CHEMWATCH

BULLETIN

Week of 2 April 2026

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GOSSIP

Conductive hydrogel enables electrical and biochemical signal control

Phys Org · 31 Mar 2026

by Emily Schöner, Leibniz Institute for Polymer Research

Many emerging medical technologies rely on seamless integration between biological systems and electronics. This requires materials that are soft, electrically conductive, and biologically active—properties that have been difficult to combine in a single system. Research teams led by Prof. Dr. Ivan Minev (TUD Dresden University of Technology, Leibniz Institute of Polymer Research Dresden) and by Dr. Christoph Tondera (Leibniz Institute of Polymer Research Dresden and Center for Regenerative Therapies Dresden at TUD) have now developed such a material.

The bioinspired hydrogel combines electrical and biochemical signal control for the first time. It binds signaling factors that stimulate cell growth and can release them on demand using electrical stimulation. It also functions as a sensor, capable of measuring biological parameters such as oxygen levels. This approach opens new possibilities for medical devices and implants, for example, in the treatment of nervous system damage. The study is published in Advanced Materials .

For implants to be well tolerated by the body, their mechanical properties must match those of the surrounding tissue. In the nervous system in particular, this means that materials should be soft, flexible, and electrically conductive. Inspired by the natural cellular environment—the extracellular matrix (ECM)—the researchers developed a water-based material (hydrogel) that mimics key properties of the ECM while remaining electrically active.

One component of the ECM is glycosaminoglycans, long-chain, highly negatively charged sugar molecules. These were combined with star-shaped polyethylene glycol (starPEG) to form a three-dimensional network capable of retaining water and other substances. The researchers then incorporated the semiconducting organic polymer PEDOT into this bioinspired hydrogel. The result is a new material (PEDOT:sGAGh) with promising properties for applications at the interface of biomedicine and electronics.

In a series of experiments, the researchers showed that PEDOT integrates into the hydrogel without disrupting its nanostructure. Instead, small conductive clusters form within the material, enabling electrical signal transmission. At the same time, the hydrogel remains soft and highly hydrated—key properties for use in the body. The electrical properties of the material can be precisely tuned, for example, by adjusting the amount of PEDOT and the density of negative charges within the network.

The team also demonstrated that bioactive molecules can be incorporated and released in a controlled manner. This is particularly relevant for implants designed to deliver therapeutic agents in addition to electrical stimulation.

"By applying weak electrical signals, we can...

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New catalyst makes plastic upcycling 10x more efficient than platinum

Science Daily · 28 Mar 2026

Many common products, including plastics and detergents, rely on chemical reactions that depend on catalysts made from precious metals such as platinum. These metals are effective but costly and limited in supply. For years, scientists have been searching for alternatives that are cheaper and more sustainable. One promising option is tungsten carbide, an Earth-abundant material already widely used in industrial machinery, cutting tools, and chisels.

Despite its potential, tungsten carbide has not been easy to use as a catalyst. Its chemical behavior can be unpredictable, which has restricted its broader adoption. Researchers led by Marc Porosoff, an associate professor in the University of Rochester's Department of Chemical and Sustainability Engineering, have now made important progress that could allow tungsten carbide to compete with platinum in key chemical reactions.

According to Sinhara Perera, a chemical engineering PhD student in Porosoff's lab, one of the main challenges lies in how tungsten carbide atoms arrange themselves.

Tungsten carbide's atoms can form many different configurations, known as phases, says Perera. These phases can strongly influence how well the material performs as a catalyst.

"There's been no clear understanding of the surface structure of tungsten carbide because it's really difficult to measure the catalytic surface inside the chambers where these chemical reactions take place," she says.

To address this problem, the research team designed a method to precisely control the structure of tungsten carbide during active reactions. In a study published in ACS Catalysis , Porosoff, Perera, and chemical engineering undergraduate student Eva Ciuffetelli '27 manipulated tungsten carbide particles at the nanoscale inside chemical reactors that operate at temperatures above 700 degrees Celsius.

Using a technique called temperature-programmed carburization, the researchers created tungsten carbide catalysts in specific phases directly inside the reactor. They then ran chemical reactions and analyzed which versions delivered the strongest performance.

"Some of the phases are more thermodynamically stable, so that's where the catalyst inherently wants to end up," says Porosoff. "But other phases that are less thermodynamically stable are more effective as catalysts."

The team identified one phase in particular, β-W2C, that showed exceptional performance in reactions that convert carbon dioxide into key building blocks for fuels and useful chemicals. With additional optimization by industry, the researchers believe this form of tungsten carbide could match platinum's effectiveness without its high price or supply limitations.

Beyond carbon dioxide conversion, Porosoff and his collaborators have also explored tungsten carbide as a catalyst...

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Scientists turn CO2 into fuel using breakthrough single-atom catalyst

Science Daily · 17 Apr 2026

Every chemical reaction must overcome an energy hurdle before it can occur. Substances need an initial input of energy to start reacting. Sometimes this barrier is small, like lighting a match. In many industrial processes, however, the required energy is much higher, which increases costs.

To make reactions easier and more efficient, chemists rely on substances called catalysts. These "reaction helpers" reduce the energy needed. The most effective catalysts often contain metals, including rare and expensive ones.

Breakthrough Catalyst Turns CO 2 Into Methanol

Researchers at ETH Zurich have now made a major advance in catalyst design. Their new system significantly lowers the energy needed to produce methanol (an alcohol) from carbon dioxide and hydrogen.

The team also achieved an unusually efficient use of the metal indium. In this catalyst, each individual indium atom acts as its own active site. This is a major shift from traditional approaches, where metals are grouped in particles.

Another key advantage is improved precision. In the past, catalyst development often relied on trial and error. This new design allows scientists to better observe and understand the reactions happening on the surface, opening the door to more deliberate and optimized catalyst development.

"Methanol is a universal precursor for the production of a wide range of chemicals and materials, such as plastics -- the Swiss army knife of chemistry, so to speak," says Javier Pérez-Ramírez, Professor of Catalysis Engineering at ETH Zurich.

Methanol is essential for producing fuels and materials, and it plays a growing role in efforts to move away from fossil fuels. If the hydrogen and energy used in the process come from renewable sources, methanol production could become climate neutral.

This approach also offers a new way to use CO 2 . Instead of releasing it into the atmosphere, it can be captured and turned into a valuable raw material.

Single Atom Catalysts Maximize Efficiency

"Our new catalyst has a single atom architecture, in which isolated active metal atoms are anchored on the surface of a specially developed support material," Pérez-Ramírez explains.

In conventional catalysts, metals are typically grouped into small particles that can contain hundreds or even thousands of atoms. Many of those atoms are not directly involved in the reaction, making the process less efficient.

Single atom catalysts represent a more efficient alternative. By using metals at the level of individual atoms, scientists can make better use of scarce and costly...

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European Chemicals Agency backs EU-wide PFAS ban

Chemistry World · 27 Mar 2026

Committees within the European Chemicals Agency (Echa) are supporting an EU-wide restriction on the production, marketing and use of per- and polyfluoroalkyl substances (PFAS). This marks ‘a major step’ in dealing with these ‘forever chemicals’, with regulatory measures that are currently in place in the EU deemed insufficient to control PFAS emissions, according to a statement released by Echa .

PFAS – also known as ‘forever chemicals’ – are a family of an estimated 15,000 synthetic chemicals that have been widely used in consumer products globally since the 1950s. They are a class of chemicals that contain at least one perfluorinated methyl (–CF 3) or methylene (–CF 2 –) group. They do not degrade easily in the environment because the carbon–fluorine bond is among the strongest in existence. The unique properties of these substances confer characteristics like repellence to oil, grease and water, as well as temperature resistance and friction reduction. This helps to create products that are non-stick and stain-resistant, for example.

However, PFAS are also highly mobile in the environment and they bioaccumulate, as well as biomagnify, up the food chain. PFOA and PFOS – the best studied of these substances – have been linked to serious health conditions like reproductive and developmental disorders, reduced immune function and certain types of cancer.

The governments of Denmark, Germany, the Netherlands, Sweden and Norway sent a proposal to Echa back in January 2023 to ban the thousands of PFAS chemicals on the market, as well as on those imported into the EU. A consultation on the proposed restrictions then ran from March to September later that year.

