CHEMWATCH

# Bulletin Board

## Contents

SEP. 25, 2021

(click on page numbers for links)



## CONTACT US


**subscribers@chemwatch.net**
**tel +61 3 9572 4700**
**fax +61 3 9572 4777**

**1227 Glen Huntly Rd**
**Glen Huntly**
**Victoria 3163 Australia**


*** 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.**

# Contents

SEP. 25, 2021






CHEMWATCH
Bulletin Board
Contents
SEP. 25, 2021

## ASIA PACIFIC

### Do you work with engineered stone?

*2021-09-13*

If you work with engineered stone, you are at risk of exposure to silica dust. Work processes or tasks that release harmful silica dust into the air include:

- cutting, grinding and polishing engineered stone
- cleaning up the workplace, and
- disposing of waste.

Implementing the right control measures can eliminate or manage your workers' exposure to these hazards and protect their lungs. Others at risk could include other tradespeople, visitors to your business, and on-site office staff.

Some of the ways you can manage the risk of silica dust are:

- substituting engineered stone for one with low or no crystalline silica
- using designated rooms with restricted access for cutting engineered stone
- using local exhaust ventilation, on-tool dust extraction and water suppression, and
- using appropriate personal protective equipment, including respiratory protective equipment.
- Our Clean Air. Clear Lungs campaign website has case studies, information sheets and checklists to help PCBUs who work with engineered stone to identify and manage the risks of exposure to hazards, such as silica, associated with occupational lung diseases.

Why not check out the animations too?

Read More

Safe Work Australia, 13 September 2021

https://www.safeworkaustralia.gov.au/media-centre/news/do-you-work-engineered-stone

**Implementing the right control measures can eliminate or manage your workers' exposure to these hazards and protect their lungs.**



CHEMWATCH
Bulletin Board
Regulatory Update
SEP. 25, 2021

### Eliminate or manage hazardous air in manufacturing

*2021-08-30*

Do you work in manufacturing? The air you breathe at work can contain hazardous dusts, gases, fumes or vapours resulting from manufacturing processes or materials. Manufacturing workers can be exposed to hazardous air, including through:

- welding
- spray painting
- food production that creates dust, including flour dust
- working with wood
- resources and minerals processing, and
- medical products that release dust or fumes. Implementing the right control measures can eliminate or manage your workers' exposure to these hazards and protect their lungs.

Some of the ways you can manage these risks are:

- limiting access to areas where dusts, gases, fumes and vapours are being released
- using engineering controls such as local exhaust ventilation and on tool dust extraction, and
- using appropriate personal protective equipment, including respiratory protective equipment.
- Our Clean Air. Clear Lungs campaign website has case studies, information sheets and checklists to help PCBUs in the manufacturing industry to identify and manage the risks of exposure to dusts, gases, fumes and vapours associated with occupational lung diseases.

Why not check out the animations too?

Safe Work Australia, 30 August 2021

https://www.safeworkaustralia.gov.au/media-centre/news/eliminate-or-manage-hazardous-air-manufacturing

**State officials are still trying to gauge the extent of the pollution offsite.**

## AMERICA

### 'Concerning' levels of forever chemicals polluting Henderson, Ky.

*2021-08-16*

High levels of PFAS chemicals have contaminated a plastics recycling company in Henderson, Kentucky, spreading through the air and water and likely contaminating a creek that flows into the Ohio River, state officials say.

The company, Shamrock Technologies Inc., notified state regulators about the problem after hiring a consultant to screen for the pollution three years ago.

State records obtained by WFPL News through a records request show the extent of the pollution at the site, where PFAS levels rival those found at EPA Superfund sites on military installations across the country, but get far less attention.

State officials are still trying to gauge the extent of the pollution offsite. As recently as last year, scientists discovered PFAS chemicals outside of Shamrock's facilities, in the soil and groundwater nearby, as well as in a creek that flows into the Ohio River, a drinking water source for millions of people.

The existence of the so-called "forever chemicals" in other communities has led to billions spent on cleanup costs, personal injury litigation and environmental monitoring. To date, state testing has not found PFAS levels above federal standards in Henderson's drinking water or at private wells near Shamrock facilities.

The consulting firm hired by Shamrock found the pollution in nearly every sample they gathered and noted concerns the pollution could migrate offsite, records show.

Read More

WFPL, 16 August 2021

https://wfpl.org/concerning-levels-of-forever-chemicals-polluting-henderson-ky/

**"Our customers depend on us to provide high-quality drinking water. That's why Cal Water is already taking steps designed to protect our customers from 'forever chemicals.'"**



CHEMWATCH
Bulletin Board
Regulatory Update
SEP. 25, 2021

### California water service announces support for setting public health goals for "forever chemicals" in drinking water

*2021-08-24*

Continuing its track record as an industry leader in providing a reliable supply of clean, safe, and affordable drinking water, California Water Service (Cal Water) today announced its support of state efforts to set public health goals for two of the most prominent "forever chemicals" found in drinking water.

"As a water provider, maintaining safe, clean drinking water is paramount and our No. 1 priority," said Martin A. Kropelnicki, Cal Water President and CEO. "Our customers depend on us to provide high-quality drinking water. That's why Cal Water is already taking steps designed to protect our customers from 'forever chemicals.'"

In July, the California State Office of Environmental Health Hazard Assessment (OEHHA) proposed establishing stringent public health goals for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS), broadly known as PFAS. PFAS are chemicals widely used in non-stick and stain-resistant coatings, waterproofing, polishes, and paints.

OEHHA is proposing "forever chemical" goals of one part per trillion and below, about 70 times lower than today's federal non-binding recommendation.

"We have also called on the state and federal governments to take additional action, including encouraging the U.S. Environmental Protection Agency to establish a federal drinking water regulation of these chemicals, and advocating for legislation at the state level to prohibit the use of certain products that contain the compounds," Kropelnicki said.

Read More

Yahoo Finance, 24 August 2021

https://finance.yahoo.com/news/california-water-announces-support-setting-201500934.html

**According to ASTM, the standard is specific to the use of the darkfield microscopy/ hyperspectral imaging analysis technique.**

## ASTM publishes laboratory guide for identifying nanomaterials

*2021-08-23*

ASTM recently announced that it published a standard, E3275, that seeks to familiarize laboratory scientists with background information and technical content necessary to image and identify engineered nanomaterials in cellular and noncellular samples. According to ASTM, the standard is specific to the use of the darkfield microscopy/hyperspectral imaging analysis technique. ASTM states that in this technique, the resulting sample analysis allows for direct visualization and identification of the nanomaterials based on comparison to the spectral profiles of well-characterized reference nanomaterials.

Read More

Nano and Other Emerging Chemical Technologies Blog, 23 August 2021

https://nanotech.lawbc.com/2021/08/astm-publishes-laboratory-guide-for-identifying-nanomaterials/

## ACC applauds passage of California legislation to address plastic waste exports

*2021-09-07*

The American Chemistry Council (ACC) applauds the California Legislature for passing AB 881, legislation authored by Assembly Member Lorena Gonzalez (D-San Diego), which strengthens requirements to help ensure that only plastics which are truly recycled are included within California's recycling metrics. ACC supported AB 881 throughout the legislative process and urges Governor Gavin Newsom (D) to sign the bill.

"ACC and its member companies are committed to eliminating plastic waste in our environment," said Joshua Baca, vice president for plastics at ACC. "AB 881 supports this objective by establishing a more accurate baseline of recycling rates for industry and government to take further action, including increasing access to waste collection and recycling; supporting deployment of technologies, such as advanced recycling, to increase the circularity of plastics; and supporting innovation in product and packaging design to improve recyclability and increase the use of recycled materials in new packaging," said Baca.

ACC recently announced Five Actions for Sustainable Change to accelerate a more circular economy for plastics. Proposed Action Three, developing

**"ACC and its member companies are committed to eliminating plastic waste in our environment," said Joshua Baca, vice president for plastics at ACC.**



CHEMWATCH
Bulletin Board
Regulatory Update
SEP. 25, 2021

a national recycling standard, depends on accurate data reporting and reliable metrics, which AB 881 will greatly improve in California and lay the groundwork for a more circular economy nationally.

Read More

American Chemistry Council, 7 September 2021

https://www.americanchemistry.com/chemistry-in-america/news-trends/press-release/2021/acc-applauds-passage-of-california-legislation-to-address-plastic-waste-exports

# EUROPE

## Commission platform on sustainable finance issues draft recommendations on taxonomy criteria

*2021-09-10*

The draft report and its Annex present **technical screening criteria** for a first set of **priority economic activities** with regard to their **substantial contribution** to four environmental objectives: sustainable use and protection of water and marine resources; **transition to a circular economy**; pollution prevention and control; and protection and restoration of biodiversity and ecosystems, as well as the criteria for **"do no significant harm" (DNSH)**. They have been drafted by the Technical Working Group, a dedicated subgroup of the Platform on Sustainable Finance **requirements under the Taxonomy Regulation** 2020/852. The Technical Working Group has **prioritised** a wide array of economic **activities**, such as the manufacture of chemicals, chemical products, plastics, machinery and waste management systems. **Chemical recycling** is not as such addressed as an economic activity but as part of other activities. For example, the Technical Working Group considers it in the context of one criterion for the **manufacture of food products and beverages** to substantially contribute to the transition to a circular economy: 85% of its packaging (by weight) consists of, among other options, material fully manufactured by mechanical or chemical recycling of post-consumer material, with claims on recycled content made using a **batch level mass balance** method. For the **manufacture of plastic packaging goods**, the draft report includes as a criterion that the goods are 95% mechanically recycled, chemically recycled, biobased or carbon capture and utilisation (CCU) feedstock.

**The Technical Working Group has prioritised a wide array of economic activities, such as the manufacture of chemicals, chemical products, plastics, machinery and waste management systems.**

The draft criteria presented in the report are **working documents** of the Platform and not an official Commission document. They do not represent the final view of the Platform. It might eventually consider economic activities not included in the first-batch of priority activities. Stakeholders can submit their feedback until 24 September. The Platform plans to submit a final report to the Commission in November 2021, and the Commission wants to publish a delegated act with the technical screening criteria for these four non-climate environmental objectives in 2022.

The EU adopted the **Taxonomy Regulation** as an EU-wide classification system for sustainable economic activities to drive green investments supporting the objectives of the European Green Deal. It entered into force in July 2021, but some of its provisions will be phased-in over the next few years. The EU Taxonomy system creates a list of **economic activities** with technical screening criteria determining which ones make a **substantial contribution** to one or more of the six **environmental objectives**: climate change mitigation; climate change adaptation; sustainable use and protection of water and marine resources; transition to a circular economy; pollution prevention and control; and protection and restoration of biodiversity and ecosystems, and **do no significant harm** to any of the others. The Taxonomy Regulation tasks the European Commission with adopting delegated acts that establish technical screening criteria with which the activity has to comply. Earlier this year, the Commission adopted the delegated act on climate change mitigation and adaption. The European Parliament and the Council are examining that delegated act, which is supposed to apply from the start of 2022.

Read More

The National Law Review, 10 September 2021

https://www.natlawreview.com/article/sustainability-outlook-european-union-august-2021

## European commission consults on pollutants in surface and ground waters

*2021-09-10*

The Commission has launched an open public consultation on its upcoming legislative proposal on the lists of pollutants affecting surface and ground waters and corresponding regulatory standards. In 2019, its Fitness Check of EU Water Law concluded that water legislation is generally fit for purpose, but there is **room for improvement** in many key

**Non-legislative options could include updating and developing guidelines on monitoring and on thresholds.**



CHEMWATCH
Bulletin Board
Regulatory Update
SEP. 25, 2021

areas, such as **chemical pollution,** where legislation did **not sufficiently address pollutants of emerging concern**, such as **pharmaceuticals**, (micro-) **plastics** and per- and polyfluoroalkyl substances (**PFAS**). In October 2020, the Commission issued an inception impact assessment (IIA), laying out the roadmap for a revision of various pieces of EU water legislation. The options that it presented include updating **(1)** the list of priority substances in surface waters (under the Water Framework Directive 2000/60), **(2)** the water environmental quality standards (under the Environmental Quality Standards Directive 2013/39), and **(3)** the lists of pollutants and standards in groundwater (under Groundwater Directive 2014/80) by adding, removing, or re-designating substances. Non-legislative options could include updating and developing guidelines on monitoring and on thresholds.

The public consultation will be open until 1 November. In parallel, an expert questionnaire will be available until 5 October. The Commission plans to issue its legislative proposal in Q3 2022. The EU co-legislators (Council and European Parliament) would then negotiate and adopt it following the ordinary legislative procedure.

Read More

The National Law Review, 10 September 2021

https://www.natlawreview.com/article/sustainability-outlook-european-union-august-2021

## European commission grants exemption for the use of phthalates in medical devices

*2021-09-10*

The Commission adopted a delegated directive allowing the use of four phthalates (plasticisers) in spare parts recovered from and used for the repair or refurbishment of medical devices, including in vitro diagnostic medical devices, for the purposes of adapting to scientific and technical progress. The permitted substances are bis (2-ethylhexyl) phthalate (**DEHP**), butyl benzyl phthalate (**BBP**), dibutyl phthalate (**DBP**) and diisobutyl phthalate (**DIBP**). The Commission also granted exemptions for (1) the use of DEHP in ion selective electrodes for analysing human body fluids and/or dialysate fluids and (2) in plastic components in magnetic resonance imaging detector coils. The Commission explained that the total negative environmental and health impacts of substitution were likely to outweigh the total benefits.

**The permitted substances are bis (2-ethylhexyl) phthalate (DEHP), butyl benzyl phthalate (BBP), dibutyl phthalate (DBP) and diisobutyl phthalate (DIBP).**

In 2015, the European Commission added these phthalates to the list of restricted substances in the Annex of the **RoHS** Directive 2011/65 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, setting a maximum concentration value by weight in homogeneous materials of 0.1%. The restriction regarding these substances in medical devices and spare parts for their repair, reuse and updating of functionalities has applied since July 2021. The exemptions provided by the recently adopted delegated directives would apply retroactively from one day before these restrictions, and for seven years. The delegated directives are expected to enter into force after a period of scrutiny by the Council and European Parliament of, in principle, two months.

Read More

The National Law Review, 10 September 2021

https://www.natlawreview.com/article/sustainability-outlook-european-union-august-2021

## Commission seeks views on endocrine disruptors

*2021-09-10*

The Commission launched a targeted consultation on **information requirements** on endocrine disrupting chemicals (EDCs). The input provided will be used by the Commission **to evaluate the potential impacts of two proposed options for introducing standard information requirements in REACH Annexes VII-X**. The Commission presented these options at the third meeting of CASG-ED, the Endocrine Disruptors Subgroup of CARACAL, the group of competent authorities for REACH and CLP in October 2020. In the consultation survey, the Commission recalls that it has been investigating the regulation of endocrine disruptors for a number of years, leading to the adoption of the Community Strategy for Endocrine Disruptors and to the 2020 Fitness Check on Endocrine Disruptors. The survey asks for views on the impact of endocrine disruptors, the measures to manage these, existing legislation and the appropriate ambition level, as well as the revision of the REACH Annexes. It also asks about alternative test methods that could reduce animal testing, as well as the impact on research, development and innovation, competitiveness and employment (in laboratories and the chemicals industry). Interested stakeholders can reply to the survey until 8 October 2021.

