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*** While Chemwatch has taken all efforts to ensure the accuracy of information in this publication, it is not intended to be comprehensive or to render advice. Websites rendered are subject to change.**

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ASIA PACIFIC

China released the list of chemicals under priority control (second batch)

2020-11-04

China MEE issued the "List of Chemicals under Priority Control (second batch)" (the "Priority Chemicals") on 2 Nov. 2020.

Chemicals listed in the "Priority Chemicals" are considered to be inherently hazardous, may exist in the environment for a long time and may pose greater environmental risks to the environment and human health. These chemicals will be restricted, phased out and replaced in production, use, import and export. There are no nickel related compounds in the "Priority Chemicals".

Enterprises that use, produce or discharge chemicals listed in the "Priority Chemicals" shall, in accordance with the "Cleaner Production Promotion Law of the PRC" and the "Measures for Cleaner Production Review", conduct cleaner production review mandatorily. These enterprises shall publicize enterprise information in a manner that is easily accessible to the public, including the names, quantities and uses of toxic and hazardous raw materials used, as well as the names, concentrations and quantities of toxic and hazardous substances discharged.

In addition, chemicals simultaneously listed in the "Priority Chemicals" and corresponding environmental management lists such as the "List of Toxic and Harmful Atmospheric Pollutants", "List of Toxic and Harmful Water Pollutants" and "List of Toxic and Harmful Substances in Soil for Priority Control", shall be managed in accordance with the "Atmospheric Pollution Prevention and Control Law of the PRC", the "Water Pollution Prevention and Control Law of the PRC" and the "Soil Pollution Prevention and Control Law of the PRC".

With the introduction of relevant national standards, chemicals listed in the "Priority Chemicals" will be restricted to use in certain products, and be included in the "List of State-encouraged Substitutes for Toxic and Hazardous Raw Materials (Products)".

There are no nickel related compounds in the "Priority Chemicals".

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Full Article

CIRS, 4 November 2020

<http://www.cirs-reach.com/news-and-articles/China-Released-the-List-of-Chemicals-under-Priority-Control-Second-Batch.html>

Request for pack size changes for agricultural products

2020-11-06

A variation to the registered pack size(s) constitutes a change to the relevant particulars of a registered product (the net contents being a relevant particular). The registered pack size(s) of a product can be varied via several pathways depending on whether the new pack size falls within the range currently registered.

The Australian Pesticides and Veterinary Medicines Authority (APVMA) often receives notifiable variation (NV) applications for agricultural products requesting inclusion of additional pack sizes on a label. These NV applications would be unnecessary if the original registered pack size was specified as a range rather than discrete pack sizes. For example, a product approved in 5 L and 20 L containers would require an NV application to add a 10 L container to the label. Had the original pack size been specified as '5 to 20 L' no NV application would be required.

This news item is a reminder to registrants for agricultural products that by specifying a packaging range for new products they could potentially avoid the need for subsequent NV applications. This does not apply to requests for additional packaging sizes outside an existing range which, depending on the circumstances, would be considered via an Item 12 or Item 14 application (see our [tailored guidance for applicants](#) for more information).~sAPVMA, 6 November 2020

<https://apvma.gov.au/>

GHS 7 transition—updates to the model WHS Regulations amendment

2020-11-05

Safe Work Australia has updated the model Work Health and Safety Regulations (Hazardous Chemicals) Amendment 2020 and explanatory statement for the transition to GHS 7.

The Globally Harmonized System of Classification and Labelling of Chemicals Revision 7 (GHS 7) is a global method of classifying chemicals

For example, a product approved in 5 L and 20 L containers would require an NV application to add a 10 L container to the label.

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and preparing labels and safety data sheets (SDS). Australia will begin a two-year transition to GHS 7 from 1 January 2021.

The updates correct an error that could have required businesses to relabel old stock of hazardous chemicals in some circumstances.

If you have downloaded the previous versions, you should re-download the updated versions. The versions published on 5 November 2020 should be used in place of the original published on 28 August 2020 in all cases.

These updated amendments will be inserted into the model WHS Regulations from 1 January 2021.

Please note that amendments to the model WHS Regulations do not automatically apply in a jurisdiction. For the model WHS Regulations, including any amendments, to have effect in a jurisdiction, they must be made in that jurisdiction. Review the WHS laws in your jurisdiction and contact your WHS regulator for more information.

To help businesses understand the changes required under GHS 7, Safe Work Australia has published a dedicated GHS 7 web page and suite of information sheets. For more information, go to the GHS 7 web page.

Safe Work Australia, 5 November 2020

<https://www.safeworkaustralia.gov.au/>

AMERICA

US EPA to regulate most uses of carbon tetrachloride

2020-11-06

Agency finds more than a dozen applications pose unreasonable risks to workers

The use of carbon tetrachloride as an intermediate in chemical manufacturing and in many other commercial and industrial applications presents unreasonable risks to worker health, the US Environmental Protection Agency concludes in a final risk assessment released Nov. 3. The agency plans to issue measures to mitigate the risks within the next 2 years.

The EPA found risks to workers associated with inhalation and dermal exposure for 13 industrial uses of carbon tetrachloride. However, the agency found no unreasonable risks to workers in the semiconductor

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industry who use carbon tetrachloride as a reactant in reactive ion etching and to people who distribute the chemical. The EPA also found no unreasonable risks to the environment or to consumers.

As it has done with other recent assessments under the Toxic Substances Control Act (TSCA), the EPA did not evaluate the risks of carbon tetrachloride on the general population from sources such as industrial emissions to air or water. Instead, the agency punted those evaluations to other EPA programs.

Carbon tetrachloride is commonly used as a feedstock to manufacture refrigerants, agricultural chemicals, chlorinated solvents, and other chemicals. The EPA considers carbon tetrachloride "likely to be carcinogenic to humans." The substance can also have adverse effects on the central nervous system, liver, and kidneys, and irritate skin.

Most nonfeedstock uses of carbon tetrachloride were phased out under the Montreal Protocol, an international treaty that aims to protect the Earth's stratospheric ozone layer. Carbon tetrachloride is an ozone-depleting substance. Currently there are no consumer uses of carbon tetrachloride, according to the EPA.

[Full article](#)

Chemical & Engineering News, 6 November 2020

<https://cen.acs.org/policy/chemical-regulation/US-EPA-regulate-uses-carbon/98/i43>

Illegal air pollution is skyrocketing in Texas, but state regulators are ignoring complaints

2020-11-05

An environmental watchdog submitted evidence of dozens of violations, but the state's environmental agency rarely followed up.

It's no secret that in the Permian Basin, one of the world's most productive oil and gas fields, pollution is everywhere. Industrial facilities burn off so much excess natural gas that you can see the flares from space. But as all that gas burns off, it releases thousands of pounds of invisible, hazardous air pollution. For years, the environmental advocacy group Earthworks has been trying to make that problem visible: Using thermal imaging, staff has captured hundreds of images of pollution pouring out of broken pipes, tank hatches, and flares. Yet state regulators have done little to address some of the most obvious violations.

The EPA found risks to workers associated with inhalation and dermal exposure for 13 industrial uses of carbon tetrachloride.

Industrial facilities burn off so much excess natural gas that you can see the flares from space.

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Since 2015, Earthworks has sent the Texas Commission on Environmental Quality (TCEQ) documentation of more than 140 industrial emissions violations. It's the agency's job to investigate whether or not the evidence is proof of a violation, and whether or not to levy a fine or require repairs at the facility. However, only 17 of the complaints, or about one in every eight, that Earthworks filed led to any type of enforcement action by TCEQ or the Texas Railroad Commission, which also oversees oil and gas permits in the state. In 58 of those documented cases, TCEQ sent an inspector to the alleged violator but didn't issue any citations, according to a new report from the environmental group. Most of the time, Earthworks never received a response from the agency at all.

Full Article

Texas Observer, 5 November 2020

<https://www.texasobserver.org/texas-illegal-air-pollution/>**EPA requests comments on its proposal to add chitosan to minimum risk pesticide active ingredient list**

2020-11-03

On November 2, 2020, the U.S. Environmental Protection Agency (EPA) published a notice in the Federal Register announcing the proposed rule to add chitosan (Poly-D-Glucosamine) to its list of active ingredients eligible for EPA's minimum risk pesticide exemption under Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Section 25(b). 85 Fed. Reg. 69307.

The proposed rule is in response to a petition submitted to EPA on October 10, 2018, requesting that chitosan be added to the list of active ingredients eligible for EPA's minimum risk exemption, followed by an April 4 2019, amended petition seeking also to add chitosan to the list of inert ingredients eligible for the minimum risk exemption. EPA on August 20, 2020, issued a Federal Register notice stating that a draft regulatory document on this issue had been forwarded to the U.S. Department of Agriculture (USDA). EPA states that no comments were submitted on that notice by USDA or any other person. EPA also forwarded the draft to the FIFRA Scientific Advisory Panel for review, but according to EPA, the Panel "waived review of this proposed rule, concluding that the proposed rule does not contain scientific issues that warrant scientific review by the Panel." On October 8, 2020, EPA again announced it was considering adding chitosan to the list of active ingredients allowed for use in

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minimum risk pesticides and provided a pre-publication version of the proposed rule.

EPA states in the November 2, 2020, Federal Register notice regarding the proposed rule: "Based on all the information available to the Agency, there are low risk concerns for human health or the environment if chitosan is intended for use as a minimum risk pesticide." According to EPA, adding chitosan to this list may save stakeholders time and money through waived FIFRA registration requirements for certain products containing chitosan. Specifically, EPA estimates the cost savings of avoiding the application process (e.g., guideline studies, registration fees) to be up to \$116,000 initially and approximately \$3,400 per year thereafter for each new product.

Full Article

Pesticide Law and Policy Blog, 3 November 2020

<http://pesticideblog.lawbc.com/entry/epa-requests-comments-on-its-proposal-to-add-chitosan-to-minimum-risk-pesti>**PFAS regulations for groundwater could be imminent**

2020-11-03

Lathrop GPM LLP attorneys say more federal and state action on PFAS in groundwater is likely under a Biden administration, but is also possible under another Trump administration. They say companies facing potential liability should prepare for more regulation regardless of who wins the election, and they suggest specific steps to do so.

There are few certainties leading up to this year's presidential election, but it's a good bet that questions surrounding PFAS in groundwater—particularly the fate of federal regulations about so-called "forever chemicals"—could be answered soon if Joe Biden is elected.

The former vice president's environmental plan specifically includes language about designating per- and polyfluoroalkyl substances, commonly referred to as PFAS, "as a hazardous substance," and setting enforceable limits for PFAS in the Safe Drinking Water Act.

This comes after the Trump administration in 2019 moved forward with a PFAS action plan—but as yet no regulations.

This comes after the Trump administration in 2019 moved forward with a PFAS action plan—but as yet no regulations.

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Full Article

Bloomberg Law, 3 November 2020

<https://news.bloomberglaw.com/environment-and-energy/pfas-regulations-for-groundwater-could-be-imminent>

EUROPE

Regulation of plant protection products (PPP is entering uncharted waters

2020-11-02

'FOR MOST people, the regulation of chemicals is not something that they will often think about, but chemicals are found in pretty much everything – from hand gel to cosmetics. Chemical manufacturing is a vital component of many other industries which is why active substances are so heavily regulated.

The chemicals industry currently faces a 'double whammy' with the threat of a no-deal or hard Brexit, and potentially diverging rules between the UK and the EU.

Even if agreement on a trade deal is reached, from January 1, 2021, the UK will no longer participate in the EU's Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) system and has instead established UK REACH under the Health and Safety Executive.

New applications for active substance approvals, PPP authorisations and Maximum Residue Levels (MRLs) will need to be separately submitted under the GB and EU regimes to gain access to both markets. The cost to companies having to apply under these parallel systems has been estimated at £1 billion.