The Risk Assessment Committee (Rac) has now concluded that ‘PFAS pose growing risks to people and the environment’, saying that ‘an EU-wide restriction is, therefore, an effective measure to reduce these risks’.

However, the committee highlights that certain products that use PFAS – including certain biocides, medicines and process chemicals – are exempt from the ban, as they already have existing restrictions. As such, Rac is also recommending clearer consumer labelling, instructions for safe use and better monitoring to minimise PFAS emissions from these products.

The Socio-Economic Analysis Committee (Seac) is also supporting the EU-wide ban, as well as strategies recommended by Rac. However, María Ottati, chairperson of Seac, notes that measures need to be ‘proportionate and workable’. ‘This balanced approach will reduce PFAS emissions while allowing certain uses to continue...

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Microplastics are falling from the sky and polluting forests

Science Daily · 19 Jan 2026

Microplastics and nanoplastics are widely known for contaminating oceans, rivers, and farmland. New research now shows they are also accumulating in forests. Geoscientists at TU Darmstadt report this finding in a study published in Nature Communications Earth & Environment , highlighting a largely overlooked form of environmental pollution.

The study reveals that forests are not just affected by local pollution sources. Instead, most microplastics arrive through the air and gradually build up in forest soils. According to the researchers, these tiny plastic particles first land on the leaves in the upper canopy.

"The microplastics from the atmosphere initially settle on the leaves of the tree crowns, which scientists refer to as the 'comb-out effect'," explains lead author Dr. Collin J. Weber from the Institute of Applied Geosciences at TU Darmstadt. "Then, in deciduous forests, the particles are transported to the forest soil by rain or the autumn leaf fall, for example."

Once on the forest floor, natural processes take over. The breakdown of fallen leaves plays a key role in trapping and storing microplastics in the soil. The researchers found the highest concentrations in the top layer of leaf litter, where decomposition has just begun. However, significant amounts were also detected deeper underground.

This movement into lower soil layers is linked not only to the decomposition of organic material but also to biological activity, such as organisms that help break down leaves and redistribute particles.

Measuring Microplastics in Soil, Leaves, and Air

To better understand how microplastics accumulate, the research team collected samples from four forest sites east of Darmstadt in Germany. They analyzed soil, fallen leaves, and atmospheric deposition (the transport of substances from the Earth's atmosphere to the Earth's surface) using a newly developed method combined with spectroscopic techniques.

In addition, the scientists created a model to estimate how much microplastic has entered forests from the atmosphere since the 1950s. This helped them assess how much of the total pollution stored in forest soils can be traced back to airborne sources.

Forests as Indicators of Airborne Plastic Pollution

"Our results indicate that microplastics in forest soils originate primarily from atmospheric deposition and from leaves falling to the ground, known as litterfall. Other sources, on the other hand, have only a minor influence," explains Weber. "We conclude that forests are good indicators of atmospheric microplastic pollution and that a high concentration of microplastics in forest soils indicates a high...

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Textiles with ‘water shield’ nano-coating can be cleaned without detergent

Chemistry World · 31 Mar 2026

A demonstration of how easily the coating can be applied, creating easy-clean clothing

Stained and dirty clothes could one day be washed by simply rinsing them with water thanks to a new self-cleaning coating for textiles. The researchers say it could make doing laundry more convenient and more environmentally friendly by reducing water use and limiting wastewater contaminated with detergents and microplastic fibres.

Self-cleaning coatings are nothing new and they are usually based on three kinds of materials. Superhydrophobic ones work against water-based contaminants but struggle with oily residues. Photocatalytic self-cleaning surfaces can degrade contaminants under light but they don’t prevent dirt attaching in the first place. Meanwhile, lubricant-based self-cleaning coatings allow contaminants to slide off but they lack long-term stability and durability on flexible fabrics.

Now, Chinese researchers have made a new kind of self-cleaning coating for textiles that instead relies on molecular interactions in a polyelectrolyte multilayer, which creates a 'nano-shield' of water molecules. This effectively prevents contaminants from latching on to fibres, making it easier to remove stains, oily residues, bacteria and mould when rinsed with just water.

'What first inspired us was not laundry itself, but a more fundamental question in interfacial chemistry: what kind of surface can prevent contaminants from sticking tightly enough that they can be removed with water alone?' says Chongling Cheng at Southeast University, China.

The team had previously investigated surfaces comprising sulfonate groups, which strongly attract water. The researchers found that when arranged at high density these groups sustained a stable and continuous nanoscopic layer of tightly bound water molecules that effectively shielded the solid surface from external contaminants.

Applying this concept to textiles, the researchers sprayed polyester, cotton and silk with two oppositely charged polyelectrolyte materials. The process – akin to nanoscale painting or brushing – was done repeatedly to make a continuous and uniform coating across the textile surface. This ensured the protective layer of water molecules was dense enough to stop contaminants from finding gaps and reaching the underlying fibres.

The coated textiles were then stained with ketchup, soy sauce and engine oil, as well as exposed to bacteria and mould. When given a single rinse cycle in a washing machine, the results either matched or outperformed uncoated textiles that received one conventional wash cycle with detergent and four rinse cycles.

A real-world stain removal test conducted on a white cotton T-shirt. An oil-soluble dye is completely removed...

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Lasers used to seal paper – no adhesives or plastics required

New Atlas · 28 Mar 2026

In the packaging war between paper and plastic, plastic has remained indispensable – even in paper products – through one vital aspect: sealing. Until now, reliable paper seals have required adhesives or plastic layers. Scientists may have found a way to eliminate both.

Despite all our efforts to curb plastic pollution by using paper packaging, we often inadvertently end up using it anyways. This happens because paper packages still require plastic to provide leak-proof sealing. You see, paper is porous, allowing air to reach solid content and allowing liquids to leak out.

To address these limitations, paper packaging for food or chemicals still contains plastic. Examples of this are everywhere. Milk and juice cartons, even though they look like paper, are lined with plastic (often polyethylene) and heat-sealed at the seams to prevent leaks. Another example is paper packets for snacks like biscuits and chips. The edges are heat-sealed plastic films to keep air and moisture out so the food stays crisp. We also have "paper" coffee cups, takeaway boxes, and cosmetic bottles that all feature plastic seams or linings.

This plastic contaminates the paper, complicating recyclability and impacting biodegradability.

To solve this problem, researchers from four institutes at Fraunhofer, a German research organization, have come together to create the PAPURE project. According to a press release by the

organization, the project aims to develop a laser-based heating process that enables adhesive-free packaging, completely eliminating the need for plastics.

The project has developed a multistage process that begins with analyzing multiple paper types to determine their suitability for the heat treatment process. This stage determines the biocellulose content of the paper, including hemicellulose, cellulose, and lignin, as these components directly impact the paper's adhesive properties. Using advanced analytical characterization techniques, this analysis also assesses for inorganic compounds that may adversely affect laser treatment.

"An excessive proportion of inorganic compounds, such as talc and calcium carbonate, has a negative effect on the adhesive properties and bond strength of the seams. It can also be said that thicker papers are more suitable for binder-free sealing," says Fraunhofer research scientist Robert Protz.

The next stage is the actual innovation that results in adhesive-free sealing. Researchers irradiate the paper surface with a CO laser, rapidly heating it and converting its primary components: lignin, hemicellulose, and cellulose, into short-chain compounds. The irradiation process creates a fusible cleavage product that remains on the paper's surface. When...

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Scientists Build Five-in-One "Super Molecule" for Next-Gen Electronics

Sci Tech Daily · 30 Mar 2026

Scientists are getting closer to building materials one molecule at a time, a long-standing goal that could reshape electronics, energy systems, and sensing technologies. At the heart of this effort are flat, carbon-rich molecules known for their ability to move electrical charge efficiently. These structures already appear in devices like solar cells and chemical sensors, but researchers have been searching for ways to push their performance even further.

One promising idea is to connect multiple molecules into larger networks so they behave like a single, more powerful system. In theory, this extended structure can improve how electrons flow, which is critical for faster and more efficient devices. In practice, though, making these larger assemblies has been a major obstacle. As molecules grow, they often stop dissolving in liquids, which makes them difficult to synthesize using standard chemical techniques.

A team led by Luis M. Mateo and Diego Peña at the Center for Research in Biological Chemistry and Molecular Materials (CiQUS) has developed a way around this problem using a hybrid approach. They begin by synthesizing carefully designed phthalocyanine units in solution. These units are then placed onto a metal surface, where they react and join together to form an extended structure made of five cross-shaped, fused phthalocyanines.

