

# Bulletin Board

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## 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.**

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## Regulatory Update

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### ASIA PACIFIC

#### Safe Work Australia has published new COVID-19 work health and safety guidance for workplaces

2020-06-17

Guidance for managing risks from COVID-19 is now available for:

- **Accommodation services**
- **Mobile consultants and client engagement services**
- **Tertiary education**

Guidance for the **Retail industry** has also been expanded with additional information for shopping centres.

A new COVID-19 **Small business planning tool** is now available, outlining key steps and considerations for small businesses operating during the COVID-19 pandemic.

For more information and resources, go to the Safe Work Australia **COVID-19 Information for workplaces**.

Safe Work Australia, 17 June 2020

<https://www.safeworkaustralia.gov.au/covid-19-information-workplaces>

### AMERICA

#### EPA orders Amazon and eBay to stop sale of certain pesticide products

2020-06-11

The U.S. Environmental Protection Agency (EPA) ordered Amazon Services LLC and eBay Inc. to stop selling a wide range of pesticide products. These products are unregistered, misbranded, or restricted-use pesticides, and pesticide devices that make false or misleading claims. As two of the largest e-commerce marketplaces, both companies oversee millions of product listings, thru either direct or third-party sales. The products subject to EPA's orders also include several products that are marketed with false or misleading claims of efficacy against the novel coronavirus, SARS-CoV-2, the cause of COVID-19.

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"These stop sale orders to Amazon and eBay demonstrate the Trump Administration's continued commitment to protecting the health and safety of Americans," said EPA Administrator Andrew Wheeler. "We remain vigilant against the claims of producers that falsely assert their efficacy and safety. Of particular concern are products that falsely claim to be effective against COVID-19. It is our duty to continue transparent communication with the public on unregistered products that may cause injury to consumers, and immediately remove them from commerce."

"American consumers need to know that the pesticide products they purchase online are effective and safe for their use," said EPA Assistant Administrator for Enforcement and Compliance Assurance Susan Bodine. "The orders we are issuing are two examples of EPA's continuing commitment to stop unlawful sales of unregistered, mislabeled and restricted use pesticides on retail websites."

"The proliferation of unregistered pesticides in the e-commerce marketplace, especially during this unprecedented time, poses a significant and immediate health risk to consumers, children, pets, and others exposed to the products," said EPA Region 10 Administrator Chris Hladick.

In April, Administrator Wheeler held discussions with Amazon, eBay, and other e-marketplaces on the availability of products that are unregistered, are registered but may be used only by trained applicators, or that make unsubstantiated and potentially dangerous claims. Despite those discussions, Amazon and eBay have thus far failed to consistently keep unregistered, misbranded, or restricted-use pesticides, and pesticide devices off their websites.

EPA's action prohibits Amazon and eBay from distributing, selling, or offering for sale the products listed on the tables attached to the stop sale orders.

None of the pesticides in the Amazon order are registered with EPA – which is a requirement for sale in the U.S. – and thus did not undergo a rigorous scientific process to ensure effectiveness and safety. Products that have been properly registered bear EPA-approved labeling evaluated to protect users by giving important information on safety and use.

In addition to unregistered pesticides, the eBay order includes pesticides classified for restricted use. It is unlawful to sell these types of products to the general public because they have the potential to cause injury to human health and the environment without additional restrictions.

**Guidance for the Retail industry has also been expanded with additional information for shopping centres.**

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In its orders, EPA also notes that the labeling of some of the unregistered or misbranded pesticides and pesticide devices includes the following violative statements:

- “Kills COVID-19”
- “Complete sterilization including the current pandemic virus”
- “Coronavirus disinfectant”
- “2020 Coronavirus Protection Coronavirus Protection Clearance Sale”
- “A Powerful, Green, Non-Toxic Solution Proven to Inactivate our current viral strain”
- “Epidemic Prevention”
- “Efficient disinfection to prevent the spread of disease”
- “Help keep your family and those you care for healthy”
- “Nontoxic causes no permanent injuries”
- “Ingredients are biodegradable and have no harmful impact on the environment”
- “There is no damage to the environment”
- “You can easily purify the living environment”
- “Safe for all people using”
- “Gentle to Child & Pets”
- “Chemical Free”

The devices listed on the tables attached to the orders also lack EPA establishment numbers from where the products were produced.

A particularly egregious example of the products found on Amazon is a product containing Chlorine Dioxide. There are several versions of the product that keep appearing on the Amazon site each with very little to no English-language instructions. The products are being sold with unprovable claims of sanitizing and disinfecting hospitals, offices and homes.

Product listings on eBay.com included 55-gallon drums of Methylene Chloride that were marketed for use as a coronavirus disinfectant and paint stripper. Not only is Methylene Chloride unapproved for use against the novel coronavirus, under the Toxic Substances Control Act, EPA banned the retail sale of Methylene Chloride to consumers for paint removal purposes due to acute fatalities that resulted from exposure to the chemical.

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Another product, *Virus Shut Out*, claimed to be a spatial disinfection card that would provide coronavirus protection to the wearer. *Virus Shut Out* was subject to previous enforcement by EPA. Yet another product, *Xtreme-Bio*, claimed to be exempt from EPA regulation and made entirely with “clean, green, safe, environmentally friendly ingredients” while also claiming to deactivate the virus causing COVID-19.

Today’s stop sale orders are critical to protecting human health and the environment during the from misleading and harmful claims from two of the world’s largest e-commerce platforms, especially during the COVID-19 public health emergency.

To view the Amazon Services LLC stop sale order, please visit: <https://www.epa.gov/enforcement/stop-sale-use-or-removal-order-issued-amazoncom-services-llc>

To view the eBay Inc. stop sale order, please visit: <https://www.epa.gov/enforcement/stop-sale-use-or-removal-order-issued-ebay-inc>

In 2018, Amazon Services LLC settled allegations that Amazon committed nearly four thousand violations of the Federal Insecticide, Fungicide, and Rodenticide Act – dating back to 2013 – for selling and distributing foreign pesticide products that were not licensed for sale in the United States.

EPA’s advisory on “What You Need to Know Regarding Products Making Claims to Kill the Coronavirus1 Causing COVID-19” may be found here: <https://www.epa.gov/sites/production/files/2020-05/documents/coronavirus-compliance-advisory.pdf>

For additional information on the coronavirus: [www.epa.gov/coronavirus](http://www.epa.gov/coronavirus)

EPA, 11 June 2020

<https://www.epa.gov/newsreleases/epa-orders-amazon-and-ebay-stop-sale-certain-pesticide-products-0>

### Podcast: TSCA was reformed 4 years ago. Is the US chemical law living up to expectations?

2020-06-17

This month marks 4 years since the Toxic Substances Control Act, or TSCA, was revised to boost confidence in chemical safety in the US by strengthening regulations. The updated law gave the US Environmental Protection Agency sweeping new authority to ensure that the tens of thousands of chemicals in everyday products do not pose unreasonable

**Is the EPA protecting public health by sufficiently evaluating the risks of chemicals, or is it giving industry a free pass to market chemicals with little toxicity data?**

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risks to human health and the environment. In this bonus episode of *Stereo Chemistry*, host Kerri Jansen and C&EN senior reporter Britt Erickson examine how the EPA is using that authority to evaluate new chemicals before they hit the market and to assess the risks of chemicals that have been in use for decades. Is the EPA protecting public health by sufficiently evaluating the risks of chemicals, or is it giving industry a free pass to market chemicals with little toxicity data?

*The following is the script for the podcast. We have edited the interviews within for length and clarity.*

Kerri Jansen: Four years ago this month, the US Congress overhauled the Toxic Substances Control Act, or TSCA. That's the law that governs how chemicals in everyday products are regulated in the US. It was originally designed to protect consumers. And the goal of the more recent changes was to help boost consumer confidence in chemical safety by allowing for stricter oversight.

But the process of implementing those changes has not gone exactly according to plan. When TSCA was revised 4 years ago, the US Environmental Protection Agency was required to choose 10 high-priority chemicals already on the market to evaluate for safety. As we near the deadline set for those risk assessments to be completed, it's clear that the agency is not going to hit its goals. Not only that, but some now question whether the revisions to TSCA have had their intended effect at all.

In this bonus episode of *Stereo Chemistry*, we'll hear from C&EN senior reporter Britt Erickson on the impact of those changes to TSCA. We'll check in on what progress has been made and discuss where we go from here. I'm your host Kerri Jansen.

Thanks for joining us for this bonus episode, Britt.

Britt Erickson: Glad to be here, Kerri. TSCA is really complicated, so we'll try to get through it together.

Kerri: Let's start with the basics. What was TSCA intended to do, and what does it cover?

Britt: Well, TSCA is a 1976 law that gives the Environmental Protection Agency authority to regulate the commercial distribution and use of chemicals in the US. It applies to both new chemicals and chemicals that are already on the market. Now, it's the EPA's job to ensure that chemicals

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do not pose a, quote, "unreasonable risk" to human health and the environment.

Chemical and Engineering News, 17 June 2020

<https://cen.acs.org/policy/chemical-regulation/Podcast-TSCA-reformed-4-years/98/i24>

### EPA decides not to regulate Perchlorate in drinking water

2020-06-18

The EPA won't set national drinking water standards for perchlorate, a rocket fuel chemical, a decision expected to result in litigation against the agency.

The Environmental Protection Agency acknowledged perchlorate can affect human health by interfering with the thyroid gland, but said the chemical doesn't appear in enough public water systems, or at high enough levels, to cause concern.

The agency's decision (RIN:2040-AF28), announced Thursday, will become final once it is published in the Federal Register.

"Our state partners deserve credit for their leadership on protecting public health in their communities, not unnecessary federal intervention." EPA Administrator Andrew Wheeler said in a news release.

Water utilities generally agree national regulations weren't necessary. But environmental advocates have raised concerns about the agency's decision not to regulate a chemical that has known health effects, and the Natural Resources Defense Council said Thursday it plans to bring the issue to court.

#### Health Risks

The chemical can be found in rocket fuel, fireworks, and fertilizers, and can cause developmental impairments in fetuses, according to the Government Accountability Office.

Long-term exposure to perchlorate can cause thyroid problems. Short-term exposure may cause eye and skin irritation, as well as nausea and vomiting, according to an EPA fact sheet.

**The chemical can be found in rocket fuel, fireworks, and fertilizers, and can cause developmental impairments in fetuses, according to the Government Accountability Office.**

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Vanderbilt University researchers said in May that perchlorate inhibits the uptake of iodide, an essential component of thyroid hormones, in a more pronounced and fundamental way than commonly considered.

The Perchlorate Information Bureau, an industry interest group whose members include Aerojet Rocketdyne, American Pacific Corp., Lockheed Martin Corp., and Northrop Grumman Corp., agreed with the EPA's decision.

"Considering that EPA's own analysis finds that the costs of a nationwide perchlorate drinking water regulation would significantly outweigh the benefits, EPA should focus its limited resources on more immediate and significant public health concerns," the bureau said in a statement.

### Legal Obligations

The EPA was bound by a 2016 consent decree, entered in U.S. District Court in the Southern District of New York, to issue a national drinking water regulation for perchlorate by December 19, 2019.

The agency asked for, and the National Resources Defense Council agreed, to extend the deadline to June 19, 2020. The environmental group said Thursday that it interpreted the agency's decision as a violation of the consent decree.

"NRDC plans to challenge EPA's refusal to comply with the consent decree in court," said Margie Kelly, a spokeswoman for the group.

Sen. Tom Carper (D-Del.), ranking member on the Senate Environment and Public Works Committee, also said the agency's decision defied the court order.

"EPA has abdicated its responsibility to set federal drinking water standards for a chemical long known to be unsafe, instead leaving it up to states to decide whether or not to protect people from it," Carper said in a statement.

An EPA spokeswoman said the consent decree no longer applies, and the agency will ask the court to terminate the agreement.

### State vs. Federal Authority

The Safe Drinking Water Act was enacted in 1974 with the intention of setting mandates for public water systems where states had failed to take action, said Mike Keegan, an analyst for the National Rural Water Association.

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Now, states are outpacing the EPA, and adopting policies they prefer, he said. But the federal agency can still use health advisories, which allows state and local governments to take immediate action on chemicals like perchlorate.

Federal drinking water regulations that come years after state or local action "will surely lead to unnecessary public confusion," Keegan said.

J. Alan Roberson, executive director of the Association of State Drinking Water Administrators, said it would be a "waste of national resources" if the EPA were to set standards that only affect one to three water utilities, as the agency estimated.

Diane VanDe Hei, chief executive officer of the Association of Metropolitan Water Agencies, said a national standard isn't necessary.

"Because several states where perchlorate contamination is most prevalent have already addressed the perchlorate contamination or developed their own drinking water standards for the substance, AMWA agrees that a new national standard would appear to offer a minimal opportunity for further health risk reduction at this time," she said in a statement.

Brent Fewell, founder of Earth & Water Group in Washington, said appropriate action has been taken to regulate perchlorate.

"The states, EPA and utilities have done an exceptional job limiting risk exposure to perchlorate over the past few years thus obviating the need for a national standard," he said.

California and Massachusetts set enforceable limits for the chemical in drinking water in 2007 and 2006, according to the Water Quality Association, an Illinois-based association of residential, commercial, and industrial water treatment facilities.

"To say that because levels of perchlorate have decreased in two states that have set strict limits for perchlorate (CA and MA, at 6 parts per billion or ppb and 2 ppb respectively), the other 48 states don't need to be protected, is absurd," said Erik Olsen, NRDC's senior strategic director for health.