The Scottish Farmer, 2 November 2020

<https://www.thescottishfarmer.co.uk/news/18831845.regulation-plant-protection-products-ppp-entering-uncharted-waters/>

Chemical manufacturing is a vital component of many other industries which is why active substances are so heavily regulated.

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Free movement of goods: Commission asks FRANCE to remove obstacles to parallel imports of veterinary medicinal products

2020-10-30

The Commission decided today to send a letter of formal notice to France regarding obstacles to parallel import of veterinary medicinal products by farmers for their own livestock. Following the Court's ruling in C-114/15 AUDACE, farmers are allowed to import veterinary medical products from other Member States, for use on their own livestock. The French measures, by conditioning such imports to very high administrative fees restrict de facto the possibility to import in parallel. This constitutes a violation of Articles 34 to 36 Treaty on the Functioning of the European Union (TFEU). France now has two months to reply to the concerns raised by the Commission; otherwise the Commission may decide to send a reasoned opinion.

European Commission, 30 October 2020

https://ec.europa.eu/commission/presscorner/detail/en/inf_20_1687

New European Union looks at chemical mixtures

2020-10-30

The European Union (EU) adopted, in mid-October, a **new strategy on chemicals — including pesticides** — that seeks to deal with their combined (synergistic) and cumulative impacts on human and environmental health. A highlight of the **new strategy** is the acceleration of work, already begun across the EU, to address the "chemical cocktail" impacts of pesticides and other chemicals. Human exposures to such "cocktails" can happen through use of multiple different agricultural pesticides that can persist as residues on food, and via industrial processes and consumer products. Beyond Pesticides has insisted for years that, here in the states, the Environmental Protection Agency (EPA) has been way **behind the eight ball in dealing with the potential synergistic** and cumulative impacts of the pesticides its registers for use. Advocates have argued that **the agency must be far more rigorous** in evaluating impacts of exposures to multiple pesticides, as well as cumulative impacts.

The toxicity problem the EU seeks to address is that interacting chemicals can have synergistic effects, even at very low levels — effects greater than and/or different from the expected impacts of each chemical per se. Pesticides can also have cumulative "toxic loading" effects in both the

The Commission decided today to send a letter of formal notice to France regarding obstacles to parallel import of veterinary medicinal products by farmers for their own livestock.

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immediate and long terms. **The new EU strategy states** that, though “it is currently ‘not realistic nor economically feasible’” to evaluate every possible combination of the thousands of chemicals used in industry and society, there is emerging scientific consensus that the impacts of chemical cocktails “need to be taken into account and integrated more generally into chemical risk assessments.” Beyond Pesticides concurs.

Full Article

Beyond Pesticides, 30 October 2020

<https://beyondpesticides.org/dailynewsblog/2020/10/new-european-union-looks-at-chemical-mixtures/>

INTERNATIONAL

GLOBAL CHEMICALS INVENTORY COULD REDUCE INDUSTRY’S NOTIFICATION OBLIGATIONS

2020-11-06

A panel of government officials, discussing whether the OECD could develop an inventory of chemicals on the market around the world, agreed that this would require significant resources but could benefit multinational exporting companies by reducing national notification obligations.

In a session of the OECD’s chemicals management virtual conference, held on 3-4 November, best practices were looked at for setting up and maintaining such an inventory. The panel, comprising representatives of national and regional agencies in the US, EU and Vietnam, posed the question of feasibility and what benefits it could bring.

Le Viet Thang, deputy head of the conventions and international cooperation division of Vietnam’s chemicals agency, said that as a developing nation in the process of creating its own inventory, a global centralised system would offer more insight into where chemicals are being used locally and internationally.

The same chemical can be listed on many inventories in the EU, Japan, South Korea and the US, he said. An international inventory could recognise national or regional lists and harmonise them, helping

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businesses avoid confusion over national notification obligations, and potentially reduce authorities’ work with industry to identify the status of the chemical in a particular country.

For example, if two countries use different terminology for their inventories, it becomes difficult for an exporting company to know if their chemicals are ‘existing’ or ‘new’ in the destination country.

Reducing burden

Bob Diderich, head of the OECD’s environmental health and safety division, told Chemical Watch it’s likely that developing a global inventory will increase the number of ‘existing’ chemicals and therefore reduce the burden on companies, because less of their chemicals will need to be notified as ‘new’.

Yvette Collazo, director of the Office of Pollution Prevention and Toxics at the US EPA, agreed that it would be a useful tool, despite the effort needed to obtain the data and manage it. “Not only [would a global inventory be useful] for the different countries and regions but also the multinational companies and supply chains,” she said.

Taking a different perspective, Jukka Malm, Echa’s deputy executive director, said there is “certainly room for jurisdictions to work closer together on developing inventories, however, adopting a single, international inventory that would serve everyone” may not be the best available option because there is such variation in chemicals management approaches.

He suggested benefits would result from improved methodologies that still recognise countries may develop different regulatory frameworks. This is important, he said, because chemical inventories are designed to serve a country or region’s regulatory system and therefore any international work must consider these variations in approaches.

“But I do realise that a lot more support can be provided to help countries, especially developing nations, develop inventories and chemicals management frameworks,” he added.

Mr Malm said another useful project would be to try and identify the differences and overlaps between inventories. “This is not as easy as it may seem because, for example, you can have the same chemical on more than one inventory but it could be differently identified in each list,” he said.

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This increases the time it takes for authorities and industry to identify how a substance is restricted in a certain country and in turn identify potential alternatives, he added.

Mr Diderich said forming a global chemicals inventory would “indeed be a great endeavour and clearly a topic that the OECD could look into”.

However, he said the challenges would be to obtain and designate the required resources, which would be vast for such a global system, and long-term maintenance would need to be assured – all requiring a lot of funding.

‘Affordable’ projects

The panel also identified other “affordable” projects that the OECD could initiate. Most significantly, it suggested the organisation develop a best practice guide for establishing an inventory.

Mr Diderich acknowledged the “high interest” in understanding the overlap between inventories. To address this, “improving consistency in the use of chemical ID descriptors sounds like a valuable first project,” he added.

The OECD plans to discuss in the coming days how it can take forward projects to address issues highlighted during the two-day conference.

Full Article

Chemical Watch, 6 November 2020

<https://chemicalwatch.com/175351/global-chemicals-inventory-could-reduce-industrys-notification-obligations>

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REACH Update

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Act now—updated IT tools and Brexit advice for companies

2020-11-05

Helsinki, 5 November 2020 – ECHA has updated its IT tools and dedicated web section on the UK’s withdrawal from the EU including Q&As with advice to companies.

The transition period of the UK’s withdrawal from the EU ends on 31 December 2020, and the Protocol on Ireland and Northern Ireland starts to apply from 1 January 2021.

REACH, CLP, the BPR, PIC and POPs will continue to apply in Northern Ireland (UK(NI)) after the transition period, but will no longer apply in the rest of the UK (UK(GB)).

Downstream users in the EU/EEA should check the list of substances registered only by UK companies on ECHA’s website to see if they need to take action before the end of the transition period. If they plan to get their supply from the UK(GB) after the end of the transition period, they should register the substance themselves as an importer, unless the registration has been transferred to the EU/EEA.

REACH registrations made by UK(GB)-based manufacturers, importers and only representatives will become void if they are not transferred to the EU/EEA before the end of the transition period. Companies are, therefore, urged to act now and not wait until the last minute.

EU/EEA companies will need to submit their own Poison Centre notifications through the ECHA Submission Portal before they import mixtures from the UK(GB). They cannot rely on submissions previously made by UK(GB) suppliers. Previously submitted notifications by UK(NI) companies will remain in the database and be available to relevant EU/EEA authorities. UK(NI) companies can continue to submit notifications through the ECHA Submission Portal to EU/EEA authorities. However, a new legal entity must first be created. Notifications to the UK(NI) market area will not be possible through the ECHA Submission Portal and must be submitted directly to UK authorities.

Product authorisations held by companies based in the UK(GB) under the Biocidal Products Regulation will need to be transferred to a new authorisation holder within the EU/EEA by the end of the transition period.

Furthermore, companies based in the EU and UK(NI) can now submit PIC export notifications in ePIC for non-EU countries, including UK(GB), taking

Companies are, therefore, urged to act now and not wait until the last minute.

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place as of 1 January 2021. Exports of PIC substances from the EU to UK(NI) do not require notification under the PIC Regulation.

ECHA, 5 November 2020

<https://echa.europa.eu/-/act-now-updated-it-tools-and-brex-it-advice-for-companies>

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Janet's Corner

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Fun Guy

2020-11-12

Why is the mushroom
always invited to parties?



Because he's a fun guy.
(fungi)

d.

<https://www.pinterest.com.au/pin/150870656256452485/>

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Hazard Alert

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Acridine

2020-11-13

Acridine is a colourless crystalline organic solid that is obtained from coal tar. Its formula is $C_{13}H_9N$. [1]

USES [2,3]

Acridine has a range of uses across various applications. It is used in the manufacture and synthesis of drugs and dyes. In the latter category, acridine orange, a fluorescent dye used for cell cycle determination. The acridine proflavine is used as an antiseptic.

ROUTES OF EXPOSURE [4]

- The main routes of exposure to acridine are ingestion, inhalation and skin contact.

HEALTH EFFECTS

Acridine poisoning affects a range of systems, including the integumentary and respiratory systems.

Acute Effects [2]

Severity of symptoms depend on the level and type of exposure. If inhaled, this compound can irritate the respiratory system. People with already impaired respiratory function, such as chronic bronchitis, could be more impactfully affected. High level doses of ingestion may be fatal. Skin exposure to the chemical could cause dermatitis, and could result in phototoxicity. Skin contact with this compound could exacerbate any pre-existing dermal conditions. Eye contact with acridine could result in irritation and/or ocular lesions.

Chronic Effects [2]

Chronic exposure to acridine is toxic to multiple body systems. Long term exposure to the compound may result in difficulty breathing and related systemic problems. This material may produce carcinogenic effects. It may also produce cumulative health effects.

~h1Safety

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Hazard Alert

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First Aid Measures [2]

- Ingestion: DO NOT induce vomiting. Contact a medical professional immediately.
- Skin contact: Avoid direct contact with contaminated clothing. Wearing protective clothing if necessary, remove all contaminated clothing, footwear and accessories. Do not re-wear clothing until it has been thoroughly decontaminated. Rinse with soap and flowing water for at least 30 minutes. Contact a doctor immediately.
- Eye contact: Flush eyes (including under the eyelids), with fresh running water for at least 30 minutes. Removal of contact lenses should only be done by skilled personnel. Do not stop flushing due to the lens. Contact a medical professional at once.
- Inhalation: Move the patient to a fresh air source. Keep them warm and rested. Prosthesis, such as false teeth, should be removed prior to conducting CPR. Contact a doctor immediately.
- General: Never administer anything by mouth to an unconscious, exposed person.

Exposure Controls/Personal Protection [2]

- Engineering controls: Emergency eyewash fountains and quick-drench areas should be accessible in the immediate area of the potential exposure. Ensure there is adequate ventilation, or use a local exhaust ventilation.
- Personal protection: Safety glasses with side shields or chemical goggles, protective and dustproof clothing, gloves (e.g. PVC), a P.V.C apron and an appropriate mask or dust respirator. Do not wear contact lenses as they could absorb chemicals in the air. Wear impervious shoes or gumboots. Other protection could overalls. For specifications regarding other PPE, follow the guidelines set in your jurisdiction.

REGULATION [5]

United States:

The Occupational Safety and Health Administration (OSHA) has set a Time Weighted Average (TWA) concentration limit for acridine of $2\text{mg}/\text{m}^3$.

Australia [2]

Australia Exposure Standards have set a TWA for acridine of $0.2\text{mg}/\text{m}^3$.

Acridine is a colourless crystalline organic solid that is obtained from coal tar.