This method brings together the control of traditional solution chemistry with the advantages of surface-based reactions carried out under controlled conditions, enabling the creation of structures that were previously difficult to achieve.

"The surface not only facilitated the synthesis of the phthalocyanine pentamer but also enabled its sub-molecular resolution characterization using scanning probe microscopy," says CiQUS researcher Luis M. Mateo.

The resulting structure forms a nanoscale system in which all five units behave as a single electronic entity. Experiments show that linking the units lowers the energy gap, an important factor for charge transport and the performance of advanced materials.

The design also takes advantage of the ability of phthalocyanines to bind metals within their central cavity. This makes it possible to place different metals at specific points in the structure, introducing new properties such as magnetism in the central region.

Diego Peña explains that the next step is to “modify the molecular precursor design to access two-dimensional polymers formed by phthalocyanines, a nanomaterial that will allow us to explore unique properties.”

This research, carried out as part of the MolDAM project (ERC Synergy Grant), involved close collaboration with the University of Regensburg...

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Scientists Found a Big Problem With How We Measure Microplastics

sciencealert.com · 31 Mar 2026

It seems like every day a new study finds tiny plastic particles called microplastics where they should not be: in our bodies and our food , water , and air .

Yet finding and identifying microplastics is extremely challenging, especially given their small size. One microplastic can range from as large as a ladybug to as small as an eighth of a red blood cell.

In addition, it can be hard for researchers to avoid unintentionally contaminating their samples, because these plastics are practically everywhere. As a result, much of this research may be overestimating the number of microplastics.

In a new study published in March 2026, our team found that , even when following established protocols, using certain methods to measure environmental microplastics can potentially contaminate the results.

We are chemists at the University of Michigan working in a collaborative team . We set out to understand how many microplastics Michiganders were inhaling when outside, and whether that depended on where they lived.

When preparing our samples, we followed all the standard protocols while conducting our research – we avoided plastic use in the lab, wore nonplastic clothing, and even used a specialized chamber to reduce potential contamination from the laboratory air.

Despite these precautions, we found plastic counts in the air that were over 1,000 times greater than previous reports . We knew these numbers didn't seem right, so what happened?

After a long path to pinpointing the contamination source, we found that laboratory gloves, which the scientific community recommends using as a best practice, can transfer particles to the surface of our samples – in this case, small metal sheets used to collect material depositing from the air. Moreover, the particles led to an overestimation of microplastic abundance in our study.

Here's how: The particles, which we identified as stearate salts , are used to help the gloves cleanly release from their mold during the manufacturing process. When gloves are used to handle laboratory equipment, the particles are transferred to anything they touch.

Stearate salts are similar to soap molecules – if you eat a lot of them, they're probably not good for you, but they're not harmful in the environment in the same way that microplastics are.

While not microplastics themselves, stearate salts are structurally similar to polyethylene , the type of plastic most often found in the environment. This structural similarity makes it difficult to...

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Researchers gene-edit the bitterness out of grapefruit

refractor.io · 26 Mar 2026

In the late 1990s, molecular biologist Yoram Eyal, and colleagues at The Volcani Center in Israel, identified the key gene and enzymes responsible for producing the bitterness compounds in grapefruit. Now, using the genome editing technology CRISPR/Cas9, the team has inactivated the gene in a type of grapefruit (Citrus paradisi) to eliminate that bitter taste.

“We started from basic research, established the pathway that generates bitter compounds in citrus, and, using genome editing, brought this to agricultural practice to develop new varieties in which the taste was modified,” Yoram Eyal told Refractor in an interview. “I think basically it's opening up a bigger market for grapefruits or for any kind of future citrus varieties.”

The bitterness receptors on our tongue are significantly more diverse than the other taste receptors. The scientists believe that it allows us to detect a wide array of toxic compounds in our food. Since we still have a limited group of receptors, we “will have off-targets,” explains Eyal. Many nutritious compounds are harmless and healthy, for example, but this survival mechanism perceives them as bitter.

For adults who eat bitter foods like grapefruit, they have likely developed an acquired taste for these bitter compounds. The food becomes pleasant through repeated exposures. However, children are generally more sensitive to the bitterness, which can make them turn away from the healthy foods, missing out on several nutritious perks.

Geoffrey Thomson, a plant genome engineer at Yale University who wasn’t involved in the study, says that removing bitterness in citrus fruits such as grapefruit is a trait that many consumers of citrus juice would find appealing.

However, eliminating a specific trait from a tree is “more technical and difficult” than genome editing in crops, says Eyal. Previous studies have identified a gene called 1,2RhaT, as a key to bitterness, and in the new research, published in The Plant Journal , the team introduced small mutations to this specific gene. This tiny error forced the plant to stop biosynthesizing the protein, effectively abolishing the bitter chemicals.

Analyses of the leaves from the modified plant show no detectable bitter compounds such as naringin, neohesperidin, or poncirin. It should be noted that the study found the metabolic compounds only in the leaves, however the team expects identical results from the fruit as well.

Thompson says that the work is still preliminary because citrus trees have a long juvenile period, so the tree...

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CURIOSITIES

Pig-boar hybrids in Fukushima evacuation zone rewrite wild genomes

refractor.io · 30 Mar 2026

When escaped domestic pigs bred with wild boar after the Fukushima evacuation, researchers gained a rare chance to observe large-scale hybridization. New findings show that maternally inherited rapid breeding accelerated genetic turnover, quickly diluting pig ancestry in the wild population. The result offers a novel lens on how fast-breeding traits can quietly reshape wildlife genetics.

In the months after the 2011 Fukushima Daiichi nuclear disaster, abandoned farms across the evacuation zone became an unlikely natural experiment. Escaped domestic pigs bred with wild boar, creating a large-scale hybrid population. More than a decade later, genetic analyses of those animals revealed something unexpected: the maternal pig lineages did not preserve pig genes, they sped up their disappearance.

A new genetic study, published in the Journal of Forest Research , led by Professor Shingo Kaneko of Fukushima University, with co-author Donovan Anderson of Hirosaki University, analyzed the genetic signatures left behind by this hybridization event. The researchers initially assumed domestic pig genes would linger in the wild population, perhaps even boosting numbers through hybrid vigor.

Instead, when they compared two kinds of genetic markers, one passed down only from mothers and another inherited from both parents, they found something counterintuitive. Wild boar carrying domestic pig mitochondrial DNA, genetic material passed down through the maternal line, often had very little pig DNA left in the rest of their genome. The maternal line traced back to domestic pigs, but most of the broader genetic material had already been replaced.

The research team found that the explanation turned out to be surprisingly simple: it was speed.

Domestic pigs do not follow the once-a-year breeding cycle typical of wild boar. They can reproduce multiple times per year. If that faster rhythm persisted in escaped females and was passed to their daughters, it would act like a fast-forward button for evolution. More litters mean more generations in the same span of time, and more chances for pig DNA to be diluted as hybrids repeatedly mated with wild boar.

That is exactly what Kaneko, Anderson and their colleagues observed. Within just a few years of the accident, many hybrids were already several generations removed from the original cross. In numerous cases, individuals carrying pig mitochondrial DNA were more than five generations past the first hybridization event, suggesting reproduction had proceeded faster than a single annual cycle would allow.

In other words, the maternal pig lineage may have been shuffling...

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This Alga Rewrites the Rules of Photosynthesis To Survive in the Dark

Sci Tech Daily · 31 Mar 2026

A hidden rearrangement of ordinary chlorophyll allows certain algae to access light others cannot.

Life in dim environments pushes photosynthetic organisms to their limits. In places where sunlight is scarce or filtered, some species have evolved ways to use parts of the light spectrum that most others cannot. A new study from Osaka Metropolitan University reveals how a freshwater alga extends its reach into far-red light by reorganizing one of biology's most familiar molecules.

Far-red light carries less energy than the wavelengths typically used in photosynthesis , which is why most plants and algae rely on visible red and blue light instead. Yet in dense forests or sediment-rich water, those higher-energy wavelengths are often absorbed before they can penetrate deeper layers. What remains is far-red light, and for most organisms, it is not enough.