### Withdrawals and Proposals

The EPA had concluded a month ago that perchlorate levels in drinking water were at safe levels after analyzing monitoring data collected since 2011, when under the Obama administration, it determined a nationwide standard was needed for the chemical.

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Last year, the agency proposed four options for perchlorate regulation, which included withdrawing its 2011 finding to set national standards.

Other options included its then-preferred approach to set a standard of a maximum allowable limit of 56 micrograms of the chemical in a liter of water.

The EPA said Thursday it was going with its fourth option: to withdraw its 2011 finding that set the stage for setting drinking water limits.

(Adds comment from Perchlorate Information Bureau in ninth and tenth paragraphs.)

Bloomberg Law, 18 June 2020

<https://news.bloomberglaw.com/environment-and-energy/nationwide-drinking-water-standards-for-perchlorate-epa-says>

### FDA updated list of notified hand sanitizers and rubbing alcohol products as of 17 June 2020

2020-06-17

Click the link below for details.

[Updated List as of 17 June 2020](#)

FDA, 17 June 2020

<https://www.fda.gov/ph/updated-list-of-notified-hand-sanitizers-and-rubbing-alcohol-products-as-of-17-june-2020/>

### Recall of certain hand sanitizers that may pose health risks

2020-06-11

Summary

- **Product:** Certain hand sanitizers made with industrial-grade ethanol
- **Issue:** Health Canada is advising Canadians that certain hand sanitizers are being recalled from the market because they contain industrial-grade ethanol that has not been authorized for use in hand sanitizers in Canada.
- **What to do:** Stop using these products. Consult your healthcare professional if you have used any of these products and have health concerns. Report any health product [adverse events](#) or [complaints](#)

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to Health Canada. See the additional information on buying health [products safely in the links below](#).

Health Canada, 11 June 2020

<https://www.healthykanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2020/73269a-eng.php>

## EUROPE

### Broadening exemptions for hand disinfectants to all sectors

2020-06-11

The Dutch Ministry of Infrastructure and the Environment [published a decision](#) on Thursday 11 June with a temporary exemption for the use of already authorized hand sanitizers with a virus claim for all professional users in all sectors. This Decree also provides that the previous temporary exemptions for hand sanitizers are also extended to all professional use in all sectors.

Articles 1 and 2 of this Decree provide that the use of the hand disinfectants authorized by the Ctgb is expanded with a virus claim. Often use is now limited to the healthcare sector. With this extension, all professional users are allowed to use the hand disinfectants, regardless of the company or profession in which they work. This exemption is granted until November 27, 2020.

The scope of the previously issued exemptions is also extended with a change to all professional use in all sectors. This is laid down in Articles 3, 4 and 5. Currently, the relevant disinfectants are exempted only for professional healthcare providers and the pharmaceutical industry. This concerns changes to the following exemptions that have already been issued: the [Temporary exemption for hand disinfection COVID-19 2020](#)

, the [Temporary exemption for hand disinfection WHO formulations COVID-19 2020](#) and the [Exemption for the simple marketing of disinfectants COVID-19 2020](#)

Biociden.nl, 11 June 2020

<https://www.biociden.nl/verruiming-vrijstellingen-handdesinfectiemiddelen-naar-alle-sectoren>

**With this extension, all professional users are allowed to use the hand disinfectants, regardless of the company or profession in which they work.**

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**Marine nitrous oxide emissions off Northwest Europe**

2020-06-17

Human activities like deforestation, transportation, and agriculture all emit nitrous oxide (N<sub>2</sub>O), which is the third most important greenhouse gas behind carbon dioxide and methane and is one of the most potent ozone depleters in the stratosphere. Natural ecosystem processes release N<sub>2</sub>O as well. The oceans, rivers, and estuaries are significant contributors to atmospheric N<sub>2</sub>O, producing it in the course of microbially mediated nitrification and denitrification processes.

Despite its importance to ozone and global climate, N<sub>2</sub>O accounting is beset by statistical uncertainty at both regional and global scales, hindering more accurate climate change projections from global climate models. The uncertainty in global models stems partly from the fact that these models underrepresent biogeochemical processes in coastal areas and continental shelves. For these geographies, regional models can better describe changes in N<sub>2</sub>O emissions across space and time.

In a new study, *Lessin et al.* applied a biogeochemical-ecological model to tease apart N<sub>2</sub>O dynamics on the northwest European continental shelf. The goal of the research was to determine patterns of oceanic and coastal N<sub>2</sub>O emissions and the causes of seasonal fluctuations and to quantify N<sub>2</sub>O contributions to the atmosphere from the area studied. The group's modeling results were supported by observational data collected during four research cruises in the study area. To understand seasonal emission patterns, the authors used an artificial neural network called a self-organizing map to find underlying trends in their data.

The results showed that the northwest European continental shelf is a source of N<sub>2</sub>O to the atmosphere, although it contributes between only 3.3% and 6.8% of the total emissions from European shelves and estuaries. In the study area, emissions mostly peaked in late autumn or winter, with the timing varying by location. The authors found that ammonium availability in the water and the duration and intensity of water column stratification regulate the timing and production of N<sub>2</sub>O emissions throughout the year.

Regional case studies and modeling efforts are critical to reducing uncertainty in global N<sub>2</sub>O emissions estimates, the authors noted, and they can support regional marine environmental management.

**The oceans, rivers, and estuaries are significant contributors to atmospheric N<sub>2</sub>O, producing it in the course of microbially mediated nitrification and denitrification processes.**

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(*Journal of Geophysical Research: Biogeosciences*, <https://doi.org/10.1029/2019JG005613>, 2020)

EOS.org, 17 June 2020

[https://eos.org/research-spotlights/marine-nitrous-oxide-emissions-off-northwest-europe?ct=t\(RSS\\_EMAIL\\_CAMPAIGN\)](https://eos.org/research-spotlights/marine-nitrous-oxide-emissions-off-northwest-europe?ct=t(RSS_EMAIL_CAMPAIGN))

**Russia publishes initial inventory of existing chemicals**

2020-06-18

On June 15, the Russian Ministry of Industry and Trade (Minpromtorg) published part of the Russian Inventory of Existing Chemicals on the country's Governmental Industry Information Exchange Platform (GISP) [1](#). This is established based on nominations collected early on.

<https://gisp.gov.ru/cheminv/pub/app/search/>

Chemlinked, 18 June 2020

<https://chemical.chemlinked.com/news/chemical-news/russia-publishes-initial-inventory-of-existing-chemicals>

**INTERNATIONAL****Vast majority of people in the UK, Poland and Bulgaria want stricter regulation on air pollution, new report and poll finds**

2020-06-17

The Clean Air Fund has today published a new report, the results of which support calls for governments to prioritise clean air in COVID-19 recovery packages.

People are demanding change. A YouGov poll commissioned by the Clean Air Fund shows at least two-thirds of citizens in Great Britain, India, Nigeria, Poland, and Bulgaria support stricter regulation to tackle air pollution. These results follow another poll last week which showed 64% of European city-dwellers do not want a return to pre-COVID19 levels of air pollution.

91% of people are very or fairly worried about air pollution as a public health issue in Poland and Bulgaria, 71% in the United Kingdom. 93% of people are very or fairly worried about air pollution as an environmental

**91% of people are very or fairly worried about air pollution as a public health issue in Poland and Bulgaria, 71% in the United Kingdom.**

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issue in Poland and Bulgaria, 76% in the UK. Bulgarian, Polish and British citizens support stricter laws and/or enforcement of regulations on air quality, respectively 85%, 72% and 67%. More than half of the respondents in Bulgaria (61%), Poland (51%) and in Great Britain (67%) say they've personally noticed air quality get better since the COVID-19 outbreak began.

As lockdowns are eased and economies restarted, people around the world do not want a return to toxic levels of air pollution, and to simply replace one public health crisis for another.

In the report, the Clean Air Fund is calling for governments to:

1. Develop and resource joint national health and environment strategies, with a specific focus on tackling air pollution.
2. Only provide an economic stimulus to industries which make ambitious and measurable commitments to clearing the air.
3. Support the repurposing of city streets for walking and cycling.
4. Implement and enforce laws and regulations to build on the improvements in air quality experienced during the pandemic.
5. Work with other governments to tackle transboundary pollution.

*Air pollution, public health and post-lockdown recovery*

Air pollution is a major public health issue, responsible for 7% of global deaths every year. According to the World Health Organization, more than nine in ten humans breathe air that is harmful to their health. The COVID-19 pandemic is also linked to air pollution. Decades of exposure to toxic air have worsened the health of communities globally. Millions have been left with respiratory and other health problems which leave them predisposed to the most severe impacts of COVID-19. The consequences are more hospitalisations and deaths, especially amongst the poorest and most vulnerable.

At the same time, during the lockdown, air quality has temporarily improved, but there is a risk of returning to pre-COVID19 pollution levels, if no action is taken. Attention is now turning to how unprecedented economic recovery packages can be used to protect health and wellbeing, as well as livelihoods

European Public Health Alliance

<https://epha.org/vast-majority-of-people-in-the-uk-poland-and-bulgaria-want-stricter-regulation-on-air-pollution-new-report-and-poll-finds/>

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## REACH Update

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### Bisphenol S has replaced bisphenol A in thermal paper

2020-06-18

Helsinki, 18 June 2020 – ECHA's fourth and final market survey on the use of BPA and other developers in thermal paper confirms that paper manufacturers have continued to replace BPA with BPS. In 2019, 187 kilotonnes of BPS-based thermal paper were placed on the EU market. By 2022, it is expected that 61% (or 307 kilotonnes) of all thermal paper in the EU will be BPS-based.

The EU-wide ban on bisphenol A (BPA) in thermal paper took effect in January 2020. According to the survey, BPA-based thermal paper still had a 29% market share in 2019 in the EU. From 2020 onwards, BPA is expected to be replaced mainly by BPS.

The wide use of BPS in thermal paper raises concern as BPS is suspected to affect human reproductive and hormonal systems.

"Replacing a hazardous substance with one that is also suspected to be hazardous is not what regulators or EU citizens want to see. Our scientific committees stated already in 2015 that a restriction on BPA in thermal paper will reduce risks only if industry chooses other alternatives than BPS. We need to increase our understanding about BPS and other bisphenols. To that end, there are ongoing regulatory actions", says Peter van der Zandt, ECHA's Director for Risk Management.

Belgian authorities are currently evaluating whether the use of BPS poses a risk to human health or the environment. Their conclusions are expected by 2021. In addition, Belgium made a proposal in 2019 to harmonise the classification and labelling of the substance as toxic to reproduction. ECHA's Committee for Risk Assessment is expected to give its opinion on this proposal in spring 2021.

Moreover, ECHA is currently looking at bisphenols as a group rather than as individual substances, to collect information for a more comprehensive regulatory strategy concerning these chemicals.

#### Background

Since 2017, ECHA has been monitoring the use of developers on the EU thermal paper market – and in particular the replacement of BPA with BPS and other alternatives – at the European Commission's request. As BPA in thermal paper has been restricted since 2 January 2020, this report will be the last of its kind.

**By 2022, it is expected that 61% (or 307 kilotonnes) of all thermal paper in the EU will be BPS-based.**

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### FURTHER INFORMATION

- [Report: The use of bisphenol A and its alternatives in thermal paper in the EU during 2014 – 2022, May 2020 \[PDF\]\[EN\]](#)
- [European Commission's decision to restrict bisphenol A in thermal paper](#)
- [Opinions of RAC and SEAC on restrictions on bisphenol A](#)
- [Hot topics: bisphenol A](#)
- [Substance evaluation on BPS](#)
- [CLH proposal for BPS](#)

ECHA, 18 June 2020

[https://echa.europa.eu/-/bisphenol-s-has-replaced-bisphenol-a-in-thermal-paper?utm\\_source=social&utm\\_medium=Twitter.com&utm\\_campaign=Bisphenol](https://echa.europa.eu/-/bisphenol-s-has-replaced-bisphenol-a-in-thermal-paper?utm_source=social&utm_medium=Twitter.com&utm_campaign=Bisphenol)

### Resorcinol not identified as a substance of very high concern

2020-06-16

Helsinki, 16 June 2020 - At its June meeting, the Member State Committee did not unanimously support France's proposal to identify resorcinol (EC 203-585-2; CAS 108-46-3) as an SVHC. However, the committee acknowledged that there is scientific evidence that resorcinol is an endocrine disruptor as defined by the World Health Organization (WHO).

Where the MSC is unable to reach a consensus, the European Commission's REACH Committee will take the final decision. After receiving the MSC's opinion, the Commission has three months to prepare a draft proposal on the identification as an SVHC and will then make a final decision in its committee procedure.

Resorcinol is used to manufacture rubber compounds, resins and coatings, as well as cosmetics. It is the first substance proposed as an SVHC because of its thyroid disrupting effects in humans. A majority of the committee members concluded that there is scientific evidence of probable serious effects to human health due to hypothyroidism and potential neurodevelopmental effects during pregnancy. However, a few members expressed different views on whether the substance is of equivalent level of concern.

# Bulletin Board

## REACH Update

JUN. 26, 2020

The committee agreed to identify other substances as SVHCs. ECHA will update the Candidate List of SVHCs later in June.