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5. <https://www.cdc.gov/niosh/npg/npgd0145.html>

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Gossip

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How COVID-19 may trigger dangerous blood clots

2020-11-02

Some of COVID-19's dangerous blood clots may come from the immune system attacking a patient's body rather than going after the virus, a new study suggests.

It's known that excessive inflammation from an overactive immune response can spur the clots' formation in severely ill patients (SN: 6/23/20). Now researchers are teasing out how. Some of that clotting may come from auto-antibodies that, instead of recognizing a foreign invader, go after molecules that form cell membranes. That attack may prompt immune cells called neutrophils to release a web of genetic material geared at trapping virus particles outside of the cells.

"Presumably in the tissues, this is a way to control infections," says Jason Knight, a rheumatologist at the University of Michigan in Ann Arbor. "But if you do it in the bloodstream, it's very triggering of thrombosis," or clotting.

That may be what happens in some COVID-19 patients, Knight, cardiologist Yogen Kanthi of the National Institutes of Health in Bethesda, Md., and their colleagues report November 2 in *Science Translational Medicine*. With COVID-19, blood clots in the lungs have been a significant cause of death, Kanthi says. And some blood clots may form when the webs trap red blood cells and platelets, creating a sticky clump that can clog blood vessels.

"These are very intriguing findings," says Jean Connors, a clinical hematologist at Harvard Medical School and Brigham and Women's Hospital in Boston who was not involved in the work. "There has been a lot of speculation about what the presence of [the auto-antibodies] means and whether they have any pathogenic role."

Studies have revealed that some auto-antibodies can interfere with the immune response to viruses (SN: 9/25/20). Some preliminary work further suggests that auto-antibodies that bind to a variety of targets in the host may be a common feature in severely ill COVID-19 patients.

Auto-antibodies that recognize cell membrane molecules called phospholipids can cause an autoimmune disease called antiphospholipid syndrome, or APS. In people with APS, the auto-antibodies can activate clot-forming cells, putting those patients at higher risk of blood clot formation.

With COVID-19, blood clots in the lungs have been a significant cause of death, Kanthi says.

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These detrimental antibodies can also appear during bacterial or viral infections such as strep throat or HIV. But it's difficult to determine whether the antibodies lead to blood clotting during infection, Connors says, especially because some healthy people might also have low levels without forming clots.

Severely ill COVID-19 patients can have high levels of neutrophils, and some have phospholipid-binding antibodies in their blood. So Knight and his colleagues wondered whether the antibodies might be causing neutrophils to release traps that trigger clotting.

Of 172 hospitalized COVID-19 patients included in the study, more than half had auto-antibodies that recognized one of three different types of host phospholipids. The presence of those immune proteins was linked to having high levels of neutrophils in the blood and proteins that suggested the neutrophils had joined the fight. And when the researchers mixed auto-antibodies taken from six COVID-19 patients with neutrophils grown in lab dishes, the neutrophils cast their nets. What's more, when the team injected patient auto-antibodies into mice, the rodents formed blood clots — hinting that clotting in people could be triggered by the immune proteins.

It's unlikely that phospholipid auto-antibodies are the whole story, says Thomas Kickler, a hematologist at Johns Hopkins School of Medicine who was not involved in the work. Other inflammatory immune responses also trigger clots, so auto-antibodies are probably one piece of the puzzle. Of the people in the study, for instance, 11 patients developed blood clots, and only half of them had the auto-antibodies.

More work needs to be done to directly link the immune proteins to clotting in people with COVID-19, Connors says. But the study does suggest one possible mechanism for how the clots form.

Removing the problematic antibodies through a process called plasmapheresis, in which the liquid part of blood is filtered, could help critically ill COVID-19 patients who don't respond to other therapies to stop clotting, Knight says. That plasma, however, would also contain antibodies that recognize and attack the coronavirus. So doctors may need to give those patients lab-made immune proteins to fight the virus if it is still replicating in their body.

sciencenews.org, 2 November 2020

<https://www.sciencenews.com>

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Japan faces another Fukushima disaster crisis

2020-11-03

LONDON, 3 November, 2020 – The Japanese government has an unsolvable problem: what to do with more than a million tonnes of water contaminated with radioactive tritium, in store since the Fukushima disaster and growing at more than 150 tonnes a day.

The water, contained in a thousand giant tanks, has been steadily accumulating since the nuclear accident in 2011. It has been used to cool the three reactors that suffered a meltdown as a result of the tsunami that hit the coast.

Tritium is a radioactive element produced as a by-product by nuclear reactors under normal operation, and is present everywhere in the fabric of the reactor buildings, so water used for cooling them is bound to be contaminated by it.

To avoid another potentially catastrophic meltdown in the remaining fuel the cooling has to continue indefinitely, so the problem continues to worsen. The government has been told that Japan will run out of storage tanks by 2022.

Announcement delayed

As often happens when governments are faced with difficult problems, the unpalatable decision to release the contaminated water into the sea has not been formally announced, but the intention of the government to take this course has been leaked and so widely reported.

Immediately both local and worldwide adverse reaction has resulted. There are the direct effects on the local fishermen who fear that no one will want to buy their catch, but over a wider area the health effects are the main concern.

As ever with the nuclear industry, there are two widely different views on tritium. The Health Physics Society says it is a mildly radioactive element that is present everywhere, and doubts that people will be affected by it. But the Nuclear Information and Resource Service believes tritium is far more dangerous and increases the likelihood of cancers, birth defects and genetic disorders.

The issue is further complicated because the Fukushima wastewater contains a number of other radionuclides, not in such high quantities, but sufficient to cause damage. Ian Fairlie, an independent consultant on

The government has been told that Japan will run out of storage tanks by 2022.

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radioactivity in the environment, is extremely concerned about Japan's plans and the health of the local people.

In a detailed assessment of the situation he says other highly dangerous radioactive substances, including caesium-137 and strontium-90, are also in the water stored at Fukushima.

They are in lower quantities than the tritium, he says, but still unacceptably high – up to 100 times above the legally permitted limit. All these radionuclides decay over time – some take thousands of years – but tritium decays faster, the danger from it halving every 12.3 years.

In a briefing for the Nuclear Free Local Authorities (NFLA), a UK based organisation, another independent analyst, Tim Deere-Jones, discusses research that shows that tritium binds with organic material in plants and animals.

This is potentially highly damaging to human health because it travels up the food chain in the marine environment, specifically accumulating in fish. This means fish-eating communities on the Japanese coast could ingest much larger quantities of tritium than some physicists think likely.

Relying on dilution

Tim Deere-Jones is also concerned that the tritium will be blown inshore on the prevailing wind in sea spray and will bio-accumulate in food plants, making it risky to eat crops as far as ten miles inland. Because of the potential dangers of releasing the water the NFLA has asked the Japanese government to reconsider its decision.

The government has not yet responded though, because officially it is still considering what to do. However, it is likely to argue that pumping the contaminated water into the sea is acceptable because it will be diluted millions of times, and anyway seawater does already contain minute quantities of tritium.

Dr Fairlie is among many who think this is too dangerous, but he admits there are no easy solutions.

He says: "Barring a miraculous technical discovery which is unlikely, I think TEPCO/Japanese Gov't [TEPCO is the Tokyo Electric Power Company, owner of the Fukushima Daiichi plant] will have to buy more land and keep on building more holding tanks to allow for tritium decay to take place. Ten half-lives for tritium is 123 years: that's how long these tanks will have to last – at least.

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"This will allow time not only for tritium to decay, but also for politicians to reflect on the wisdom of their support for nuclear power." – Climate News Network

cliamtenewsnetwork.net, 3 November 2020

<https://website>

'We don't have time to lose': plans for coral ark to help save the world's reefs

2020=10-29

A Noah's ark-like plan to house hundreds of the world's most at-risk coral species at a publicly accessible bank next to the Great Barrier Reef could prove an important part of long-term coral conservation, marine biologists say.

The Living Coral Biobank, labelled a "coral ark" by its proponents, would serve as a technologically advanced facility where 800 different types of hard corals would be kept and bred, in the event live samples are needed to revive populations wiped out in nature in the future.

Inspired by Norway's global seed vault, and with architecture influenced by mushroom coral, the bank will also include a function space, research labs, and serve as an aquarium-like tourist attraction for Port Douglas in far north Queensland, a gateway to the adjacent Great Barrier Reef.

If built, members of the public would be able to see corals from around the world as they are conserved in tightly controlled settings – and have a chance to observe corals' night time glow.

The facility would be the physical base for the larger Biobank project, a worldwide network of aquariums – both commercial and in residential homes – aimed at coordinating the preservation of diverse coral samples in the event global populations suffer further from misuse and bleaching.

Great Barrier Reef Legacy, the non-profit group behind the Biobank, will begin gathering corals for conservation next week, when the first of its diving teams takes samples of about 20 different species of corals from around the reef to be temporarily housed in the Cairns marina.

The project has already secured about \$4.8m in partnership agreements, including an allotment of land for the bank in Port Douglas, sustainable architectural plans from global firm Contreras Earl, and the backing of Australia's Climate Council.

The Living Coral Biobank, labelled a "coral ark" by its proponents, would serve as a technologically advanced facility where 800 different types of hard corals would be kept and bred...

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The Biobank director and marine biologist, Dr Dean Miller, told Guardian Australia he hopes the facility will be built and house 800 coral species by 2025.

He said the project will need the support of “an Elon Musk or a Richard Branson” if its facility is to be built, but that the Biobank network can “survive like Uber” – relying on public and personal aquariums instead of its own physical infrastructure – until its base can be built.

“We’ve watched very serious bleaching events, and we came to this realisation there were some great conservation projects out there but they were many years from fruition and would only protect a few types of corals.

Miller said the Biobank network will be “a life support system for corals”, and that “there’s a time pressure on this with every bleaching event that happens”.

“Every year we wait, we’re losing corals, and we don’t have any time to lose.”

Prof Ove Hoegh-Guldberg, a researcher of coral bleaching at the University of Queensland who is not linked to Biobank, told Guardian Australia the idea was “very worthy”, and that he had recently co-authored a paper which backed the creation of a “coral ark”.

However Hoegh-Guldberg stressed the Biobank should be pursued alongside several conventional conservation strategies, including marine park rules for sustainable fishing.

He said curbing climate change, which can heat waters and lead to coral bleaching, needed to be the focus of conservation efforts.

“If we don’t get our act together now we could need this as a plan B.”

Corals on the Great Barrier Reef have more than halved over the past 25 years, according to a recent study that prompted scientists to again warn the world-famous landmark will become unrecognisable without a sharp reduction in greenhouse gas emissions.

Last year, the Great Barrier Reef Marine Park Authority, in its five-yearly reef health report, downgraded the outlook for the world’s biggest reef system

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to “very poor”. It has repeatedly said that climate change was the “single greatest challenge” facing the 2,300km reef system.

theguardian.com, 29 October 2020

<https://www.theguardian.com>

Monster bird fossils unearthed in Antarctica

2020-10-31

Not long after the dinosaurs went extinct, a new breed of giants rose: Monster birds with wingspans that stretched up to 21 feet (6.4 meters) long, about the length of a U-Haul truck.

These enormous birds darkened the skies above Antarctica as early as 50 million years ago, a new examination of fossils from the continent finds. The new research reveals that very large species of these birds, called pelagornithids, arose less than 15 million years after an asteroid wiped out the non-avian dinosaurs.

The new study was published Oct. 27 in the journal Scientific Reports. It focused on a bone from a bird’s foot, collected on Seymour Island near the Antarctic Peninsula in the 1980s. In 2015, Peter Kloess, a University of California, Berkeley, paleontology graduate student found the bone in the collections of the University of California Museum of Paleontology. As he looked over the notes accompanying the bone, he realized that the bones were from older rock than had originally been recognized. Instead of being 40 million years old, as it said on the label, the bone was 50 million years old, and far larger than other pelagornithid bones found of that age.

PLAY SOUND

“I love going to collections and just finding treasures there,” Kloess said in a statement. “Somebody has called me a museum rat, and I take that as a badge of honor. I love scurrying around, finding things that people overlook.”