"Whilst certain cyanobacteria use specialized chlorophylls to absorb far-red light, many plants and algae achieve the same effect by reorganizing ordinary chlorophyll a into cooperative assemblies within their photosynthetic antennas," said Ritsuko Fujii, lead author and associate professor at the Graduate School of Science and Research Center for Artificial Photosynthesis at Osaka Metropolitan University.

Chlorophyll a is a pigment that cannot absorb far-red light on its own. So, how exactly do these organisms achieve photosynthesis?

To investigate, the researchers studied the freshwater eustigmatophyte alga Trachydiscus minutus . This species builds up large amounts of a light-harvesting protein that can use far-red light.

While the alga can photosynthesize under normal lighting, these elevated protein levels become especially important in low-light environments.

"The organism produces a specialized photosynthetic antenna called a red-shifted violaxanthin–chlorophyll protein (rVCP), which absorbs far-red light even though it contains only chlorophyll a ," Fujii said.

Using cryo-electron microscopy, the researchers determined the structure of rVCP at a high resolution of 2.4 Å. They found that the protein forms a previously unreported architecture: a tetramer composed of two different heterodimers. This unique assembly brings chlorophyll a molecules into close proximity, allowing them to form unusually large pigment clusters.

To see how this structure influences light absorption, the researchers combined structural data with multiscale quantum chemical calculations.

"Our analysis showed that three chlorophyll clusters within each heterodimer play a major role in absorbing far-red light," Fujii said. "Importantly, this absorption arises purely from energy delocalization across multiple chlorophyll molecules, independently of the charge-transfer effects that are thought to drive similar red-shifted systems."

The results point to...

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Scientists claim to have found the two types of water that explain the liquid's oddness

Chemistry World · 27 Mar 2026

Despite being the most familiar liquid, water is weird . It breaks many of the usual rules that govern the liquid state. In 1992 a team of researchers suggested why that is. Perhaps, they said, there are two types of liquid water, which become distinct only at temperatures well below freezing point, where it's all but impossible to keep water liquid. 1 Researchers have sought evidence for this bold conjecture ever since – and now an international team claims to have found it.

Water is weird. It has over 60 properties that mark it as rather different to other liquids, such as high surface tension, high boiling point and low compressibility. Is it because liquid water is better thought of as two different liquids?

Anders Nilsson of Stockholm University and his co-workers have used ultrafast laser pulses to rapidly melt ice at temperatures and pressures close to those at which the two deeply supercooled liquid phases of water are thought to exist. They then used x-ray scattering to see a signature of the two liquids and the liquid–liquid phase transition between them – an abrupt (first-order) transition that, like the transition between a normal liquid and gas phase, ends in a critical point where the two phases become indistinguishable. 2

'The new results are the most persuasive evidence to date of a liquid–liquid critical point [LLCP] in water,' says physicist Greg Kimmel of Pacific Northwest National Laboratory in Richland, Washington.

'The LLCP is important because it is the source of the water anomalies,' says Nilsson. It means that ordinary water at ambient conditions is in fact a supercritical liquid, existing at temperatures above the critical point of the two metastable (provisionally stable) supercooled liquid phases. One of these phases is denser than ordinary water because it lacks many of the hydrogen bonds between H 2 O molecules that keep the molecules at 'arm's length' in the other, lower-density liquid. The competition between a hydrogen-bonded, more open structure – which makes normal ice less dense than water itself – and the closer-packed structure is ultimately what creates anomalies such as water's density maximum being 4°C above freezing.

The liquid–liquid transition (LLT) is predicted at temperatures below a LLCP at about -50°C and at a pressure of around 1000 atmospheres. But it's virtually impossible to probe this region of the phase diagram without water freezing to ice. Several previous experiments have offered...

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Scientists Propose a Radical New Method To Find Alien Life

Sci Tech Daily · 31 Mar 2026

Assembly Theory shifts the search for life from identifying specific molecules to measuring chemical complexity, offering a more universal and less Earth-biased approach.

Astronomers have faced a quiet but persistent challenge for decades. The usual strategy for finding life beyond Earth is to analyze exoplanet atmospheres for gases such as oxygen, methane, and ozone, which are hard to explain without biology. The idea is smart, but it has a major limitation. This checklist is based entirely on Earth, so it effectively searches for life that resembles our own.

Meanwhile, the number of ways non-biological chemistry can imitate these so-called biosignature gases is growing quickly. Each new false positive requires additional planetary data to rule it out, raising doubts about whether we can ever gather enough information to be certain. Despite sixty years of research in astrobiology, the basic approach to biosignatures has changed very little.

Sara Walker, a professor of astrobiology at Arizona State University, and her colleagues are working to address this issue. Their solution is based on assembly theory, which takes a fundamentally different approach.

Assembly theory shifts the focus away from identifying specific molecules. Instead, it considers how difficult those molecules are to form. Each molecule is assigned an assembly index, which represents the minimum number of steps needed to build it from simple chemical components. Simple molecules can form by chance, but highly complex ones that require many steps are unlikely to appear without some form of selection.

If an atmosphere contains many molecules that are extremely difficult to produce randomly, and if those molecules show strong chemical connections, such as sharing and reusing fragments while exploring many possible bond combinations, then something beyond standard chemistry may be involved. According to the theory, that process is very likely life.

Crucially, the theory makes no assumptions about what that life actually is. No specific metabolism, biochemistry, or molecular machinery is presumed. It is, in the researchers' own terms, agnostic to life's specific instantiation. It simply suggests where life might exist.

Comparing Earth's atmosphere to Venus , Mars , and various exoplanet archetypes, Earth's atmosphere stands out as the most complex by this measure, independent of any observational bias. Earth and Venus have a similar diversity of chemical bonds available to them, yet Earth's atmosphere contains far greater molecular diversity above any given abundance threshold. Earth's biosphere, it seems, is allowing a much more exhaustive exploration of chemical...

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'One Plant Health Concept' connects tradition and technology to address plant diseases in Africa

Phys Org · 31 Mar 2026

An article published in CABI Agriculture and Bioscience calls for a diverse, participatory approach that combines indigenous, local knowledge systems with modern technologies to tackle plant diseases and strengthen food security in Africa. This comprehensive review proposes a strategy for "One Plant Health" management across the continent and aims to address challenges such as climate change and emerging plant viruses.

Authors Dr. Gilbert Nchongboh Chofong, Dr. Julia Mulabisana, and Dr. Katja Richert-Poeggeler explain the core of this strategy as an integrated approach that brings together a broad range of stakeholders while combining old and new techniques for plant health and crop cultivation.

Effective environmental management strategies can be developed and implemented, for example, by integrating indigenous communities' profound understanding of local ecosystems with data from remote sensing technologies such as drone and satellite imagery.

"A synergy is created when we combine indigenous knowledge with modern technologies," said lead author Dr. Gilbert Nchongboh Chofong, Senior Research Associate at the Julius Kühn-Institut.

"Our review shows that by using a combined, participatory approach, focusing on traditional techniques and modern approaches, stakeholders can unite to improve disease management, strengthen sustainable agriculture, and build more resilient food systems across Africa now and in future."

Local communities have long identified disease-resistant traits in plant varieties, cultivating them through seed selection, conventional breeding, and intercropping.

Today, modern research employs smart breeding techniques (e.g. screening for molecular markers) that develop genetically improved crops for enhanced plant yield and resistance to plant viruses and other diseases. By integrating techniques, embracing both traditional wisdom and cutting-edge approaches, the strategy aims to improve plant health, reduce food shortages, and foster economic growth in Africa.

Furthermore, the strategy can be applied to address broader environmental problems. An integrated approach can help to tackle challenges such as deforestation, land degradation, soil pollution, and water scarcity.

Collaboration is key to the strategy, which emphasizes coordinated efforts among diverse participants, including researchers, farmers, local communities, and policymakers.

The paper aims to promote the integration of plant health and phytopathology into the One Health concept and encourage practices in agroecology to address broader health challenges.

By researching the interconnectedness of human, animal, and ecological well-being, the study explains how we can better limit the impact of emerging plant pathogens on health in general. Plant health remains underrepresented within One Health, making the study particularly important within the framework.

Gilbert Nchongboh Chofong, et al. One Plant Health...

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Most people get food’s environmental impact completely wrong, study finds

Science Daily · 29 Sep 2026

A new study offers fresh insight into how people judge the environmental impact of the foods they eat, and the results suggest many are getting it wrong. These misunderstandings point to a clear need for simple environmental impact labels to help guide better choices.