### FURTHER INFORMATION

- Member State Committee
- WHO definition of an endocrine disruptor

ECHA, 16 June 2020

[https://echa.europa.eu/-/resorcinol-not-identified-as-a-substance-of-very-high-concern?utm\\_source=social&utm\\_medium=Twitter.com&utm\\_campaign=resorcinol](https://echa.europa.eu/-/resorcinol-not-identified-as-a-substance-of-very-high-concern?utm_source=social&utm_medium=Twitter.com&utm_campaign=resorcinol)

**Resorcinol is used to manufacture rubber compounds, resins and coatings, as well as cosmetics.**

## Bulletin Board

## Janet's Corner

JUN. 26, 2020

## How a chemist sees the glass

2020-06-26

## Optimist



**The Glass  
is Half  
Full**

## Pessimist



**The Glass  
is Half  
Empty**

## Chemist



**The Glass  
Contains  
50% H<sub>2</sub>O(l)  
39% N<sub>2</sub>(g)  
10.5% O<sub>2</sub>(g)  
.44% Ar(g)  
.06% CO<sub>2</sub>(g)**

~<https://www.chemistryjokes.com/jokes/how-a-chemist-sees-the-glass/>

## Bulletin Board

## Hazard Alert

JUN. 26, 2020

## 1,4 Dioxane

2020-06-26

1,4-Dioxane (also known as dioxane) is a clear, colourless liquid, with a faint ether-like odour. It is highly flammable and easily dissolvable in water. It has been classified as a Group 2B carcinogen: possibly carcinogenic to humans, as studies done on animals who were exposed to the chemical, developed cancer. [1,2]

## USES [1,2,3]

1,4-dioxane is used across chemical industries. It is primarily used as a solvent in organic products, and as a stabiliser in varnish, paint strippers, chlorinated solvents, dyes and lacquers. It is also used as a laboratory reagent, and is a trace contaminant of some chemicals used in shampoos, detergents and cosmetics. Nowadays, manufacturers try to reduce dioxane from these chemicals before they go into products used in the home.

## ROUTES OF EXPOSURE [2,4]

- Exposure to 1,4-dioxane can occur by breathing contaminated air, drinking contaminated water, or using cosmetics, shampoos or detergents containing 1,4-dioxane.
- Exposure can also occur from dermal contact.

## HEALTH EFFECTS

1,4-Dioxane poisoning affects a range of systems including the digestive, respiratory and nervous systems.

## Acute Effects [2,4]

Severity of symptoms depend on the level and type of exposure.

- Low level exposure to 1,4-dioxane can result in eye and nose irritation, headaches, drowsiness, nausea and throat inflammation.
- Higher level exposure to the chemical could cause severe liver and kidney effects and possibly death.

## Chronic Effects [2]

1,4-Dioxane is toxic to multiple body systems. Long-term exposure to the chemical *could* result in cancer, however this has not been proven in a

**1,4-Dioxane (also known as dioxane) is a clear, colourless liquid, with a faint ether-like odour.**

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human study. Chronic 1,4-dioxane poisoning could result in severe and irreversible kidney and liver effects. Inhalation of 1,4-dioxane can affect the nasal cavity.

### SAFETY

#### First Aid Measures [1]

- Ingestion: DO NOT INDUCE VOMITING. If conscious, give the victim one or two glasses of water to dilute the chemical. Immediately contact a medical professional.
- Skin contact: Immediately wash affected skin with water for at least 15 minutes. Remove contaminated clothing. Do not re-wear until it has been thoroughly de-contaminated. Continue rinsing contaminated skin with soap and water. Contact a healthcare professional, even if no symptoms develop.
- Eye contact: Check for and remove contact lenses if easy to do so. Rinse eyes carefully with water or normal saline solution for 20-30 minutes. Take the victim to a medical centre, even if no symptoms, such as redness, develop.
- Inhaled: Take victim to the nearest fresh air source and monitor their breathing. Allow them to rest and immediately contact a medical professional.
- General: Never administer anything by mouth to an unconscious, exposed person.

#### Exposure Controls/Personal Protection [5]

- Engineering controls: Emergency eyewash fountains and safety showers should be accessible in the immediate area of the potential exposure. Ensure there is adequate ventilation. Whenever possible, material should be handled in a laboratory.
- Personal protection: Safety glasses, protective and dustproof clothing, glove, an apron and an appropriate mask.

### REGULATION [1]

#### United States:

The Occupational Safety and Health Administration (OSHA) has set an 8-hour Time-Weighted Average (TWA) concentration for 1,4-dioxane of 100ppm.

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#### Australia [3]

Safe Work Australia has set an 8-hour time TWA for 1,4-dioxane of 5ppm.

### REFERENCES

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## Bulletin Board

## Gossip

JUN. 26, 2020

**Coronavirus rips through Dutch mink farms, triggering culls to prevent human infection**

2020-06-09

**LELYSTAD, THE NETHERLANDS**—In a sad sideshow to the COVID-19 pandemic, authorities in the Netherlands began to gas tens of thousands of mink on 6 June, most of them pups born only weeks ago. SARS-CoV-2 has attacked farms that raise the animals for fur, and the Dutch government worries infected mink could become a viral reservoir that could cause new outbreaks in humans.

The mink outbreaks are “spillover” from the human pandemic—a zoonosis in reverse that has offered scientists in the Netherlands a unique chance to study how the virus jumps between species and burns through large animal populations.

But they’re also a public health problem. Genetic and epidemiological sleuthing has shown that at least two farm workers have caught the virus from mink—the only patients anywhere known to have become infected by animals. SARS-CoV-2 can infect other animals, including cats, dogs, tigers, hamsters, ferrets, and macaques, but there are no known cases of transmission from these species back into the human population. (The virus originally spread to humans from an as-yet-unidentified animal species.)

The first two mink outbreaks were reported on 23 and 25 April at farms holding 12,000 and 7500 animals, respectively. More mink were dying than usual, and some had nasal discharge or difficulty breathing. In both cases, the virus was introduced by a farm worker who had COVID-19. Today, it has struck 12 of about 130 Dutch mink farms. Once COVID-19 reaches a farm, the virus appears to spread like wildfire, even though the animals are housed in separate cages. Scientists suspect it moves via infectious droplets, on feed or bedding, or in dust containing fecal matter.

That mink are susceptible wasn’t a surprise, because they are closely related to ferrets, says Wim van der Poel of Wageningen University & Research, which has an animal health laboratory here. (Both mink and ferrets can also contract human influenza viruses.) Like humans, infected mink can show no symptoms, or develop severe problems, including pneumonia. Mortality was negligible at one farm and almost 10% at another. “That’s strange—we don’t really understand it,” says virologist Marion Koopmans of Erasmus Medical Center in Rotterdam. Feral cats roaming the farms—and stealing the mink’s food—were found to be

**Genetic and epidemiological sleuthing has shown that at least two farm workers have caught the virus from mink—the only patients anywhere known to have become infected by animals.**

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infected as well. The researchers published a [preprint about their work](#) on 18 May; a paper in *Eurosurveillance* may come out soon.

The Netherlands is the only country so far to have reported SARS-CoV-2 in mink. In Denmark, the world’s largest mink producer, “We have not recorded any similar disease or outbreaks,” says Anne Sofie Hammer, a veterinary scientist at the University of Copenhagen. Neither has China, the second largest producer, says virologist Chen Hualan of the Chinese Academy of Agricultural Sciences. (Hubei, the province hardest hit by COVID-19, does not have mink farms, she notes.)

The Dutch outbreaks are giving scientists a chance to study how the virus adapts as it spreads through a large, dense population. In some other animal viruses, such conditions trigger an evolution toward a more virulent form, because the virus isn’t penalized if it kills a host animal quickly as long as it can easily jump to the next one. (Avian influenza, for instance, usually spreads as a mild disease in wild birds but can become highly pathogenic when it lands in a poultry barn.) Although SARS-CoV-2 is undergoing plenty of mutations as it spreads through mink, its virulence shows no signs of increasing.

Even so, the Dutch outbreaks have alarmed people in North Brabant province, where mink farms are concentrated. The region’s burgeoning goat industry caused the [world’s largest human epidemic of Q fever between 2007 and 2009](#). Anxious citizens feared a repeat with SARS-CoV-2 and mink. But *Coxiella burnetii*, the bacterium that causes Q fever, forms hardy spores that wafted out of barns and blew off fields fertilized with goat manure. SARS-CoV-2 is far more fragile; environmental sampling has not turned up any virus outside mink sheds, says veterinary epidemiologist Arjan Stegeman of Utrecht University, who leads the research on mink outbreaks. Whereas farm workers should wear protective equipment, the population at large is at very low risk, Stegeman says.

Eventually, the virus seems to burn itself out at every farm, once more than 90% of the animals have contracted it and developed antibodies. Combined with the low mortality rate, that means the outbreaks are far less devastating for farmers than, for instance, bird flu in poultry or foot-and-mouth disease in cattle.

Even though just two of the Netherlands’s [nearly 50,000 confirmed human COVID-19 cases](#) have been linked to the farms, the government decided to cull the animals because the problem could become bigger in the months ahead. Female mink give birth in April and May, leading to a sixfold increase in populations. Antibodies in their mother’s milk probably protect

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pups for a while, but they might become vulnerable later to any virus lingering at the farm. "That could mean there's a second wave in minks in the fall," Van der Poel says—raising the risk of more human cases. The mink are culled by gassing them with carbon monoxide; the Dutch government will compensate farmers.

In the long run, their businesses were doomed anyway: A law approved by the Dutch parliament in 2012 [bans mink farming as of 2024](#) for ethical reasons. The affected farmers may be allowed to reopen their farms for another 3 years if tests conclusively show the virus is gone—or they can decide to throw in the towel now.

[sciencemag.org](https://www.sciencemag.org), 9 June 2020

<https://www.sciencemag.org>

### A flame retardant commonly found in vintage furniture may be affecting human sperm

2020-06-10

A new study reveals that polybrominated biphenyl-153 (PBB-153) — a [flame retardant](#) present in older consumer products, which has been banned since [1976](#) — may cause serious birth defects by altering the genetic code in sperm. The new study into this common household chemical raises questions about the present-day consequences of corporate malfeasance nearly half a century ago.

[Polybrominated biphenyls](#) tend to resemble white, off-white or beige powders at room temperature. Currently, biphenyl-153 is only manufactured in a very limited capacity, such as in electronics and electronic products sold in the European Union. In the past, however, biphenyl-153 was commonly used as a fire retardant in products like automobile upholstery, lacquers and coatings, as well as a flame retardant additive in molded plastics, textiles and synthetic fibers. Application of PBB and similar chemicals as flame retardants began in earnest after the [Flammable Fabrics Act](#) was amended in 1967.

Because these chemicals were so prevalent in consumer goods and did not stay within the confines of their application, the chemicals seeped into the environment. As they take a notoriously long time to break down, these pollutants are still accumulating today. The Centers for Disease Control [notes](#) that both PBBs and a related group of chemicals, polybrominated diphenyl ethers (PBDEs), can be [found](#) in «furniture foam

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padding; wire insulation; rugs, draperies, and upholstery; and plastic cabinets for televisions, personal computers, and small appliances.»

As they leached out of household goods, PBBs began to be discovered in many places where they were not intended to be: meat and meat products, milk and dairy products, air, soil, fish and shellfish, and dust. Environmental Working Group, a nonprofit science foundation, studied the blood of 38 mothers and children and found that [all 38 had PBB-153](#) in their blood.

There are also [concerns](#) that PBB-153 and another group of man-made chemicals, diethylhexyl phthalate (DEHP), could be responsible for the 50 percent global reduction in human sperm quality over the past 80 years. The same reduction in sperm quality has been observed by domesticated dogs. DEHP is present in carpets, floor tiles, furniture upholstery, rainwear, shoes, shower curtains, tablecloths and toys. [According to the National Center for Biotechnology Information](#), "because flame retardants are not chemically bonded to the foam [in products where they are used], they are able to escape into the surrounding environment." This is why people are especially likely to be exposed to dangerous flame retardant chemicals when they are indoors, or touching older couches that may have foam padding that is likely to have been treated with PBB-153 or similar chemicals.

*Advertisement:*

The recent [study](#) on PBB-153, which was published in the academic journal *Scientific Reports* and authored by University of Georgia environmental health science doctoral student Katherine Watkins Greeson, follows up on a scandal that occurred in 1973. In an incident known as «Cattlegate," a flame retardant known as FireMaster that contained PBB-153 was accidentally sent to state grain mills in Michigan and eventually entered the local food supply. The company that manufactured FireMaster, Velsicol Chemical Company, also manufactured a nutritional supplement called NutriMaster, and the two were [mistaken](#) at the factory.

Experts believe that as many as 6.5 million Michiganders were exposed to PBB-153 as a result of this incident, and scientists have hypothesized that illnesses such as cancers, skin discoloration, joint pain, headaches and dizziness resulted from it. There were also a number of birth defects that seemed to be linked to the chemical, including hernias and scrotum buildup for boys and a higher rate of miscarriages or stillborn births for girls.

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“Though it has been nearly 45 years since the accident, people who were exposed through the consumption of contaminated animal products and those exposed in utero and through breastmilk still have circulating levels of PBBs,” the authors of the study wrote. “As recently as 2015, 60% of tested members of the PBB Registry have elevated levels of PBB above the ninety-fifth percentile of the U.S. population. The half-life of PBB is estimated to be between 10 and 29 years, which may explain why people are still experiencing health issues related to this accident.”

The authors added that, through their research, they had learned that PBBs altered sperm in a way that “has the potential to cause diseases in offspring,” including “improper parent-of-origin gene imprinting in offspring” which can cause diseases like Silver-Russell Syndrome. They also pointed to the specific ways that sperm are compromised by the chemical as an explanation for why “the children of people directly exposed to PBB during the initial exposure have different health effects compared to their parents, including reproductive problems.”