**The survey asks for views on the impact of endocrine disruptors, the measures to manage these, existing legislation and the appropriate ambition level, as well as the revision of the REACH Annexes.**



CHEMWATCH
Bulletin Board
Regulatory Update
SEP. 25, 2021

Read More

The National Law Review, 10 September 2021

https://www.natlawreview.com/article/sustainability-outlook-european-union-august-2021

## Commission launches consultation on the revision of classification on labelling rules for chemicals

*2021-09-10*

The consultation seeks views on the revision of the Classification, Labelling and Packaging of Chemicals (**CLP**) Regulation 1272/2008. The Commission had announced the revision of the Chemicals Strategy for Sustainability (**CSS**) in October 2020 (please also see frESH Law Horizons March 2021). The survey asks about introducing **three new hazard classes** – endocrine disruptors (EDCs); persistent, bio-accumulative and toxic (**PBT**); and persistent, mobile and toxic chemicals (**PMT**). Questions cover using the World Health Organisation (**WHO) criteria for endocrine disruptors** as a basis for CLP criteria, either directly, or the EU criteria for plant protection products or for biocide products, which are based on the WHO definition and criteria. As foreseen in the inception impact assessment, the open public consultation addresses specific rules for **online sales,** the use of an only representative type-system for **poison centre notifications**, and changes to labelling rules. The survey also asks about the harmonisation of toxicological and ecotoxicological as part of the "One substance, one assessment" concept.

The survey will be open until 15 November 2021. The Commission plans to make the legislative proposal in Q2 2022. The EU co-legislators (Council and European Parliament) will then negotiate and adopt it.

The Commission is expected to run a public consultation on the options for a REACH revision in the first quarter of 2022, with the intention of putting forward a proposal in the fourth quarter of the same year (please see frESH Law Horizons May 2021).

Read More

The National Law Review, 10 September 2021

https://www.natlawreview.com/article/sustainability-outlook-european-union-august-2021

## ECHA updates guidance on REACH registrations

*2021-09-10*

The European Chemicals Agency (ECHA published an updated guidance on registration requirements under REACH. It **aligns the Guidance with two implementing regulations** that the Commission adopted recently on the registration and data sharing of phase-in substances after the final registration deadline and on updates of registration dossiers, respectively (please see frESH Law Horizons October 2019 and October 2020).
ECHA removed all the references to the now obsolete pre-registration process and guides companies on how to calculate the tonnage band in which they have to register. For each tonnage band, REACH defines the **minimum information** that the registrant must provide on the intrinsic properties of their substance. At the lowest tonnage level (1-10 tonnes per year), the standard information requirements are defined in Annex VII. When a new tonnage band level is reached, additional requirements must be fulfilled, which are described in Annex VIII, including **testing proposals** for studies addressed in Annexes IX and X. ECHA also provides guidance to companies on determining when they need to **update** their **REACH registrations**. Additionally, the updated document includes a section on **joint submission of data** that was previously in the guidance on data sharing. Information on data-sharing such as joint submission of data, joint submission obligation and conditions for opting out from the joint submission, has been added and updated.

Read More

The National Law Review, 10 September 2021 ~shttps://www.natlawreview.com/article/sustainability-outlook-european-union-august-2021

## Know more about hazardous chemicals in products – SCIP data published

*2021-09-14*

ECHA/NR/21/22

You can now access data from the EU's first public database of substances of very high concern in products, SCIP. It aims to allow consumers to make more informed purchasing choices and help waste operators to further develop the re-use of articles and the recycling of materials.

Helsinki, 14 September 2021 – Around 6 000 companies across the European Union have successfully complied with their new duty to



CHEMWATCH
Bulletin Board
REACH Update
SEP. 25, 2021

notify ECHA about products containing substances of very high concern, SVHCs. The SCIP database now displays more than four million article notifications.

Based on the information submitted so far, the most commonly notified product categories in the database are:

- machinery and their parts;
- measuring instruments and their parts;
- electronic equipment and their parts;
- vehicles and their parts;
- articles made of rubber; and
- furniture.

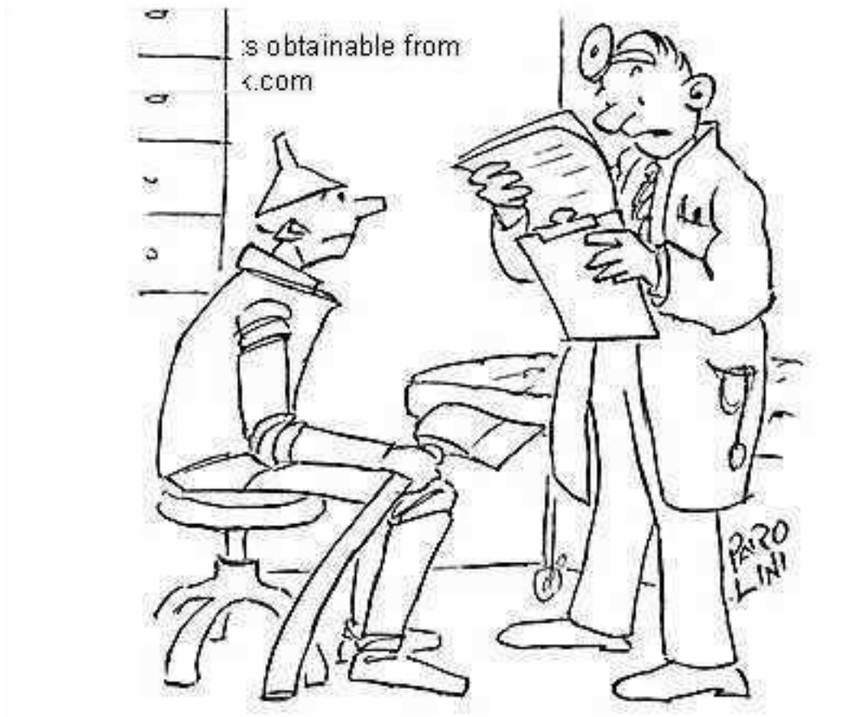
The most common substances of very high concern in notifications are:

- lead (e.g. in ball bearings, batteries);
- lead monoxide (e.g. in lamps, vehicle parts);
- lead titanium trioxide (e.g. in electric cookers);
- silicid acid, lead salt (e.g. in lead crystalware, vehicle coatings); and

**ECHA removed all the references to the now obsolete pre-registration process and guides companies on how to calculate the tonnage band in which they have to register.**

## Iron Man

*2021-09-25*




**undefined.**

http://www.dierk-raabe.com/science-cartoons/





## Fluorine

*2021-09-25*

Fluorine is a chemical element with symbol F and atomic number 9. [1] It is a univalent poisonous gaseous halogen, it is pale yellow-green and it is the most chemically reactive and electronegative of all the elements. Fluorine readily forms compounds with most other elements, even with the noble gases krypton, xenon and radon. It is so reactive that glass, metals, and even water, as well as other substances, burn with a bright flame in a jet of fluorine gas. In aqueous solution, fluorine commonly occurs as the fluoride ion F-. Fluorides are compounds that combine fluoride with some positively charged counterpart. [2] Fluorine does not exist in nature in its elemental state. [3]

### USES [2,3

Fluorine is used in the petrochemical industry, aluminium manufacturing, in dye and ceramics, for etching glass and enamel, as flux for smelting and in agricultural chemicals. Atomic fluorine and molecular fluorine are used for plasma etching in semiconductor manufacturing, flat panel display production and MEMs fabrication. Fluorine is indirectly used in the production of low friction plastics such as teflon and in halons such as freon, in the production of uranium. Fluorochlorohydrocarbons are used extensively in air conditioning and in refrigeration.

**Fluorine is a chemical element with symbol F and atomic number 9.**

### IN THE ENVIRONMENT [2]

When fluorine from the air ends up in water it will settle into the sediment. When it ends up in soils, fluorine will become strongly attached to soil particles. In the environment fluorine cannot be destroyed; it can only change form. Fluorine that is located in soils may accumulate in plants. The amount of uptake by plants depends upon the type of plant and the type of soil and the amount and type of fluorine found in the soil. With plants that are sensitive for fluorine exposure even low concentrations of fluorine can cause leave damage and a decline in growth. Too much fluoride, whether taken in form the soil by roots, or adsorbed from the atmosphere by the leaves, retards the growth of plants and reduces crop yields. Those more affected are corns and apricots. Animals that eat fluorine-containing plants may accumulate large amounts of fluorine in their bodies. Fluorine primarily accumulates in bones. Consequently, animals that are exposed to high concentrations of fluorine suffer from dental decay and bone degradation. Too much fluorine can also cause the uptake of food from the

paunch to decline and it can disturb the development of claws. Finally, it can cause low birth-weights.

## SOURCES & ROUTES OF EXPOSURE

### Sources of Exposure [4]

- The general population can be exposed to fluorine in contaminated air, food, drinking water and soil.
- People living in communities with fluoridated water or high levels of naturally occurring fluoride may be exposed to higher levels.
- People who work or live near industries where fluorine-containing substances are used may be exposed to higher levels.

### Routes of Exposure [5]

Main routes of exposure to fluorine are:

- Inhalation;
- Skin contact;
- Eye contact

## HEALTH EFFECTS [3]

Fluorine is an extremely strong irritant to all tissues it comes in contact with. It can cause injury ranging from mild irritation to caustic burns depending on the concentration of the gas at the time of exposure. It is a very severe irritant of the lungs, mucous membranes, skin and eyes. The reaction of this gas with moisture produces hydrofluoric acid. Thermal burns have been reported when fluorine gas comes in contact with the skin due to the violent reaction between the skin and the gas. Direct contact with liquid fluorine can cause frostbite. The lungs appear to be the most affected tissue. Respiratory tract irritation may progress to pulmonary oedema.

## SAFETY [5]

## FIRST AID MEASURES

- Inhalation: Remove victim to uncontaminated area wearing self-contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.



CHEMWATCH
Bulletin Board
Hazard Alert
SEP. 25, 2021

- Skin/Eye Contact: Remove contaminated clothing. Drench affected area with water for at least 15 minutes. In case of skin contact, wearing rubber gloves rub 2.5% calcium gluconate gel continuously into the affected area for 1.5 hours or until further medical care is available. Immediately flush eyes thoroughly with water for at least 15 minutes. Alternatively irrigate eyes intermittently for 20 minutes with an aqueous Calcium gluconate 1% solution if available. Obtain medical assistance.
- Ingestion: Ingestion is not considered a potential route of exposure.
- Delayed adverse effects possible. Prolonged exposure to small concentrations may result in pulmonary oedema. May cause severe chemical burns to skin and cornea. Treat with a corticosteroid spray as soon as possible after inhalation.
- Obtain medical assistance.

### Fire Information

- Extinguishing media: dry powder and carbon dioxide. Do not use water.
- Exposure to fire may cause fluorine containers to rupture/explode. Fluorine reacts with water.

## Exposure Controls & Personal Protection

### Engineering Controls

- A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product.
- Fluorine should be handled in a closed system and under strictly controlled conditions.
- Keep concentrations well below occupational exposure limits.
- Consider work permit system e.g. for maintenance activities. Preferably use permanent leak-tight connections (eg. welded pipes).
- Systems under pressure should be regularly checked for leakages.
- Provide adequate general or local ventilation.
- Gas detectors should be used when toxic quantities may be released.
- Gas detectors should be used when quantities of oxidising gases may be released.

### Personal Protective Equipment

The following personal protective equipment should be used when handling fluorine:

Eye and face protection:

- Wear goggles and a face-shield when transfilling or breaking transfer connections;
- Wear eye protection to EN 166 when using gases;
- Full-face mask recommended

Hand protection:

- Wear working gloves and safety shoes while handling containers.
- Chemically resistant gloves complying with EN 374 should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Material: Neoprene

Body protection:

- Keep suitable chemically resistant protective clothing readily available for emergency use.
- Personal protective equipment for the body should be selected based on the task being performed and the risks involved.

Other protection:

- Wear working gloves and safety shoes while handling containers.

Respiratory protection:

- Keep self-contained breathing apparatus readily available for emergency use.
- Use SCBA in the event of high concentrations,
- The selection of the Respiratory Protective Device (RPD) must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected RPD.
- When allowed by a risk assessment, Respiratory Protective Equipment (RPE) may be used.

## REGULATION

### United States [6]

OSHA: The United States Occupational Safety & Health Administration has set the following Permissible Exposure Limit (PEL) for fluorine:

- General Industry: 29 CFR 1910.1000 Table Z-1 - 0.1 ppm, 0.2 mg/m3 TWA
- Construction Industry: 29 CFR 1926.55 Appendix A - 0.1 ppm, 0.2 mg/m3 TWA
- Maritime: 29 CFR 1915.1000 Table Z-Shipyards - 0.1 ppm, 0.2 mg/m3 TWA

ACGIH: The American Conference of Governmental Industrial Hygienists has set a Threshold Limit Value (TLV) for fluorine of 1 ppm, 1.6 mg/m3 TWA; 2 ppm, 3.1 mg/m3 STEL

NIOSH: The National Institute for Occupational Safety and Health has set a Recommended Exposure Limit (REL) for fluorine of 0.1 ppm, 0.2 mg/m3 TWA

### Australia [7]

Safe Work Australia: Safe Work Australia has set a Time Weighted Average (TWA) concentration for fluorine of 1 ppm, 1.6 mg/m3 for a 40-hour workweek.

## REFERENCES

1. https://en.wikipedia.org/wiki/Fluorine
2. http://www.lenntech.com/periodic/elements/f.htm
3. http://www.kumed.com/~/media/Imported/kumed/documents/kdhefluorine.ashx
4. http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=211&tid=38
5. https://www.boconline.co.uk/internet.lg.lg.gbr/en/images/sg-057-fluorine-v1.2410_39632.pdf
6. https://www.osha.gov/dts/chemicalsampling/data/CH_242400.html
7. http://www.safeworkaustralia.gov.au/sites/swa/about/Publications/Documents/772/Workplace-exposure-standards-for-airborne-contaminants.docx

## Barnyard breakthrough: Researchers successfully potty train cows

*2021-09-13*

"Why not just potty train the cows?" That's what a radio jockey asked animal behaviorist Lindsay Matthews during a 2007 interview about how cow urine harms the environment. The question was in jest, but it got Matthews—a researcher at the University of Auckland—thinking. Now, nearly 14 years later, he and colleagues have accomplished what many thought impossible: They've taught nearly a dozen calves, which normally pee and poop at random, to "hold it" and urinate in a specific location. Yes, dear readers, the bovines learned to use the bathroom.

The new finding is far from a parlor—or pasture—trick. If applied to the 270 million dairy cows across the globe, it could put a serious dent in the toxic chemicals and greenhouse gases produced by bovine waste.

"It's a huge issue," says Lindsay Whistance, an applied ethologist at the Organic Research Centre, a U.K.-based organization that works to make farms more environmentally friendly. She also likes that scientists are taking the bovine mind seriously. "These animals are capable of much more than we ask of them."

Whistance tried her hand at potty training cows in 2009. Looking for ways to keep the animals from soiling their bedding, she and colleagues taught a handful of calves to relieve themselves for a reward. Right after they peed or pooped, the cows turned to Whistance for a treat, showing they were aware of their bathroom habits. But funding for the project ran out, and Whistance wasn't convinced that toilet training cows would be practical for farmers or the cattle themselves.