Researchers from the University of Nottingham's School of Psychology asked 168 participants in the UK to sort a wide variety of supermarket foods into environmental impact categories of their own making. The findings revealed consistent misconceptions about which foods are more or less harmful to the environment. The study was published in the Journal of Cleaner Production .

Why Food Choices Matter for the Environment

Food production plays a major role in environmental issues, including greenhouse gas emissions and biodiversity loss. Encouraging more sustainable eating habits depends in part on understanding how people perceive the environmental footprint of different foods.

Scientists measure a food's environmental impact using a life cycle assessment, which tracks the entire process from production to disposal. This "cradle-to-grave" approach considers inputs such as fertilizer, water, and energy, along with outputs like emissions and waste. It evaluates multiple factors, including greenhouse gas emissions (often as CO 2 equivalents), land use, and water use.

Study Examines Real-World Grocery Choices

Earlier research has typically focused on a limited selection of foods. This project, funded by the UKRI's Smart Data Research UK, is the first to explore how people perceive the environmental impact of a broad range of products commonly found in a typical grocery shop.

Participants were also shown scientific estimates of each product's environmental impact and asked whether the results were higher or lower than they expected.

Key Misconceptions About Food and Sustainability

The study found that people tend to judge food impact using two main factors: whether the food comes from animals or plants, and how processed it is. In general, participants assumed that meat and dairy products, as well as highly processed foods, are worse for the environment.

However, these assumptions do not always match reality. Many participants overestimated the environmental impact of processed foods while underestimating the impact of water-intensive products (e.g. nuts). They were also surprised to learn how much higher the environmental impact of beef is compared to other meats like chicken.

Labels Could Help People Make Better Choices

Daniel Fletcher, Postdoctoral researcher from the School of Psychology is lead author on the study, he said: "We designed an...

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Scientists find gut bacteria inject proteins that control your immune system

Science Daily · 5 Jan 2026

Scientists have uncovered a surprising way that gut bacteria interact with the human body. Certain microbes living in the digestive system can send proteins straight into human cells, actively influencing how the immune system behaves. The research, led by Helmholtz Munich with contributions from Ludwig Maximilians University (LMU), Aix Marseille University, Inserm, and other international collaborators, reveals a previously unknown form of communication between bacteria and human cells. This discovery offers new insight into how the gut microbiome affects health and may help explain its role in conditions such as Crohn's disease.

For years, researchers have linked the gut microbiome to immune, metabolic, and inflammatory disorders. However, most of that evidence has been based on correlations, and the biological processes behind those links have remained unclear.

"Our goal was to better characterize some of the underlying processes of how gut bacteria affect human biology," says Veronika Young, first author of the study together with Bushra Dohai. "By

systematically mapping direct protein-protein interactions between bacterial and human cells, we can now suggest molecular mechanisms behind these associations."

Hidden Injection Systems in "Friendly" Gut Bacteria

The team found that many common, non-harmful gut bacteria carry type III secretion systems. These are tiny, syringe-like structures that allow bacteria to inject their own proteins directly into human cells. Previously, scientists believed these systems were limited to disease-causing bacteria such as Salmonella.

"This fundamentally changes our view of commensal bacteria," says Prof. Pascal Falter-Braun, Director of the Institute for Network Biology at Helmholtz Munich and corresponding author of the study. "It shows that these non-pathogenic bacteria are not just passive residents but can actively manipulate human cells by injecting their proteins into our cells."

Mapping How Gut Bacteria Influence Human Cells

To explore what happens after these proteins enter human cells, the researchers mapped more than a thousand interactions between bacterial effector proteins and human proteins. This large network revealed that bacterial proteins tend to target pathways involved in immune regulation and metabolism.

Follow-up experiments confirmed that these proteins can influence key immune signaling systems, including NF-κB and cytokine responses. Cytokines are signaling molecules that help coordinate immune activity and prevent excessive reactions that could lead to autoimmune disease. For instance, blocking the cytokine Tumor Necrosis Factor (TNF) is a common treatment for Crohn's disease, an autoimmune condition affecting the gut.

The researchers also discovered that genes responsible for these bacterial effector proteins are more...

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These dinosaurs had wings but couldn’t fly

Science Daily · 9 Dec 2026

Dinosaur fossils preserved with their feathers suggest that some of these animals had already lost the ability to fly. As the research team explains, "Feather molting seems like a small technical detail -- but when examined in fossils, it can change everything we thought about the origins of flight, highlighting how complex and diverse wing evolution truly was."

A new study led by a researcher from the School of Zoology and the Steinhardt Museum of Natural History at Tel Aviv University analyzed rare fossils with intact feathers and found evidence that these dinosaurs were not capable of flight. This unusual discovery offers a rare look at how animals lived 160 million years ago and sheds new light on how flight evolved in both dinosaurs and modern birds. The researchers note, "This finding has broad significance, as it suggests that the development of flight throughout the evolution of dinosaurs and birds was far more complex than previously believed. In fact, certain species may have developed basic flight abilities -- and then lost them later in their evolution."

The research was led by Dr. Yosef Kiat, alongside collaborators from China and the United States, and published in the journal Communications Biology by Nature Portfolio.

Dr. Kiat, an ornithologist who studies feathers, explains that dinosaurs split from other reptiles about 240 million years ago. Not long after (on an evolutionary timescale), many species developed feathers, which are lightweight, protein-based structures used for flight and temperature regulation. Around 175 million years ago, a group of feathered dinosaurs known as Pennaraptora appeared. These animals are considered distant ancestors of modern birds and were the only dinosaur lineage to survive the mass extinction at the end of the Mesozoic era 66 million years ago.

Scientists believe Pennaraptora evolved feathers for flight, but environmental changes may have led some species to lose that ability over time, similar to flightless birds today such as ostriches and penguins.

Rare Fossils Preserve Feather Color and Structure

The study focused on nine fossils from eastern China belonging to Anchiornis, a feathered Pennaraptoran dinosaur. These fossils are exceptionally rare because they preserved not only the feathers but also their original coloration, thanks to unique fossilization conditions in the region. Each specimen showed wing feathers that were white with a distinct black spot at the tip.

This preserved coloration allowed researchers to closely examine the structure and growth of the feathers in ways...

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Climate change may produce 'fast-food' phytoplankton

Phys Org · 31 Mar 2026

by Jennifer Chu, Massachusetts Institute of Technology

We are what we eat. And in the ocean, most life-forms source their food from phytoplankton. These microscopic, plant-like algae are the primary food source for krill, sea snails, some small fish, and jellyfish, which in turn feed larger marine animals that are prey for the ocean's top predators, including humans.

Now MIT scientists are finding that phytoplankton's composition, and the basic diet of the ocean, will shift significantly with climate change. In a study appearing today in the journal Nature Climate Change , the team reports that as sea surface temperatures rise over the next century, phytoplankton in polar regions will adapt to be less rich in proteins, heavier in carbohydrates, and lower in nutrients overall.

The conclusions are based on results from the team's new model, which simulates the composition of phytoplankton in response to changes in ocean temperature, circulation, and sea ice coverage. In a scenario in which humans continue to emit greenhouse gases through the year 2100, the team found that changing ocean conditions, particularly in the polar regions, will shift phytoplankton's balance of proteins to carbohydrates and lipids by approximately 20%. The researchers analyzed observations from the past several decades, and already have found a signature of this change in the real world.

"We're moving in the poles toward a sort of fast-food ocean," says lead author and MIT postdoc Shlomit Sharoni. "Based on this prediction, the nutritional composition of the surface ocean will look very different by the end of the century."

The study's MIT co-authors are Mick Follows, Stephanie Dutkiewicz, and Oliver Jahn; along with Keisuke Inomura of the University of Rhode Island; Zoe Finkel, Andrew Irwin, and Mohammad Amirian of Dalhousie University in Halifax, Canada; and Erwan Monier of the University of California at Davis.

Phytoplankton drift through the upper, sun-lit layers of the ocean. Like plants on land, the marine microalgae are photosynthetic. Their growth depends on light from the sun, carbon dioxide from the atmosphere, and nutrients such as nitrogen and iron that well up from the deep ocean.

When studying how phytoplankton will respond to climate change, scientists have primarily focused on how rising ocean temperatures will affect phytoplankton populations. Whether and how the plankton's composition will change is less well-understood.