Speaking to a news outlet for the University of Georgia, Greeson explained that «hopefully this work will lead to more studies combining epidemiology and bench science in the future, which will tell us more about why we’re seeing an effect from an environmental exposure in human populations and encourage experimental studies to more closely mimic human exposures.»

salon.com, 10 June 2020

<https://www.salon.com>

### New study highlights cybersecurity concerns to due to work-from-home move because of Coronavirus

2020-06-10

Thanks to the shift to work from home in many organizations due to COVID-19, a number of different cybersecurity challenges are beginning to emerge. That’s according to the Morphisec Work-from-Home Employee Cybersecurity Threat Index.

According to the firm’s research, 56 percent of employees are using their personal device for work. And almost 25 percent of employees don’t know what security protocols are in place on their device.

While 75 percent of work-from-home employees say they usually are always follow their IT team’s advice when it comes to cybersecurity

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protocols, 20 percent of workers have received no tips from their IT team during the shift.

Almost two-thirds of employees working from home rate their IT department’s response to COVID-19 as above average or better.

securitytoday.com, 10 June 2020

<https://www.securitytoday.com>

### The biggest dinosaur ever may have been twice the size we thought

2020-06-10

FOR a century, visitors to Chicago’s Field Museum have marvelled at a display featuring two African bush elephants, frozen mid-fight. In the past couple of years, however, this awesome spectacle of the largest living land animals has been overshadowed by an enormous skeleton. As impressive as the elephants are, they look like squabbling children beside Patagotitan, a 100-million-year-old sauropod dinosaur that was as long as a blue whale, taller than a giraffe and probably outweighed each elephant 10 times over.

Since 2014, when news first broke of its discovery, *Patagotitan* has frequently been described as the most massive animal ever to walk the Earth. Such superlatives captivate us. Even if you aren’t a dinosaur fan, it is awe-inspiring to think that the skeleton in the Field Museum belongs to a creature that is as big as they get.

Except it isn’t. Weighing up such giants isn’t simple, but new calculations indicate that other dinosaurs from the same family – the aptly named titanosaurs – were at least as massive. In fact, *Patagotitan* might not even come close to claiming the heavyweight title. Some palaeontologists now believe that the ground once trembled under the mass of a near-mythical dinosaur that was twice as heavy as *Patagotitan*. How they have reached these conclusions is a story of monumental discoveries, lost treasures, academic showmanship and clay models.

Sauropods first appeared in either the Late Triassic or early Jurassic, about 200 million years ago. Dinosaurs in the group, which includes Diplodocus and Brachiosaurus, are known for having large bodies, long necks and tails, and tiny heads. Yet their most defining characteristic is their size (see “How to grow really big”). For more than a century, people have wanted to know just how big they could get. Until recently, an answer has proved elusive, not least because sauropods often

Since 2014, when news first broke of its discovery, *Patagotitan* has frequently been described as the most massive animal ever to walk the Earth.

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leave surprisingly light footprints in the fossil record. “The bigger they are, the less of them we find,” says Mathew Wedel at the Western University of Health Sciences in California. “Burying a whale-sized land animal isn’t easy.”

“Sauropods often leave surprisingly light footprints in the fossil record”

So when, in the late 1980s, palaeontologists in Argentina excavated a few bones of a truly enormous sauropod, it wasn’t clear what the complete animal looked like or how large it was. They named it *Argentinosaurus* and continued to work – and to great effect. In the past two decades, the fossil beds of Argentina have yielded a string of remarkable discoveries from the same group of sauropods, the titanosaurs. First, in 2000, came *Futalognkosaurus*, an animal known from three specimens that together preserve about three-quarters of the skeleton, excluding the skull – sauropod skulls were so fragile that they rarely fossilised. In 2005, *Dreadnoughtus* began to emerge from the ground in the form of two specimens, also representing around three-quarters of the skeleton. Finally, in 2013, work began to uncover bones at a site in Chubut province. At least six specimens of *Patagotitan* were found, which together encompass most of the skeleton.

“Titanosaurs were very fragmentary and poorly known,” says Gregory Paul, an independent researcher based in Baltimore, Maryland. “Now we’re getting enough skeletal material to get some good reconstructions.” Rebuilding these skeletons still requires someone who understands sauropod anatomy, he says, because there is plenty of variation and potential for error. This is especially true when it comes to the torso, where the bulk of a sauropod’s weight is concentrated. Rebuild the skeleton incorrectly – which even some museums do, according to Paul – and you will overestimate the weight of the sauropod. But get the anatomy right and you can calculate its body mass with reasonable precision.

A few months ago, Paul published his latest estimates for a range of sauropods. To do so, he fashioned 30-centimetre-long models from clay, measured their volumes from the amount of water they displaced and then scaled up. *Futalognkosaurus* came out at about 29 tonnes and *Dreadnoughtus* at about 31 tonnes. *Patagotitan* was much heavier, weighing between 50 and 55 tonnes. These estimates are very close to others published recently based on virtual sauropod models built using computer software. In other words, says Paul, a consensus is beginning to emerge on exactly how big these titanosaurs were. There is just one problem.

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An alternative method for estimating body mass in land animals is based on the idea that it correlates with the sturdiness of their limbs. After all, it is the limbs that must bear the weight of anything that stalks the land. That is why, however you measure them, not even the most enormous dinosaurs yet discovered are anything like as big as the giants of the sea: blue whales, which can weigh in at upwards of 150 tonnes, remain the biggest animals we know to have existed on Earth.

By measuring the circumference of a thigh bone and plugging this into a “scaling equation”, you can get reasonably accurate body mass estimates for animals as distinct as orangutans and kangaroos, says Nicolás Campione at the University of New England in Armidale, Australia, who swears by the technique. However, when applied to sauropods, it gives results wildly different from those obtained with anatomical models. For instance, it almost doubles the weight of *Dreadnoughtus* to 59 tonnes, and makes *Patagotitan* about a third heavier at 69 tonnes. What is going on?

“I don’t think the scaling equations are wrong,” says Wedel. “I think they’re imprecise.” The main problem is the margin of error, which can be 30 tonnes or more for a gigantic sauropod. Despite its imprecision, the method is popular among dinosaur palaeontologists because it is easy to use, even without a good understanding of sauropod anatomy. They aren’t necessarily concerned by its shortcomings. Biologically and behaviourally speaking, a 30-tonne sauropod was probably similar to a 60-tonne one, says Campione, and pinning down body mass more precisely arguably has limited scientific value.

Kenneth Carpenter at Utah State University Eastern in Price, who has attempted to measure sauropod body mass with great accuracy, agrees that such efforts aren’t particularly important scientifically. He points out that palaeontologists who claim to have found the largest and heaviest sauropods are invariably male. This sentiment is echoed by Kristi Curry Rogers at Macalester College in Saint Paul, Minnesota. “I just don’t get that excited by these claims, even though I work on these giant dinosaurs myself,” she says. “I’d rather put more focus on the palaeobiology and less on the sauropod showmanship.”

Yet try telling an inquisitive child it doesn’t matter exactly how big the biggest ever land animal was – or, indeed, anyone’s inner child. That is why people take notice when someone like Wedel says that *Patagotitan* was almost certainly not “the largest dinosaur that ever lived”, as the Field Museum claims. He thinks that the half dozen *Patagotitan* specimens

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were approximately the same size and weight as the largest specimens of two other Argentinian titanosaurs we know from just a few bones: our old friend *Argentinosaurus* and *Puertasaurus*, which was discovered in 2001. What's more, this could be very significant. "Maybe they're hitting the limits of what you can bury," he says. To put it another way, sauropods might have come much larger than *Patagotitan*, but such gigantic beasts might be so difficult to fossilise that we will never find their remains. Or will we?

**Mythical monster?**

Way back in 1878, Philadelphia-based palaeontologist Edward Cope received delivery of a fossil from a quarry in Colorado. It was part of a sauropod vertebra – a spine bone – and it was astonishingly large: the fragment alone was 1.5 metres tall. Cope named the dinosaur *Amphicoelias fragillimus*. He then, somehow, misplaced the fossil, or perhaps it was so fragile – as the name suggests – that it crumbled to dust. Ever since, *A. fragillimus* has been considered almost legendary. Some simply refuse to accept that the bone was as large as Cope claimed, because that would make the dinosaur unfeasibly huge. In 2014, a pair of researchers suggested that there was a typo in his description – that he mistakenly labelled its height as 1500 millimetres instead of 1050 millimetres. Carpenter finds that implausible, pointing out that the specimen's collector, Oramel Lucas, discussed the fossil's size in his correspondence. "It is an independent corroboration of what Cope published," he says.

In 2018, Carpenter estimated that the complete vertebra stood 2.4 metres tall. The equivalent bone in *Patagotitan* is 1.4 metres tall. He also suggests an explanation for its enormity. Researchers now recognise a distinct group of Diplodocus-like sauropods with unusually large vertebrae. Carpenter believes *A. fragillimus* belongs in this group; these dinosaurs had thigh bones about 1.2 times as long as their vertebrae, whereas in some sauropods they are almost twice as long. This would put the thigh bones of Cope's specimen at 2.9 metres – not outrageously longer than *Patagotitan* thigh bones, all of which are around 2.4 metres long. That isn't implausible, according to Wedel.

Paul has taken Carpenter's reappraisal of Cope's dinosaur and built on it. In his recent study, Paul estimated its body mass at between 80 and 120 tonnes, making it about twice as heavy as *Patagotitan*. Carpenter says such a wide range is little better than a guess, and Paul accepts that his estimate is necessarily vague, given that it is based on one fossilised vertebra that

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is now lost. Nevertheless, when Carpenter attempted a similar estimate 15 years ago, he calculated that the missing giant might have weighed 120 tonnes.

"Sauropods might have come much larger than *Patagotitan*, but such gigantic beasts might be too difficult to fossilise"

Wedel reserves his judgement. He says that, without discovering many more fossils, we can't be sure just how big the biggest ever land animals were – however frustrating that might be to some museum-goers. "There's a widespread perception that we understand dinosaurs a lot better than we do," he says. "Palaeontologists are nowhere near done. We are just getting started."

[newscientist.com](https://www.newscientist.com), 10 June 2020

<https://www.newscientist.com>

**Plastic dust is blowing into U.S. national parks—more than 1000 tons each year**

2020-06-11

Remote wilderness areas and national parks in the western United States are getting a dusting of plastic every year, perhaps 1000 tons or more, according to a new study. Up to one-quarter of the microscopic pieces of plastic—which come from carpets, clothing, and even spray paint—may originate in storms passing over nearby cities, whereas the rest likely comes from farther flung locations. The findings, the first to tease apart geographic origins, add to mounting evidence that such microplastic pollution is common worldwide.

"We created something that won't go away," says Janice Brahney, a biogeochemist at Utah State University and lead author on the new paper. "It's now circulating around the globe."

Brahney didn't set out to track plastic pollution. Instead, she wanted to study how wind-blown dust delivers nutrients to ecosystems. So, she set up a pilot study with the National Atmospheric Deposition Program to collect such dust at a network of weather stations usually used to sample rainwater across the United States, mostly in remote locations.

Looking at samples from 11 remote areas in the western United States, including the Grand Canyon and Joshua Tree National Park, Brahney noticed brightly colored fragments under the microscope. "I realized that I was looking at deposition of plastics, which was really shocking," Brahney

**"We created something that won't go away," says Janice Brahney, a biogeochemist at Utah State University and lead author on the new paper. "It's now circulating around the globe."**

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didn't have funding to study microplastic pollution, so she did the analysis on her own time, spending a "very long and stressful year" of evenings and weekends counting nearly 15,000 tiny pieces—most of them less than one-third the width of a human hair.

Brahney found a lot of tiny fibers, likely from clothes, carpets, and other textiles. She also found minuscule particles, about 30% of which were brightly colored spheres. Smaller than the plastic microbeads that have been used in cosmetics and other personal care products, the spheres are components of paints that might be released to the atmosphere during spray painting, she says.

Chelsea Rochman, an ecologist at the University of Toronto who studies microplastics, calls that finding "striking." The paints are "a whole new source that hasn't really been discussed before."

The remaining 70% of the particles were harder to classify. So Brahney and a colleague turned to a technique called Fourier transform infrared spectroscopy to analyze those particles and the fibers. It showed that the samples contained on average 4% plastic. "That number blew us away," says Brahney, who had expected less than 1%.

After running the numbers, Brahney and her colleagues estimated that about 132 pieces of microplastic land on every square meter of wilderness each day. That adds up to more than 1000 tons of plastic per year across national parks and other protected areas of the western United States—the equivalent of 300 million plastic water bottles, they report today in *Science*. Other studies have found similar amounts of microplastics in remote locations, including Europe's Pyrenees Mountains and in Arctic. But the new study has far more detailed data, which helped Brahney in her next step: figuring out where the plastic was coming from.

To do that, Brahney used a weather model to identify the paths of storms for 48 hours before they reached the sampling sites. Storms that had passed over or near large cities carried more microplastic than other storms, she found. The largest amounts were carried in storms that had passed over Denver; these storms deposited 14 times as much microplastic in the Rocky Mountain National Park sample station as storms that came from other directions. The pieces of microplastic were also larger than those that settled out of the air in dry weather, suggesting the strong winds of the storms had picked up the heavier pieces.

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Brahney says most of the plastic is likely coming from more distant locations, brought in via high-altitude winds rather than regional rainstorms. About 75% of the plastic was deposited during dry rather than rainy weather. Those pieces tended to be smaller—the size of extremely fine dust, which can travel for thousands of kilometers. In addition, the deposition patterns showed some influence of the jet stream. Higher elevation sites also tended to have more microplastic, further implying that the particles move high in the atmosphere—and may circulate globally.

Rochman calls this piece of the study the "wow" part. Trying to understand the patterns and processes of how microplastics move around the globe is only just beginning, she says.