The bone was overlooked no longer. Kloess and his colleagues discovered another pelagornithid bone from the same island and era — a partial lower jaw. Analyzing them both, the researchers concluded that the bird’s skull would have been 2 feet (60 centimeters) long. The animal would have been among the biggest, if not the biggest, pelagornithid ever found.

Pelagornithids were known to be a very old group of birds. The oldest fossil from these birds dates back 62 million years. However, that fossil

Instead of being 40 million years old, as it said on the label, the bone was 50 million years old, and far larger than other pelagornithid bones found of that age.

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was from a species much smaller than the one discovered by Kloess and colleagues.

The newly discovered birds were more similar to the modern-day albatrosses, with huge wingspans that would have allowed them to soar for days or even weeks at a time over the open ocean. Modern-day albatross, however, top out with wingspans of 11.5 feet (3.5 m). The 50-million-year-old pelagornithid would have had a wingspan nearly double that.

The beaks of these ancient sky monsters also had bony projections covered in keratin. These toothlike structures, about 1 inch (3 cm) tall, would have helped the birds hang on to fish and squid scooped from the seas.

Fifty million years ago, Antarctica was warmer than it is today. It was a haven for birds, including early penguins, as well as now-extinct mammals, such as the hoofed sparnotheriodontids, according to a 2014 study in the journal *Paleontology*. Large pelagornithids likely dominated the skies.

"[T]hese bony-toothed birds would have been formidable predators that evolved to be at the top of their ecosystem," study co-author Thomas Stidman of the Institute of Vertebrate Paleontology and Paleoanthropology at the Chinese Academy of Sciences said in the statement.

Pelagornithids likely boasted the largest wingspan of any bird, followed by a group of scavenging birds called teratorns, which evolved 40 million years later. (Some pterosaurs had them both beat: *Quetzalcoatlus northropi*, for example, could extend its giant wings up to 43 feet, or 13 m.) The last pelagornithids went extinct 2.5 million years ago.

[livescience.com](https://www.livescience.com), 31 October 2020

<https://www.livescience.com>

This failed planet is slowly rusting in space

2020-10-31

Roughly two to three times Earth's distance from the sun, in the Asteroid Belt that lies between Mars and Jupiter, 16 Psyche makes its home. This giant metal asteroid is one of the most massive objects in the Asteroid Belt, categorized as a minor planet.

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Astronomers think that 16 Psyche is the exposed core of a full planet that didn't make it all the way, and we're itching to know more about it. NASA will be sending a probe to check it out in the next few years, and in the meantime, scientists are working to glean what they can from Earth.

Now, for the first time, 16 Psyche has been studied in ultraviolet wavelengths using the Hubble Space Telescope, revealing that, just as we thought, the dense chunk of space rock is remarkably metallic. **PLAY SOUND**

"We've seen meteorites that are mostly metal, but Psyche could be unique in that it might be an asteroid that is totally made of iron and nickel," said planetary scientist Tracy Becker of the Southwest Research Institute.

"Earth has a metal core, a mantle and crust. It's possible that as a Psyche protoplanet was forming, it was struck by another object in our Solar System and lost its mantle and crust."

16 Psyche is a pretty fascinating chunk of rock. It's about 226 kilometers (140 miles) across, and just a little less dense than Earth. Its composition seems to consist of somewhere between 30 to 60 percent metal, and the rest low-iron silicate.

If 16 Psyche is a protoplanetary core, it's possible such impacts stripped it of its accumulating material. Planets are thought to form when their stars are very young — possibly even in tandem — and are surrounded by a thick cloud of dust and gas. Material in this cloud starts to stick together, first electrostatically, then gravitationally as the object grows more massive.

As these bodies grow, they become hot and a bit molten, allowing material to move around. Core differentiation is the process whereby denser material sinks inwards towards the center of the object, and less dense material rises outwards. For 16 Psyche to be a differentiated core, the protoplanet would once have had to have been much bigger than it is now.

Exactly when, and how, its outer mantle was stripped away is a bit of a head-scratcher. But Becker's team's research could be the breadcrumbs that put us on the trail to figuring it out.

"We were able to identify for the first time on any asteroid what we think are iron oxide ultraviolet absorption bands," she said. "This is an indication that oxidation is happening on the asteroid, which could be a result of the solar wind hitting the surface."

This giant metal asteroid is one of the most massive objects in the Asteroid Belt, categorized as a minor planet.

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In other words, 16 Psyche is rusting. And we might be able to work out how old its surface is based on how much oxidation has occurred — which in turn could give us a timeline of when the asteroid was stripped of its outer material.

The asteroid's high reflectivity at ultraviolet wavelengths suggests that it's been a long time; usually, ultraviolet brightness is linked with space weathering. But we won't know for sure until NASA's Psyche probe reaches the asteroid sometime around 2026.

Scientists are also keen to get a closer look at 16 Psyche's composition. There's a lot of wiggle room between 30 and 60 percent metal that has made it hard to track down smaller pieces of rock that may have resulted from the impact fragmentation of the 16 Psyche's mantle.

It was once thought that the relatively metallic mesosiderite meteorites were remnants of 16 Psyche, but more recent research has found the connection weak.

The work of Becker and her team revealed a spectrum that is consistent with pure iron, but that may be misleading - as little as 10 percent iron on the surface could dominate the ultraviolet spectrum. There are also very few analogous observations of planetary surfaces in ultraviolet against which to compare the new views of 16 Psyche.

So, we obviously just have to go and check it out with an actual orbiting probe, which in turn will indicate how well we've done trying to figure out this strange object from hundreds of millions of kilometers away. Whatever we learn, it's going to be like looking at a solar system time capsule.

"What makes Psyche and the other asteroids so interesting is that they're considered to be the building blocks of the solar system," Becker said.

"To understand what really makes up a planet and to potentially see the inside of a planet is fascinating. Once we get to Psyche, we're really going to understand if that's the case, even if it doesn't turn out as we expect. Any time there's a surprise, it's always exciting."

The research has been published in *The Planetary Science Journal*.

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This article was originally published by ScienceAlert. Read the original article [here](#).

[livescience.com](https://www.livescience.com), 31 October 2020

<https://www.livescience.com>

Researchers develop interactive database for translatable circular RNAs based on multi-omics evidence

2020-10-30

A specialized database has been published online in *Nucleic Acids Research*. Called TransCirc, the database provides comprehensive evidence supporting the translation potential of circular RNAs (circRNAs). This database was generated by integrating various direct and indirect evidence to predict coding potential of each human circRNA and the putative translation products.

Recent studies indicated that some cytoplasmic circRNAs can be effectively translated into detectable peptides and many short sequences have been reported to function as internal ribosome entry site (IRES)-like elements to drive circRNA translation. The translation of circRNA was upregulated during cellular stress, and some circRNA-encoded proteins were found to play key roles in regulating cancer cell growth.

However, the identification of circRNA-encoded protein has been a very difficult task, mainly because the sequences from circRNAs and their cognate linear mRNAs of host gene have a large overlap and differ only at the small window across the back-splice junction. As a result, while a large number of circRNAs have been identified through high-throughput transcriptome sequencing, a specialized and comprehensive database for translatable circRNAs is still lacking.

To meet this need, the researchers from the CAS-MPG Partner Institute for Computational Biology, Shanghai Institute of Nutrition and Health (SINH) of the Chinese Academy of Sciences (CAS) and the Bio-Med Big Data Center of SINH developed a comprehensive database, TransCirc, which contains information of ~300,000 circRNAs together with multi-omics evidence from published literatures to support circRNA translations.

Integrating seven types of evidence for circRNA translation, TransCirc provides an interactive data search engine and visualization interface for the translatable circRNAs and their translation products, as well as the

...and some circRNA-encoded proteins were found to play key roles in regulating cancer cell growth.

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regulatory elements that support its translation and analytic tools for potential function of circRNA encoded genes.

The TransCirc database is expected to facilitate further analysis of circRNA function and streamline the identification of circRNA translation product. All of the information and data is freely available at TransCirc.

circRNAs have recently been demonstrated as a class of abundant and conserved RNAs in animals and plants. Previous studies have revealed that circRNAs may play diverse biological roles by functioning as either non-coding or coding RNAs. Because circRNAs are more stable than their linear counterpart, they can naturally function as competitors of the linear RNAs to play regulatory roles in gene expression. Since most circRNAs contain exonic sequences and are localized in cytoplasm, many of these circRNAs may also function as mRNA to direct protein translation.

phys.org, 30 October 2020

<https://www.phys.org>

Researchers see signs of chronic stress in polar bears' blood

2020-10-28

Since the 1980s, scientists have routinely helicoptered to the western edge of Manitoba's Hudson Bay to find, immobilize, measure, and collect blood from polar bears to keep an eye on how they're doing. What scientists are finding is worrying; climate change has driven sea ice to thaw sooner in the spring and freeze later in the fall, reducing the period when polar bears can hunt for seals—forcing them to fast far longer than normal.

Rudy Boonstra, an ecophysiologicalist at the University of Toronto Scarborough in Ontario, wanted to find out if that large collection of blood could tell a deeper story about how the bears have been coping with the physiological stress of fasting.

Using blood collected from 300 bears between 1983 and 2015, he and his colleagues began by measuring cortisol. In polar bears, as in humans, the hormone surges under stressful conditions, triggering the body to release its stores of carbohydrates and fat before moving on to protein in the muscles. This pumps the bear with enough energy to combat whatever is stressing it out. While this acute stress response is useful, chronically high levels of cortisol can be destructive, since they force the body to rapidly

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burn through precious energy reserves while suppressing other critical activities, such as growth, immune response, and reproduction.

The team found that between years prior to 1990, when sea ice conditions were suitable for hunting, and subsequent low-ice years, polar bears' cortisol levels didn't change much. Boonstra says that's not surprising: cortisol levels are sensitive to immediate threats—getting chased by a helicopter would be enough to elevate them.

But when they examined a more robust measure of chronic stress—cortisosteroid binding globulin (CBG), a protein that regulates cortisol by binding to it—they found the bears' CBG levels were significantly higher in years with little sea ice. Boonstra found this astonishing. In virtually all other mammal species studied so far, including humans and snowshoe hares, CBG declines under chronic stress.

Boonstra thinks the bears' unusual response to chronic stress could have arisen as an evolutionary adaptation to historical climate swings. By mopping up excess cortisol, the high CBG levels could be protecting polar bears from its harmful effects, and perhaps staving off the point at which the bears would have to digest their own muscle to survive. "They are the most amazing bears," says Boonstra.

But there may already be signs that this potential source of resilience is maxing out, says Kimberley Bennett, a physiologist at Scotland's Abertay University who wasn't involved in the research. To her, the team's data suggests that some bears that have already endured abnormally long fasts are struggling to ramp up their CBG levels. She says this could further hinder the bears' ability to handle short-term sources of stress, like tourist visits or mining activity.

As for the bears' long-term fate, study coauthor Péter Molnár, a biologist at the University of Toronto Scarborough, recently projected the survival of 13 different polar bear subpopulations and found that even when using optimistic estimates for their metabolic rates, few high-Arctic populations would survive past 2100. Molnár says he doubts that the bears' CBG adaptation is powerful enough to prevent that outcome.

Though polar bears may have evolved a secret weapon against climatic changes of the past, it probably won't be enough to help them survive what's hitting them now.

hakaimagazine.com, 28 October 2020

<https://www.hakaimagazine.com>

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False facts about candy you always thought were true

2017-09-01

You would be hard-pressed to find someone who hates candy. With so many different types of treats, there's something for everyone. Not only is there a lot of candy out there, there's a lot of false information out there, too. You've probably fallen prey to some of these "facts" about candy that are actually complete myths. How many of these false facts about candy have you believed?

Chewing gum takes years to digest

Every kid knows they should never, ever, ever swallow their chewing gum, right? Its rubbery texture has been rumored to take years to digest if you swallow it and can supposedly wreak havoc on your digestive system.