"There's been an awareness that the nutritional value of phytoplankton can shift with climate change," says Sharoni, "But there has been...

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Women over 50 lost 35% more weight with this surprising combo

Science Daily · 15 Jul 2026

A Mayo Clinic-led study reports that postmenopausal women using menopausal hormone therapy experienced significantly greater weight loss when taking tirzepatide, a Food and Drug Administration-approved medication for overweight and obesity. On average, these women lost about 35% more weight compared to those using tirzepatide alone. The results, published in The Lancet Obstetrics, Gynaecology, & Women's Health , point to new possibilities for treating obesity and related health conditions in women after menopause.

Menopause is often associated with increased weight gain and a higher risk of developing overweight and obesity. These changes can raise the likelihood of serious health problems, including cardiovascular disease and type 2 diabetes. In addition to weight gain, declining estrogen levels during menopause can trigger other changes in the body that may further increase cardiovascular risk. "This study provides important insights for developing more effective and personalized strategies for managing cardiometabolic risk in postmenopausal women," says Regina Castaneda, M.D., postdoctoral research fellow at Mayo Clinic and first author of the study.

Exploring the Role of Hormone Therapy in Weight Loss

Hormone therapy remains the most effective first-line option for relieving common menopausal symptoms such as hot flashes and night sweats, which affect up to 75% of postmenopausal women. However, its potential role in enhancing weight-loss medications has not been well understood. Earlier studies have suggested that women using hormone therapy may lose more weight when treated with GLP-1-based drugs like semaglutide, but data on tirzepatide had been lacking.

To address this gap, researchers analyzed data from 120 adults with overweight or obesity who were treated with tirzepatide for at least 12 months. They compared outcomes between those who also used hormone therapy and those who did not, ensuring both groups had similar baseline characteristics.

The analysis showed that women receiving both treatments lost significantly more weight. "In this observational study, women who used menopausal hormone therapy lost about 35% more weight

than women taking tirzepatide alone. Because this was not a randomized trial, we cannot say hormone therapy caused additional weight loss," says Maria Daniela Hurtado Andrade, M.D., Ph.D., endocrinologist at Mayo Clinic and senior author of the study.

"It is possible that women using hormone therapy were already engaged in healthier behaviors, or that menopause symptom relief improved sleep and quality of life, making it easier to stay engaged with dietary and physical activity changes."

Potential Synergy Between Estrogen and GLP-1 Medications

Although more controlled studies...

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REACH UPDATE

ECHA to launch consultation on draft SEAC PFAS opinion

ECHA · 25 Mar 2026

ECHA/NR/26/16

ECHA is inviting stakeholders to provide information on the draft opinion of its Committee for Socio-Economic Analysis (SEAC) on the proposed restriction of per- and polyfluoroalkyl substances (PFAS). The consultation launches on 26 March and is open until 25 May 2026.

25 March 2026 – Stakeholders — including industry, non-governmental organisations, producers and developers of alternatives, researchers and members of the public — are invited to provide evidence-based comments that will help inform SEAC's final opinion.

The 60-day consultation uses a structured survey format, inviting participants to respond to questions on the potential impacts of restricting the use of PFAS across various sectors as described in the SEAC draft opinion. Participants are also asked to provide specific information about the availability and feasibility of alternatives to these widely used chemicals. Any information marked as confidential will be treated appropriately.

Information on the hazards and risks to human health and the environment associated with PFAS will not be considered, as these are covered by the opinion of the Committee for Risk Assessment (RAC).

The focus of the consultation is the SEAC draft opinion agreed by the Committee on 10 March. ECHA has published consultation guidelines and a mapping of PFAS uses to help contributors prepare and submit relevant information. The Agency encourages participants to carefully review the draft opinion and follow the guidelines to ensure their input is as useful as possible for SEAC.

The consultation will be accessible on ECHA's webpage on 26 March.

All non-confidential consultation responses will be published on ECHA's website.

Next steps

Relevant information submitted through the consultation will be assessed to confirm or modify the Committee's conclusions as presented in the draft opinion. The Committee is expected to adopt its final opinion by the end of 2026. This adoption will conclude ECHA's Committees' scientific evaluation of the proposed restriction and the opinions will be formally submitted to the European Commission.

Based on the two final opinions, the Commission will propose a restriction for discussion and vote in the REACH Committee, composed of EU Member States.

Background

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REGULATORY UPDATE

ASIA PACIFIC

Korea, China discuss cooperation on tackling climate change, improving air quality

The Korea Times · 25 Mar 2026

Korea and China on Wednesday discussed efforts to tackle climate change, including plans and policies to reduce greenhouse gas emissions, as well as ways to improve related air quality, the foreign ministry said.

Kyun Jong-ho, Korea's ambassador for climate change, had the talks with Xia Yingxian, director general for climate change at China's Ministry of Ecology and Environment, during their joint commission on climate change in Beijing, the ministry said in a release.

The two sides exchanged details of their status regarding the action plans to reduce greenhouse gas emissions, also known as the Nationally Determined Contributions under the Paris Agreement on climate change.

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Updates from EPAC2026

APVMA · 25 Mar 2026

On 19 and 20 February 2026, the Australian Pesticides and Veterinary Medicines Authority (APVMA) hosted an international conference on Advancing Sustainability in Agriculture: Enabling Precision Application of Crop Protection Products by Inclusion in Regulatory Approaches (Processes), also known as EPAC2026. The event coincided with Agrifutures evokeAG conference, at which the APVMA chaired a session titled Precision at scale: Turning innovation into on-farm reality.

Sponsored by the Organisation for Economic Co-operation and Development (OECD), EPAC2026 was attended by delegates from Australia and overseas from a wide range of stakeholder groups, including regulators from the EU, UK, Canada, Australia and NZ, research and academia, equipment manufacturers, the crop protection industry, growers and grower representatives.

In addition to hearing presentations from a range of national and international speakers, delegates participated in a hands-on workshop held on day 2 of the conference, focusing on 4 key topics:

Definitions, classifications and use patterns

Building trust in the technology

Risk assessment approaches and identifying/addressing regulatory gaps

Label language and supporting precision application

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AMERICA

NSF Will Establish National Quantum And Nanotechnology Research Infrastructure; Letters Of Intent Are Due March 16, 2026

Bergeson & Campbell, P.C., 17-02-26 · 17 Feb 2026

The U.S. National Science Foundation (NSF) announced on February 13, 2026, that it is investing up to $100 million to establish a nationwide network of open-access research facilities for quantum and nanoscale technologies, innovation, and workforce training. According to NSF, the NSF National Quantum and Nanotechnology Infrastructure (NSF NQNI) program will support up to 16 sites over five years, providing students, researchers, and industry with access to state-of-the-art fabrication and characterization tools, instrumentation, and expertise. Together, the sites will form a shared national resource serving regional innovation ecosystems, including community colleges and small businesses. NSF states that the NSF NQNI will accelerate U.S. leadership in quantum information science and engineering, nanotechnology, semiconductors, biotechnology, advanced manufacturing, and other emerging technologies. NSF notes that letters of intent are required and are due March 16, 2026.

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EPA Highlights Major Year One PFAS Actions to Combat Risks and Make America Healthy Again

US EPA · 6 Feb 2026

U.S. Environmental Protection Agency (EPA) Administrator Lee Zeldin released a top list of actions the agency has taken in the first year of the Trump Administration to combat risks from per- and polyfluoroalkyl substances (PFAS) contamination and Make America Healthy Again. Under President Trump's leadership, EPA is tackling PFAS contamination through better testing and detection, direct community support, enforcement, clear public education, commonsense regulation, and cutting-edge research so families across the country can have safer drinking water and cleaner environments.

Administrator Zeldin made addressing PFAS a top agency priority on day one and EPA has taken a number of important actions to combat risks from PFAS contamination.

"Keeping Americans safe from the risks of PFAS chemicals has been a top priority of mine dating back to my time in Congress," said EPA Administrator Lee Zeldin. "At the Trump EPA, we are focused on real results to protect families, farmers, and small businesses. That means locating PFAS, stopping it from getting into drinking water, cleaning it up where it's already a problem, and holding polluters accountable. These efforts are just the start of the work we will do on PFAS contamination to ensure ALL Americans have the cleanest air, land, and water."