Brahney is now working with atmospheric scientists who specialize in dust transport to study such questions as how plastic particles move through the atmosphere, where they might come from, and how much could be in the air. Much of this microplastic might have been circulating for years, if not decades, she says. The particles may have first settled in farm fields, or deserts, or the ocean and then have been picked up again by winds as part of a global "plastic cycle."

[sciencemag.org](https://www.sciencemag.org), 11 June 2020

<https://www.sciencemag.org>

### Those COVID-19 masks, gloves and wipes we're all using are polluting land and sea

2020-06-09

Waste from more than a million toilets flows out of giant sewage pipes, creating a swirling stinky river that has to be processed at the Annacis Island Wastewater Treatment Plant which serves a large section of Metro Vancouver.

It's just one of many facilities across Canada and around the world seeing an uptick in discarded masks, gloves and wet wipes being flushed down the toilet and causing treatment problems since the advent of COVID-19.

"It looks like we saw a few masks going up," said plant supervisor Dave Hoffman, as he pointed to a giant metal mechanical screen that separates items that don't biodegrade from the usual sludgy mass of poop and toilet paper.

**"Whether they're wipes, whether they're masks, whether they're rubber gloves, all of those things can't be treated in the sewage system and, in fact, damage our equipment," said Jerry Dobrovolny, chief administrative officer for Metro Vancouver.**

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Personal protective equipment (PPE) and other items that don't biodegrade are dried before ending up in a large waste pile nearby. At this point, they're matted into a putrid, grey mass, but a few medical gloves and items such as condoms stand out.

It's a problem that's drawn the attention of researchers at the University of British Columbia who are at work on creating a protective mask that biodegrades or can be recycled.

"Whether they're wipes, whether they're masks, whether they're rubber gloves, all of those things can't be treated in the sewage system and, in fact, damage our equipment," said Jerry Dobrovolny, chief administrative officer for Metro Vancouver.

He says there's been an uptick in this type of waste since the outbreak of the pandemic, but it hasn't been quantified.

This adds to the problem highlighted by the infamous fatbergs — wet wipes and kitchen fats clogging up sewage systems around the world after so-called "flushable wipes" surged in popularity.

COVID-19-related personal protective equipment (PPE) is adding to the problem, because even a small percentage of improperly disposed of items can clog pumps, pipes and other infrastructure.

Dobrovolny said colleagues across Canada who run sewer and solid waste systems are seeing a similar rise in improperly disposed of PPE, and taxpayers end up footing the bill.

"What we're finding now with COVID is that those numbers are increasing. Across the country, it can total over \$250 million a year in increased maintenance costs," said Dobrovolny.

### Masks made from plastic fibre

Metro Vancouver is putting new emphasis on an existing campaign to encourage people to be careful what they send into the sewer system. He reminds homeowners that they, too, can face personal costs if their home sewer system gets clogged.

Disposable masks, for instance, may feel like soft cotton, but they're almost all made from non-biodegradable material such as polypropylene.

In addition to people flushing them down the toilet, cities are seeing personal protective equipment discarded on the street. A spokesperson

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for the city of Vancouver says that's raising concerns for crews who have to deal with the waste.

Also, something dropped on the street can then get flushed into storm drains, many of which empty straight into streams or the ocean.

Richard Thompson, a professor of marine biology at the University of Plymouth in the United Kingdom, says society needs to understand and deal with what happens to all disposable items after they're used.

"The persistence of litter is incredibly long-lasting — hundreds if not thousands of years — and that's why it's really important that that end-of-life phase is fully thought out," he said.

And he notes that this new waste stream is adding to the already serious problem of microplastics, the tiny pieces of debris now found in every ocean.

"The sea is sort of downhill from everywhere, and so there's a tendency for materials to accumulate there carried by rivers or carried by wind."

### Racing to make eco-friendly masks

At a research lab at the University of British Columbia, a group of scientists saw the problem and decided they could put a dent in the growing waste pile.

They recently formed an ad hoc team to come up with less-damaging mask.

"This is all paper — all wood fibre," said Orlando Rojas, a professor at UBC's Bioproducts Institute, pointing to an array of materials and mask prototypes on a workbench.

Canada has a long history of making paper products, and he's confident once the right formula is found, millions of eco-friendly masks and other protective gear can be produced at low cost.

"People are very conscious about sustainability, so this flies really high in people's minds. If we match that interest with the performance of wood fibre, we likely have a winner here," Rojas said.

It would also help reduce dependency on foreign suppliers, a huge ongoing problem, as demand for PPE far exceeds supply.

The key is creating a soft, durable paper product that can still filter out viruses.

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## • Turn captions on

Rojas said many of the initial technical hurdles have already been solved, and talks are underway with manufacturers.

It could be a long-term proposition, with people all around the world now wearing face masks and concern growing over their impact on the environment.

A made-in-Canada-solution, with the potential for local manufacturing would also help ensure the country isn't caught short again when it comes to supplies of crucial equipment needed to fight the pandemic, said Rojas.

cbc.ca, 9 June 2020

<https://www.cbc.ca>

### 'Forever chemicals' are building up in the Arctic—and likely worldwide

2020-06-12

The Arctic can appear to be a pristine, isolated frozen land. But human pollution has reached even this remote corner of the world—which the World Wildlife Fund has called “the chemical sink of the globe.” Now researchers have discovered that a virtually indestructible type of chemical has been building up in the region since the 1990s. The presence of these “forever chemicals” is undoubtedly growing worldwide, scientists say. And the potential impacts on the health of humans and ecosystems are not yet fully known.

The problem paradoxically started because of an effort to fix another environmental issue: the hole in the ozone layer. Under the 1987 Montreal Protocol, countries agreed to phase out ozone-destroying chemicals called chlorofluorocarbons (CFCs). But industry needed something to replace those substances, which were used in a vast range of products ranging from refrigerators to hair spray. Manufacturers turned to chemicals such as hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs).

When these replacements rise into the atmosphere, however, they react with other chemicals to form several types of substances known as short-chain perfluoroalkyl carboxylic acids (scPFCA). These compounds then drop down and deposit on Earth's surface. Because of this process, scientists have suspected since the early 1990s that scPFCA would increase in the environment. But until now, researchers did not have enough data to understand what was occurring with them over time.

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“We knew, in theory, it was going to happen. But we didn't know to what extent it was happening in the real environment,” says Cora Young, an assistant professor of chemistry at York University in Toronto.

To see whether scPFCA had started accumulating after the Montreal Protocol, Young and her colleagues sampled ice cores from two locations in the Canadian Arctic. Such samples can act as time capsules, recording the chemicals that fall out of the atmosphere and become encased in the ice layers that build up year by year. The depth of the cores meant they covered several decades: one contained 38 years of ice, and the other had 50 years.

Through their analysis, Young and her colleagues found that the amount of scPFCA in the Arctic has grown significantly, starting in 1990—right around the time the Montreal Protocol took effect. For example, she says that for one of the scPFCA they looked at, the amount deposited in the Arctic every year is now 10 times greater than it was prior to the treaty. Through computer modeling and comparing trends in chemical production, the team also concluded that the replacement chemicals for CFCs were either the exclusive cause of this increase or one of its major sources. (The researchers found that the fluoropolymer industry, which produces chemicals for products such as nonstick pans, was another source of scPFCA.) Their results were published in April in *Geophysical Research Letters*.

Young notes that even though the study only examined Arctic ice cores, scPFCA are inevitably present in environments all over the planet. That situation is because their precursors—the replacement chemicals—are in the atmosphere worldwide, as are the chemicals that react with them. “If we're seeing [scPFCA] accumulation in the Arctic, that means they're accumulating everywhere,” Young says. This buildup is potentially problematic, because scPFCA are extremely persistent chemicals. “They are characterized by carbon-fluorine bonds, which are the strongest single bonds that can be formed,” she explains. “The bonds are so strong that there aren't really any environmental processes that can break them down.” Any scPFCA that accumulate in the environment will be there for thousands of years, Young says.

There is some disagreement over the potential toxicity of the scPFCA looked at in the study. Some experts say they are not a hazard for organisms until they reach much greater amounts than currently exist in the environment. “From what we know now, they're not toxic at the levels observed or bioaccumulative [capable of building up] in wildlife

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or humans," says Ian Cousins, a professor of environmental organic chemistry at Stockholm University in Sweden, who was not involved in Young's paper. "So it's unlikely that they're going to cause any toxic effect on humans or other organisms until they accumulate to a much higher level." He does note, though, that researchers may discover something new about their toxicity in the future. Chemical industry representatives say that at least one of the study's identified scPFCAs, called trifluoroacetic acid (TFA), is not problematic. "Previous scientific studies have shown that TFA [presents] negligible risk to organisms higher on the food chain, including humans," wrote the [European Fluorocarbons Technical Committee \(EFCTC\)](#), which represents fluorocarbon manufacturers in Europe, in a statement to *Scientific American*. "They do not bio-concentrate in aquatic organisms, and do not bio-magnify in the food chain." The EFCTC did call the study "robust in general."

Other experts think there has not been enough research to truly understand whether scPFCAs may be toxic—in particular, at low-dose, chronic levels of exposure. "If [these chemicals] are in the environment for a long period of time, humans and organisms will be continually exposed," says Jamie DeWitt, an associate professor of pharmacology and toxicology at the Brody School of Medicine at East Carolina University, who was not involved in the April study. "The question is: Is the low concentration in the environment, with consistent exposure, sufficient to overwhelm the body and produce toxicity? That is not known." That lack of information is because these types of studies are very difficult to conduct. John Ferry, an environmental chemist at the University of South Carolina, who was also not involved in Young's recent research, agrees that the potential impacts of scPFCAs are not fully known yet. "The fact that studies today don't necessarily show anything—it's hard to say how important that really is," he says. "Even if an effect may be unknown today, [that] doesn't mean it will be unknown tomorrow."

Ultimately most experts seem to agree that scPFCAs' extreme persistence is concerning. "I don't think it's a good idea to release these kinds of substances where they never degrade," Cousins says. "You can be sure that if you continue releasing them, there will be an effect sooner or later that's going to be problematic. And then you have to wait a long time for that effect to stop, because you can't reverse the contamination."

scientificAmerican.com, 12 June 2020

<https://www.scientificamerican.com>

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### CVS joins Walmart in keeping multicultural beauty products out of locked cabinets

2020-06-12

Reuters) - Drugstore chain CVS Health Corp joined Walmart Inc in announcing it will stop keeping beauty and personal care products designed for people of color in locked display cases, after the practice drew criticism online.

In the wake of nationwide protests in the U.S. against police brutality and racial inequality following the killing of George Floyd last month, companies have issued statements in support of the black community and set up funds to fight systemic racism.

The change in policy at both companies comes after a Walmart customer complained the practice of locking up items that cater to people of color was discriminatory.

"We have a firm-nondiscrimination policy that applies to all aspects of our business and our product protection measures have never been based on the race or ethnicity of our customers," CVS said in an emailed statement on Friday.

The drugstore chain said it had expanded its selection of products in its textured hair and color cosmetics categories by 35% over the past year to add new brands that appeal to communities of color.

Walgreens Boots Alliance Inc has also said it would stop keeping similar beauty and hair care products in locked cabinets, according to Associated Press [here](#). The company did not immediately respond to a Reuters request for comment.

reuters.com, 12 June 2020

<https://www.reuters.com>

### Solid state battery stability improves with 'battery butter'

2020-05-26

Solid state lithium batteries could represent an environmentally sound alternative to their lithium-ion counterparts, as the former rely on a solid ceramic electrolyte instead of a potentially flammable liquid. However, maintaining stability at high current densities remains a challenge as a result of reactivity at the interface between the solid electrolyte and the

**The change in policy at both companies comes after a Walmart customer complained the practice of locking up items that cater to people of color was discriminatory.**

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lithium metal anode. An interlayer paste-like material has been formulated by researchers from Chalmers University of Technology, Sweden, and Xi'an Jiaotong University, China, to address this performance barrier.

The soft, spreadable, "butter-like" substance is composed of nanoparticles of the ceramic electrolyte lithium-aluminum-germanium phosphate (LAGP) mixed with an ionic liquid. The liquid encapsulates the LAGP particles and renders the interlayer soft and protective, ensuring fast lithium-ion transport and stability toward metallic lithium.

The ion-conducting interlayer was demonstrated to suppresses the severe thermal runaway typically observed for LAGP electrolyte at high temperatures and to deliver a tenfold increase in current density. As reported in *Advanced Functional Materials*, the material reduced interfacial resistance and allows the use of a high areal current density, 1.0 mA cm<sup>2</sup>, at ambient temperature, which is roughly an order of magnitude higher than previously reported.

insights.globalspec.com, 12 June 2020

<https://www.insights.globalspec.com>

### Sea-level rise likely to swallow many coastal mangrove forests

2020-06-10

Coastal mangrove forests aren't adapting rapidly enough to escape rising sea levels, and many could disappear by 2050 in much of the tropics, according to recent [research published in Science](#).

Authors of a study reported June 5 used sediment cores from 78 sites on five continents to determine when mangroves first appeared over the past 10,000 years, as sea-level rise had slowed once Earth fully emerged from the Ice Age. They found that mangrove ecosystems did not develop unless relative sea-level rise was less than 6 to 7 millimeters\* per year. (The term "relative" is used because the rate of sea-level rise is determined by the increase in water volume of the oceans plus subsidence or uplift of coastal land).

*Sea-level rise is accelerating*

The global rate of sea-level rise has doubled from 1.8 millimeters per year over the 20th century to approximately 3.4 millimeters per year in recent years. In many coastal areas, the rate of relative sea-level rise is much

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higher as a result of subsidence resulting from human causes, such as groundwater pumping and fossil fuel extraction.