That's where Matthews came in. A few years after his radio interview, he was chatting with colleagues about a problem he coined the "climate killer conundrum." Since the early 2000s, farmers in Europe and other regions had moved from chaining dairy cows in a barn or confining them in small stalls to giving them more room to roam indoors. But now, instead of the urine and feces from dozens of animals going straight into an easy-to-clean trench, it slopped all over the concrete floors.

Scattered excrement can cause bacterial infections in cows. And when their poop mixes with pee, it creates an environmental hazard: ammonia, which can transform into the potent greenhouse gas nitrous oxide. Half of the ammonia produced in Europe comes from cattle farms, says study co-author Jan Langbein, an applied ethologist at the Leibniz Institute for Farm

**Yes, dear readers, the bovines learned to use the bathroom.**



CHEMWATCH
Bulletin Board
Gossip
SEP. 25, 2021

Animal Biology. Given the hundreds of millions of dairy cows in the world, he says, studies have shown that capturing 80% of cow urine would lead to a 56% reduction in ammonia emissions.

So Langbein and his Leibniz colleagues constructed a small barn on the grounds of their institute. The inside looked like a queue for an amusement park ride. Metal pipes and railings formed long hallways that ended at a swing-open gate, which stood in front of a square patch of artificial turf—the cow commode. (The team calls it the "MooLoo.") Inside, a window could open to provide the animals a treat—a molasses mixture or crushed barley.

In phase one of the potty training, the team gave 16 Holstein calves a diuretic before confining each one to the MooLoo. The animals were rewarded with food whenever they urinated. After 10 to 30 tries, 10 calves learned to associate peeing with the treat: They turned to the food window right after urinating (see video, above)—sometimes midstream. "They learned really quickly," Langbein says.

In the next two phases, the researchers moved the calves into the hallway, gradually increasing the distance to the latrine up to 5 meters. Cows that urinated before they got to the commode were softly sprayed with water. After five to 15 rounds in the new setup, 10 of the calves walked all the way to the bathroom to relieve themselves, almost always without an accident along the way, the researchers report today in Current Biology.

"The calves' rate of learning is within the range seen with 2- to 4-year-old children, and faster than for many children," Matthews says. The waste, Langbein adds, could be moved to a storage tank, used for fertilizer, or even sampled to monitor the health of individual cows.

Jeffrey Rushen, an animal behaviorist at the University of British Columbia, Vancouver, whose own team separately taught cows to urinate in a specific location—essentially phase one of the current study—calls the new work "the essential next step." But as farmers are likely to balk at potty training hundreds of cows, researchers will need to find a way to automate the process, he says, perhaps with moisture sensors and automated treat dispensers. They'll also need to expand the training to pooping.

"We've never really exploited the cognitive abilities of cows," says Rushen, who has previously shown that the animals learn to recognize different people much faster than pigs do. "If we can use their ability to help keep barns clean, it's not just good for the environment, it reduces the workload of the farmers."

Still, Whistance isn't convinced that potty training cows in the real world is realistic. The animals would have to hold their bladders for much longer distances in an actual barn and might have to muscle past dozens of other cows to get to the bathroom. "They already have to learn where to lie down and where to eat," she says. "Now we're telling them, 'You can't even have a wee when you want one.'"

If nothing else, Langbein hopes the work will burnish the reputation of the much-maligned bovine. "People think of farm animals as dirty and stupid—and that affects how we treat them," he says. "When people realize that these animals are much smarter than we've given them credit for, maybe they'll care more about their welfare."

science.org, 13 September 2021

https://www.science.org

## Pennsylvania vows to regulate PFAS in drinking water—again—but regulations are at least two years away

*2021-09-14*

PITTSBURGH—Thousands of Pennsylvanians have been exposed to dangerous chemicals in their drinking water without knowing it, including people in the Pittsburgh region, but state-level regulations on the toxics remain at least two years away, according to state officials.

Pennsylvania first promised to tackle the issue in 2017, and in the meantime around 10 other states have moved forward with regulations to protect residents. While Pennsylvania officials say the process will take at least two more years, PFAS contamination is disrupting residents' lives. Some residents of McKeesport, a town about 11 miles southeast of downtown Pittsburgh, recently went an entire month without drinking water as a result of local contamination.

Pennsylvania residents risk ongoing exposure unless local water authorities start voluntarily filtering PFAS out of drinking water—which is unlikely because they're often underfunded and must prioritize the testing and removal of chemicals that are already regulated.

The class of chemicals, known as PFAS (perfluoroalkyl and polyfluoroalkyl substances), includes more than 5,000 individual chemicals with similar properties. PFAS don't readily break down once they're in the environment, so they can accumulate in animal and human tissues, earning them the nickname "forever chemicals."

**Some residents of McKeesport, a town about 11 miles south-east of downtown Pittsburgh, recently went an entire month without drinking water as a result of local contamination.**



CHEMWATCH
Bulletin Board
Gossip
SEP. 25, 2021

In addition to being detected in food and takeout wrappers and boxes, PFAS are used in many kinds of nonstick and waterproof coatings and have been detected at troubling levels in drinking water supplies throughout the country. Exposure is linked to health effects including testicular and kidney cancers, decreased birth weights, thyroid disease, decreased sperm quality, high cholesterol, pregnancy-induced hypertension, asthma and ulcerative colitis.

Since 2016 the U.S. Environmental Protection Agency (EPA) has recommended a non-enforceable health advisory limit of 70 parts per trillion (ppt) for PFAS in drinking water—a level scientists, several states and other federal agencies have determined is too high to adequately protect people's health.

In California, for example, state health officials have recommended some of the most stringent PFAS goals in the country: 0.007 ppt for PFOA and 1 ppt for PFOS in drinking water (Perfluorooctanoic acid and Perfluorooctanesulfonic acid respectively; two of the most harmful and ubiquitous PFAS chemicals). Because we're exposed to PFAS from many different sources and they stay in the human body forever, many health leaders recommend removing all PFAS from drinking water, but regulators must also consider what level of filtration is achievable given budget constraints.

The EPA has promised to set stricter federal standards for PFAS in drinking water (and efforts to do so are underway), but the process has been slow. In the meantime, local municipalities face an uphill battle when it comes to controlling contamination.

"These chemicals are destroying lives," Hope Grosse, whose family lives near a contaminated site near Philadelphia, told state officials at a public hearing in 2019. "We need you to make changes today, not tomorrow."

A series of delays

In 2018, New Jersey became the first state to set a Maximum Contaminant Level (MCL) for any PFAS in drinking water. California, Colorado, Connecticut, Massachusetts, Michigan, Minnesota, New Hampshire, New York, North Carolina and Vermont have also adopted or proposed limits, and several other states have passed legislation to require monitoring of PFAS in public drinking water systems.

A state MCL will require more frequent monitoring of PFAS in drinking water by every water provider in the state and mandate filtration if levels exceed the legal threshold.

In June, the Pennsylvania Environmental Quality Board (EQB) voted to move forward with setting an MCL for PFAS including PFOA and PFOS, two of the most widespread and harmful PFAS.

But some community advocates are getting a sense of deja vu.

The June vote mirrored a similar vote taken by the board in 2017, when it accepted a petition filed by environmental advocacy group the Delaware Riverkeeper Network urging the state to set an MCL for PFOA (Perfluorooctanoic acid).

When no further action had been taken to create an MCL two years later, the Delaware Riverkeeper Network sued the Department of Environmental Protection (DEP) over the lack of action.

The EPA had promised to announce updates on the federal regulation of PFAS in February 2019, but after it failed to do so, the DEP again renewed its promise to establish a statewide MCL.

At the time, a DEP spokesperson told EHN the process had been slow because the chemical class was new to most state regulators, state agencies were having difficulty hiring a qualified toxicologist, and Pennsylvania has unique pro-business laws that make it difficult to quickly pass and implement new health-protective regulations.

The agency has since hired a toxicologist, who submitted recommendations for a statewide MCL in January 2021—but the COVID-19 pandemic has further delayed the process.

"It is difficult to give a timeline for implementation [of a PFAS MCL]," DEP spokesperson Jamal Thrasher told EHN, pointing to the lengthy process for enacting new regulations in Pennsylvania. "DEP staff are currently developing a draft regulation…which will eventually be presented to the Environmental Quality Board. The general timeline once a draft regulation is presented to the EQB is roughly two years, though that is subject to change."

The lack of PFAS regulations in Pennsylvania is part of a larger problem of inadequate regulations locally, nationally and internationally, according to a paper published Tuesday in Environmental Science and Technology by University of Pittsburgh PFAS scientist Carla Ng.



CHEMWATCH
Bulletin Board
Gossip
SEP. 25, 2021

"Knowledge deficits are often put forward to delay concrete measures," stressed co-author Dr. Martin Scheringer. "But we already know enough about the harm being caused by these very persistent substances to take action to stop all non-essential uses and to limit exposure from legacy contamination."

The state rejected recommendations the Delaware Riverkeeper Network submitted for a PFOA limit between 1 ppt and 6 ppt, saying further studies are needed. Other states that have set an MCL for PFOA are generally in the range of 5 to 15 ppt. TheDEP said it intends to set an MCL for additional PFAS chemicals, but Thrasher told EHN it has not yet determined which ones.

Meanwhile, the EPA expects to publish proposed drinking water regulations for Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonate (PFOS), in March 2023. State-level restrictions are still important because federal regulation has been delayed numerous times and states may wish to pass more stringent regulations based on local contamination and cleanup capacity.

In July, the Commonwealth Court of Pennsylvania rejected DEP's request to dismiss Delaware Riverkeeper Network's 2019 lawsuit. DEP claimed the issue is moot since they're now moving forward with the rulemaking, but the Court pointed out that the agency's delayed response has still not been addressed.

"The need for a protective drinking water standard that would require the removal of PFOA from our drinking water was urgent in 2017 when we filed our petition," Tracy Carluccio, deputy director of the Delaware Riverkeeper Network said in a statement. "It was urgent in 2019 when we went to court to press for action from DEP on the need to remove this highly toxic compound from drinking water in Pennsylvania. Inexcusably, years have passed while people continued to drink water contaminated with PFOA, endangering their health."

Statewide testing results

After conducting statewide testing, the DEP did not find widespread PFAS contamination exceeding the EPA's current threshold, according to a study released in June.

There were two drinking water systems that did exceed EPA standards: One at a manufacturing business in Centre County and one in Saegertown Borough in Crawford County.

The DEP only tested for certain PFAS chemicals, and only flagged locations with PFAS levels above the current EPA health advisory of 70 parts per trillion for combined levels.

Among the states that have set their own limits for PFAS, many keep limits below 15 ppt. If one of these more stringent standards were adopted in Pennsylvania, there would be dozens more sites out of compliance.

The state also only tested around 400 sites that it believed could have contamination with the intention of estimating how widespread and severe contamination is. Private wells were not tested, and there could be other public water systems with contamination that were not tested.

Local contamination

Coraopolis, a small borough about 13 miles southwest of downtown Pittsburgh, showed one of the highest levels of the six kinds of PFAS during the state's first round of sampling in 2019. At that time, the township's water authority committed to using additional filtration to remove PFAS.

The borough is located near Pittsburgh International Airport, a location that has frequently spread one of the most common sources of PFAS contamination into the ground: aqueous film forming foam (AFFF), a substance airport firefighters use to extinguish and prevent oil and gas fires.

The EPA now routinely tests for 24 different PFAS chemicals, so the DEP retested Coraopolis and more than 100 other sites a second time in 2021. This time Coraopolis' water sample showed less than half as much PFAS contamination as it had in 2019.

Coraopolis never did introduce additional carbon filtration, a way of removing PFAS chemicals from the water, because it proved too expensive.

Two samples from the same water source can vary by as much as 30% because of a lack of precision in the testing, according to Ng, the PFAS expert at the University of Pittsburgh. So it's not clear from the state test results if PFAS levels in Coraopolis have actually fallen.

More recently, residents of McKeesport, a town about 11 miles southeast of downtown Pittsburgh, experienced PFAS in their drinking water after an accident involving aqueous firefighting foam.

In July, about 500 residents were instructed not to use their tap water to drink, bathe, or cook because firefighting foam may have inadvertently



CHEMWATCH
Bulletin Board
Gossip
SEP. 25, 2021

been injected into a fire hydrant during a local fire. Unlike some other contaminants, PFAS in tap water can't be reduced by boiling, freezing, or using typical household filters.

Over the next several weeks the number of homes instructed not to use their tap water dwindled as officials determined the scope of the impact, but some homes in the region were without usable tap water for nearly a month. By the time the order was lifted, testing and cleanup had cost the municipal water authority hundreds of thousands of dollars.

While the do-not-use order remained in effect, community advocacy group Women for a Healthy Environment distributed ZeroWater filters, which reduce PFAS by an estimated 94.9%. The incident also prompted the organization to call for a statewide ban on aqueous firefighting foam.

"Safer, reliable alternatives exist," Abdul Alobireed, Women For a Healthy Environment's Environmental Health Fellow, said in a statement, "Regulatory protections must be enacted to ban the use of [these] foams and protect local drinking water sources."

Statewide bans of PFAS-containing firefighting foams were recently passed in Connecticut, California, Washington and New York, where such alternatives are already in use.

Under-funded water treatment plants

While state officials maintain that having federal restrictions on PFAS in drinking water would speed up cleanups, some municipal water authorities have lobbied against the move. Representatives from these lobbying groups have said that while they support removing PFAS from drinking water, they fear legal liability for harms caused by exposure to the chemicals will fall to them, and worry that proposed federal funding for cleanup won't be enough to cover legal costs.

Several states and water authorities, including Pennsylvania American Water, have sued companies that manufacture PFAS, like 3M and DuPont, for polluting water sources with PFAS.

Unfortunately, PFAS contamination is just one of many expensive problems facing underfunded municipal water authorities.

John Schombert, who chairs the Coraopolis water authority board, said PFAS filtration in Coraopolis would've been more expensive than they initially thought, and the authority has to look at other potential contaminants, not just PFAS. The requirements are likely to get more

stringent over time for a number of chemicals. Their wells are also located near a known superfund site on Neville Island, and the town is already unable to draw water from some of its wells because there are other contaminants, such as iron, that are too high to meet water quality standards.

"We are a groundwater plant, so you can anticipate that maybe there are other organic chemicals that no one is analyzing for or may show up in the future that we need to be prepared for," he said.

The authority has put in an application for federal funding to help pay for improvements. Another option would be to start buying its water from a bigger water authority. But purchasing water can be expensive too, he said.

"Whatever choices we make it has to be for the long term," he said. "It's a huge investment."

ehn.org, 14 September 2021

https://www.ehn.org

## Report: Climate change could see 200 million move by 2050

*2021-09-14*

BARCELONA, Spain (AP) — Climate change could push more than 200 million people to leave their homes in the next three decades and create migration hot spots unless urgent action is taken to reduce global emissions and bridge the development gap, a World Bank report has found.

The second part of the Groundswell report published Monday examined how the impacts of slow-onset climate change such as water scarcity, decreasing crop productivity and rising sea levels could lead to millions of what it describes as "climate migrants" by 2050 under three different scenarios with varying degrees of climate action and development.