It turns out that this "fact" is just playground lore. While the composition of chewing gum does make it difficult to break down (which is why it doesn't disintegrate in your mouth), it doesn't actually linger around in your body if you swallow it. Instead, it gets pushed out with the rest of your body's waste, just as any other foreign object would.

Chocolate will give you acne

It's likely that your parents used the threat of an acne-scarred face to warn you off of eating too much chocolate. While that threat may have done the trick, it turns out that you didn't really have to swear off all of those Hershey's bars.

Dr. Ava Shamban, a board-certified dermatologist, told The Huffington Post, "chocolate per se will not make you break out" and that "there is little evidence that chocolate or any specific fatty foods will cause acne." While it's true that a diet high in sugar and fat can contribute to acne breakouts, there is no evidence that eating chocolate will cause a zit to sprout on your face.

White chocolate is chocolate

Some people think white chocolate is just another form of chocolate, but the truth is that white chocolate isn't really chocolate at all. While milk chocolate and dark chocolate are derived from cocoa powder, white chocolate is made from cocoa butter. This lack of chocolate solids means that white chocolate doesn't qualify as real chocolate (although it is still pretty tasty).

Candy makes kids hyper**How many of these false facts about candy have you believed?**

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A lot of parents refrain from giving their kids too much candy, convinced it will make them hyper and out-of-control. It turns out, however, there is no truth to the idea that sugar causes hyperactivity in kids. One study published in The New England Journal of Medicine found that "most controlled studies have not found consistent adverse effects" when sugar or aspartame was given to children. The next time your kid asks for a piece of candy before bedtime, you won't be able to argue that it will keep them awake!

Candy causes cavities

Another common myth about candy is that eating it will quite literally rot your teeth. While the consumption of sweets can contribute to cavities, the real culprit is the bacteria in your mouth which produces acid as it breaks down the candy. The acid harms the enamel of your teeth which leads to cavities.

This acid isn't just produced when you eat candy, though. Any carbohydrates or starches consumed will lead to the same acid production. If you're plagued with toothaches, your pain isn't necessarily caused by eating too much candy, but is more likely because you're not brushing your teeth afterwards. Eating candy probably won't damage your oral health, as long as you're brushing and flossing.

Gum is bad for your teeth

Many people shy away from regularly chewing gum as it is thought that too much chewing can wear away at your teeth. This fear seems logical, as chewing gum might result in more wear and tear on your teeth. However, the Oral Health Foundation says that chewing sugar-free gum can actually help prevent tooth erosion.

Chewing gum helps create more saliva in the mouth, which helps replace minerals lost when acidic foods and drinks wear away at tooth enamel. If you chew gum after eating, it can bring the acid levels in your mouth back to the "safe zone."

Mentos and Coke can kill you

An urban legend that has seen some circulation on the internet warns of the dangers of eating Mentos and then drinking Coke. According to rumors, the combination of the fizzy soda with the mint can lead to a buildup of foam that might even result in death.

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Snopes debunked this myth. While dropping Mentos into a bottle of Coke will cause the soda to create pressure and bubble up into a geyser that surges up to 20 feet into the air, the same effect will not occur if you consume the Coke and Mentos yourself.

That doesn't mean, however, that "chasing down a handful of Mentos with as much pop as can be gulped" is a good idea. Snopes reported that those who have attempted this say "the intensity of the reaction forces the mouth open, thereby releasing most of the gas and foam into the wild, as it were, rather than keeping them contained within the person." While it's not a lethal combination, it's far from pleasant and shouldn't be attempted at home.

Chocolate raises your cholesterol

There's some good news for people who are trying to lower their cholesterol. While people with high cholesterol typically avoid eating too much chocolate, some studies show there's a possibility that eating chocolate may actually lower it.

While doctors still aren't recommending that you incorporate the sweet into your diet to lower your cholesterol, small amounts of dark chocolate are good for your heart. You still shouldn't overindulge, but a cup of hot cocoa might prove to be beneficial.

Pop Rocks are dangerous

The dangers of Pop Rocks were so widely believed that there have actually been campaigns to make the candy illegal. The candy begins to fizzle and pop when it comes into contact with the saliva in your mouth, leading to an urban legend that eating them and drinking Coke can cause your stomach to explode.

At the height of the rumors, General Foods, the maker of Pop Rocks, had to launch a media campaign to defend the candy from attacks. Pop Rocks are totally safe (and fun!) to eat.

You shouldn't eat candy

As with most foods, candy is not bad for you so long as it is consumed in moderation. While too much candy can result in weight gain and increased risks of certain illnesses, small amounts of some candies, such as chocolate, can be good for your health.

Samira Kawash, a self-proclaimed "candy professor" who is a professor emerita at Rutgers University, is the author of *Candy: A Century of Panic*

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and Pleasure. In an interview with The Globe and Mail, Kawash said that many of the concerns about eating candy are unnecessary. "When you've filled your diet with real food, having a little bit of candy is not really going to be too harmful," she said.

mashed.com, 1 July 2017

<https://www.mashed.com>

These human nerve cell tendrils turned to glass nearly 2,000 years ago

2020-10-30

Nearly 2,000 years ago, a cloud of scorching ash from Mount Vesuvius buried a young man as he lay on a wooden bed. That burning ash quickly cooled, turning some of his brain to glass.

This confluence of events in A.D. 79 in the town of Herculaneum, which lay at the western base of the volcano, preserved the usually delicate neural tissue in a durable, glassy form. New scrutiny of this tissue has revealed signs of nerve cells with elaborate tendrils for sending and receiving messages, scientists report October 6 in PLOS ONE.

That the young man once possessed these nerve cells, or neurons, is no surprise; human brains are packed with roughly 86 billion neurons (SN: 8/7/19). But samples from ancient brains are sparse. Those that do exist have become a soaplike substance or mummified, says Pier Paolo Petrone, a biologist and forensic anthropologist at the University of Naples Federico II in Italy. But while studying the Herculaneum site, Petrone noticed something dark and shiny inside this man's skull. He realized that those glassy, black fragments "had to be the remains of the brain."

Petrone and colleagues used scanning electron microscopy to study glassy remains from both the man's brain and spinal cord. The researchers saw tubular structures as well as cell bodies that were the right sizes and shapes to be neurons. In further analyses, the team found layers of tissue wrapped around tendrils in the brain tissue. This layering appears to be myelin, a fatty substance that speeds signals along nerve fibers.

The preserved tissue was "something really astonishing and incredible," Petrone says, because the conversion of objects to glass, a process called vitrification, is relatively rare in nature. "This is the first ever discovery

That burning ash quickly cooled, turning some of his brain to glass.

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of ancient human brain remains vitrified by hot ash during a volcanic eruption.”

sciencenews.org, 30 October 2020

<https://www.sciencenews.org>

Delete offensive language? Change recommendations? Some editors say it's OK to alter peer reviews

2020-10-28

Fiona Fidler, a metaresearcher at the University of Melbourne, was outraged. She had discovered that her appraisal of a submitted paper had been changed before being sent to the author, sometimes drastically. The words “very sympathetic” had become “generally sympathetic.” “This one is a good example” ended up as “this one still needs work.” Worst of all, she felt that the bottom line of her peer-review report to the journal *Educational and Psychological Measurement*, recommending that it accept the paper with minor revisions, was misrepresented in the editor’s rejection letter to the author.

“I had never experienced anything like this before,” Fidler says about the 2012 incident. She demanded explanations from the journal editor. And she later partnered with the snubbed paper author, Rink Hoekstra, a psychologist at the University of Groningen, to find out how widespread this practice was.

With colleagues, they’ve now surveyed 322 editors at high-impact journals across ecology, economics, medicine, physics, and psychology on when they think altering peer-review reports is justified. Published as a preprint earlier this year at the Open Science Framework and now under review at *eLife*, the survey reports that 91% of the respondents identified at least one situation in which they would edit a report. More than 80% said they would do so if a reviewer used offensive language or made inappropriate personal comments about the authors. But 8% said they would change the reviewer’s overall recommendation—even without their permission, a finding that shocked Hoekstra. He believes that’s probably an underestimate, given the stigma of admitting to such dubious behavior in a survey. “I think there are probably even more who actually do it.”

The survey comes amid a wider push for consistent guidelines. There’s little dispute that editors should intervene when peer-review comments are hostile. Such comments have a disproportionate impact on minorities and other marginalized groups, inducing self-doubt and harming

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productivity, according to a 2019 PeerJ paper. It’s not just ethical to edit such review reports—it’s essential, says Seth Leopold, editor-in-chief of *Clinical Orthopaedics and Related Research*.

Jane Alfred, director of Catalyst Editorial, which offers training on research integrity and publication ethics, thinks it’s best to return reports containing hostile language and ask the reviewer to change it. Reviewers are often grateful for the chance to revise ill-considered comments, she says. But Leopold says this may be impractical at fast-paced journals, and trying to educate reviewers who make unprofessional comments is likely futile. It’s better, he says, not to ask that person to review again.

Changing a reviewer’s recommendation is another matter, says Howard Browman, a council member of the nonprofit Committee on Publication Ethics, which is developing guidance on how to navigate the ethics of editing reviewers’ comments. “It’s so obviously something you wouldn’t do,” he says.

Yet it apparently happened to Fidler, who stumbled on the changes to her report by accident. Although the review process was double-blinded, she recognized the paper as Hoekstra’s because she had seen him present the work, on Ph.D. students’ statistical reasoning, at a conference in Slovenia. So after sending in her review, she emailed him to congratulate him and tell him that her review was nitpicky but positive.

That same day, Hoekstra’s paper was rejected by the journal. “The reviewers have spoken in nearly a single voice in their recommendation to me that I decline publication of the paper in its current form,” wrote the editor-in-chief, George Marcoulides, a research methodologist at the University of California, Santa Barbara. Although editors may override reviewer recommendations, the normal practice is to explain this in the decision letter. Hoekstra wrote back to Fidler, attaching the two reviews he got from the journal and asking for suggestions of other journals that might publish the work.

When she saw the reviews, Fidler cottoned on. “I think we have a controversy on our hands,” she wrote to Hoekstra. She downloaded her review from the online journal system, and compared it, word by word, with the review Hoekstra received. Her sentence saying her concerns were minor had been deleted. Other sentences criticizing Hoekstra’s methods had been added. She emailed Marcoulides, who replied that the journal computer system sometimes blended and distorted reviewer comments.

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Fidler calls that explanation “preposterous,” saying it would be impossible for a technical glitch to create “perfectly grammatical sentences that are exactly opposite in meaning.” She reached out to contacts at SAGE, the journal’s publisher, who said they would investigate, but she heard no more from them. In an email to Science, a SAGE spokesperson wrote that the publisher “addressed the issue directly with the editor at the time” and that Marcoulides now double-checks reviewer comments for consistency.

Later in 2012, Marcoulides invited Hoekstra to resubmit his paper. This time, Fidler’s review made it through intact, and Hoekstra’s paper was accepted—pivotal for him winning a permanent job at Groningen. In an email to Science, Marcoulides wrote that the reviewer comments automatically attached to his decision letter were “distorted” and his edits were intended to clarify his interpretation of Fidler’s assessment. “In hindsight, I should have contacted her rather than attempting to resolve the problem on my own,” he wrote. He added that he still sometimes edits reports for clarity or to remove inappropriate language.

Few journals offer explicit guidance on when editing peer-review reports is and isn’t permissible. Alfred says they ought to, and should also allow reviewers to opt out from being edited. No matter how well-intentioned editors may be, she says, clear policies will ensure a transparent and unbiased process. Many journals have a safeguard: They share all reviews and the editorial decision with reviewers, allowing them to see how their comments were communicated to the authors. But about 20% of the editors in the survey report that their journals do not send out either the reports or the decision letters to reviewers.