For example, the Mekong Delta of Vietnam is subsiding at a rate of 6 to 20 mm/year and the Ganges-Brahmaputra Delta by 1 to 7 mm/year. At the same time, sediment supply to the coast has declined as a result of damming of rivers and mining and export of sediment, further increasing the vulnerability of mangroves to sea-level rise.

Coastal wetlands act as natural levees against storms as a result of their ability to reduce water velocity and wave turbulence. Moreover, wetlands accumulate sediments that provide protection against rising sea levels and local subsidence. In the U.S., per square kilometer, wetlands save \$1.8 million per year in storm damages.

A March 17, 2020, study in PNAS, [Coastal wetlands reduce property damage during tropical cyclones](#), showed just how valuable wetlands are in reducing storm damage. The researchers analyzed property damage caused by 54 tropical storms and 34 hurricanes hitting the U.S. between 1996 and 2016. They found that counties with more wetland coverage experienced significantly less property damage: a 1% loss of coastal wetlands was associated with a 0.6% increase in property damage. (Side note: a 1% increase in wind increased damages by 7%, and counties on the storm path's right side experienced 140% more damage than those on the left.)

The expected economic value of the protective effects of wetlands varied widely, averaging that \$1.8 million per square kilometer. Wetlands conferred relatively more protection against weaker storms and in states with weaker building codes. Wetland losses of 2.8% in Florida between 1996 and 2016 are estimated to have increased property damage from the 2017 Hurricane Irma by \$430 million.

*Mangroves in Louisiana and Texas in trouble*

In the U.S., mangroves grow along much of the Florida coast and along large portions of the coasts of Louisiana and Texas. Most of the mangroves in those two states are experiencing rates of relative sea level that will threaten their existence. The [NOAA Tides & Currents website](#) indicates that six out of seven coastal tide gauges between Rockport, Texas, and New Orleans, Louisiana, over the past 40 to 50 years had rates of relative sea-level rise exceeding 5.8 mm/year:

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9.6 mm/yr: Eugene Island, Louisiana  
 9.1 mm/yr: Grand Island, Louisiana  
 6.6 mm/yr: Galveston, Texas  
 6.0 mm/yr: Sabine Pass, Texas  
 5.8 mm/yr: New Canal, New Orleans, Louisiana  
 5.8 mm/yr: Rockport, Texas

A [2017 analysis](#) of wetlands change at 185 sites across the Mississippi Delta found even higher rates of sea-level rise since 2006:  $13 \pm 9$  mm per year. About 65% of these sites were able to keep up with this rate of sea-level rise over that relatively short period of time. The situation is more encouraging in Florida: The highest rate of relative sea-level rise at NOAA tide gauges along Florida's mangrove forests is 3.8 mm per year, in the Florida Keys.

The results of the June study support the findings of a May 22, 2020, paper in *Science Advances*, [Tipping points of Mississippi Delta marshes due to accelerated sea-level rise](#). That research presented an 8,500-year-long sediment record from 355 boreholes in the Mississippi Delta marshes of Louisiana. It showed that at rates of relative sea-level rise of 6-9 mm per year, marsh conversion into open water occurs in about 50 years. Even at slower rates of relative sea-level rise of 3 mm per year, the researchers found that marshes in 80% of cases transitioned to open ocean in a few centuries, and they concluded that drowning of the Mississippi Delta marshes is inevitable.

An excellent analysis of [this paper at NOLA.com](#) details provisions in Louisiana's coastal master plan – a \$50 billion effort to defend the coast against rising sea levels – to help deal with the threat.

Mangrove forests provide a U.S. coastal population of more than 200 million people with services like protection from intense storms and waves, reduction of coastal flooding, sequestering of carbon, improved water quality, and preservation of biodiversity and fisheries.

Some might say it's something of a Scooby-Doo "Ruh-roh" moment to see science predicting the loss of much of the world's mangroves in just 30 years. Human development and sea-level rise have already led to the loss of one-fifth of the world's mangroves [between 1980 and 2010](#); Tampa Bay, Florida, has lost [almost half of its mangroves](#) in the past century.

Nonetheless, the Trump administration has torpedoed a major Obama administration regulation protecting wetlands: On June 22, [new EPA](#)

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[regulations](#) substantially reducing the number of water bodies and wetlands protected by the Clean Water Act are to take effect.

*Orrin Pilkey: '... we can walk away methodically, or we can flee in panic.'*

Sea-level rise is expected to cause massive upheavals to civilization in coming decades:

- forcing millions of people to abandon the coast as rising seas inundate populated areas and major cities;
- opening the way for climate change-amplified hurricanes to drive higher storm surges farther inland;
- knocking out transportation systems and sewage treatment plants;
- swallowing prime agricultural land and barrier islands; and
- infiltrating aquifers with salt water.

But the impacts of sea-level rise are not limited to future decades—they're happening right now. Hurricane Sandy's storm surge in New York City in 2012 [caused an extra \\$2 billion in damage](#) as a result of higher water levels the city experienced from 20th century sea-level rise. "Nuisance" flooding has become a growing problem in places like Miami Beach, Norfolk, and San Francisco. And in Maryland, for instance, both Annapolis and Baltimore now get [more than nine times the number of flood days they experienced in the 1960s](#). (I review many more examples in a [December 2017 review](#) of Jeff Goodell's must-read book on sea-level rise, "The Water Will Come: Rising Seas, Sinking Cities, and the Remaking of the Civilized World.")

In response to news that a long-predicted acceleration of sea level is already underway, one does well to heed the words of Duke University sea-level rise expert Dr. Orrin Pilkey and co-authors in their 2016 book, "Retreat From a Rising Sea: Hard Choices in an Age of Climate Change":

[yaleclimateconnections.org](http://yaleclimateconnections.org), 10 June 2020

<https://www.yaleclimateconnections.org>

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### Team turns seaweed into biofuel, bulk chemicals

2020-05-15

Researchers from the U.K.'s University of Exeter and the University of Bath have developed a saltwater based approach for turning invasive seaweed into biofuel and bulk chemicals.

Processes for transforming seaweed into bulk chemicals and biofuels generally require the removal of saltwater, which tends to be expensive. However, the researchers devised a method for transforming the seaweed into bulk chemicals and biofuels with the addition of a fractionation step, which is a separation process in which a mixture is divided during a phase transition into several smaller quantities.

Using both acidic and basic catalysts, the fractionation step releases sugars that nourish a yeast that create a palm-oil like substitute. This step readies the leftover seaweed for hydrothermal liquefaction wherein the seaweed is subjected to high temperature and pressure that transforms the seaweed into bio-oil. With additional processing, that oil can be turned into fuel or fertilizer.

According to the [researchers](#), this sustainable and inexpensive method for turning abundant seaweed into bulk chemicals and bio-fuel can also be accomplished when plastic waste is combined with the seaweed due to plastic pollution in the world's oceans. This is another prohibitive feature of earlier methods for transforming seaweed into biofuel that requires the time-consuming separation of plastic from seaweed.

[insights.globalspec.com](https://www.globalspec.com), 15 May 2020

<https://www.globalspec.com>

### Dogs can be 'early-warning systems' for toxic chemical exposure at home

2020-06-10

More than 10,000 years of [domestication](#) have made [dogs](#) strikingly similar to humans, from their ability [to read facial our expressions](#) to our [closely related genomes](#). Now, a new study reveals that dogs and humans carry the same toxic chemicals in their bodies—a discovery that could possibly improve human health.

Many everyday items, from food packaging to cosmetics, contain harmful substances, such as pesticides; flame retardants; and phthalates, which are used to soften [plastic](#). Long-term, chronic exposure to these three

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common chemical groups has been linked to diseases in people, including several types of [cancer](#).

[Since dogs are much like us](#), and share the same living space, scientists conducted the first investigation into how industrial chemicals impact humans and pet dogs living in the same household.

Using silicone wristbands and collars—a relatively new technology for detecting chemical exposure—the team found remarkable similarities between dogs and their owners' chemical loads, according to the study, [published recently in the journal \*Environmental Science and Technology\*](#).

These results are encouraging, says study leader Catherine Wise, because they show dogs can act as early-warning systems for human health, providing valuable clues about the detrimental effects of these exposures.

It often takes decades for chemical-related diseases to manifest in people, but the impact on pets may only take several years, says Wise, a Ph.D. candidate at North Carolina State University. So, for example, if scientists found that phthalates consistently led to cancer in dogs, they could offer guidance for people to be more vigilant in their exposure to plastics.

Wise adds that her research is particularly relevant now, due to the [coronavirus pandemic](#).

"When most of us are stuck at home with our dogs a lot longer," she says, the importance of "our shared environment has never been so great as it is today."

### Canine in the coal mine

That chemical exposures would affect our pets isn't all that shocking, but what no one knew was how closely correlated these exposures were, nor how they played out over a pet's life span, says study co-author [Matthew Breen](#), an expert in canine cancer at North Carolina State.

"Dogs have very similar cancers, so would it not make sense that also the dogs could be in this situation because they also share the same environment?" Breen says. "A dog breathes the same air and drinks the same water, and when we throw a ball across the park, a dog runs across the same herbicide-treated grass."

For the study, Breen and Wise mailed silicone wristbands and collar tags to 30 human-dog pairs in New Jersey and North Carolina, and asked the study subjects to wear them for five days in July 2018. The participants

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then mailed the items back to Wise and Breen, who soaked the wristbands and tags in a chemical solvent to extract the collected compounds.

The pollutant levels were alike in dogs and humans; for instance, the scientists found a type of polychlorinated biphenyl (PCB) in 87 percent of human wristbands and 97 percent of dog tags. These chemicals were once widely used as electronic coolant fluids and in a variety of industrial processes before the U.S. government banned their use in 1979. ([Learn about PCB contamination in orcas.](#))

The silicone is so effective because it passively absorbs chemicals in a similar manner to human cells, giving scientists an idea not only of the chemicals a person contacts while they wear the bracelet, but also how much. Previously, scientists could only measure chemicals found in blood and urine, says [Kim Anderson](#), an environmental toxicologist at Oregon State University, who developed the wristband technology.

“You and I can be exposed to the exact same thing at the exact same time and that will appear in our urine very differently,” Anderson says, making it hard to understand just how much of a chemical a person was exposed to.

But Anderson cautions that these types of studies can’t prove that a particular compound causes a specific outcome: They can only show associations.

**Chemical connections**

Such research builds on previous work in other animals, including horses and cats. In 2019, Anderson [found an association between flame retardants and a disease in cats](#) known as feline hyperthyroidism. That may be because cats like to rest on upholstered furniture, which often contains flame retardants.

Anderson has also adapted the silicone wristband into a necklace for horses, and published a study in April showing a [strong link between sick foals and chemicals released by a nearby hydraulic fracturing operation in Pennsylvania](#).

Now that Wise and Breen have established this connection in dogs, they plan to use the same method to study how chemicals are connected to bladder cancer in dogs. Previous research has found links between [a dog’s exposure to lawn herbicides and developing bladder cancer](#).

That is, once lab work starts up again. Right now, Wise is still at home chasing after her rescue dog, Simbaa. “She does keep me company and

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makes cameos in Zoom meetings, although she has to compete for the spotlight with our two cats, Loki and Nebula.”

[nationalgeographic.com](#), 10 June 2020

<https://www.nationalgeographic.com>

**England’s covid-19 contact tracers failed to reach thousands of people**

2020-06-11

In its first week of operation, England’s [coronavirus](#) contact tracing scheme was unable to reach a third of the people who tested positive for the virus, official figures show.

The [NHS Test and Trace](#) system has been hailed as a vital way for the country to manage the epidemic as it relaxes lockdown and social distancing measures. It involves asking people who have been in close contact with someone who has the virus to self-isolate.

The [first statistics](#) for the scheme, released today, show it was able to contact 5407 of 8117 people who tested positive between 28 May and 3 June, and was unable to contact the remaining 33 per cent. The people who did respond disclosed an average of around six close contacts, or 31,794 in total, and the contact tracers managed to reach around 85 per cent of this number.

[An earlier contact tracing initiative](#) that was running in the first weeks of the UK epidemic managed to reach 95 per cent of close contacts, before it was shut down. Sustaining a high percentage of contacts being reached will be crucial in the coming months, as [modelling has shown levels above 80 per cent are needed](#) to keep the spread of covid-19 in check.

The new figures didn’t include any data on the time between tests being ordered and tracers reaching the onward contacts of positive cases. It is important to keep this time period as short as possible to reduce the spread of the virus. Speaking at a press conference today, Dido Harding, who leads Test and Trace, said the scheme needs to work faster, though she didn’t provide a date for when these statistics would be released.

Asked by *New Scientist* why the service was reaching fewer contacts than its predecessor, Harding said it is because the system is still very new. “I don’t think that comparison looks too shabby for a service that’s a week old,” she said.

**The people who did respond disclosed an average of around six close contacts, or 31,794 in total, and the contact tracers managed to reach around 85 per cent of this number.**

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The vast majority of people the contact tracers spoke to have taken swift action to self-isolate. The figures show that 85 per cent isolated themselves within a day, with another 10 per cent doing so within 24 and 48 hours, 3 per cent between 48 and 72 hours, and 1 per cent taking longer.