Under the most pessimistic scenario, with a high level of emissions and unequal development, the report forecasts up to 216 million people moving within their own countries across the six regions analyzed. Those regions are Latin America; North Africa; Sub-Saharan Africa; Eastern Europe and Central Asia; South Asia; and East Asia and the Pacific.

**Under the most pessimistic scenario, with a high level of emissions and unequal development, the report forecasts up to 216 million people moving within their own countries across the six regions analyzed.**



CHEMWATCH
Bulletin Board
Gossip
SEP. 25, 2021

In the most climate-friendly scenario, with a low level of emissions and inclusive, sustainable development, the world could still see 44 million people being forced to leave their homes.

The findings "reaffirm the potency of climate to induce migration within countries," said Viviane Wei Chen Clement, a senior climate change specialist at the World Bank and one of the report's authors.

The report didn't look at the short-term impacts of climate change, such as the effects of extreme weather events, and did not look at climate migration across borders.

In the worst-case scenario, Sub-Saharan Africa — the most vulnerable region due to desertification, fragile coastlines and the population's dependence on agriculture — would see the most migrants, with up to 86 million people moving within national borders.

North Africa, however, is predicted to have the largest proportion of climate migrants, with 19 million people moving, equivalent to roughly 9% of its population, due mainly to increased water scarcity in northeastern Tunisia, northwestern Algeria, western and southern Morocco, and the central Atlas foothills, the report said.

In South Asia, Bangladesh is particularly affected by flooding and crop failures, accounting for almost half of the predicted climate migrants, with 19.9 million people, including an increasing number of women, moving by 2050 under the pessimistic scenario.

"This is our humanitarian reality right now and we are concerned this is going to be even worse, where vulnerability is more acute," said Prof. Maarten van Aalst, director of the International Red Cross Red Crescent Climate Centre, who wasn't involved with the report.

Many scientists say the world is no longer on track to the worst-case scenario for emissions. But even under a more moderate scenario, van Aalst said many impacts are now occurring faster than previously expected, "including the extremes we are already experiencing, as well as potential implications for migration and displacement."

While climate change's influence on migration is not new, it is often part of a combination of factors pushing people to move, and acts as a threat multiplier. People affected by conflicts and inequality are also more vulnerable to the impacts of climate change as they have limited means to adapt.

"Globally we know that three out of four people that move stay within countries," said Dr. Kanta Kumari Rigaud, a lead environmental specialist at the World Bank and co-author of the report.

The report also warns that migration hot spots could appear within the next decade and intensify by 2050. Planning is needed both in the areas where people will move to, and in the areas they leave to help those who remain.

Among the actions recommended were achieving "net zero emissions by mid-century to have a chance at limiting global warming to 1.5° degrees Celsius" and investing in development that is "green, resilient, and inclusive, in line with the Paris Agreement."

Clement and Rigaud warned that the worst-case scenario is still plausible if collective action to reduce greenhouse gas emissions and invest in development isn't taken soon, especially in the next decade.

apnews.com, 14 September 2021

https://www.apnews.com

## Delta-8 marijuana products can be dangerous, health officials warn

*2021-09-15*

U.S. health officials are warning about the potential dangers of "delta-8 THC," a compound derived from marijuana, after seeing an increase in hospitalizations tied to the substance.

On Tuesday (Sept. 14), both the Centers for Disease Control and Prevention (CDC) and the Food and Drug Administration (FDA) alerted consumers of a recent rise in the availability of products containing delta-8 THC, as well as reports of adverse effects from the products.

Delta-8 tetrahydrocannabinol (THC) is one of more than 100 compounds known as "cannabinoids" found in the cannabis plant. It is similar to delta-9 THC, the psychoactive compound that's primarily responsible for the high people experience from marijuana. Delta-8 THC is estimated to be about 50% to 75% as psychoactive as delta-9 THC, but it's naturally produced in only very low levels in the cannabis plant, according to the CDC.

For this reason, some manufacturers use chemicals to convert other, non-psychoactive cannabinoids, such as cannabidiol (CBD), into delta-8 THC.

**Delta-8 THC is estimated to be about 50% to 75% as psychoactive as delta-9 THC, but it's naturally produced in only very low levels in the cannabis plant, according to the CDC.**



CHEMWATCH
Bulletin Board
Gossip
SEP. 25, 2021

This process may create byproducts, or contaminants, that are harmful to people's health, according to the FDA.

In addition, products containing delta-8 THC are sometimes labeled simply as "hemp," a term that refers to the non-psychoactive parts of the cannabis plant and their derivatives. Such labeling may mislead consumers into thinking that they are taking a product without psychoactive effects, the FDA says. What's more, some products containing delta-8 THC may be labeled with only the delta-9 concentration, rather than total THC content, which would underestimate the dose of THC in the product.

Recently, the American Association of Poison Control Centers (AAPCC) began monitoring adverse events tied to delta-8 THC and found that from Jan. 1 to July 31, 2021, there were 660 reports of delta-8 THC exposure, nearly 20% of which required hospitalization, according to the CDC. Nearly 40% of these cases involved children younger than 18. The FDA notes that manufacturers of delta-8 THC products often package and label the products in ways that appeal to children, including selling the products as gummies, chocolates, cookies or candies.

The FDA separately received 22 reports from December 2020 to July 2021 of people who experienced adverse reactions — including vomiting, hallucinations, trouble standing and loss of consciousness — after taking products with delta-8 THC.

Consumers should be aware that the FDA hasn't evaluated or approved delta-8 THC products for any use, and that companies may market or label the products in ways that put people's health at risk, the FDA says. People should also be aware that products labeled as hemp or CBD could contain delta-8 THC and cause psychoactive effects. Parents should keep products that contain THC or CBD away from children and pets, officials said.

People who experience serious effects from THC or CBD products should call poison control or seek immediate medical care, the CDC says.

Originally published on Live Science.

livescience.com, 15 September 2021

https://www.livescience.com

**In a statement Copernicus said that this year's hole "has evolved into a rather larger than usual one".**

## 'Larger than usual': this year's ozone layer hole bigger than Antarctica

*2021-09-16*

The hole in the ozone layer that develops annually is "rather larger than usual" and is currently bigger than Antartica, say the scientists responsible for monitoring it.

Researchers from the Copernicus Atmosphere Monitoring Service say that this year's hole is growing quickly and is larger than 75% of ozone holes at this stage in the season since 1979.

Ozone exists about seven to 25 miles (11-40km) above the Earth's surface, in the stratosphere, and acts like a sunscreen for the planet, shielding it from ultraviolet radiation. Every year, a hole forms during the late winter of thesouthern hemisphere as the sun causes ozone-depleting reactions, which involve chemically active forms of chlorine and bromine derived from human-made compounds. In a statement Copernicus said that this year's hole "has evolved into a rather larger than usual one".

Vincent-Henri Peuch, the service's director, told the Guardian: "We cannot really say at this stage how the ozone hole will evolve. However, the hole of this year is remarkably similar to the one of 2020, which was among the deepest and the longest-lasting – it closed around Christmas – in our records since 1979.

"The 2021 ozone hole is now among the 25% largest in our records since 1979, but the process is still under way. We will keep monitoring its development in the next weeks. A large or small ozone hole in one year does not necessarily mean that the overall recovery process is not going ahead as expected, but it can signal that special attention needs to be paid and research can be directed to study the reasons behind a specific ozone hole event."

Scientists accept that the depletion in the ozone layer is caused by human-made gases called CFCs, which were first developed in the 1930s for use in refrigeration systems and were then deployed as propellants in aerosol spray cans. The chemicals are stable so can travel from the Earth's surface to the stratosphere. But then, at the altitude where stratospheric ozone is found, they are broken down by high-energy UV radiation. The ensuing chemical reactions destroy ozone. CFCs have been banned in 197 countries around the world.



CHEMWATCH
Bulletin Board
Gossip
SEP. 25, 2021

Since the ban on so-called halocarbons the ozone layer has shown signs of recovery, but it is a slow process and it will take until the 2060s or 70s for a complete phasing-out of the depleting substances. During recent years with normal weather conditions, the ozone hole has typically grown to a maximum of 20 million sq km (8 million sq miles).

The 2020 Arctic ozone hole was also very large and deep, and peaked at roughly three times the size of the continental US.

The Antarctic ozone hole usually reaches its peak between mid-September and mid-October. When temperatures start to rise high up in the stratosphere in late southern hemisphere spring, ozone depletion slows, the polar vortex weakens and finally breaks down and, by December, ozone levels usually return to normal.

theguardian.com, 16 September 2021

https://www.theguardian.com

## New Zealand is not as clean or clean as we think—plastic waste is polluting our land

*2021-09-20*

Growing up my school lunches were covered in plastic wrapping, like those of many of my schoolmates. I was taught from a young age to pick up my rubbish and recycle, and I trusted the recycling systems in place especially because New Zealand streets were so clean. Years later, I saw a video on Facebook of a turtle with a straw in its nose, but I knew Kiwis weren't to blame, our rubbish systems were too sturdy. Ignorance is bliss, and ignorance is the cause of the world's plastic pollution crisis.

The illusion was shattered for me when I watched For The Blue, a documentary by Project Blue, a group of young ocean enthusiasts from Aotearoa, who travelled across the globe to investigate the world's plastic-waste crisis – only to find themselves back in clean, green New Zealand experiencing the effects of the global plastic epidemic in their own back yard. During their visit to a once pristine area in the South Island, they found plastic trash strewn across the land, after the Fox river breached a closed landfill on its banks.

The surging water sent waves of plastic trash through untouched landscapes, including a marine reserve and unmodified wetlands. This shocking event emphasised the hidden reality of plastic pollution on our own soil, the result of broken recycling systems and poorly placed coastal

**Ignorance is bliss, and ignorance is the cause of the world's plastic pollution crisis.**

landfills. There are at least 321 closed landfills set up across Aotearoa situated next to the coastlines and riverbanks, and it's only a matter of time until many of these may burst under rising seas and increasing floods.

Kiwis trust their plastic waste will be recycled when it's put in the recycling bin. Unfortunately, New Zealand facilities can only recycle three types of plastic (1,2,5), the other plastics (3, 4, 6, 7 and contaminated plastics) are difficult to recycle and therefore sent to landfills across the nation or exported overseas. By and large, every day we are using single-use plastics which are polluting our earth.

The plastic pollution crisis is naively blamed on countries in South-east Asia which have become dumping grounds for the western world's plastic waste. In 2018, the west's recycling system collapsed when China refused to import any more plastic waste indefinitely to help prevent further pollution to their nation. This left western countries offloading difficult to recycle plastic to developing countries who are without adequate recycling facilities.

Developing countries accept the imported plastic for money, contributing to their population's health problems and environmental disruption through often dangerous recycling practices, as well as the dumping and burning of materials. Since China shut the doors, nations like Malaysia have been the recipients of New Zealand's trash. For Kiwis it's largely a case of "out of sight, out of mind".

But the consumer isn't wholly at fault. We need accessible options that allow us to refuse plastic at the source. Single-use plastic consumption thrives off our busy lifestyles and need for time convenient products like pesky plastic takeaway containers. Our linear "take, make, dispose" consumerism style needs to transition to a circular one "reduce, reuse, recycle".

The swapping of traditional cosmetics and household products for plastic-free alternatives has already started gaining momentum in mainstream stores. But our economy needs to normalise sustainable packaging options – if it's within people's means to buy products that leave zero waste, they should, as this will help drive the demand for companies to provide affordable and accessible sustainable options for everyone. Reusabowl are an example of Kiwi ingenuity that allows customers to still enjoy takeaway options but waste free. Takeaway stores partner with Reusabowl, who offer a bowl borrowing system; borrow a bowl for $10 and get a full refund upon returning it. It's the perfect example of a circular economy.



CHEMWATCH
Bulletin Board
Gossip
SEP. 25, 2021

The New Zealand government has kicked off its mission to phase out single-use and hard to recycle plastics by 2025, after its ban on single-use plastic shopping bags in 2019. This includes bans on polystyrene takeaway packaging, plastic cutlery and plates, straws and fruit stickers. The government is sending a clear message about its stance on transitioning to a low-waste economy. However, there will still be a large amount of plastic waste which is unaccounted for on our supermarket shelves, that we will not have the capacity to recycle for some time, and that will ultimately go to landfill as plastic can only be recycled a handful of times. This is a good first step, but we have much more work to do.

New Zealanders' misinformed ideas about where our plastic waste ends up has tricked us into guilt-free plastic consumption. Unknowingly we have polluted developing countries, the ocean and our own home. We are running out of time. Plastic producing giants and broken recycling systems need to take accountability for the mess they've created and put in meaningful work to fix their unsustainable practices. As individuals we can refuse plastic at the source to limit waste from landfill. But ultimately the decision makers at the top of our waste systems and mass corporations need to change – our future depends on it.

theguardian.com, 20 September 2021

https://www.theguardian.com

## McDonalds vows to reduce plastic in Happy Meal toys

*2021-09-21*

US-based fast-food giant McDonald's announced plans on Tuesday to reduce plastic in its famous Happy Meal toys.

McDonald's said it was considering alternatives, such as three-dimensional cardboard toys or board games with plant-based or recycled materials, to help it "drastically reduce plastics."

Sustainable Happy Meal toys will be rolled out by the end of 2025, McDonald's said.

**Sustainable Happy Meal toys will be rolled out by the end of 2025, McDonald's said.**

"In a few more years, every Happy Meal toy in every Happy Meal around the world, no matter where you are, will be more sustainable," said the company's chief sustainability officer, Jenny McColloch.

McDonald's restaurants in the UK and Ireland already offer only soft toys, paper-based toys or books with the kids meal.

Eliminating 90% of 'virgin' plastic

McDonald's sells more than 1 billion toys each year.

"Transitioning to more renewable, recycled, and certified materials for our Happy Meal toys will result in an approximately 90% reduction in virgin fossil fuel-based plastic use against a 2018 baseline," McDonald's said in a statement.

In recent years, the world's largest restaurant chain has tried to respond to criticism over its use of plastic.

In 2018, Mcdonald's said it would make recycling available in all of its restaurants by 2025. The company has also switched to environmentally friendly packaging materials.

As the name implies, virgin plastic is newly produced rather than recycled. Since the 1950s, roughly 8.3 billion tons of plastic have been produced, with only around 9% of that recycled.

dw.com, 21 September 2021

https://www.dw.com

## COVID-19 has now killed as many people in the U.D. as the 1918 Spanish flu

*2021-09-22*

COVID-19 has now killed as many people in the U.S. as the 1918 flu pandemic, which is often cited as the most severe pandemic in recent history, according to the Associated Press.

As of Tuesday (Sept. 21), more than 676,200 people have died in the U.S. from COVID-19, according to the Johns Hopkins dashboard. The 1918-1919 flu pandemic is thought to have killed roughly 675,000 people in the U.S., according to the Centers for Disease Control and Prevention (CDC).

But it's not exactly clear how many people died a century ago, due to incomplete records and poor understanding of the illness cause, according to the AP.

The worldwide mortality from COVID-19 — estimated at around 4.7 million deaths to date — is nowhere near global deaths brought by the 1918 flu, a number estimated to be more than 50 million.