The Trump EPA has moved quickly to turn its PFAS commitments into concrete results as part of this Administration's unwavering commitment to Make America Healthy Again. Since January 2025, some of the many positive Trump EPA highlights of the effort to combat PFAS include:

Launched the PFAS OUTreach Initiative (PFAS OUT) to connect with every public water system that needs system upgrades to address PFAS, including those finding PFOA and PFOS in their water. PFAS OUT will engage utilities, technical assistance providers and local, state, Tribal, and territorial leaders to develop effective and practical solutions where needed most.

Released $945 million to reduce exposure to PFAS in drinking water.

Developed a method to detect 40 PFAS compounds in wastewater, surface water, groundwater, soil, sludge, sediment, landfill liquid, and fish tissue.

Proposed commonsense changes to PFAS reporting regulations under the Toxic Substances Control Act (TSCA) to improve implementation and reduce duplicative reporting requirements while maintaining the ability to obtain important use and safety information.

Advanced the science-based levels for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) in National Primary Drinking Water Regulations (NPDWR), while revising compliance dates to ensure successful implementation.

Affirmed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substance listing for PFOA and PFOS.

Initiated more frequent updates to the PFAS Destruction and Disposal Guidance—changing from every three years to annually—as EPA continues to assess the effectiveness of available treatment technologies.

Finalized a consent order requiring removal of PFAS foam and system cleaning at Brunswick Executive Airport in Maine.

Installed 108 Point of Entry Treatment water systems to address PFAS contamination and sampled over 350 wells and provided bottled water to almost 200 residents near the Route 31 Sludge Superfund removal site in New Jersey.

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California Certified food standard

Legiscan · 25 Mar 2026

Existing law defines, for certain school-related purposes, "ultraprocessed food" as any food or beverage that contains a specified substance and either high amounts of saturated fat, sodium, or added sugar or a nonnutritive sweetener or other substance, as specified. Existing law requires the department to adopt regulations, on or before June 1, 2028, to define "ultraprocessed foods of concern" and "restricted school foods," as specified, and requires the department, when defining ultraprocessed foods of concern and restricted school foods, to consider specified factors, including, among others, whether the substance or group of substances are banned or restricted in other state, federal, or international jurisdictions due to concerns about adverse health consequences.

This bill would require the department, no later than June 1, 2028, to accredit certification agents that can certify products as “California Certified.” The bill would prohibit an accredited certification agent from certifying a product as “California Certified” if it is classified as an ultraprocessed food, ultraprocessed food of concern, or a restricted school food, as defined. The bill would require the department to create a specified standardized “California Certified” seal. The bill would authorize a person to use the seal on a product only if the product has been certified by an accredited certification agent. The bill would require an accredited certification agent to, among other things, register with the department and provide a list to the department of all the products certified by the accredited certification agent. The bill would require any registration information submitted by an accredited certification agent to the department to be made available to the public for inspection and copying.

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EPA Extends Compliance Dates for Perchloroethylene and Carbon Tetrachloride TSCA Rules

US EPA · 24 Mar 2026

U.S. Environmental Protection Agency (EPA) is releasing a proposal that would extend certain compliance dates in the final risk management rules for perchloroethylene (PCE) and carbon tetrachloride (CTC) under the Toxic Substances Control Act (TSCA) while the agency works to revise these rules to ensure they are practical and implementable to protect human health and the environment and maintain uses that power the U.S. economy. The proposed timeline adjustment does not weaken any existing protections and does not change the ultimate level of protection required.

While we will be extending compliance dates through this action, the current deadlines remain effective until modified through this rulemaking. EPA intends to focus its resources on compliance with the new compliance dates that will be established by this rulemaking. However, EPA may take any action necessary to protect human health and the environment. Consistent with the March 12, 2025, memo entitled “Implementing National Enforcement and Compliance Initiatives Consistently with Executive Orders and Agency Priorities,” concurrence from the Assistant Administrator for the Office of Enforcement and Compliance Assurance or his/her delegee shall be sought before any enforcement or compliance assurance actions regarding elements of this rule subject to reconsideration are taken.

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EUROPE

Letter to EU Commission on Implementation Dialogue on agriculture and environmental protections

EEB · 12 Mar 2026

This letter outlines clear calls from a coalition of farmers’ organisations, civil society and environmental groups following the European Commission’s Implementation Dialogue on

environmental legislation and farming. The signatories stress that the resilience of farming depends on healthy ecosystems and reliable rules.

Environmental laws such as the Water Framework Directive, Nitrates Directive, and Birds and Habitats Directives protect the foundations of agriculture: clean water, healthy soils and functioning ecosystems. The letter urges the Commission to prioritise proper implementation of these laws rather than weakening them, while supporting the transition towards more sustainable farming systems that secure the long-term stability of farmers and rural communities.

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Harmful Chemicals Identified in Lip Balms Available in the EU

Chemtrust · 12 Mar 2026

The Danish Consumer Council THINK Chemicals recently reviewed the ingredients of 50 lip balms and lip masks purchased on the Danish market, bought from both physical and online stores. Allergenic substances and suspected endocrine disrupting chemicals (EDCs) were identified in several products.

Overall, the study concluded that one in four lip balms contained chemicals that are problematic for the environment or health. Suspected EDCs were identified in nine lip balms and one lip mask, which all received a C-rating – the lowest rating given by the Danish Consumer Council THINK Chemicals.

EDCs are chemicals that disrupt the normal functioning of the hormone system. Exposure to EDCs has been linked to adverse health impacts such as certain cancers, reduced fertility, and impaired brain development.

Personal care products that contain harmful chemicals can contribute to our overall exposure, even if the individual products don't contain dangerous levels, this is known as the 'cocktail effect'. Leave-on products such as lip balms and lip masks can cause prolonged exposure because they stay on the skin longer than rinse-off products.

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PFAS-Free Food Packaging by August 2026

Food Safety · 11 Mar 2026

As the EU moves to meet goals set for climate neutrality and achieve a circular economy, EU Regulation 2025/40 dictates rules and procedures to reduce packaging waste, without causing adverse risk to the consumer. Adopted in 2024 and with additional aspects of the regulation coming into force this year, manufacturers, importers, and distributors are seeking to ensure their obligations under extended producer responsibility (EPR) are met. Part of this relates to new restrictions placed on PFAS and BPA, with additional substances of concern to be reported in December 2026.

With increased attention on product safety and compliance, the regulation drives a need for testing —using reliable, accurate, and reproducible methods to ensure low uncertainty in the reported results. With the need to (potentially) understand additional substances of concern next year and

beyond, while also considering the increased risk of contamination from the mandatory increased use of recycled materials in packaging as we move toward 2030 and beyond.

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UK HSE Annual science review

UK HSE · 24 Mar 2026

Through a series of case studies, the annual science review shows how investigations into real-world incidents, alongside targeted research and standards development, translate scientific insight into practical interventions that reduce risk and improve safety outcomes.

Case studies in this review include:

strengthening AI standards for cutting-edge people detection systems

investigating potentially environmentally catastrophic releases of thousands of litres of highly corrosive acid

research into safer liquid hydrogen refueling stations

a 65,000-participant pesticide worker study

engineers uncovering the causes of fatal incidents and how to prevent them in the future

how workers can be protected from crystalline silica dust

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HAZARD ALERT

White Phosphorus

2 Apr 2026

Phosphorus is a non-metallic chemical element with symbol P and atomic number 15. As a mineral, it is almost always present in its maximally oxidised state, as inorganic phosphate rocks. Elemental phosphorus exists in two major forms—white phosphorus and red phosphorus—but due to its high reactivity, phosphorus is never found as a free element on Earth. [1]

Pure white phosphorus is a colourless-to-white waxy solid, but commercial white phosphorus is usually yellow. Therefore, it is also known as yellow phosphorus. White phosphorus is also called phosphorus tetramer and has a garlic-like smell. In air, it catches fire at temperatures l0-15 degrees above room temperature. Because of its high reactivity with oxygen in air, white phosphorus is generally stored under water. White phosphorus does not occur naturally. Industries produce it from naturally occurring phosphate rocks. [2]

White phosphorus glows in the dark (when exposed to oxygen) with a very faint tinge of green and blue. [1]

Uses [2]

White phosphorus is used mainly for producing phosphoric acid and other chemicals. These chemicals are used to make fertilisers, additives in foods and drinks, cleaning compounds, and other products. Small amounts of white phosphorus have been used as rat and roach poisons and in fireworks. In the past, white phosphorus was used to make matches, but another chemical with fewer harmful health effects has since replaced it. In the military, white phosphorus is used in ammunitions such as mortar and artillery shells, and grenades.

