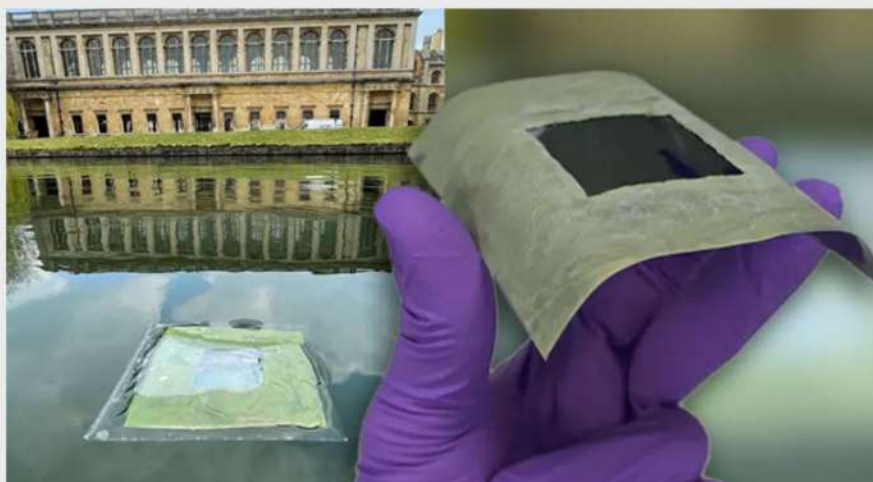
"Artificial leaves could substantially lower the cost of sustainable fuel production, but since they're both heavy and fragile, they're difficult to produce at scale and transport," Virgil Andrei from Cambridge's Yusuf Hamied Department of Chemistry, the paper's co-lead author, said in a statement.

"We wanted to see how far we can trim down the materials these devices use, while not affecting their performance," said Reisner, who led the research. "If we can trim the materials down far enough that they're light enough to float, then it opens up whole new ways that these artificial leaves could be used".

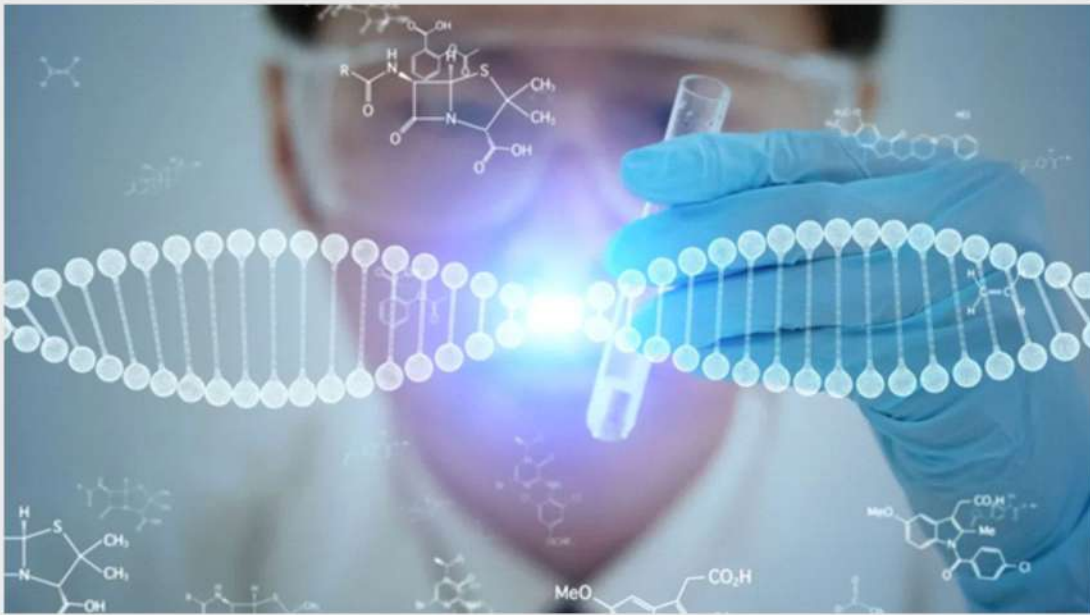
We envision similar farms for fuel synthesis'

The experts sought inspiration from the electronics industry as the field is known for its miniaturization techniques.

But, the challenge was to deposit light absorbers onto lightweight substrates and protect them against water infiltration. To overcome these, the team used thin-film metal oxides and materials known as perovskites, which can be coated onto flexible plastic and metal foils. The devices were covered with micrometer-thin, water-repellent carbon-based layers that prevented moisture degradation.



Researchers allegedly create a new 'controllable, reversible' gene-editing method in China



Scientists from the Chinese Academy of Sciences (CAS) have allegedly developed a new "controllable, reversible and safer" gene-editing approach using CRISPR technology.

The system, named Cas13d-N2V8, showed a significant reduction in the number of off-target genes and no detectable collateral damage in cell lines and somatic cells, which indicated its future potential, according to a report published in *South China Morning Post* newspaper.

The new approach using the Cas13 enzyme, targeting RNA, is safer because RNAs are transient molecules that only exist in the cell for a short period of time and are not integrated into the genome, the researchers claimed.

Compared to other DNA editing techniques, "the Cas13 gene editing system is safer, and the effects are more controllable and short-lived," said Yang Hui, the corresponding author of the study and a researcher at the CAS Centre for Excellence in Brain Science and Intelligence Technology, China.

The technique involves CRISPR

The technique involves the use of Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) technology, a natural Défense mechanism that allows bacterial cells to detect and destroy the viruses that attack them and has become one of the most used gene-editing techniques in recent years.

CRISPR-associated protein-9 (Cas9) is an enzyme that can cut the two strands of DNA in the genome to add or remove material in the most widely used system. "CRISPR-Cas9 and Cas9-based gene editing tools are well protected by patents. Other companies don't have a chance [to develop them]," Hui told Bioworld, a WeChat official account focusing on research.

"The CRISPR-Cas13 systems are more specific and precise, so they have a broader scope of application." However, the enzyme's ability to cleave non-target RNAs, or collateral cleavage, limits its clinical application.

"Cas13 can degrade both target and non-target RNAs at random," making it difficult to design experiments and interpret results when using Cas13, the researchers explained on the CAS website. But "the CRISPR-based gene editing tool does not permanently change the genome, and the effects of editing are controllable, reversible, and safer," he added.