**But it's not exactly clear how many people died a century ago, due to incomplete records and poor understanding of the illness cause, according to the AP.**



CHEMWATCH
Bulletin Board
Gossip
SEP. 25, 2021

Of course, an apples-to-apples comparison doesn't reveal the true picture of either pandemic, as there are many factors that have changed since a century ago.

On one hand, the population of the U.S. was about a third of what it is today, which means that the 1918 flu wiped out a bigger part of the population than the COVID-19 pandemic has so far, according to the AP. (And the population of the world was about a fourth of what it is today.)

On the other hand, there have been significant scientific advances since a century ago, including three currently available vaccines against COVID-19 in the U.S.

Not only were vaccines not available in 1918, but also they didn't have antibiotics to treat secondary bacterial infections at the time, according to the AP. The 1918 flu killed young, healthy adults in much bigger numbers than COVID-19, which has disproportionately targeted the older and more vulnerable population.

There are currently about 1,900 COVID-related deaths a day, on average in the U.S., and University of Washington projections suggest an additional 100,000 deaths related to the disease in the U.S. by Jan. 1, 2022, according to the AP.

About 64% of the eligible population in the U.S. (those 12 years of age or older) are now fully vaccinated against COVID-19.

Only about 43% of the world population has received at least one dose of a COVID-19 vaccine, with only 2% of people in low-income countries who received one dose, according to our World in Data. (The vaccines are still not readily available in many countries around the world.)

COVID-19 would have been much less deadly in the U.S., where vaccines are readily available, if more people had quickly gotten vaccinated. "We still have an opportunity to turn it around," Dr. Jeremy Brown, director of emergency care research at the National Institutes of Health, told the AP. "We often lose sight of how lucky we are to take these things for granted."

How the COVID-19 pandemic will be remembered in comparison to the 1918 flu remains unclear. You'd like to say it won't be remembered the worst in human history, .

"We have a lot more infection control, a lot more ability to support people who are sick. We have modern medicine," Ann Marie Kimball, a retired University of Washington professor of epidemiology, told the AP. "But we

have a lot more people and a lot more mobility. ... The fear is eventually a new strain gets around a particular vaccine target."

Read the original Associated Press story here.

Originally published on Live Science.

livescience.com, 22 September 2021

https://www.livescience.com

## Extinction of Indigenous languages leads to loss of exclusive knowledge about medicinal plants

*2021-09-20*

"Every time a language disappears, a speaking voice also disappears, a way to make sense of reality disappears, a way to interact with nature disappears, a way to describe and name animals and plants disappears," says Jordi Bascompte, researcher in the Department of Evolutional Biology and Environmental Studies at the University of Zurich.

The project Ethnologue concluded that 42% of the world's more than 7,000 existing languages are endangered. Of the 1,000 Indigenous languages spoken in Brazil prior to the arrival of the Portuguese in 1500, only about 160 are still alive, according to language research non-profit SIL International.

In a recent study, Bascompte and biodiversity specialist Rodrigo Cámara-Leret warn that the extinction of Indigenous languages equates to a loss of traditional knowledge about medicinal plants, which could reduce chances for the discovery of future medicines.

Many of today's mass-market medications are derived from medicinal plants. They range from acetylsalicylic acid—commonly known as aspirin, whose active ingredient is extracted from white willow (Salix alba L.)—to morphine, which is extracted from poppies (Papaver somniferum).

As Indigenous groups traditionally rely on the spoken word for intergenerational knowledge transfer, the disappearance of these languages will take with it a universe of information.

Double the challenge

The study's scientists analyzed 3,597 vegetal species with 12,495 medicinal uses and linked this data with 236 Indigenous languages from three biologically and culturally diverse regions—the northwestern Amazon,

**The project Ethnologue concluded that 42% of the world's more than 7,000 existing languages are endangered.**



CHEMWATCH
Bulletin Board
Gossip
SEP. 25, 2021

New Guinea and North America. From this, they concluded that in these regions, 75% of the medicinal uses for medicinal plants are known in only one language.

"We found that those languages with unique knowledge are the ones at a higher risk of extinction," says Bascompte. "There is a sort of a double-problem in terms of how knowledge will disappear."

The Americas stood out in the study as a hotspot for Indigenous knowledge in which most of the medicinal knowledge is linked to endangered languages, and the northwestern Amazon particularly proved to be a prime example of the double-problem mentioned by Bascompte. The study evaluated 645 plant species and their medicinal uses according to oral tradition in 37 languages and found that 91% of this knowledge exists in a single language only. Therefore if a language is extinguished, as could happen with many in the Amazon in coming years, the medicinal knowledge therein will also die.

The Amazonian plants evaluated in the study were drawn from the book The Healing Forest: Medicinal and Toxic Plants of the Northwest Amazonia, written in 1990 by Richard E. Schultes, the North American author considered the father of ethnobotany.

Cultural loss is greater than the loss of biodiversity

By analyzing the vulnerability of such medicinal species, the study found that the endangerment status of 64% and 69% of plants associated with endangered languages in North America and the northwestern Amazon respectively have not been evaluated by the International Union for the Conservation of Nature (IUCN). Due to this lack of assessment, less than 4% and 1% of species, respectively, are currently classified as threatened.

The researchers supplemented the limited data from IUCN conservation status reports with further predictions from a separate machine-learning study and concluded that "most medicinal plant species in our sample are not threatened"; however, they still note that "IUCN conservation assessments are still urgently needed for these plant species."

While upholding this call for action, the study highlights that the loss of languages will likely have a greater impact on the extinction of medicinal knowledge than the loss of biodiversity. With regard to the maintenance of ecosystem services, cultural heritage is as important as the survival of the plants, as has been previously proven in scientific studies. But results from another study the same scientists led in 2019 showed that cultural

and biological connections are inseparable – a concept further solidified by their new paper.

"We can't ignore this network now and think only about the plants or only about the culture," says Bascompte, pointing to the tendency to minimize diversity. "We humans are very good at homogenizing culture and nature so that nature seems to be more or less the same everywhere."

At the beginning of September during the third cycle of the Amazoniar Project organized by the Amazon Environmental Research Institute (IPAM), artist and educator Denilson Baniwa spoke about this homogenization from an Indigenous perspective: "If I speak Portuguese this well, it is because, in a certain manner, my people and other peoples in Brazil were forced to understand the technologies, knowledge and information of other, mostly non-Indigenous, peoples, in order to be able to survive."

Education over extinction

"When we speak of preservation in Brazil, Indigenous schools hold an important role," says Luciana Sanchez Mendes, a linguist specialized in Indigenous tongues. "It is at Indigenous schools located in the villages that children will learn—both in Portuguese and also in the community's own language."

An initiative to preserve the culture of the Karitiana people, the Pedagogical Lexicon of Karitiana Plants and Animals, was created during a study to be used as didactic material in bilingual education at the school on the Karitiana Indigenous Reserve in the Brazilian state of Rondônia. The project began with a list and description of plants and animals found on the reserve in the Karitiana language. The document's production involved elders, leaders, gatherers and teachers who recorded traditional knowledge on the Amazon biome.

Meanwhile, in Bahia and northern Minas Gerais states, a group of researchers studied and revitalized the Pataxó tongue, which has been considered extinct for years. Together with Pataxó youth and teachers, they studied documents and carried out fieldwork, resulting in the Pataxó Culture and Language Research and Documentation Project. The recovered language, which is now being taught in a number of villages, is called Patxohã.

"Linguists consider a language to be endangered when people stop speaking with their children in their native tongue," says Mendes, who holds a post-doctoral degree from Brazil's Roraima Federal University.



CHEMWATCH
Bulletin Board
Gossip
SEP. 25, 2021

In Brazil, the devaluation of Indigenous languages has been in favor of Portuguese and Spanish—which have been dominant since colonial times—as Indigenous parents forego their native tongues in aims to equip their children for social success. Numerous other pressures on Indigenous peoples together with the recent deaths of leaders from Covid-19 have also caused cultural losses.

To help Indigenous peoples worldwide preserve, revitalize and promote their languages, UNESCO has launched its Decade of Action for Indigenous Languages from 2022 to 2032.

"There is life outside English," says Bascompte. "These are languages that we tend to forget—the languages of poor or unknown people who do not play national roles because they are not sitting on panels, or sitting at the United Nations or places like that. I think we have to make an effort to use that declaration by the United Nations to raise awareness about cultural diversity and about how lucky we are as a species to be part of this amazing diversity."

news.mongabay.com, 20 September 2021

https://www.news.mongabay.com

## Firefighters race to save the world's largest trees as wildfires rage

*2021-09-18*

California firefighters have wrapped the bases of the world's largest trees in fire-resistant aluminum blankets to protect them from a wildfire that is raging nearby, according to recent news reports.

The Paradise and Colony fires, collectively called the KNP Complex Fire, have been burning, uncontained, in California's Sequoia National Park since Sept. 10, according to the National Wildfire Coordinating Group. By Friday (Sept. 17), the fire, which was caused by a lightning storm, had spread across 11,365 acres (4,599 hectares) of the park and had come dangerously close to the"Giant Forest," which is home to many of the planet's most massive trees.

The Giant Forest contains the world's largest tree by volume, the General Sherman, a 2,200-year-old sequoia that stands 275 feet (83 meters) and is over 36 feet (11 m) in diameter, according to the National Park Service.

Y SOUND

**The Giant Forest contains the world's largest tree by volume, the General Sherman, a 2,200-year-old sequoia that stands 275 feet (83 meters) and is over 36 feet (11 m) in diameter, according to the National Park Service.**

Giant sequoias (Sequoiadendron giganteum) are adapted to withstand wildfires and even rely on fire to heat up their cones and release seeds, according to the Los Angeles Times. But climate change and drought are fueling higher-intensity fires that are now too hot even for these fire-adapted giants, as is evidenced by the Castle Fire, which killed thousands of giant sequoias — 10% of these trees — last year.

See more

On Thursday, firefighters wrapped the bases of the General Sherman and some other giant sequoias in flexible burn wrap made of aluminum, to protect them from falling embers and to reflect heat, according to the LA Times.

"It's a very significant area for many, many people, so a lot of special effort is going into protecting this grove," Rebecca Paterson, a spokesperson for Sequoia and Kings Canyon National Parks, told the LA Times. Along with applying the aluminum wrap, the firefighters are using controlled fires to clear vegetation around the trees so there's less material to kindle.

Firefighters have conducted prescribed burns in the Giant Forest before, which may have protected the forest from the massive Rough Fire in 2015, according to the LA Times.

Read the original LA Times story here.

Originally published on Live Science.

livescience.com, 18 September 2021

https://www.livescience.com





## Bizarre pig-faced shark found dead in the Mediterranean Sea. Is it real?

*2021-09-14*

In the water, it looks like any other shark: a swift, gray hunter with steep dorsal fins poking out of its back. But take a close look at its face, and suddenly you're locking eyes with a real-life pig emoji.

Meet the angular roughshark (Oxynotus centrina) — better known in some harbors as the "pig fish." Naval officers in Elba (an Italian island in the Mediterranean Sea not far from Tuscany) created an online stir when they pulled one of these beauties from the water on Sept. 3, posting pictures of the snub-headed oddity on Facebook.

If the shark's flat head, wide-set eyes and blunt, pinkish snout weren't enough to earn the "pig fish" its nickname, then a single utterance from its mouth should put all doubt to rest.

"It is commonly called a 'pig fish' because when it comes out of the water it emits a kind of grunt," Yuri Tiberto of the Elba Aquarium in Italy, told Toscana Media News following the recent discovery.

According to the Elba Island app Facebook page, naval officers found the roughshark floating dead in the water before they hauled it onto the pier. The sharks are plentiful in the Mediterranean, where their spiny dorsal fins and relatively large bodies make them vulnerable to fishing operations, according to the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. Because of this, angular roughshark populations have been in decline for decades, and the species is considered vulnerable (that's one slot safer than "endangered" on the Red List's scale).

**Meet the angular roughshark (Oxynotus centrina) — better known in some harbors as the "pig fish."**

The shark also lives throughout the East Atlantic Ocean, from Norway to South Africa. They have been spotted between 200 and 2,200 feet (60 to 670 meters) below the ocean's surface, and they usually grow to be about 3.3 feet (1 m) in length, according to the IUCN.

The Mediterranean Sea has no shortage of strange sharks. In July 2019, fishers in the Mediterranean trawled up a "naked" shark — that is, a shark seemingly born with no skin or teeth. Astonishingly, the shark had lived to be 3 years old before it died in the fishers' nets. Scientists have yet to see anything else like it.

LAY SOUND

Originally published on Live Science.

livescience.com, 14 September 2021

https://www.livescience.com

## Forget oil or water. In Iceland, well diggers seek to tap a volcano's magma

*2021-09-15*

KRAFLA VOLCANO IN ICELAND—After years of effort, volcanologists are ready to open a gateway to hell. From the rim of the Víti ("hell" in Icelandic) crater—a smaller crater within Krafla's 10-kilometer caldera—Ottó Elíasson looks down on at a tranquil grassy field disturbed only by a spindly weather station. That will change soon, says Elíasson, science chief at Eimur, a geothermal research center. "Ten years from now, this could be the center of volcanology."

The main attraction lies 2 kilometers below this spot on this volcanically hyperactive island, which is being split in two by the spreading Mid-Atlantic Ridge. In 2009, drillers trying to tap hot water for geothermal energy here accidentally pierced a hidden magma chamber. After an outpouring of steam and glass shards from quenched magma, the borehole created the hottest geothermal well ever measured—until the casing failed.

Now, researchers are returning to penetrate the molten rock on purpose, using hardier equipment, to create the world's only long-term magma observatory. "We've been to Mars. We've been to Venus," says Paolo Papale, research director at Italy's National Institute of Geophysics and Volcanology. "But we have never observed magma below the Earth's surface." Results could help explain how magma moves through the crust, while improving eruption forecasts. They could also shed light on how the continents formed and grew.

In May, the Krafla Magma Testbed (KMT) received financing from the International Continental Scientific Drilling Program, which said the project was one of its top priorities for the decade. With that support, along with several million dollars in funding from Iceland and other European science agencies, the project this month entered its preparation phase. It will prove out the technologies needed to hold the well open despite the corrosion that comes with superheated water, take geophysical soundings of the magma chamber, and model how the

**"Ten years from now, this could be the center of volcanology."**



CHEMWATCH
Bulletin Board
Curiosities
SEP. 25, 2021

chamber will behave once penetrated. The first borehole, costing as much as $25 million, could begin as soon as 2023.

Unable to study magma directly, volcanologists rely on surface measurements from seismometers, GPS sensors, and radar satellites to guess its movements. They can examine solidified magma chambers exhumed by Earth's upheavals—but those remnants are incomplete, selectively depleted by ancient lava flows. They can study lava at the surface, but the samples have by then lost most of the trapped gases that drive eruptions and influence the magma's original temperature, pressure, and composition. Crystals, inclusions, and bubbles in the hardened lava hold clues to its original state. But a sample from the Krafla chamber will tell researchers whether those estimates "are fictional or reliable," says John Eichelberger, a volcanologist at Southern Methodist University and KMT leader.

Island of fire and ice

Riven by tectonic plates, Iceland hosts many active volcanoes. At Krafla, magma is close to the surface.

Getting a sample will also reveal the true nature of the magma chamber. Most scientists reject the cartoonish view of magma chambers as hellish underground lakes. "We think of these systems as a mush"—small amounts of liquid between crystallized grains—"rather than a liquid balloon," says Marie Edmonds, a petrologist at the University of Cambridge.