In the Environment [3]

- White phosphorus can enter the environment when it is made, used in manufacturing or by the military, or accidentally spilled during transport and storage.
- It can be found in the water and bottom sediment of rivers and lakes near facilities that make or use it.
- In the air, white phosphorus reacts rapidly with oxygen to produce relatively harmless chemicals within minutes.
- In water, white phosphorus reacts with oxygen within hours or days.
- In water with low oxygen, white phosphorus may degrade to a highly toxic compound called phosphine, which eventually evaporates to the air and is changed to less harmful chemicals.
- White phosphorus can build up slightly in the bodies of fish that live in contaminated lakes or streams.

- In soil, white phosphorus may stick to particles and be changed within a few days to less harmful compounds.
- In deep soil or sediments with little oxygen, white phosphorus may remain unchanged for many years.

Sources & Routes of Exposure

Sources of Exposure [3]

- Breathing contaminated air near a facility that is using white phosphorus.
- Eating contaminated fish or game birds from sites containing white phosphorus.
- Drinking or swimming in water that has been contaminated with white phosphorus.
- Touching soil contaminated with white phosphorus.
- If you work in industries that use or manufacture white phosphorus or munitions containing white phosphorus.

Routes of Exposure [4]

White phosphorus can be absorbed into the body by inhalation, ingestion, or skin contact. It is unknown whether systemic exposure can occur from eye contact.

Health Effects [5]

Acute Effects

- Acute oral exposure to high levels of white phosphorus in humans is characterised by three stages: the first stage consists of gastrointestinal effects; the second stage is symptom-free and lasts about 2 days; the third stage consists of a rapid decline in condition with severe gastrointestinal (vomiting, abdominal cramps and pain), kidney, liver, cardiovascular, and CNS effects.
- Acute inhalation exposure has resulted in respiratory tract irritation and coughing in humans.
- Respiratory, liver, and kidney effects have been reported in animals acutely exposed to white phosphorus smoke via inhalation.
- Dermal exposure to white phosphorus in humans may result in severe burns, which are necrotic, yellowish, fluorescent under ultraviolet light, and have a garlic-like odour.
- Acute animal tests in rats and mice have shown white phosphorus to have extreme acute toxicity from oral exposure.

Chronic Effects

- Chronic exposure to white phosphorus in humans results in necrosis of the jaw, termed "phossy jaw." Progressive symptoms begin as a local inflammation or irritation and proceed to swelling, ulceration, and destruction of the jawbone with perforation to the sinus or nasal cavities and externally to the cheek.
- In one occupational study, anaemia and leukopenia were observed.
- Animal studies have reported effects on the blood from inhalation exposure to white phosphorus.

- The Reference Dose (RfD) for white phosphorus is 0.00002 milligrams per kilogram body weight per day (mg/kg/d) based on reproductive effects (parturition mortality and forelimb hair loss in rats).
- EPA has not established a Reference Concentration (RfC) for white phosphorus.
- The California Environmental Protection Agency (CalEPA) has calculated an inhalation reference exposure level of 0.00007 milligrams per cubic metre (mg/m3) based on a route-to-route extrapolation of EPA's RfD. The CalEPA reference exposure level is a concentration at or below which adverse health effects are not likely to occur.
- ATSDR has calculated an acute inhalation minimal risk level (MRL) of 0.02 mg/m3 for white phosphorus smoke based on respiratory effects in humans. The MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure.

Reproductive/Developmental Effects

- No information is available on the reproductive or developmental effects of white phosphorus in humans.
- An animal study reported a high maternal mortality rate from oral exposure to white phosphorus.

Cancer Risk

- No information is available on the carcinogenic effects of white phosphorus in humans or animals.
- EPA has classified white phosphorus as a Group D, not classifiable as to human carcinogenicity.

Safety [6]

First Aid Measures

- Inhalation: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, qualified personnel should administer oxygen. If respiration or pulse has stopped, have a trained person administer Basic Life Support (Cardio-Pulmonary Resuscitation/Automatic External Defibrillator) and CALL FOR EMERGENCY SERVICES IMMEDIATELY.
- Skin Contact: Immediately immerse contaminated areas under water. GET MEDICAL ATTENTION IMMEDIATELY. Keep contaminated area immersed in water until medical attention arrives. Remove contaminated clothing, jewellery and shoes. Discard contaminated clothing and footwear.
- Eye Contact: Immediately flush eyes with a directed stream of water for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissues. Washing eyes within several seconds is essential to achieve maximum effectiveness. GET MEDICAL ATTENTION IMMEDIATELY.
- Ingestion: Never give anything by mouth to an unconscious or convulsive person. If swallowed, do not induce vomiting. Give large amounts of water. If vomiting occurs spontaneously, keep airway clear. Give more water when vomiting stops. GET MEDICAL ATTENTION IMMEDIATELY.

Fires Information

- Fire Hazard: Phosphorus poses a severe fire hazard. Will ignite on exposure to air. If allowed to dry, contaminated water may ignite.
- Extinguishing Media: Use regular foam, water, wet sand or earth. Do not use alkaline-based extinguishing agents.
- Fire Fighting: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Do not scatter spilled material with high-pressure water streams. Avoid inhalation of material or combustion by-products. Wear NIOSH approved positive-pressure self-contained breathing apparatus operated in demand mode.
- Flash Point: Spontaneously flammable
- Autoignition Temperature: 86 F (30 C)
- Hazardous Combustion Products: Phosphorus pentoxide, Oxides of phosphorus

Exposure Controls & Personal Protection

Engineering Controls

- Use closed systems when possible.
- General or local exhaust ventilation and other forms of engineering controls are the preferred means for controlling exposures.
- Ensure compliance with applicable exposure limits.

Personal Protective Equipment

The following personal protective equipment is recommended when handling white phosphorus:

- Eye Protection: Wear splash resistant safety goggles with a face shield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area. A quick drench tank should be used if feasible.
- Skin and Body Protection: Wear chemical resistant clothing and rubber boots when potential for contact with the material exists. In certain situations, a full body suit with hood and boots may provide short-term protection.
- Hand Protection: Wear appropriate chemical resistant gloves.
- Protective Material Types: Best Nitty Gritty(R), Aluminised Kevlar(R)
- Respiratory Protection: Supplied air is required unless there is no phosphine gas or phosphorus pentoxide present. A NIOSH approved respirator with acid gas cartridges/N95 filters cartridges may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits, or when symptoms have been observed that are indicative of overexposure. A respiratory protection program that meets 29 CFR1910.134 must be followed whenever workplace conditions warrant use of a respirator.

Regulation [3,7]

United States

EPA: The Environmental Protection Agency has listed white phosphorus as a Hazardous Air Pollutant. The EPA requires that spills or accidental releases into the environment of 1 pound or more of white phosphorus be reported to the EPA.

The National Institute for Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), and the American Conference of Governmental Industrial Hygienists (ACGIH) have all set the inhalation exposure limit for white phosphorus in the workplace during an 8-hour workday at 0.1 milligram of white phosphorus per cubic metre of air (0.1 mg/m³).

Australia

Safe Work Australia: Safe Work Australia has set an 8-hour Time Weighted Average (TWA) concentration of 0.1 mg/m³

References

- http://en.wikipedia.org/wiki/Phosphorus
- http://www.atsdr.cdc.gov/toxprofiles/tp103.pdf
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- http://www.cdc.gov/niosh/ershdb/EmergencyResponseCard_29750025.html
- http://www.epa.gov/ttn/atw/hlthef/whitepho.html
- http://archpdfs.lps.org/Chemicals/Phosphorus_white.pdf
- http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/639/Workplace_Exposure_Standards_for_Airborne_Contaminants.pdf

JANET'S CORNER

Who Am I?

2 Apr 2026

I am the king of chemicals, produced in greater tonnage worldwide than any other substance, yet few people know my face.

My oily character and colorless purity belie my ferocious appetite—I devour organic matter and release terrifying heat when diluted.

I am essential to refining petroleum, producing fertilizers, and manufacturing countless industrial products; without me, modern civilization stutters.

My chemical formula is H_2SO_4, and I am so corrosive that I must be stored in glass or specialized plastic containers to prevent catastrophic reactions.