Harding said a larger proportion of people were using the service online than expected, rather than by phone, and said there is “significant overcapacity” in both testing and tracing. It has now been around three weeks since the UK government last released figures on the number of people tested each day.

newscientist.com, date

<https://www.newscientist.com>

### Op-ed: It’s time to rethink the food system from the ground up

2020-06-12

The COVID-19 pandemic and resulting economic shutdowns have severely disrupted and spotlighted weaknesses in the U.S. food system. Farmers, food distributors, and government agencies are working to reconfigure supply chains so that food can get to where it’s needed. But there is a hidden, long-neglected dimension that should also be addressed as the nation rebuilds from the current crisis.

As scholars who study different aspects of soil, nutrition, and food systems, we’re concerned about a key vulnerability at the very foundation of the food system: soil. On farms and ranches across the U.S., the health of soil is seriously compromised today. Conventional farming practices have degraded it, and erosion has shorn away much of it.

Iowa has lost about half the topsoil it had in 1850. Since they were first plowed, America’s farmland soils have lost about half of their organic matter—the dark, spongy decomposed plant and animal tissue that helps make them fertile.

The soil that produces our nation’s food supply is a weakened link slowly failing under ongoing strain. This breakdown isn’t as dramatic as what happened in the 1930s during the Dust Bowl, but it is just as worrying. Human history holds many examples of once-thriving agricultural regions around the world where failure to maintain soil health degraded entire regions far below their potential agricultural productivity, impoverishing the descendants of those who wrecked their land.

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We believe there is an urgent need to rebuild soil health across the U.S. This can help maintain harvests over the long run and lay a solid foundation for a more resilient food system. Investing in soil health will benefit environmental and human health in ways that are becoming increasingly apparent and important.

### Food Production Starts with Soil

Soil is the foundation of the U.S. food system. Fruits, vegetables, nuts, and oils come directly from plants grown in soil. Meat, poultry, dairy products, and many farmed fish come from animals that feed on plants. Wild-caught fish and shellfish, which provide a tiny fraction of the typical American diet, are virtually the only exception.

As populations around the globe ballooned over recent centuries, so did pressure to force more productivity out of every available acre. In many parts of the world, this led to farming practices that degraded soil far beyond its natural fertility.

In the Southeastern U.S., for example, agricultural erosion stripped soil from hillsides a hundred times faster than the natural rate of soil formation. Today farmers in the Piedmont, from Virginia to Alabama between the Atlantic coast and the Appalachian mountains, coax crops from poor subsoil rather than the rich topsoil that early European settlers praised.

Researchers, government agencies and nonprofit groups recognize soil degradation as a national problem and have started to focus on rebuilding soil health. The U.S. Department of Agriculture’s Natural Resource Conservation Service helps farmers improve the health and function of their soils. Nongovernment organizations are recognizing the need to restore soil health on agricultural lands. And the 2018 Farm Bill directed new attention and funding to soil health programs.

### Public Health

Beyond growing food, soils support human, public, and planetary health. Well before the current pandemic, experts in public health and nutrition recognized that modern agriculture was failing to sustain consumers, the land, and rural communities. This insight helped spur the emergence of a new multidisciplinary field, known as food systems, that analyzes how food is produced and distributed.

But work in this field tends to focus on the environmental impacts of food production, with less attention to economic and social implications, or

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to links between farming practices, soil health and the nutritional quality of food. Many studies narrowly focus on greenhouse gas emissions from agriculture when addressing soils and sustainability, without including the many ecological benefits that healthy soils provide.

To be sure, man-made climate change is a major long-term threat to human and planetary health. But soil health is just as critical in its own right. Human actions have already harmed agricultural productivity in areas around the world. And when soil is degraded, food production systems are less able to weather future challenges that we can expect in a changing climate.

The study of soil health can also have its own blind spots. Often agricultural research focuses solely on crop yields or the impact of individual conservation practices, such as adopting no-till planting or planting cover crops to protect soil from erosion. Such analyses rarely consider linkages driven by dietary demand for specific foods and crops, or the effects of farming practices on the nutrient content of forage and crops that sustain livestock and humans.

Food systems experts have called for transforming food production to improve human health and make agriculture more sustainable. Some researchers have proposed specific diets that they argue would accomplish both goals. But fully understanding connections between soil health and public health will require greater collaboration between those studying food systems, nutrition and how we treat the soil.

### Growing Our Values

Now that COVID-19 has deconstructed much of the national food supply network, it would be a mistake to pour efforts into simply rebuilding a flawed system. Instead, we believe it is time to redesign the U.S. food system from the ground up, so that it can deliver both soil health and human health and be more resilient to future challenges.

What would it take to do this? The foundation of a revised system would be adopting regenerative farming methods that integrate multiple soil-building practices, such as no-till, cover crops and diverse crop rotations to restore health to land. It would also take creating and expanding markets for more diverse crops, as well as expanding regenerative grazing and promoting reintegration of animal husbandry and crop production.

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And it would require investing in research into the linkages between farming practices, soil health and the nutritional quality of foods—and what that all could mean for human health.

In sum, we think it's time to rethink the food system, based on a recognition that providing healthy diets based on healthy soils is critical to achieving a healthier, more just, resilient, and truly sustainable world.

civileats.com, 12 June 2020

<https://www.civileats.com>

### With trails opening, is it safe—or ethical—to go hiking this summer?

2020-06-05

Summer is officially here, and that means millions of people nervous about flying in the age of coronavirus will likely hit the road in a car. As America's national parks and forests start to reopen, many vacationers are looking to stretch their legs out on the trails, from Alaska's Glacier Bay National Park and Preserve to Virginia's Shenandoah National Park.

In ordinary times, a surge of hikers would be a boon for the picturesque gateway towns near these popular outdoor destinations. But during a pandemic, locals whose livelihoods are largely built on seasonal tourism are forced to reconsider the cost-benefit ratio of welcoming hordes of out-of-towners searching for that perfect waterfall picture or alpine vista.

That's especially true in native lands, like Navajo Nation, situated near popular recreation areas like Grand Canyon National Park. With 5,250 cases to date, Navajo Nation has one of America's highest coronavirus infection rates, making it particularly vulnerable to an influx of tourists.

Some backcountry communities have avoided disaster. The small and often underfunded regional hospitals that serve these areas haven't been pushed to their breaking points yet. And the grocery stores are fully stocked, saved for the time being from visitors clearing shelves and leaving residents with a shortage of supplies.

Part of the low infection numbers may be due to these towns' geographic isolation offering something of a social distancing buffer. But that could change as summer gets underway, bringing with it urbanites seeking to escape their COVID-stricken environs.

### Bracing for crowds—and coronavirus

**But that could change as summer gets underway, bringing with it urbanites seeking to escape their COVID-stricken environs.**

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North Conway, [New Hampshire](#), is a prime example of a backcountry recreation village. It rests in the shadow of [White Mountain National Forest](#), a half hour's drive from popular trailheads. The central strip offers brewpubs, burger joints, and hotels with names like [Eastern Slope Inn](#) and the [Swiss Chalets Village Inn](#). From a grassy rest stop on the north edge of town, you can gaze out at the pinnacle of Mount Washington.

It's an ideal place to hang your hat—or trekking poles—after a lung-buster of a hike. As such, seasonal tourism is a [pillar](#) of North Conway's economy. In some years, the year-round population of 2,000 swells with an additional 17,000 visitors [flocking](#) here from nearby [Boston](#) and [New York City](#) on weekends alone to put their feet up in the rental cottages and second homes nestled in the hills and hollows.

To date, Carroll County, which includes North Conway, has [confirmed](#) 37 COVID-19 cases. The actual number could be higher, given the shortage of test kits in New Hampshire and the role that asymptomatic carriers might be playing in spreading the virus. The “outbreak” here isn't remotely comparable to what's happening in large American cities and suburbs. But locals are preparing for the worst as temperatures rise and city folk get tired of baking bread.

“We've been a little worried about an influx of people from out of state because in this particular instance, the prevalence [of COVID-19 infections] has been much greater outside of our border,” says [Dr. Antonia Altomare](#), an infectious disease and international health specialist at [Dartmouth-Hitchcock Medical Center](#), in Lebanon, New Hampshire, about two hours by car from North Conway. “We just started antibody testing in New Hampshire and we're finding that less than 4 percent of our population has detectable antibodies. What that means for immunity is still unclear.”

Rick and Celia Wilcox are preparing for the crowds. The owners of [International Mountain Equipment](#) in North Conway are allowing 10 to 15 customers at a time into their 10,000-square-foot climbing school and outdoor gear shop, with its labyrinthine consignment basement. They've stocked up on disinfectant and will be asking customers to wear masks and keep six feet of distance at all times.

Even with the precautions, Rick Wilcox is optimistic that visitors from coronavirus-stricken cities will be especially mindful about social distancing best practices. But he acknowledges that this year, summer tourism is a controversial topic with some business owners, given that about 75 percent of their customers come from outside the state. “We're looking for those folks to come up here, recreate, and do it safely,” he says.

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“But folks who are scared of people coming from the city and bringing the virus north would probably say, ‘Well, they're gonna go into your store and you're gonna get sick.’”

### Safety on the trails

Going on a hiking getaway while minimizing exposure to backcountry communities is trickier than it may seem. Sticking with day trips, social distancing on trails, and avoiding restaurants is easy. But how do you handle gas station fill-ups in rural towns? What if you find yourself in need of a toilet, or a mechanic, if your car breaks down? Worse, what happens if you twist an ankle or succumb to heat exhaustion in the wild?

America's [search-and-rescue](#) (SAR) providers have [struggled](#) to stay solvent as millions of new hikers have flocked to parks and public lands in recent years, straining the resources of the volunteer-dependent organization. The pandemic has added complications.

“This spring, we really had to scramble to get the proper [personal protective equipment (PPE)] that we needed,” says Drew Hildner, a Boulder, [Colorado](#), resident and a medic with [Rocky Mountain Rescue](#), one of the largest SAR providers in the U.S.

Unlike large ambulance companies or fire departments, SAR doesn't have big accounts with medical suppliers because they don't need them. “Normally, we're not burning through our equipment and we'd make infrequent orders,” Hildner says. “We ended up crowdsourcing masks and other PPE items.”

Even with a new supply of PPE, including N95 masks, secured for now, Hildner notes that the occupational hazards of treating patients during a pandemic could nonetheless impact the scale of SAR operations.

“We're currently on pace to have our third busiest rescue season in our 73-year history,” he says, alluding to the heavy usage the Boulder-area trails have already [seen](#), since the pandemic began. “Because we're trying to limit exposure, we are very quickly capping our SAR response teams, once we have the minimum number of people required for any given rescue. Most of these rescues require at least 10 to 15 people, and if we end up with a patient who tested positive for COVID-19, those 10 to 15 SAR volunteers would have to be in self-quarantine for the next two weeks. And if that happened twice in a row, then we'd be pretty hard-up for response.”

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For road-tripping hikers, these questions are mostly ethical. But for rural communities, they may be existential. Back in March, when the pandemic lockdowns began, the town of [Moab, Utah](#) (a base camp for Grand Canyon tourists) [urged](#) non-essential visitors to stay home, stressing the region's limited healthcare infrastructure.

Island communities in MidCoast [Maine](#) put out a similar [notice](#) to seasonal visitors. "Every additional person who comes here is just putting one more stressor on what we have for resources, whether it be the grocery store, the gas station, our EMS system," said Marc Candage, the fire chief and emergency management director of [Vinalhaven](#) (home of Maine's largest lobstering fleet), in an interview with Maine's local NBC News affiliate.

**Rural economies in danger**

These requests to stay home aren't made lightly. Tourism in America, a [trillion dollar industry](#), has thrived in recent years. The U.S. Travel Association found that in 2019, four out of five domestic trips taken within the U.S. were for leisure. A sustained nosedive of seasonal travel could mean a disproportionately painful economic punch for rural communities that normally attract hikers and other outdoor recreation enthusiasts. The Bureau of Labor Statistics' April [jobs report](#) found that the coronavirus pandemic has already wiped out more than 7 million leisure and hospitality jobs.

These industries are a big deal in outdoor tourism towns. Consider national park "gateway communities" such as [West Yellowstone, Montana](#). A [study](#) by Resources magazine found that in West Yellowstone, tourism-related jobs comprise 37 percent of all local jobs. The study also highlighted western towns such as [Springdale, Utah](#) (gateway to [Zion](#)) and [Cortez, Colorado](#) (gateway to [Mesa Verde](#)). The takeaway was stark—in each town, tourism jobs accounted for at least 12 percent of the local economy, but usually much more. To date, the federal government hasn't come up with any plans to bail out these communities.

As a result, would-be vacationers face uncertainty and frustratingly differing rules. [Vermont](#) and Maine have instructed all visitors to self-quarantine for two weeks upon entering the state. But in towns like North Conway, there's no blanket directive for out-of-state hikers who are thirsting for hemlock evergreens and *krummholz*, the gnarled bonsai-like trees that grow at the timberline. Hikers are being urged to wear masks and keep their distance, though small towns don't have the resources to enforce social distancing measures.

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**Hiking on hold—for now**

All this uncertainty is causing some vacationers to rethink their summer plans. Jonathan Rosenfield, a social worker based in Boston, has put his usual northern New England hiking plans on hold.

Instead, he's begun taking localized "urban hikes" around the weird side streets and forgotten parklets of the city. "I've been discovering all sorts of gorgeous dead ends and pretty houses around where I live," he says. "I much prefer the natural world with no noises from cars, but I like seeing new things."

Alison Dunn, a wine industry professional, has taken a similar approach to summer hiking. She's been scaling the hills in Dorchester, her neighborhood and one of Boston's most COVID-stricken communities.

Dunn had been planning to take part in a fundraising ascent of Mount Washington this summer, for the benefit of the mountaintop [weather observatory](#). But that's not happening anymore.