But Krafla, which last erupted in 1984, may be an exception. The glassy bits from the 2009 drilling campaign hinted that the magma was not only liquid, but also circulating, interacting with melt lower down. "That's the most shocking thing from what little we've gleaned so far," Eichelberger says. But little is known about the magma chamber's size or how long it has persisted—questions KMT can help answer. "It's seeing through a glass darkly, as it were," Eichelberger says.

KMT will also help answer basic questions about the raw material of continental crust. The world's sea floors, and much of Iceland, take shape from basaltic magma—much the same stuff that exists in the mantle. But the granite rocks of the continents form from a stickier, silica-rich "rhyolitic" magma that is thought to lie below the KMT site. No one is sure how the continent-forming magma originates; one idea is that basaltic magma gets altered by seawater, remelts, and eventually erupts from volcanoes as rhyolite. Samples of rhyolite from basalt-dominated Iceland could provide a window on how this process works worldwide, Eichelberger says.

KMT intends to collect multiple samples over time and embed sensors in and near the magma to measure heat, pressure, and even chemistry despite temperatures of more than 1000°C. "The technical challenges are formidable," says Wendy Bohrson, a volcanologist at the Colorado School of Mines. KMT's drilling partners are testing flexible couplings that can allow the steel liner of the well to expand and contract with extreme heat. And others are developing innovative electronics to withstand the heat and pressure, which could someday be used on Venus.

The technologies could also benefit Iceland's many geothermal energy companies, which have shied away from the hottest rock. Getting closer to magma could dramatically increase the power potential of individual wells—as was clearly seen with the accidental 2009 well, which on its own could have powered a small city. "The geothermal industry is really looking to understand the real source of its energy," says Hjalti Páll Ingólfsson, managing director of Iceland's Geothermal Research Cluster.

The large amounts of water injected to cool and lubricate the drill will likely perturb the volcanic system a bit, and geophysicists will be watching closely. (There is little worry of triggering an eruption, given the mild behavior of the 2009 borehole, but the site's remote, uninhabited location is another selling point.) Changes in the speed of seismic waves after drilling could reveal the magma's extent, Papale says. Watching these subtle changes could also help with predicting future rhyolite eruptions. Although scientists have gotten quite good at detecting a volcano's warning signs, false alarms abound.

And if KMT remains in place, scientists will eventually get to watch an eruption in action—from the perspective of the underground source of magma. "That will be gold," says Yan Lavallee, a volcanologist at the University of Liverpool. "It is bound to happen."

science.org, 15 September 2021

https://www.science.org

## Some birds learn to recognize calls while still in their eggs

*2021-09-16*

Over a decade ago, behavioral ecologist Diane Colombelli-Négrel was wiring superb fairy wrens' nests to record the birds' sounds when she noticed something odd. Mother fairy wrens sang while incubating their eggs, even though it would have made more sense to keep quiet to avoid attracting predators.

**The discovery "was a bit of an accident," says Colombelli-Négrel, of Flinders University in Adelaide, Australia.**

The discovery "was a bit of an accident," says Colombelli-Négrel, of Flinders University in Adelaide, Australia. And it made her wonder: Could the baby birds be learning sounds, or perhaps even songs, even before they hatch?

Scientists have long wondered how early in development individuals learn to perceive distinct sounds. It's known that human fetuses learn to recognize their mother's voice (SN: 1/7/13). For birds such as superb fairy wrens (Malurus cyaneus) that perfect their songs with parental tutoring, it was thought that sound perception began well after hatching. But when it became obvious that mother birds were intentionally singing to their eggs, "we knew we were on to something," says avian ecologist Sonia Kleindorfer of the University of Vienna.

Previous research by Colombelli-Négrel, Kleindorfer and colleagues showed that unhatched superb fairy wrens learn a vocal "password" from mom that helps mothers discriminate their own nestlings from those of pesky cuckoo invaders (SN: 5/9/14). What's more, unhatched superb fairy wrens appear to distinguish between songs of their own species and others, the team reported in 2014.

That ability extends beyond superb fairy wrens, new research suggests. At least four additional types of birds recognize sounds specific to their species while still in their eggs, the researchers report in the Oct. 25 Philosophical Transactions of the Royal Society B.

The finding is a surprise to many birdsong scientists, says vocal learning neuroscientist Wan-chun Liu of Colgate University in Hamilton, N.Y., who wasn't involved in the new research. "We used to think a lot of the learning happened after hatching, but now there seems to be more and more evidence suggesting, even in the embryonic stage … they are listening," he says.

In birds and humans, a drop in embryonic heart rate is known to indicate attention to a stimulus. Colombelli-Négrel and colleagues' earlier studies of unhatched fairy wrens showed a slowed heart rate in response to repeated sounds of their own species, but not others.

To investigate whether this phenomenon is widespread among birds, the team turned their attention to the embryonic heartbeats of captive Japanese quail (Coturnix japonica domestica), plus three more wild

species: little penguins (Eudyptula minor), red-winged fairy wrens (Malurus elegans) and Darwin's small ground finches (Geospiza fuliginosa).

The team temporarily removed 109 eggs from nests and measured the heart rates of unhatched chicks before, during and after exposure to playbacks of songs from their own species or others. And the researchers investigated whether 138 individual embryos became habituated to repeated sounds of unfamiliar individuals singing their species' own songs, which would imply learning had occurred.

"We expected to find learning evidence in the songbirds but not in the quail and penguins," Colombelli-Négrel says. That's because penguins and quail are "vocal nonlearners" — birds thought to have calls that are genetically programmed from birth and not learned from a tutor.

To the researchers' surprise, all of the embryos showed not only a slowed heart rate in response to repeated sounds of their own species, but also habituation. That finding suggests that these birds learn to perceive the sounds of their species-specific songs embryonically.

The scientists don't know why the penguins and quail, which have their own calls genetically baked in, have the ability to distinguish their own species' calls from those of other birds right from birth. Perhaps it's useful for survival, the researchers speculate.

"Birds are like humans in that there is mother- or father-offspring communication even before birth," says coauthor Mark Hauber, a neurobiologist at the University of Illinois at Urbana-Champaign. The team hopes to study prenatal sound perception in even more bird species to probe the advantages of this early egg-u-cation.

sciencenews.org, 16 September 2021

https://www.sciencenews.org

### How 'Spider-Man' and 'Pac-Man' immune cells team up to fight invasive bacteria

*2021-09-14*

In the ultimate superhero crossover, Spider-Man-like immune cells sling webs to capture invasive bacteria and keep those supervillains restrained until Pac-Man-like cells come to gobble them up, a new study shows.

The research was conducted in mice and mouse cells, but it still may help to explain how these "Spider-Man" cells, called neutrophils, fight off

**It turns out, these spidey cells may not work well in people with autoimmune conditions, such as lupus, making those individuals more susceptible to staph infections, the study authors wrote.**



CHEMWATCH
Bulletin Board
Curiosities
SEP. 25, 2021

infections in humans — and why they sometimes fail. It turns out, these spidey cells may not work well in people with autoimmune conditions, such as lupus, making those individuals more susceptible to staph infections, the study authors wrote.

When a staph infection first begins to take hold in the body, our friendly neighborhood neutrophils swoop in as first responders to help fight the Staphylococcus aureus bacteria, senior author Eric Skaar, director of the Vanderbilt Institute for Infection, Immunology and Inflammation in Nashville, Tennessee, told Live Science. These neutrophils have a secret weapon: They can self-destruct and eject a sticky web from their ruptured membranes. This web, called a neutrophil extracellular trap (NET), contains neutrophil DNA studded with proteins that degrade bacteria.

PLAY SOUND

Researchers previously found that NETs carry chemical red flags that prompt macrophages, white blood cells that munch bacteria, to spark inflammation at an infection site, The Scientist reported. But the new study shows that the two cell types also team up to launch coordinated attacks against invasive microbes, Skaar said. Neutrophils cast their NETs to immobilize the bad guys, and then macrophages swoop in and swallow the bugs whole — not unlike how Pac-Man devours ghosts.

While gobbling down its catch, the macrophage is "actually taking this giant bite out of the NET," Skaar said. The antimicrobial proteins from the NET then mix with antimicrobial proteins already in the macrophage's "belly," so together, the two cell types degrade bacteria more effectively than either cell alone.

In their recent mouse studies, led by Andrew Monteith, a postdoctoral research fellow at Vanderbilt, the team found that some neutrophils release their NETs more quickly than others when chasing down staph bacteria. Specifically, a protein called S100A9 dictates how quickly neutrophils sling their webs. Mice with low levels of this protein seem to survive better against methicillin-resistant S. aureus (MRSA), the team showed in research published in 2017 in the journal Cell Host & Microbe.

In their new study, the researchers started to zero in on why: When neutrophils that are low in this protein encounter staph bacteria, their mitochondria — the so-called powerhouses of the cell — leak electrons and generate harmful free radicals in the cell. This, in turn, drives the cell to self-destruct and release its NETs more quickly than it would otherwise. This super-speedy NET casting boosts the ability of neutrophils and

macrophages to clear staph from the body, as a germ-fighting duo, the team found.

The same held true when the team pitted the immune cells against Streptococcus pneumoniae, which can infect many organs in the body, including the lungs and brain; and they again found the same results with Pseudomonas aeruginosa, a common cause of hospital-acquired infections that can affect the lungs, bones and other organs.

People with certain autoimmune conditions, such as lupus and rheumatoid arthritis, produce more S100A9 than people without these conditions, so in theory, their neutrophils may release their NETs more slowly than average, according to Skaar. "This could partially explain why they're more susceptible to staph" than the general population," he said. However, the team still needs to confirm this theory in humans.

"Having it all be in mice is, of course, a major limitation," Skaar said.

In addition to exploring this potential link to autoimmune diseases, the team plans to study exactly why S100A9 influences the speed at which neutrophils deploy their sticky NETs. Scientists could then boost the web-slinging abilities of neutrophils, to supercharge their infection-fighting abilities.

The research was described Friday (Sept. 10) in the journal Science Advances.

Originally published on Live Science.

livescience.com, 14 September 2021

https://www.livescience.com

## Australian fires in 2019–2020 had even more global reach than previously thought

*2021-09-15*

The severe, devastating wildfires that raged across southeastern Australia in late 2019 and early 2020 packed a powerful punch that extended far beyond the country, two new studies find.

The blazes injected at least twice as much carbon dioxide into the atmosphere as was previously thought, one team's satellite-derived estimates revealed. The fires also sent up vast clouds of smoke and ash that wafted far to the east over the Southern Ocean, fertilizing the waters



CHEMWATCH
Bulletin Board
Curiosities
SEP. 25, 2021

with nutrients and triggering widespread blooms of microscopic marine algae called phytoplankton, another team found. Both studies were published online September 15 in Nature.

Meteorologist Ivar van der Velde of the SRON Netherlands Institute for Space Research in Leiden and colleagues first examined carbon monoxide data collected over southeastern Australia by the satellite-based instrument TROPOMI from November 2019 to January 2020, during the worst of the fires. Then, to get new estimates of the carbon dioxide emissions attributable to the fires, the team used previously determined ratios of carbon monoxide to carbon dioxide emitted by the region's eucalyptus forests — the predominant type of forest that was scorched in the blazes — during earlier wildfires and prescribed burns.

Van der Velde's team estimates that the fires released from 517 trillion to 867 trillion grams of carbon dioxide to the atmosphere. "The sheer magnitude of CO2 that was emitted to the atmosphere … was much larger than what we initially thought it would be," van der Velde says. The emissions "from this single event were significantly higher than what all Australians normally emit with the combustion of fossil fuels in an entire year."

**The emissions "from this single event were significantly higher than what all Australians normally emit with the combustion of fossil fuels in an entire year."**

Previous assessments of CO2 emissions from the fires, based on estimations of burned area and biomass consumed by the blazes, calculated an average of about 275 trillion grams. Using the satellite-derived carbon monoxide data, the researchers say, dramatically improves the ability to distinguish actual emissions from the fires from other background sources of the gases, giving a more accurate assessment.

That finding has worrisome implications. The fires swiftly cut a swath through southeastern Australia's eucalyptus forests, devastating the forests to a degree that made their rapid recovery more difficult — which in turn affects how much carbon the trees can sequester, van der Velde says (SN: 3/9/21). Fires in northern and central Australia's dry, grassy savannas are seen as more climate neutral because the grasses can regrow more quickly, he says.

And severe fire seasons are likely to become more common in southeastern Australia with ongoing climate change. Climate change has already increased the likelihood of severe fire events such as the 2019–2020 fire season by at least 30 percent (SN: 3/4/20).

The smoke and ash from the fires also packed a powerful punch. Scientists watched in awe as the fires created a "super outbreak" of towering

thunderclouds from December 29 to December 31 in 2019 (SN: 12/15/20). These clouds spewed tiny aerosol particles of ash and smoke high into the stratosphere.

Aerosols from the fires also traveled eastward through the lower atmosphere, ultimately reaching the Southern Ocean where they triggered blooms of phytoplankton in its iron-starved waters. Geochemist Weiyi Tang, now at Princeton University, and colleagues analyzed aerosols from the fires and found the particles to be rich in iron, an important nutrient for the algae. By tracing the atmospheric paths of the cloud of ash and smoke across the ocean, the team was able to link the observed blooms — huge patches of chlorophyll detected by satellite — to the fires.

Researchers have long thought that fires can trigger ocean blooms, particularly in the Southern Ocean, under the right conditions, says marine biogeochemist Joan Llort, now at the Barcelona Supercomputing Center and a coauthor on the study. But this research marks the most direct observation ever made of such an event — in part because it was such a massive one, Llort says.

Large ocean blooms are "yet another process which is potentially being modified by climate change," says biogeochemist Nicolas Cassar of Duke University, also a coauthor on the study.

One of the big questions to emerge from the study, Cassar adds, is just how much carbon these phytoplankton may have ultimately removed from the atmosphere as they bloomed. Some of the carbon that the algae draw out of the air through photosynthesis sinks with them to the seafloor as they die. But some of it is quickly respired back to the atmosphere, muting any mitigating effect that the blooms might have on the wildfire emissions. To really assess what role the algae play, he says, would require a rapid-response team aboard an ocean vessel that could measure these chemical processes as they are happening.

The sheer size of this wildfire-triggered bloom — "larger than Australia itself" — shows that "wildfires have the potential to increase marine productivity by very large amounts," says Douglas Hamilton, a climate scientist at Cornell University who was not connected with the study.

"The impact of fires on society is not straightforward," Hamilton adds. The same smoke that can cause severe health impacts when inhaled "is also supplying nutrients to ecosystems and helping support marine food webs." What this study demonstrates, he adds, is that to understand how



CHEMWATCH
Bulletin Board
Curiosities
SEP. 25, 2021

future increases in fire activity might help shape the future of marine productivity "it is crucial that we monitor the impacts closely now."

sciencenews.org, 15 September 2021

https://www.sciencenews.org

## In cities, money doesn't grow on trees, but more trees grow near money

*2021-09-16*

The trend is clear: the wealthier your neighbourhood, the more likely you will be surrounded by trees.

A CBC News analysis of data from the City of Montreal and Statistics Canada shows the higher the median income of a neighbourhood, the more extensive the tree cover.