Simine Vazire, editor-in-chief of *Collabra: Psychology* and a colleague of Fidler’s, argues for a bright line on the question: no edits without reviewer permission. Her journal has no policy on the issue, but she is considering proposing one. Without clear boundaries, she says, it becomes easy to rationalize changes, adding that journal editors have lots of power and little accountability. “There’s no one watching over editors,” she says. “I think it’s especially important that they have really hard and fast rules for themselves.”

sciencemag.org, 28 October 2020

<https://www.sciencemag.org>

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Bizarre molecule discovered on Titan has never been found on any moon or planet, ever

2020-11-03

As if Saturn’s moon Titan wasn’t already weird enough, scientists have now found something weirder in its atmosphere, and no, it’s not aliens — yet.

There is an extremely rare carbon-based molecule that can only exist in a lab on Earth because it’s so reactive. The only other place it has ever been found is the void of space, floating around in clouds of dust and gas where particles have been dispersed too far away from each other to give it anything to react with. NASA scientists have now found the elusive C₃H₂, or cyclopropenylidene, molecule in the atmosphere of Titan. Never mind that this is the first time C₃H₂ has ever been detected in a planetary atmosphere; it is also the type of molecule that can build the backbone of DNA. So it’s not aliens, but it may or may not mean aliens.

C₃H₂ is so strange because it doesn’t typically behave like you would expect a molecule containing carbon to behave. Carbon is something of an extrovert. It has four electrons in its outer level, so it tends to form four molecular bonds whenever it can. However, C₃H₂ is a type of molecule known as a carbene. These molecules only form bonds with two of the electrons in their carbon atoms, leaving the other two to bond with each other, which is about as awkward as being one of the only people in your senior class not to get a prom date. Say there were two best friends who both had zero luck finding anyone to go with. C₃H₂ is so reactive because these awkward electrons will immediately bond with the first potential dates they find.

“Electrons in a carbene are very hungry to form bonds with electrons from other atoms or molecules that drift by,” NASA Goddard planetary scientist Conor Nixon, who led a study recently published in *The Astronomical Journal*, told SYFY WIRE. “They will pair up with other unpaired electrons in other atoms, or even break bonds in other molecules and insert themselves (if it sounds like a lot of relationship drama, it basically is).”

Yes, a NASA scientist actually compared molecular bonding with relationship drama. That is how intense things can get with C₃H₂.

Carbenes are not the types of things you would expect to find in a planetary atmosphere because they obviously waste no time bonding, and atmospheres are much denser than the void. A dense atmosphere means there are plenty of molecules dancing at that prom. Any carbenes around other molecules would soon react with them and turn into

**So it’s not aliens,
but it may or may
not mean aliens.**

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something else, so they would no longer show up as carbenes to scientists looking for them. Then why are all those lonely C_3H_2 molecules wandering around above Titan? Nixon believes that it is because of all the methane (CH_4) in the moon's atmosphere. CH_4 can break down into carbon and hydrogen atoms which can then reconfigure themselves in many ways, and one of those is C_3H_2 .

"The lack of oxygen in Titan's atmosphere means that the C and H atoms don't do what they would do on Earth, Mars, or Venus, which is to 'combust' (oxidize) and form CO_2 and water," he said.

So about the possibility for aliens. Methane-eating bacteria exist on Earth, and on Titan, methane is not just in the atmosphere, but also falls to the surface as rain and is thought to exist as entire lakes and seas. Primordial Earth had hardly any oxygen in its atmosphere before what is known as the "great oxidation event" that happened 2 to 2.4 billion years ago. It was a planet we wouldn't recognize, crawling with photosynthetic microorganisms known as cyanobacteria, which are now better known as blue-green algae. These eventually multiplied enough to give the atmosphere a major oxygen boost. Titan's atmospheric chemistry is very similar to what Earth's was then. The problem is that there is too much that remains unknown about nascent Earth, so scientists don't exactly know what to expect when looking for processes that could lead to life.

What we do know about C_3H_2 in relation to living organisms is that it is a closed-loop molecule or closed system. These molecules do not allow a transfer of matter outside of themselves, and the only other one found on Titan is benzene. The reason closed-loop molecules have NASA excited is that these are the same type of rings that form nucleobases, nitrogen-containing compounds which make up the more complex components of DNA and RNA. The space agency's upcoming Dragonfly mission might find out.

"We don't know how the gap was bridged between large molecules and life," said Nixon. "It's exciting just to see and investigate what is happening on Titan, since that gives us some insight into that period of time in the Earth's history, and may ultimately help to clear up some of the mysteries."

Could there possibly be C_3H_2 hiding in the atmospheres of other moons or planets? If it is, it probably is in the atmosphere and not on the surface, because it is unlikely to reach the surface of Titan in its original form. It probably reacts with something long before it ever comes close to the surface and forms larger molecules like benzene. C_3H_2 may also be a part of Titan's thick organic haze, which is like the extraterrestrial version

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of smog, except without any pollution involved. Both haze and other atmospheric molecules either condense on their own or bond to create methane that rains down on the surface. While nobody knows what C_3H_2 may react with and turn into if it exists in other atmospheres, there is a chance it is somewhere else. Nixon wants to believe.

"I think we will ultimately find C_3H_2 in the atmospheres of the giant planets, if we look hard enough in specific places where C_3H_2 could be plentiful, like in the auroral regions near the magnetic poles," he said. "But right now, Titan is the only instance we know of."

syfy.com, 3 November 2020

<https://www.syfy.com>

This reusable packaging could help stop the massive amounts of e-commerce waste

2020-11-03

If you order a sweater or t-shirt from the clothing brand Eliou, you don't have to get it in a plastic or cardboard mailer. Instead, you can choose to have it sent in a reusable package. When the shipment arrives, you take out the clothing, fold up the empty package, seal it with the included return label, and drop it in a mailbox to be sent back, cleaned, and used again.

The company is one of the first in the U.S. to work with RePack, a Finland-based packaging company that aims to begin replacing standard cardboard boxes and plastic bubble mailers. RePack's recycled plastic mailers—made from the same tough woven polypropylene as Ikea's reusable shopping bags—are designed to have a lower carbon footprint than a typical box or bag as soon as they're reused once.

The impact shrinks further each time the bag goes through the system. "Even taking into consideration that that empty return path—when the RePack's folded up and mailed back to us, and the carbon that it takes for that post truck post office truck to take it back—it's still a huge win over single-use in terms of carbon emissions," says Mitch Barlas, the company's president for North America. The system also helps keep old packages out of landfills.

In Europe, the company has run pilots with large brands like H&M, and now works with 125 companies, with hundreds of thousands of its packages in circulation. In the U.S., where it launched this year, it's in talks

Instead, you can choose to have it sent in a reusable package.

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with brands like the North Face and Vans, with several pilots in planning with other companies. Levi's recently partnered with the Danish brand Ganni to launch a capsule collection that rents out upcycled denim clothing via the new packaging.

The first package, best suited for clothing companies, is waterproof and durable. Customers can also use it to return an order. If they keep the clothing, the package goes back to RePack, which cleans and sanitizes it before sending bundles of reused packages back to a distribution center for the next round of reuse. (While customers don't pay a deposit on the package, RePack has partnered with companies that have strong sustainability missions, and it expects that those customers will be motivated to take the extra step to drop the package in the mail.) When the packages eventually wear out, the company uses scraps of the material to make upcycled products like reusable shopping bags.

This packaging-as-a-service system is a little more expensive than traditional single-use packaging, although, as Barlas points out, the costs of conventional boxes and bags don't account for their actual environmental cost. If cities or states eventually decide to start charging companies an extra fee for the trash they create—the type of “producer pays” laws that exist in the European Union—the cost could become comparable. For now, brands can either decide to incorporate the extra cost into their pricing, or, like Eliou, offer consumers the choice to pay a little extra for the packaging (in Eliou's case, it's a \$3 charge for a brand that sells \$100 sweaters).

Barlas believes that the packaging will become more mainstream as awareness of sustainability issues continues to grow. “We were all just having that conversation about what the tipping point for this particular technology will be,” he says. “It's going to be somewhere at the convergence of people realizing they need to switch their behavior somehow and when people realize that reusable does take a small behavior change, but in the long run, it's quite small. I mean, it's almost imperceptible to fold up your packaging and flip out the label and leave it for your [postal carrier].”

fastcompany.com, 3 November 2020

<https://www.fastcompany.com>

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Long-hidden 'selfie' of a medieval mason found in historic Spanish cathedral

2020-11-05

During the 11th century, an unknown, lowly medieval mason held an important job: helping to build the grand Santiago de Compostela Cathedral in northern Spain, now one of the country's most famous churches. That craftsman's identity has been lost to time, but he left behind a tribute to himself in stone — a cleverly concealed self-portrait.

Whoever this mason was, his sneakily-executed “selfie” went unnoticed for about 900 years, until it was recently spotted by an art historian during a stone-by-stone survey of the cathedral.

In the carving, a jolly-looking round face peers out over fronds of foliage. Measuring about 11 inches (28 centimeters) tall and located at the top of a pillar around 40 feet (12 meters) off the ground, the portrait was positioned so that it would go unnoticed by the cathedral's clergy, but would be easy for fellow masons to find and appreciate, ArtNet reported.

PLAY SOUND

Jennifer Alexander, a scholar in the History of Art department at the University of Warwick in the United Kingdom, was leading a team of experts in a painstaking search for mason's marks in the cathedral — one stone at a time — when she found “our little figure,” Alexander told Live Science in an email. Her team was paying close attention to the upper parts of the building; on the ground level, many of the stones were covered by paint applied over centuries. But stones that were installed higher up retained their original surface markings, Alexander explained.

“We shone our lights on the upper capitals in the gallery, which is a part of the building the public doesn't access and the clergy rarely used,” Alexander said. As they recorded the marks left behind by stonemasons 900 years ago, “suddenly we were face-to-face with one of the men themselves,” she said in the email.

Remarkable details in the self-portrait suggested that the carver must have been a talented stoneworker, as the granite stone used in the building is difficult to shape. “And yet his hair is detailed and you can make out all his fingers,” Alexander said. “Although these people were trained in the craft tradition, they were very much the artists of their period, quite capable of creating sculpture as well as cutting stone.”

Remarkable details in the self-portrait suggested that the carver must have been a talented stoneworker, as the granite stone used in the building is difficult to shape.

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Artisan self-portraits such as these frequently appear in medieval buildings. They are easily concealed “in plain sight” amid other sculptural flourishes and portraiture, though often “they’re hidden away where only another mason, or someone working on the building would find them,” such as the portrait in Santiago de Compostela, according to Alexander.

Another memorable stonemason selfie lurks in Southwell Minster, a church in Nottinghamshire, England, “where he’s grinning at you at the bottom of the staircase to the chapter house roof,” Alexander said. “But he’s in the dark, so you have to be carrying a light to spot him.”

But even with all the portrait details in the cathedral selfie, the carver’s name will likely never be known, as historic records of low-ranking builders — even on important construction projects — are exceptionally rare, Alexander said.

“Finding the identity of one mason who carved his own image would be very special — and I’ve never managed to do this!” she said.

Originally published on Live Science.

[livescience.com](https://www.livescience.com), 5 November 2020

<https://www.livescience.com>

A fish’s fins may be as sensitive to touch as fingertips

2020-11-03

Fish fins aren’t just for swimming. They’re feelers, too. The fins of round gobies can detect textures with a sensitivity similar to that of the pads on monkeys’ fingers, researchers report November 3 in the *Journal of Experimental Biology*.

Compared with landlubbers, little is known about aquatic animals’ sense of touch. And for fish, “we used to only think of fins as motor structures,” says Adam Hardy, a neuroscientist at the University of Chicago. “But it’s really becoming increasingly clear that fins play important sensory roles.” Studying those sensory roles can hint at ways to mimic nature for robotics and provide a window into the evolution of touch.