In other Canadian cities and beyond, researchers are tracking similar dynamics between green space and socioeconomic status, and looking for solutions to address the imbalance.

"The general pattern is that wealthier areas — more privileged neighbourhoods — tend to have not only higher tree cover, but also a greater diversity of species," said Carly Ziter, a biology professor at Concordia University in Montreal who specializes in urban ecology.

**"Those patterns do seem to hold in many of our cities."**

"Those patterns do seem to hold in many of our cities."

The need for trees, and the cooler, better air they provide, has become ever more pressing as the climate warms and cities are subjected to more extended periods of extreme heat, Ziter said.

New research has pointed to more far-reaching effects of trees, from an increase in tourists in leafier commercial areas to tangible improvements in an individual's mental health when surrounded by urban green space.

Montreal endured two lengthy heat waves last month, leading to the hottest August on record.

Ziter said improved tree cover in more dense, low-income areas would help mitigate the impact of future heat waves.

"Trees are like mini air conditioners. They reduce temperature not only by providing shade, which I think is what we tend to think of, but also by evaporating water," she said.

"What we're seeing here is kind of a double hit, where the neighbourhoods who likely have the highest access to cool, air-conditioned spaces also have the highest access to this natural cooling provided by trees."

Clear divide

CBC News calculated the percent of canopy in every census tract on the island of Montreal to three census variables: median household income, visible minority population and per cent of people living below the poverty line. Income showed the clearest correlation with tree cover.

(At the highest income level, there is drop off because some wealthy households are situated near large industrial areas with little tree cover, such as the Bois-Franc neighbourhood of Saint-Laurent north of Montreal's Trudeau airport.)

One of the most pronounced divisions on the island of Montreal plays out between Parc-Extension, a low-income, diverse neighbourhood, and the adjacent, more affluent Town of Mount Royal.

One census tract in TMR has a median household income of $110,000, and trees cover roughly 30 per cent of the surface area.

In neighbouring Parc-Extension, where the median income is between $32,000 and $40,000, trees cover a far lower percentage of the neighbourhood — somewhere between six and 15 per cent, depending on the census tract.

Across the island, there is a correlation between tree cover and median household income.

One area of Westmount, for instance, has a median household income of $270,000 and tree cover of 39 per cent.

Nearby Snowdon, by contrast, has a median household income of $34,000 and 19 per cent cover.

The pattern extends to areas outside the city core, as well.

In the suburban West Island, Beaconsfield has more trees than Pierrefonds, which has a lower median income and a larger commercial area.

Further east, at Cité-Jardin, a section of Rosemont north of Maisonneuve Park, the canopy is far lusher than most of Hochelaga-Maisonneuve, which has a lower average income.

What's behind the disparity?



CHEMWATCH
Bulletin Board
Curiosities
SEP. 25, 2021

There are a number of reasons behind the link between income and tree cover, and they play off one another to further the divide between green neighbourhoods and those with more concrete, said Thi Thanh Hiên Pham, an expert in urban vegetation and professor at the University of Quebec in Montreal.

Research has shown that homes in neighbourhoods with more trees are more attractive on the real estate market, thereby increasing the value.

Such homes also tend to have bigger lots, where trees are able to spread their roots and grow.

At the same time, neighbourhoods with more valuable homes have more property tax revenue to plant and care for more trees, while low-income areas have more apartment buildings, where owners are less likely to be motivated to do the same.

Pham said there are exceptions, notably the storied neighbourhood of Old Montreal, where property is more expensive but tree cover can be as low as five per cent.

The area, much of which dates back to the 17th century, features narrow streets and sidewalks that make it difficult to plant trees or for those already in the ground to survive.

500,000 trees promised

Late last year, Montreal Mayor Valerie Plante committed to "plant, maintain and protect" 500,000 trees over the next decade as part of the city's 2020-2030 climate plan.

The plan commits, in particular, to putting more trees "in zones vulnerable to heat waves." It is also meant to mitigate the culling of thousands of ash borer trees on both public and private land in recent years.

In a statement, city spokesperson Karla Duval said Montreal is on track to plant 46,900 trees along with 6,000 shrubs in 2021. (Local borough initiatives aren't included in this tally.)

The publicly available city canopy data dates back to 2015. New data is slated to be made available at the end of the year, showing the state of the canopy in 2019.

Ziter said the pattern playing out in Montreal and other cities can be gradually rectified, but not only by putting money into low-canopy areas.

They must also be cared for and maintained as they get older.

"We love to plant trees and then we don't necessarily think as much about the care and maintenance of those trees and the city, especially, you know, a dense neighborhood," she said.

"It's a really hard place to grow up. If you're a tree, you've got not very good soil, you've got pollution, you've got people locking their bikes to you."

A new study examining Toronto, Gatineau-Ottawa, Montreal and Quebec City also found that not only are low-income areas more likely to have fewer trees, but those trees are also more susceptible to environmental challenges, meaning that neighbourhoods lacking urban forest are more at risk of losing it.

There are ways to protect young trees in the city, Ziter said, such as a better designed "soil cell" — the little box in the sidewalk where the tree grows — or widening sidewalks to give them more room.

Beyond the maple tree

Maples are the most common trees on the island, but there are plenty of others dotting the landscape — including ash, linden and honey-locusts.

Experts say a greater variety of species would help prevent the spread of disease and pests. Thousands of ash trees in Montreal, for instance, have fallen victim to the emerald ash borer, a tiny invasive beetle.

"The quantity is important but quality is even more important, to ensure the survival of the trees," said Malin Anagrius, the manager of Soverdi, a Montreal-based non-profit organization that plants trees around the city.

On a recent afternoon, a small crew was adding a mix of trees and shrubs to a school in Rosemont — tamarack, white pine and mountain ash among them.

"We do like to think that we democratize the green here in the city," Anagrius said.

'We try to focus on areas on that doesn't have as many trees as they should have because we know that tree canopy has a big effect on health."

On private property, Ziter said such programs designed to encourage and subsidize trees for citizens, schools and businesses are increasingly important.



CHEMWATCH
Bulletin Board
Curiosities
SEP. 25, 2021

Ziter and her team are trying to document the trees on private land. Right now, she's focusing on collecting information in the neighbourhood of Notre-Dame-de-Grâce, but the hope is to expand the project across the city.

"We often focus on tree planting because it feels very actionable, but we also need to keep the trees we have, that are contributing to our canopy already," she said.

cbc.ca, 16 September 2021

https://www.cbc.ca

## Fossil tracks may reveal an ancient elephant nursery

*2021-09-16*

Fossilized footprints found on a beach in southern Spain betray what may have been a nursery for an extinct species of elephant.

The track-rich coastal site, which scientists have dubbed the Matalascañas Trampled Surface, is typically covered by 1½ meters of sand, says Clive Finlayson, an evolutionary biologist at the Gibraltar National Museum. But storm surges in the spring of 2020 washed away much of that sand and exposed the preserved footprints of ancient elephants, cattle, deer, pigs, wolves, water birds and even Neandertals, Finlayson and colleagues report September 16 in Scientific Reports. The sandy-clay sediments hosting this trove of tracks were probably laid down about 106,000 years ago, previous studies suggest.

**The sandy-clay sediments hosting this trove of tracks were probably laid down about 106,000 years ago, previous studies suggest.**

Among the newly uncovered tracks are the first-of-their-kind footprints of newborn straight-tusked elephants (Palaeoloxodon antiquus), an extinct species that probably died out during the last ice age (SN: 6/13/17). The teeny tracks — which measure 9.6 centimeters across, about the size of a drink coaster — suggest that the petite, possibly 2-month-old pachyderms stood about 66 centimeters tall at their shoulders and weighed around 70 kilograms, slightly heftier than a Newfoundland dog.

Based on previous finds elsewhere of actual bones, adult straight-tusked elephants may have weighed 5.5 metric tons for females and a whopping 13 tons for males.

The mix of elephant tracks at the site suggests that family groups including newborns, juveniles and adult females frequented the area and possibly used it as a nursery, the researchers say. Other fossils found at the

site, including those preserving traces of ancient roots, hint that the area was rich in vegetation and speckled with lakes and ponds.

The team's findings "are a thrilling study," says Anthony Martin, a trace fossil expert at Emory University in Atlanta who wasn't involved in the research. Series of footprints show how the ancient elephants were moving, offer insight into their social structure and even provide a glimpse of their reproductive ecology, he says. If newborns were part of the family group and "if they were acting anything like modern elephants, the mother had to be nearby," Martin says.

What's more, the presence of preserved Neandertal footprints at the site suggests that the ancient hominids foraged there and may have preyed upon young elephants or scavenged dead elephants or other creatures, Martin says. The Neandertals "probably were not foolhardy enough to take on a full-sized elephant."

sciencenews.org, 16 September 2021

https://www.sciencenews.org

## Study of up to 40,000 people will probe mysteries of Long Covid

*2021-09-15*

Weeks or months after their coronavirus infection clears, many people diagnosed with COVID-19 still have debilitating symptoms such as fatigue, foggy thinking, and headaches. Today, the National Institutes of Health (NIH) announced a nearly $470 million grant to enroll up to 40,000 adults and children newly and previously infected with SARS-CoV-2 in a study that will probe the causes of these postinfection effects, dubbed Long Covid, and look for clues to treatments and prevention.

"The only way we're going to sort this out is with very large studies that collect lots and lots of data about symptoms, physical findings, and laboratory measures," NIH Director Francis Collins said at an online press briefing.

One prominent patient activist is disappointed the federal effort will largely enroll people who haven't yet developed Long Covid, not the estimated millions now suffering from it. NIH's large study, says Diana Berrent, founder of Survivor Corps, which represents people with Long Covid, is "smoke and mirrors. This doesn't get us closer to any answers."

**Sometimes the symptoms are so severe that a person can't work and struggles through daily tasks.**



CHEMWATCH
Bulletin Board
Curiosities
SEP. 25, 2021

Long Covid, or what NIH calls postacute sequelae of SARS-CoV-2 infection (PASC), can include pain, fatigue, "brain fog," trouble sleeping, headaches, shortness of breath, fever, chronic cough, depression, and anxiety that linger or appear more than 4 weeks after an initial infection. Sometimes the symptoms are so severe that a person can't work and struggles through daily tasks.

The Centers for Diseases Control and Prevention estimates 10% to 30% of COVID-19 patients develop Long Covid. Possible explanations include a hidden reservoir of SARS-CoV-2, a misfiring immune system, or a metabolic problem triggered by the infection, Collins said. But, he acknowledged, "We don't know."

NIH outlined its initial plans for a Long Covid research program in February, after Congress approved $1.15 billion over 4 years to study the condition. The program's centerpiece study announced today, the Researching COVID to Enhance Recovery (RECOVER) Initiative, is funded with a $470 million grant to New York University (NYU) Langone Health. NYU will make subawards to more than 100 researchers at 35 institutions who will enroll patients using a common protocol.

Starting in October, the program will aim to enroll between 30,000 and 40,000 volunteers over 12 months from diverse populations in all 50 states. Although some people who already have Long Covid will be studied, the majority will have acute infections—that is, they will have just fallen sick with COVID-19, said NYU Grossman School of Medicine cardiologist Stuart Katz, the study's principal investigator. The study will include hospitalized patients as well as those with milder COVID-19 cases—it's not clear whether being sicker initially leads to more Long Covid.

Using electronic medical records and providing participants with wearable devices that monitor heart rates, sleep, and more, the study will compare the health of those who quickly recover with others whose symptoms persist, looking for risk factors and biological clues that may explain the different outcomes. Researchers will also explore questions such as whether getting a COVID-19 vaccination eases Long Covid symptoms, as some anecdotal reports suggest.

About one-half of those enrolled will be children, including some newborns, NIH officials hope. Even though children with COVID-19 usually have mild or no symptoms, concerns about long-term effects are growing because the number of cases in children is now "the highest it's been throughout the entire pandemic," Diana Bianchi, director of the National Institute of Child Health and Human Development, said on the Zoom call.

The study won't itself test new treatments for Long Covid, Katz said. But its leaders will try to identify proteins or molecular processes that play a role in Long Covid and could be blocked with an existing drug. NIH hopes to find those targets within 18 months and then launch treatment trials using its remaining congressional funding for Long Covid research.

Lisa McCorkell, who is part of the Patient-Led Research Collaborative, a Long Covid group started by patients who are also researchers, says if the RECOVER study engages meaningfully with patients, it will be "a welcome step toward finding answers."

But Berrent contends there's a major flaw with the RECOVER plan to enroll newly infected people at a time when many people are vaccinated: The study may struggle to recruit participants. "The people who are just getting Long Covid now because they're not vaccinated are not the same people who are going to enroll in an NIH longitudinal study," she says.

She argues NIH should instead study those who already have Long Covid, including people with severe symptoms such as peripheral neuropathy and diabetes, which aren't described in NIH's press release. The announcement is "insulting" and "completely dismissive of the severity of the long-term sequelae of this virus, which is devastating," she says.

science.org, 15 September 2021

https://www.science.org

## Earthquakes in Australia: How big do they get and how prepared are we?

*2021-09-22*

Most of us tend to associate earthquakes with places like New Zealand, California or Japan.

These locations lie on the edges of tectonic plates, where the stress of plates pushing against each other causes rocks deep within the earth to suddenly break and slip past one another, resulting in an earthquake.

But what about earthquakes in Australia?

Well, they do happen, as evidenced by Wednesday's 5.8-magnitude earthquake, felt in various parts of south-eastern Australia.



CHEMWATCH
Bulletin Board
Curiosities
SEP. 25, 2021

## But what about earthquakes in Australia?

Trevor Allen is a seismologist with Geoscience Australia who works on determining the likelihood of catastrophic earthquakes affecting Australian communities.

As Australia sits in the centre of a tectonic plate, our earthquakes are a bit different to other places, he says.

Dr Allen uses a pavlova to describe why we have earthquakes in Australia.

"Imagine if you will, that a tectonic plate is analogous to a pavlova — with a thin brittle crust lying above a ductile, but mostly solid meringue mantle," Dr Allen says.

"The Australian continent would sit in the middle of our pavlova."

If you put your hands on the edge of the pavlova and start to squeeze, the crust around your hands will be the first to break, like those earthquakes at the boundaries of tectonic plates.

But if you continue to squeeze, eventually strain builds up in the centre of the crust, and cracks will begin to appear.

This is similar to how we get earthquakes in Australia.

"The same forces that drive earthquakes on tectonic plate boundaries are at play — they just take a lot longer to manifest in the middle of our pavlova," Dr Allen says.

Australia is actually rocked by an earthquake about once per day, but the more damaging quakes — above magnitude-5 — are only typically seen about twice a year.

But Dr Allen says it's extremely unlikely Australia would ever experience a magnitude-8 or 9 earthquake.

That's because the forces necessary only occur at the plate boundaries, where plates can lock together and break apart with tremendous force.

"We don't have faults that are large enough or active enough to have these really big earthquakes we see on the plate boundaries," Dr Allen says.

"In general, the rates of earthquakes we see here in Australia and in other stable tectonic regions are roughly about a hundred times less than that of areas on plate boundaries."

What big earthquakes have happened?

Australia experiences about 80 magnitude-3 and larger earthquakes a year, although the majority are small.

The largest recorded earthquake in Australia was a magnitude-6.6 at the sparsely populated Tennant Creek, NT in 1988. Two similar-sized earthquakes followed within 12 hours and aftershocks are still being recorded today.

A magnitude-6.5 earthquake hit the small WA wheatbelt town of Meckering in 1968, destroying the town with a 37-kilometre-long rupture and 2-3 metres of vertical deformation from one side of the fault to the other.

One of the most significant earthquakes to occur in Australia was the magnitude-5.6 Newcastle earthquake that took place on a December morning in 1989.

It wasn't that big in terms of magnitude, but because it occurred close to the city, it caused significant destruction and injury, and the death of 13 people.

Nine of those people were killed in the collapse of the Newcastle Workers' Club, which was due to have a concert that night with thousands of attendees.

"It doesn't take much imagination to see that the consequences of that day could have been so much worse had the earthquake been just a few hours later," Dr Allen says.

When will we get another one?

Even in high earthquake zones, there is no perfect tool to predict when an earthquake might occur.

Fault lines and historic events can help scientists identify likely sites of future earthquakes.

But an earthquake could also occur in an unexpected location on an undiscovered fault.

"In spite of our best forecasting efforts, no part of Australia is immune from strong earthquake ground shaking," Dr Allen says.

Quite a few of Australia's more active fault lines are close to major urban centres, particularly near Adelaide and Melbourne.



CHEMWATCH
Bulletin Board
Curiosities
SEP. 25, 2021

An earthquake at these locations could be catastrophic, and disrupt the lives and livelihoods of many Australians.

These events are exceedingly rare, but that doesn't mean that they can't happen in our lifetime.

How can we prepare for a big earthquake?

Given we can't predict where the next large earthquake will hit, how prepared are we to cope if it was to occur in a heavily populated area of Australia?

Ensuring that structures are built to withstand earthquakes is an important step.

"The best defence against earthquakes are strong building codes, and compliance with those codes," Dr Allen says.

Structural engineer Michael Griffith works on developing ways to make older buildings less susceptible to earthquake damage.

"Most of the mainstream buildings in Australia were … built before earthquake forces were required to be considered," says Dr Griffith, a researcher with the Bushfire and Natural Hazards CRC.

In 1995, after the Newcastle earthquake, the Building Code of Australia introduced earthquake design requirements.

This means that any modern construction should have quite a bit of inherent resistance in it.

"They may be damaged beyond economic repair, but they shouldn't collapse and kill anyone," Dr Griffiths says.

The main risk, he says, are older, unreinforced brick buildings.

Many street fronts in our capital cities have two- to three-storey buildings with large ornate brick fronted facades.

"[They] are very attractive and really give a lot of atmosphere for the area, but those are the types of buildings that have been damaged so heavily in Christchurch after their recent earthquakes," Dr Griffiths says.

Many of the fatalities from the Christchurch earthquakes in 2010-11 were people who were outdoors and hit by falling masonry.

Dr Griffiths would like to see more work put into strengthening existing buildings, so that in the event of an earthquake, there is minimal damage and loss of life.

"As decades go by, progressively more and more of those old buildings will be demolished and replaced with modern construction that will comply with modern codes" Dr Griffiths says.

"But at the moment, there's quite a few buildings that are fairly vulnerable."

How can people protect themselves?

If you do happen to find yourself in an earthquake like the one on Wednesday, Dr Allen has a few tips on what to do.

His best advice is to "drop, cover and hold on".

Take cover under a sturdy table or desk if you can, and hold on until the shaking stops.

The aim is to protect yourself from any falling debris or toppling furniture.

"Don't go to a doorway — the door will probably swing shut and break your nose," he says.

"Don't try to run out of the building — in a strong earthquake, you won't be able to walk, let alone run!"

A great way to feel prepared is to participate in the GreatShakeOut, the world's largest earthquake drill, on October 21.

And if you ever do feel any tremors, let Geoscience Australia know through a felt report.

This will help provide important information to emergency services and first responders in the event of a damaging earthquake anywhere in Australia.

abc.net.au, 22 September 2021

https://www.abc.net.au

**The world started wanting solar panels and Australia stopped making them.**



CHEMWATCH
Bulletin Board
Curiosities
SEP. 25, 2021

## The world is hungry for solar panels. Why did we stop making them?

*2021-09-21*

Every day of the year, Australia installs about 1,000 rooftop solar systems; those black rectangles appearing on rooftops everywhere represent billions of dollars spent on silicon, glass and a little bit of metal.

Given we have the highest uptake of solar in the world, you might expect that some of these panels would be made here.

But with a few exceptions, that's never the case.

Twenty years ago it was different: Australia appeared set to be a global player in the small but promising industry of manufacturing panels that could extract energy from the sun.

And then everything changed.

The world started wanting solar panels and Australia stopped making them.

Now, with Australia relying more and more on solar to meet its energy needs, there are calls for that to change.

So, how did Australia lose its head start, and can it claw its way back?

The decline and fall of the panel factory

If you go searching for the remains of Australia's solar manufacturing industry, you'll eventually find yourself at an investor-focused real estate agency in the Sydney suburb of Homebush.

On this site once stood the largest solar factory in the southern hemisphere.

Over 20 years ago, the Harbour City was preparing to host the Olympic Games and the BP Solar factory was in full swing, making solar cells that were assembled into panels and then installed at the athletes' village, promoted as one of the largest solar suburbs in the world.

Here was a trumpeted example of Australian ingenuity; the technology had been developed in consultation with the University of New South Wales (UNSW) and its photovoltaics research team, which was famous for breaking record after record for solar cell efficiency.

"The factory was big on the global scale at the time," says Nigel Morris, a solar industry veteran who worked for BP Solar in those years.

"We were serving the domestic Australian market and exporting to South-East Asia as well."

But less than a decade after the 2000 Olympic Games, the factory closed.

Many of the leading lights of the UNSW research team moved to China, where they set up the country's first solar PV factories.

From a standing start at the turn of the century, China now accounts for about 70 per cent of global solar panel production.

Australia accounts for about a third of 1 per cent.

The story of how this happened begins with a UNSW PhD student who would go on to become known as "the sun king": at one time China's richest man and the first billionaire in solar.

Here comes the sun king

"Zhengrong kickstarted it all," says Martin Green, a UNSW professor who is a legend in the world of solar cell research.

"The solar boom in China was largely an Australian initiative."

In 1989, a young engineering graduate named Shi Zhengrong moved to Sydney from Shanghai, as a foreign-exchange scholar.

The UNSW research team was breaking records for solar cell efficiency and had just invented a cell design that, some 30 years later, would become the global commercial standard.

"I went to knock on Martin Green's door and he came out and I said, 'Can I find a job here?'," Dr Shi recalls, on a WeChat call from China.

"That was the way I came into solar."

Dr Shi completed a PhD under Professor Green in record time and then stayed on in Sydney to do more research.

He took a gamble in 2000, moving back to China to found a solar manufacturing company, Suntech.

At the time, China produced no solar panels.

"I've been asked many times, why did I start the business in China, not Australia?" Dr Shi says.



CHEMWATCH
Bulletin Board
Curiosities
SEP. 25, 2021

"When I was in Australia, I was just a scholar and a student. I really didn't have much confidence in running a business over there.

"Also the cost of labour in Australia is fairly high."

Solar panels, it turned out, could be made much more cheaply in China.

In the years that followed, other UNSW solar graduates followed Dr Shi, starting their own factories in China.

In 2005, Suntech listed on the New York Stock Exchange and raised $US420 million, making Dr Shi a billionaire.

"When I started Suntech, I didn't expect it to develop so fast," Dr Shi says.

The listing heralded the start of a Chinese solar boom.

In the six years to 2011, American investment flowed and Chinese solar production grew by a factor of 200; the country's share of global production increased from 14 to 60 per cent.

"There were all these little tinpot companies founded on hope and a shoestring," Professor Green says.

"Through US listings, they got hundreds of millions of dollars and grew to major players overnight.

"Australia was right in the thick of it. The Australians were the ones who knew how to set up production lines, so they provided technical expertise."

To this day, Australian graduates working in the Chinese solar industry talk shop on a WeChat group with 300 members, Professor Green says.

Many of these graduates are top executives.

"Seven of the top 10 Chinese solar manufacturers have Australian graduates at the level of chief technology officers or higher."

Australia 'missed an opportunity'

China's solar panel industrial boom has driven the price of solar panels through the floor, reduced household energy bills, and pointed the way to deep emissions cuts through mass electrification.

The average cost per watt for a solar panel in 2006 was around $8.50 per watt. By 2019, this cost had fallen to just $0.52 per watt.

"The stiff competition between cashed-up Chinese companies sort of accelerated everything by decades," Professor Green says.

But as Chinese production was booming, Australia's was faltering.

Cheap Chinese panels largely wiped out the local solar manufacturing industry.

"From 2005-2008, everything went wild," says Renate Egan, a UNSW solar expert who worked in Australian solar manufacturing in the noughties.

"We were running lines of 100 megawatts and the Chinese were installing 1 gigawatt lines."

BP Solar sold the Homebush factory in 2009, unable to compete with the Chinese factories' economies of scale.

Mr Morris remembers the "death knell" of Australian solar manufacturing being largely ignored by government.

"BP Solar struggled to get money," he says.

"They struggled to get interest from government at various points in time."

Dr Egan agrees there was little government support; Australia allowed its manufacturing head start to dwindle away.

"We did miss an opportunity," she says.

"We were building detention centres when we could have been investing in module manufacturing."

What if China stops selling solar panels to Australia?

Standard solar panels, or modules, consist mostly of an aluminium frame, a glass sheet, about 60 silicon solar cells, and a junction box.

BP Solar made the solar cells and assembled them into modules.

The only commercial-scale solar module manufacturer in Australia today is a small company in Adelaide named Tindo Solar, which imports all of the components and assembles them into modules.

Its new 150MW facility will produce about 350 panels a day.

(By comparison, the world's largest solar module production plant in Hefei, China is 60GW, or roughly 400 times larger than the Adelaide facility).

Though it's hard to compete on price alone, there is demand for an Australian-made product, Tindo chief executive officer Shayne Jaenisch says.



CHEMWATCH
Bulletin Board
Curiosities
SEP. 25, 2021

In the first months of the COVID-19 pandemic, when supply from China was disrupted, companies concerned about supply chain security looked for panels made closer to home.

"We went from 64 companies contacting me to buy panels to over 1,000 in just over a year," Mr Jaenisch says.

"The whole landscape for us has changed."

He says Australia can't make the cheapest panels, but it can offer better quality customer service, and mitigate "sovereign risk"; the possibility that China will one day stop selling solar panels to Australia.

Solar will account for most of Australia's energy production by the end of decade, Dr Egan estimates.

"If we're going to be that reliant on solar, should we be making the panels here? If half the world's energy come from solar, the solar panels can't all come from one nation," she says.

"Sovereign risk" is partly why the US, Europe and India are looking to increase local production; India has introduced a 40 per cent duty on imported solar modules to boost local manufacturing.

"It might be worth paying a bit more for the ancillary benefits, including supply chain resilience and security," Dr Egan says.

Australia will need hundreds of millions of solar panels

Then there's the potential economic benefit: jobs and growth.

"The solar industry is big now and it's going to be a lot bigger," says Andrew Blakers, a former UNSW colleague of Professor Green who is now director of ANU's Centre for Sustainable Energy Systems.

"It's going to be bigger than oil, gas and coal put together."

He's calculated roughly how big.

For Australia to produce enough energy that it won't need coal or gas and can also meet the extra demand of mass electrification, it will need about 450GW of solar and wind generation, he says.

Of that, about 300GW would be solar, he estimates.

With about 20GW of installed solar already, it'll need another 280GW.

"We're going to be importing a lot of glass and a lot of panels with a little bit of silicon attached," Professor Blakers says.

Australia will need hundreds of millions of standard-size solar panels to meet its energy needs in the next couple decades.

And that's just domestic demand; there are also plans for Australia to export renewable energy to Asia from massive solar farms in the Northern Territory and Western Australia's Pilbara region.

The output of these farms alone is roughly equal to the current combined output of all the solar in Australia.

That's a lot of solar panels.

Sun Cable, the company that intends to export energy to Asia from solar farms in the NT, plans to build a factory in Darwin to assemble solar modules from imported components.

Andrew Forrest's Fortescue Metals, which plans to build big solar farms in the Pilbara to power its mines and potentially also new refineries, is also considering manufacturing solar panels.

"We lost our manufacturing to China in the early part of the century, but there's no reason we can't get it back," Professor Blakers says.

"We have seriously skilled people and we have a need for it."

'More opportunity in using the cheap energy'

But Professor Green, whose research and teaching helped incubate the Chinese industrial boom in solar manufacturing, is sceptical.

There's not much money in making solar panels, he says, and the sovereign risk issue is overblown.

"The solar industry is a mug's game because the margins are so low," he says.

"India and Europe will be only be too pleased to sell us modules if the Chinese stopped."

He thinks there's more to be won by focusing on the economic opportunities generated by cheap Chinese solar panels.

"Use them to do sensible things like make [zero-emissions] green steel and green aluminium," he says.



CHEMWATCH
Bulletin Board
Curiosities
SEP. 25, 2021

And what about royalties for the use of Australian solar inventions?

About 90 per cent of solar panels being manufactured around the world today contain the PERC technology developed at UNSW. Just last year, $US130 billion worth of PERC systems were installed.

Unfortunately, the solar boom arrived long after the patents for the technology expired, Professor Green says.

Australia has benefited from cheap solar panels creating a path to abundant, emissions-free electricity.

But we get none of the billions of dollars China earns from solar panel exports.

Australia may have missed an opportunity, Dr Shi says, but there is still room aboard the money train, even if you're not making panels.

Installation, for instance, has to be made simpler; he envisions panels being clipped together like blocks of Lego.

"When you send a container ship to a site, you press a button and install one megawatt in a week," he says.

Now that's something no-one imagined 20 years ago.

abc.net.au, 21 September 2021

https://www.abc.net.au

CHEMWATCH

# Bulletin Board

## Technical Notes

SEP. 25, 2021

**(NOTE: OPEN YOUR WEB BROWSER AND CLICK ON HEADING TO LINK TO SECTION)**

## CHEMICAL EFFECTS

Effects of endocrine disrupting chemicals on gonad development: Mechanistic insights from fish and mammals

Reevaluating tear gas toxicity and safety

Prenatal exposure to endocrine disrupting chemicals is associated with altered DNA methylation in cord blood

A systematic comparison of neurotoxicity of bisphenol A and its derivatives in zebrafish

## ENVIRONMENTAL RESEARCH

Dissipation, Fate, and Toxicity of Crop Protection Chemical Safeners in Aquatic Environments

Transformation products of pharmaceuticals in the environment: Their fate, (eco)toxicity and bioaccumulation potential

Microplastics as an aquatic pollutant affect gut microbiota within aquatic animals

## OCCUPATIONAL

Respiratory Symptoms and Pulmonary Function of Workers in the Waste Management Industry

Assessment of burden of disease induced by exposure to heavy metals through drinking water at national and subnational levels in Iran, 2019

## PHARAMACEUTICAL/TOXICOLOGY

Absorption, distribution, and toxicity of per- and polyfluoroalkyl substances (PFAS) in the brain: a review