The newfound parallels between primates and fish suggest that limbs that sense physical forces emerged early, before splits in the vertebrate evolutionary tree led to animals with fins, arms and legs, says Melina Hale, a neurobiologist and biomechanist also at the University of Chicago. “These capabilities arose incredibly early and maybe set the stage for

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what we can do with our hands now and what fish can do with their fins in terms of touch.”

Hardy and Hale measured the activity of nerves in the fins of bottom-dwelling round gobies (*Neogobius melanostomus*) to get a sense of what fish learn about texture from their fins. In the wild, round gobies brush against the bottom surface and rest there on their large pectoral fins. “They’re really well suited to testing these sorts of questions,” Hardy says.

Working with fins from six euthanized gobies, the researchers recorded electrical spikes from their nerves as a bumpy plastic ring attached to a motor rolled lightly above each fin. A salt solution keeps the nerves functioning as they would if the nerves were in a live fish, Hardy says. Different spacings of bumps provided information on the range of roughness the fins could detect, with narrower spacings mimicking the texture of a coarse sand and larger gaps producing a roughness on the scale of pebbles.

The periodic patterns of neural spikes corresponded with the spacings of ridges. More closely spaced ridges produced more frequent sets of spikes while larger spaces produced less frequent bursts of electrical activity. These signals also varied with the speed of the rotating ring. Together, these results suggest that goby fins respond to the different textures they encounter. The fins’ “ability to perceive really fine detail ... was impressive,” Hale says. These spike patterns were similar to those recorded by other researchers from tests on monkeys’ finger pads. “The most surprising thing was the similarities between primates and fish” even though these animals’ limbs and environments are a world apart, she says.

Hale and Hardy are continuing to study different types of sensing cells in fins and their arrangement. And with the vast diversity of fishes, studying those from other habitats, including ones that spend more time swimming, could reveal how common such feeling fins are, Hardy says.

Studying fish fins could also lead to new designs for robots that swim and sense underwater and that can explore areas that would otherwise be difficult for people to reach. In general, robots have typically been designed to have separate parts for creating motion and sensing, but “biology puts sensors on everything,” says Simon Sponberg, a biophysicist at the Georgia Tech in Atlanta.

From fish fins to mammal legs to insect wings, animals use such parts for motion and sensing, Sponberg says. “It now seems that lots of animals

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can reach out and touch their environment and gain the same kind of information that we do when we brush our hands against a surface.”

[sceincenews.org](https://www.sciencenews.org), date

<https://www.sciencenews.org>

How the pandemic is driving a boom in pollution

2020-10-31

Switzerland spends more than \$200 million annually to combat littering, but this year its cleanup efforts feature a new type of rubbish: discarded face masks used for COVID-19 protection.

When Let's Do It Switzerland joined the annual World Cleanup Day event in September, the more than five tons of garbage collected by more than 1,000 volunteers included more than 500 masks. More than 100 masks alone were found near Lake Geneva, which has seen more gatherings than usual as the virus has forced restaurants and bars to close.

Mask pollution at Lake Geneva is a microcosm of the looming problem for global waterways.

Sales of disposable masks are expected to more than double to nearly \$170 billion this year as they are being promoted as a key to slowing the spread of COVID-19. Based on historical data, as much as 75 percent of the used masks will likely make their way into landfills or end up floating in lakes, streams, and oceans.

If not managed properly, officials are concerned there could be a new wave of uncontrolled dumping of environmentally harmful single-use plastics, such as masks and other COVID-related medical waste. Aside from the environmental damage, the financial cost to tourism and fisheries could reach \$40 billion, according to the UN Environment Programme (UNEP).

The potential consequences include public health risks from infected used masks and the open burning or uncontrolled incineration of masks, leading to the release of toxins in the environment and secondary transmission of diseases to humans. As a result, UNEP is urging governments to treat the management of waste, including medical and hazardous waste, as an essential public service.

“Plastic pollution was already one of the greatest threats to our planet before the coronavirus outbreak,” says Pamela Coke-Hamilton, UNCTAD’s

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director of international trade. “The sudden boom in the daily use of certain products to keep people safe and stop the disease is making things much worse.”

One part of the solution could be making masks and other medical products from biodegradable or more easily recyclable alternative materials, such as natural fibers, rice husk, and natural rubber. These products would be more environmentally friendly and, as developing countries are key suppliers of many plastic substitutes, could provide the added benefit of boosting those economies.

[environmental-expert.com](https://www.environmental-expert.com), 31 October 2020

<https://www.environmental-expert.com>

Narwhals could be at high risk of catching COVID-19: researcher

2020-10-28

Frozen tissue samples from a narwhal harvested by Inuit subsistence hunters will soon arrive at a laboratory in Boston, where researchers will work to determine whether the species could be susceptible to COVID-19.

At the Broad Institute of MIT and Harvard, scientists will expose live narwhal cells to SARS-CoV-2 to determine if the virus that causes COVID-19 can latch onto the cells and cause a potentially lethal infection.

Scientists are focusing on narwhals because they have almost the same number of “binding sites” as humans. These binding sites are found on ACE2 receptors, proteins on cells throughout the body. ACE2 receptors act as doorways for the coronavirus to enter and infect a range of cells.

Humans have 25 of these sites; narwhals have 22. This puts the elusive northern in a high-risk category of animals that could contract the virus, said lead researcher Martin Nweeia, an assistant professor at Case Western Reserve University School of Dental Medicine and an expert on narwhal tusks.

“It’s likely that narwhal can bind this virus,” he said. “No one is clear yet as to how many of these binding sites, which ones does it take and what number of viral entities does it take to actually produce COVID-19.”

“I think the real point of this research is that it allows us to be ahead of an issue.”

“It’s likely that narwhal can bind this virus,” he said.

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While there have been reports of captive animals coming down with COVID-19 — such as tigers at the Bronx Zoo — there has been little testing done on wild species and their susceptibility to the virus, Nweeia said.

The research is anticipated to be completed by the end of the year, with a paper slated for publication in spring, he said.

Nweeia has been studying the narwhal's elongated tooth for two decades, primarily in Pond Inlet, Nunavut. But due to COVID-19 travel restrictions, he wasn't able to travel to the community himself, so he asked Inuit hunters to collect tissue samples.

Spokespeople from Pond Inlet and the community's hunters and trappers association weren't immediately available for comment.

Can humans transmit COVID-19 to narwhals?

Nweeia said transmission from humans to other mammals such as the narwhal is likely, even though narwhals live in remote Arctic waters.

Narwhals could contract the virus through wastewater, and the coldness of the water could allow the virus to live longer, Nweeia said.

"It's likely that we're dumping waste in the water all the time on boats," he said, adding that future research will explore the potential of COVID-19 to be transmitted through wastewater. "Now we have increased traffic in the High Arctic, both with cruise lines, commercial vessels."

A narwhal could also pass the virus onto the rest of its pod or other whales, as narwhals tend to migrate in large groups, Nweeia continued, citing the whales' blowholes as an "enormous vector" for transmission.

"If distribution of ACE2 receptors are found to be high in narwhal blowholes for example, respiratory droplet transmission could be possible from animal to animal," he said.

Getting to the bottom of how susceptible wildlife are to the virus has implications for conservation, he said.

"I think this is one of the most important conservation efforts of any research I've encountered," he said. "This is an opportunity for us, and the Inuit, to say this is our environment, we deserve these protected rights with how industry develops, how the cruise line industry is monitored."

"We have to learn to behave better. If it takes a viral pandemic to send that message, so be it."

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Hundreds of animals at varying risk of contracting COVID-19

Harris Lewin, a professor at the University of California, who's also part of Nweeia's narwhal study, said if certain wildlife contract COVID-19, the virus could all but devastate endangered species — lowland gorillas, for instance, which have as many binding sites as humans.

Lewin recently published a study that compiled a list of hundreds of species that are at varying levels of risk of contracting the virus through these ACE2 receptors. The list includes 410 vertebrates, 252 of which are mammals, including the narwhal.

According to the U.S. Centers for Disease Control and Prevention, COVID-19 originated in an animal, likely a bat.

But Lewin said there's a missing link. "We know from the science that there was likely one intermediate species between the bats and humans," he said.

The database will serve as a basis for further research, he said, adding that animals such as cattle, sheep or white-tailed deer could be the intermediate species.

"The reason why we want to look at the deer, the cattle and the sheep is because they're all around that area of China, where the bats that harbour the coronaviruses live," he said. "What we wanted to do was to identify one or more species as the candidate host."

The pandemic is an opportunity to reassess our relationship with the natural world, Lewin said. Humans continue to encroach on animal habitat, which could make pandemics even more common in the future, he said. This research is important because it will help determine which species are susceptible and, beyond that, hopefully inform decisions on how to conserve wildlife and their environments, he said.

"All of these things that bring humans into closer contact with wildlife will potentially create a threat to humans and wildlife. It can go either way."

thenarwhal.ca, 28 October 2020

<https://www.thenarwhal.ca>

This means that as the sun ages, it gets steadily brighter.

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Will our solar system survive the death of our sun?

2020-11-01

Our sun's death is a long way off — about 4.5 billion years, give or take — but someday it's going to happen, and what then for our solar system?

The trouble begins before the death proper: The first thing we have to contend with is the elderly sun itself. As the fusion of hydrogen continues inside the sun, the result of that reaction — helium — builds up in the core.

With all the waste product hanging around, it gets harder for the sun to do its fusion dance. But the inward crushing weight of the sun's atmosphere doesn't change, so to maintain balance the sun has to increase the temperature of its fusion reactions, leading ironically to a hotter core. **PLAY SOUND**

This means that as the sun ages, it gets steadily brighter. The dinosaurs knew a dimmer sun than we see today, and in as little as a few hundred million years, Earth will get too hot to handle.

Our atmosphere will get stripped away. Our oceans will evaporate. For awhile, we'll look something like Venus, locked in a choking, carbon dioxide atmosphere.

And then it gets worse.

In the final stages of hydrogen fusion, our sun will swell and swell, becoming distorted and bloated — and red. The red giant sun will consume Mercury and Venus for sure. It might or might not spare Earth, depending on exactly how large it gets. If the sun's distended atmosphere does reach our world, Earth will dissolve in less than a day.

But even if the sun's expansion stops short, it won't be pretty for Earth. The extreme energies emitted by the sun will be intense enough to vaporize rocks, leaving behind nothing more than the dense iron core of our planet.

Shuffling the deck

The outer planets won't enjoy the increased radiation output from the sun, either. The rings of Saturn are made of almost pure water ice, and the future sun will simply be too hot for them to survive. The same goes for the ice-locked worlds orbiting those giants. Europa, Enceladus, and all the rest will lose their icy shells.

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At first, the increased radiation will blast the four outer planets, stripping away their atmospheres, which are just as fragile as that of a terrestrial planet. But as the sun continues to swell, some of the outer tendrils of its atmosphere can find their way to the giants, traveling through funnels of gravity. Feeding on that material, the outer planets can gorge themselves, becoming far larger than they ever were before.

But the sun still won't be done. In its final stages, it will repeatedly swell and contract, pulsing for millions of years. This isn't the most stable situation, gravitationally speaking. The deranged sun will push and pull the outer planets in odd directions, potentially drawing them into a deadly embrace or kicking them entirely out of the system.

A new home

For a few hundred million years, the outermost parts of our solar system will be a decent place to call home. With so much heat and radiation pouring from the red giant sun, the habitable zone — the region around a star where the temperatures are just right for liquid water — will shift outward.

As we saw above, at first the moons of the outer worlds will melt, losing their icy shells and potentially hosting liquid water oceans on their surfaces. Eventually, the Kuiper belt objects, including Pluto and its mysterious friends, will also lose their ices. The largest may transform into mini-Earths orbiting a distant, distorted red sun.

But eventually, our sun will give up the struggle, shrugging off its outer atmosphere in a series of outbursts that leave behind the star's core: a white-hot lump of carbon and oxygen.

This white dwarf will initially be staggeringly hot, blasting off X-ray radiation that can do brutal damage to life as we know it. But within a billion years or so, the white dwarf will settle down to more manageable temperatures and simply hang out for trillions upon trillions of years.

That dim white dwarf will host a new habitable zone, but because the former sun will be so cool, that zone would be incredibly close, much closer than Mercury orbits our sun today.

At that distance, any planet (or planetary core) would be vulnerable to tidal disruption — a pretty way of saying the gravity of the white dwarf could inadvertently rip a planet to shreds.

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But that may be the best we'll get.

livescience.com, 1 November 2020

<https://www.livescience.com>

Look Ma, no ears! Teensy spiders hear with organ on their legs

2020-10-31

Ogre-faced spiders hang from their webs, and like gymnasts, they flip backwards to snatch flying insects from the air. To hear their prey coming, the spiders "listen" for the flap of tiny wings using a special organ in their spindly legs, a new study has found.

The organ looks like a patch of parallel slits cut into the spider's exoskeleton; located near the tip of each leg, each slit measures between 0.000003 and 0.000007 inches (10-200 nanometers) in length. These tiny slits contain nerve cells that detect minute changes in pressure caused by sound waves rippling through the air; the organ then sends this information to the brain.

Thus equipped, ogre-faced spiders (*Deinopis spinosa*) can hear sounds up to 6.5 feet (2 meters) away and pick up frequencies between 100 and 10,000 hertz, according to a new study, published Oct. 29 in the journal *Current Biology*. Humans can hear sounds between about 20 and 20,000 hertz, for context.

"It's very alien to us because we don't have a sensory system like this," said study author Jay Stafstrom, a postdoctoral researcher studying sensory biology at Cornell University.

Humans, of course, use their eardrums to detect sounds, but spiders don't have eardrums. That said, Stafstrom and his colleagues suspected that the ogre-faced spider might rely on some form of hearing to snag flying prey from the air — and the new study supports that suspicion.

PLAY SOUND

The authors found that certain sounds sent the spiders flipping; as if on cue, the arachnids would hear the sound and perform a sudden half-backflip as if launching toward a passing bug. Ogre-faced spiders can be found in forested regions of Australia, Africa and parts of the United States, including Florida, according to *Cosmos Magazine*; the teeny spiders, which measure less than an inch (1.5-2.5 cm) in length, hide among palm fronds

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and other vegetation and use their nimble acrobatics to catch moths, mosquitoes and flies that fly past.

The flip is "ballistically rapid, it's very quick ... and they're surprisingly accurate," in terms of enabling the spider to catch prey on the fly, Stafstrom told Live Science. "From such a tiny little spider, with a tiny little brain, it's very impressive."

In general, ogre-faced spiders are better known for their impressive vision than their hearing. "They've got the biggest eyes of any spider," Stafstrom said. The spiders hide from predators throughout the day, camouflaged to blend in with the plants they live on. At night, the arachnids emerge and use their two huge, night-vision eyes to spot crawling insects on the ground below. To catch the creepy-crawlies, the spiders hang suspended from a web near the ground and ensnare bugs in a tiny, stretchable net that they hold between four legs.

The spiders deploy the same net to catch flying insects, but they contort their bodies backwards to aim the net upward, rather than lurching down toward the ground. It wasn't initially clear, however, if the spiders relied on their night-vision to aim the net at flying prey.

In a previous study, published 2016 in the journal *Biology Letters*, Stafstrom set out to determine whether ogre-faced spiders even needed their eyes to capture flying insects. He blindfolded the spiders using dental silicone, a kind of opaque plastic, and found that they could no longer capture crawling prey from the ground, but they could still pluck flying insects right out of the air. Clearly, they were relying on some other sense besides vision, Stafstrom said.

In the new study, Stafstrom and his co-authors played different sounds for the spiders to see if any would trigger their signature backflip. When exposed to low-frequency sounds, between 150 Hz and 750 Hz, the spiders lurched backwards and stretched their nets as if to catch a bug. These low-frequency sounds mimic the wingbeat patterns of various flying insects, the authors noted. The authors found that no sounds of any frequency caused the spiders to aim forward toward the ground, confirming that the spiders use their vision, not hearing, to catch crawling prey.

Compared with low-frequency sounds, high-frequency tones did not send the spiders somersaulting. However, electrical recordings of the spiders' brain cells revealed that specific groups of brain cells, or neurons, react to high frequencies, specifically between 1,000 Hz and 10,000 Hz; the sensory

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organ in the spiders' legs reacted to the same range of sounds. The authors speculate that, since flying insects don't flap their wings at such high rates, the spiders might also listen for the high-pitched call of predator birds.

"It might be an early warning sign, that a bird that could end your life may be in the vicinity," Stafstrom said. "We're really interested in knowing, 'Can these spiders hear bats?'" he added, but the study didn't include frequencies high enough to mimic most bat chirps.

While the study of spider hearing remains quite new, several other arachnid species can also hear sound, Stafstrom noted.

For instance, jumping spiders sense and respond to sounds more than 9.8 feet (3 m) away, Live Science previously reported. Jumping spiders have pressure-sensitive leg hairs that respond to the movement of air particles around them. Ogre-faced spiders also have these special leg hairs, and jumping spiders have the same sensory organ in their legs as the ogre-faced does.

"We suspect that both spiders are using both systems," but that has yet to be confirmed, Stafstrom said.

With the discovery that ogre-faced spiders use their hearing to capture prey, Stafstrom and his team now wonder how well the spiders can discern which direction a given sound is coming from. They plan to place the spiders in an arena and play sounds from various angles, to see whether the spiders change up their acrobatic routine to aim their net in the corresponding direction.

Originally published on Live Science.

[livescience.com](https://www.livescience.com), 31 October 2020

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Does vitamin D protect against COVID-19?

2020-11-03

In the absence of a COVID-19 cure or vaccine, scientists are investigating whether vitamin D can reduce the risk of COVID-19 infection or the severity of the disease. Indeed, the idea of taking a vitamin to ward off COVID-19 infection certainly is appealing.

But although some recent studies have suggested a link between low vitamin D levels and a higher risk of catching the disease, experts say it's

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not enough to prove that vitamin D itself protects against the disease, or if other factors are playing a role.

One study, published Sept. 3 in JAMA Network Open, found that the risk of COVID-19 infection in people with vitamin D deficiency was nearly two times higher than in people with sufficient levels of the vitamin. Another study, published Oct. 27 in The Journal of Clinical Endocrinology & Metabolism, found that hospitalized COVID-19 patients had higher rates of vitamin D deficiency than a control group of patients who didn't have COVID-19 but whose vitamin D status was measured pre-pandemic.

These associations don't prove that vitamin D deficiency causes increased COVID-19 risk, said Adrian Martineau, who studies respiratory infections and immunity at Queen Mary University of London, and , who was not involved with either study. "But it's suggestive and it's enough to justify doing further research to find out whether or not there is a true cause-effect relationship," Martineau told Live Science. LAY SOUND

A protective effect?

There are several reasons to hypothesize that vitamin D might reduce COVID-19 risk, Martineau said. Vitamin D has been shown to boost the immune system's response to viruses and dampen its inflammatory response; an excessive inflammatory response characterizes severe COVID-19 cases, he said.

According to a meta-analysis by Martineau, first published in 2017 in the journal BMJ and updated to include more recent studies this July on the preprint server medRxiv, vitamin D supplementation reduced the risk of acute respiratory tract infections in general compared with a placebo. (However, the meta-analysis did not include studies about COVID-19.)

Additionally, there's an overlap between the groups of people with higher risk of vitamin D deficiency, such as older people and people with darker skin, and those at higher risk for COVID-19, Martineau said. "People put two and two together and thought, 'Well, this is quite a striking coincidence, if it is indeed a coincidence.'"

An earlier study published May 6 in the journal Aging Clinical and Experimental Research found that in 20 European countries, the lower the average vitamin D levels, the higher the rate of coronavirus cases and deaths were for a given country.

Still, not all studies have suggested a protective effect. A study published May 7 in the journal Diabetes & Metabolic Syndrome found no statistically

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significant association between vitamin D levels and COVID-19 risk once the researchers took into account other factors that could affect COVID-19 risk.

The chicken or the egg

In the JAMA Network Open study, the researchers examined the relationship between likely vitamin D levels and COVID-19 risk in 489 people who took a COVID-19 test at the University of Chicago Medicine between March 3 and April 10 and whose vitamin D levels had been measured within the previous year. The study researchers found that the risk of testing positive for COVID-19 in people whose vitamin D levels were likely deficient — patients with low vitamin D at their last test and who hadn't changed their treatment — was 1.77 times greater than that of patients whose vitamin D levels were likely sufficient. That's according to the researchers' analysis which accounted for other differences between the two groups that could affect COVID risk.

The Journal of Clinical Endocrinology & Metabolism study compared the vitamin D levels of 216 patients hospitalized with COVID-19 at University Hospital Marqués de Valdecilla in Santander, Spain, from March 10 to March 31 with a control group of 197 patients who had their vitamin D levels tested the previous year as part of a different study. Of the COVID-19 patients, 82% had vitamin D deficiency compared with 47% of control patients, a statistically meaningful difference.

A strength of the University of Chicago study is that vitamin D levels were measured before patients' COVID-19 tests, Martineau said. For the Spanish study, on the other hand, patients had vitamin D levels measured after they had tested positive for COVID-19. "You can't tell the chicken from the egg. In other words, the COVID might have caused the low vitamin D or it might be a consequence of it," Martineau said. Because the University of Chicago study was observational — participants were not randomly assigned to take vitamin D or not — it still doesn't prove that vitamin D deficiency increases COVID risk, Martineau said.

Dr. David Meltzer, a University of Chicago researcher who led the study there, agrees. "None of that proves that vitamin D deficiency is causing COVID," Meltzer said, referring to his study and to other associations between vitamin D and COVID risk. "It may be that people who are sicker in general are more likely to have low vitamin D levels," he added.

To try to answer the chick-and-egg question, Martineau is leading a study in which participants are randomized to take differing doses of vitamin D,

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then followed to see whether taking more vitamin D reduces COVID-19 risk or severity. The database ClinicalTrials.gov lists about 30 such studies of vitamin D and COVID, according to The Scientist.

While studies are underway, should people start popping supplements? Martineau's advice would be yes, but only if they aren't already meeting current guidelines for vitamin D intake from food. In the U.S., the daily recommended vitamin D intake is 600 international units (IUs) for adults up to age 70 and 800 IUs for adults 71 and up, according to the National Institutes of Health Office of Dietary of Dietary Supplements. "My recommendation would be to follow that advice because it's well established that this will have benefits for bone and muscle, and there's a chance, a good chance, perhaps, that it may also have some benefit against COVID, although that remains unproven," Martineau said. Martineau does not, however, recommend that people start taking higher doses of the vitamin in the absence of more data about how dosage and COVID-19 risk are related.

Originally published on Live Science.

[livescience.com](https://www.livescience.com), 3 November 2020

<https://www.livescience.com>

Ultrawhite paint could cool buildings and combat climate change

2020-10-22

Air conditioning may be a blessing on hot days, but it's also a major source of carbon dioxide emissions the world over. In recent years, researchers have devised plastic films and paints that can cool surfaces to a lower temperature than the surrounding air by radiating heat out into space. Now, researchers have come up with a new ultrawhite paint that one-ups the competition, they report this week in Cell Reports Physical Science. Not only does it cool surfaces below ambient temperatures at night—as other materials have done—but it can also cool them by 1.7°C in the heat of the day. The paint's makeup should also make it easier to produce in bulk, BBC reports. That could be useful for cooling everything from apartment buildings to data centers with less power.

[sciencemag.org](https://www.sciencemag.org), 22 October 2020

<https://www.sciencemag.org>

Not only does it cool surfaces below ambient temperatures at night—as other materials have done—but it can also cool them by 1.7°C in the heat of the day.

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