For Dunn, who grew up in a small town in Georgia, a summer without backcountry hiking is a sacrifice that feels like the right thing to do, especially now. It's a lesson she learned last year, when she saw firsthand how locals felt at the end of the fall foliage season in the Whites.

"You could sense this relief that the deluge of tourists was finally over and people could go back to their towns, and I felt like a fraud," she recalls thinking back then. "I'm from a small rural town in the countryside, and I want to respect these towns, because I'm a visitor. And yet, here I am. You can see my [Massachusetts] plates in the driveway."

[nationalgeographic.com](#), 5 June 2020

<https://www.nationalgeographic.com>

**Is a four-day work week the secret to saving the planet?**

2020-06-10

**IT WAS 2005** when Bob Thomson first heard about a man marching across France with his pet donkey, drawing crowds with his fiery speeches about how humanity's need for constant growth would be our undoing. The man's name was François Schneider; the donkey was called Jujube.

Thomson, then fifty-nine and working for an **NGO** in Paris, set out with three colleagues on a road trip to the small central town of Magny-Cours to see Schneider complete the last leg of his journey. "We went down

**Degrowth, the chorus says, is the only way we can prevent climate change-induced calamity.**

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for the weekend and camped out and just listened,” says Thomson, now retired and living in Ottawa. There were about a thousand people there, Thomson recalls, a mix of activists, academics, and curiosity seekers, who walked with Schneider and Jujube before setting up tents in a field near the centre of town.

As Thomson tells it, Schneider, an industrial ecologist by training, described his vision for “décroissance,” or degrowth, over the course of the weekend. Economic growth, he argued, was inextricably linked to environmental degradation and climate change. His message was simple: the more goods we produce and consume, the more damage we inflict on the environment and, inevitably, ourselves.

Schneider told the crowd that the solution to our planetary problem was obvious: we need to embrace living with less. Governments must prioritize social and environmental well-being over economic growth by using tools like stronger environmental regulations, higher taxation on the rich, and a shorter work week. The change must be personal, too, he said. It means making less money and buying fewer things—repairing, sharing, and making do with what’s at hand. But what we lose in spending power, Schneider argued, we would gain in leisure time and social connection.

Thomson, a self-described environmentalist, was immediately hooked on Schneider’s radical degrowth philosophy. The idea just made sense: “You just can’t have infinite growth on a finite planet,” he says. And today, some fifteen years on, an increasing number of environmentalists and scientists seem to agree. Degrowth, the chorus says, is the only way we can prevent climate change–induced calamity.

Economic growth has long been considered a good thing. A booming economy has typically been associated with more jobs, higher wages, and a better standard of living for all. But, in recent years, there has been increasing debate over the benefits and feasibility of perpetual economic growth. In 2018, more than 200 academics published a letter in the *Guardian* calling on governments to seriously consider degrowth to avoid environmental collapse. Other supporters include prominent environmentalists Bill McKibben, Naomi Klein, and Canadian scientist Vaclav Smil, who recently told the *Guardian*: “Growth must come to an end. Our economist friends don’t seem to realise that.” Activist Greta Thunberg made a similar point when speaking at the United Nations last fall: “We are in the beginning of a mass extinction, and all you can talk about is money and fairy tales of eternal economic growth. How dare you!”

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Now, with the arrival of **COVID-19**, degrowth has gone from a hypothetical idea to our reality almost overnight. Planes have been grounded, factories have shut down, and retail sales have plummeted. The current slowdown differs from the one envisioned by Schneider and others in a few important ways: it’s been reactive, unplanned, and it’s harming lower-income people most severely. But it has also illuminated the direct tie between economic activity and the environment. The abysmal air quality in Wuhan, China, for example, has improved dramatically in recent months. Wildlife has crept back into now quiet city streets. Carbon emissions have declined for the first time in years.

For degrowth supporters, **COVID-19** has shown that radical societal change is possible in the face of a crisis. Climate change, they argue, poses a much graver threat for humanity than the virus—and, if we return to unbridled economic growth as soon as we can, the problem will only get worse.

**THE ECONOMY** has been expanding, in fits and starts, ever since the Industrial Revolution. But the political imperative for growth is relatively new. According to *Economic Research: Retrospect and Prospect*, prior to the Second World War, federal economic policies were largely about maintaining equilibrium and riding out shocks, like stock market crashes. After the war, however, **GDP** growth became a widely adopted goal. In the words of former US president Harry S. Truman: “Greater production is the key to prosperity and peace.” Through the 1950s and ’60s, Canada’s **GDP** increased by upward of 3 percent a year (more than double the rate of this past decade). Middle class Canadian families generally prospered during this time, with the average household income nearly doubling, and access to health care, education, and other public services improving.

It wasn’t until the early 1970s that questions began to arise around how much growth our planet could sustain and for how long. To answer those questions, a team of researchers at **MIT** developed a computer model known as World3. The model used inputs like the rate of population growth, agricultural production, and resource consumption to generate long-term projections for our species’ survival, which it spat out as graphs. The results were grim.

In World3’s business-as-usual scenario, population and resource consumption increased exponentially until around 2020, at which point things began to unravel. Nonrenewable resources, like oil, reached low levels. Food production required more land and resources but lagged

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behind population growth. Meanwhile, pollution worsened, causing widespread health issues. By about 2050, the graphs seem dystopian, with the global population dropping by about half a billion people per decade.

The **MIT** study was published as the book *The Limits to Growth*, which, with approximately 30 million copies sold, makes it the bestselling environmental book of all time. But *The Limits to Growth* was also met with heavy backlash, especially from economists. Critics argued that it was overly simplistic. Technological advances to improve the rate of agricultural productivity, for example, weren't factored into the model's future scenarios. A review in the *New York Times*, written by three economists from Harvard and Columbia Universities, dismissed the book as "less than pseudoscience and little more than polemical fiction."

Degrowth never did catch on in the twentieth century. Rather, the prevailing ideas were "sustainable development" and, later, "green growth." The main premise behind these two ideas is that economic growth can continue indefinitely while, at the same time, we can protect the natural world by reducing carbon emissions through environmentally friendly technologies. Green growth is often seen as an appealing vision and is the basis for most national greenhouse gas-reduction plans today, including Canada's. But, for Peter Victor, a professor emeritus at York University and one of the world's leading ecological economists, the numbers don't jibe.

Over the past century, Victor says, global greenhouse gas emissions and gross domestic product have both risen dramatically. For green growth to work, economic prosperity and emissions would need to diverge, or "decouple." But the decoupling hasn't been happening fast enough. The technological changes that green growth relies on—which include shifts away from oil and toward renewable energies such as solar and wind—are not on track to meet global climate targets, Victor says. And, as our economy continues to grow, requiring more energy all the time, the carbon-cutting challenge will become even more daunting.

In 2019's *Managing without Growth*, Victor modelled Canadian carbon emissions under three different economic scenarios. Under the business-as-usual growth scenario, emissions continued to rise dramatically. For the carbon-reduction scenario—which resembled green growth and involved the implementation of a high carbon tax that increased over time—carbon emissions declined 75 percent by 2067. In the sustainable-prosperity scenario, which included such degrowth principles as a reduction of the average hours worked per person and a guaranteed

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income, emissions dropped 86 percent by that same year. Poverty levels and income inequality also declined.

Victor says that a sustainable economy and planet are possible if we're willing to get creative. One of the best ways to promote well-being and to live within our means is by changing our work-life balance. A shorter work week, Victor explains, could translate to fewer resources extracted and fewer emissions caused by the production, transportation, and consumption of goods. Countries like Germany, where people work, on average, over 300 fewer hours per year than Canadians do, show that it's possible. "There are different futures out there," Victor says. "We just need to be open to thinking about them and talking about them."

**ROBERT POLLIN**, an economics professor at the University of Massachusetts Amherst and the author of *Greening the Global Economy*, is what might be described as a progressive economist. He agrees with much of what the degrowth movement is trying to achieve, including tackling climate change and improving social equity. But he thinks the idea itself is fundamentally misguided.

Pollin uses an example to illustrate: If Canada's economy were cut by 10 percent—roughly four times the Great Recession of 2009—the resulting reduction in emissions would be precisely 10 percent. That's not nearly enough to hit Canada's climate target of cutting emissions to 30 percent below 2005 levels by 2030. But the societal impacts of cutting just that 10 percent, he says, would be massive, including widespread unemployment, income losses, and bankruptcies.

The data from the **COVID-19** shutdown seems to bear this out. According to the *Guardian*, researchers are projecting a drop in global carbon emissions for 2020 of roughly 2.5 billion tonnes, making it the biggest year-over-year decline on record. But this still amounts to a reduction of only approximately 5 percent, nowhere near the cut required to avoid the two degrees of warming that scientists predict could be catastrophic. And this reduction has come at a steep societal cost: in Canada alone, approximately 2 million people have lost their jobs. What's more, declines in carbon emissions during previous recessions were quickly undone when the economy bounced back.

Instead of focusing on degrowth, Pollin is a proponent of the Green New Deal, a US policy proposal that calls for launching large-scale renewable-energy projects as a way of tackling climate change and growing industries. It's an idea that many environmentalists are pushing for as a way to stimulate the economy and restore jobs. By Pollin's rough

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calculation, transitioning completely to renewable energy over the next few decades will require an investment of roughly 2 percent of the US's **GDP**. For Canada, a similar calculation puts the price at about \$30 billion a year. Not exactly small change, Pollin concedes, but he believes the shift would help create a robust economy. "To get to zero emissions in thirty years will require a massive expansion in renewable energy," he says. "The idea that we somehow need to get smaller is misleading."

For degrowth advocates, however, climate change is just one of many environmental problems that economic growth is causing. Peter Victor points to a 2019 report by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, which warns that more than 1 million species of animals and plants are likely to disappear this century. Some scientists have predicted that our planet has entered its sixth mass extinction event. "Even if we manage to 'technology' our way out of climate change," Victor says, "there are other impacts of growth."

In the years since World3 and François Schneider's mule-supported march across France, there have been modest signs that degrowth might be gaining traction. Last year, New Zealand ditched the **GDP** as its guiding indicator for economic policy. Earlier this year, Finland's prime minister floated the idea of a four-day work week. The media response was decidedly mixed, but for degrowth supporters, it was encouraging news.

In cities around the world, lending libraries, repair cafés, and clothing swaps have become popular. A similar shift can be found in the proliferation of car- and bicycle-sharing programs. For degrowth supporter Bob Thomson, these are all positive trends. Since returning to Canada from France, Thomson says, he has tried to live a "degrowth lifestyle" by forgoing car ownership and avoiding frivolous purchases.

Still, Thomson is pragmatic about the likelihood of an immediate societal shift. Now seventy-four, he concedes that the change to sustainable living may not happen in his lifetime. But, as he says, degrowth is inevitable for our species, whether we want it or not.

thewalrus.ca, 10 June 2020

<https://www.thewalrus.ca>

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### Why cracking nuclear fusion will depend on artificial intelligence

2020-06-10

THE big joke about sustainable nuclear fusion is that it has always been 30 years away. Like any joke, it contains a kernel of truth. The dream of harnessing the reaction that powers the sun was big news in the 1950s, just around the corner in the 1980s, and the hottest bet of the past decade.

But time is running out. Our demand for energy is burning up the planet, depleting its resources and risking damaging Earth beyond repair. Wind, solar and tidal energy provide some relief, but they are limited and unpredictable. Nuclear fission comes with the dangers of reactor meltdowns and radioactive waste, while hydropower can be ecologically disruptive. Fusion, on the other hand, could provide almost limitless energy without releasing carbon dioxide or producing radioactive waste. It is the dream power source. The perennial question is: can we make it a reality?

Perhaps now, finally, we can. That isn't just because of the myriad fusion start-ups increasingly sensing a lucrative market opportunity just around the corner and challenging the primacy of the traditional big-beast projects. Or just because of innovative approaches, materials and technologies that are fuelling an optimism that we can at last master fusion's fiendish complexities. It is also because of the entrance of a new player, one that could change the rules of the game: artificial intelligence. In the right hands, it might make the next 30 years fly by.

Nuclear fusion is the most widespread source of energy in the universe, and one of the most efficient: just a few grams of fuel release the same energy as several tonnes of coal. These vast quantities of energy have their origins in something vanishingly small: the nucleus of an atom. Consisting of positively charged protons and neutral neutrons orbited by negatively charged electrons, the nucleus makes up the bulk of an atom's mass.

When two or more small atomic nuclei come into contact, they can, under certain circumstances, merge to form larger nuclei, releasing huge amounts of energy in the process. On a gargantuan scale, this is what takes place within the core of stars like our sun, giving them the power they need to shine for billions of years.

Fusion's extraordinary potential has been tantalising scientists for decades, but remains difficult to realise on Earth. It requires the creation

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of a “plasma” of naked atomic nuclei at huge temperatures and densities – something that is both difficult to achieve and difficult to control (see “Why fusion is so hard”).

At present, the most popular approach is to use what is called a magnetic confinement fusion device. In fusion’s early days in the 1950s, the favoured design was a kinked doughnut shape known as a stellarator. These machines created complex magnetic fields that could theoretically hold a charged plasma steady, but their twisted shape made them tricky to build.

By the 1970s, interest had turned to simpler designs: vast hollow rings called tokamaks in which trapped plasma is heated to hundreds of millions of degrees. The forces required to keep such a plasma in place can only be generated by powerful superconducting magnets cooled to close to absolute zero, creating the sharpest temperature gradients in the known universe.

These magnetic confinement devices have had a few successes over the years. In 1997, the Joint European Torus (JET) near Oxford, UK, set the world record for the amount of energy created in a fusion reaction, producing 16 megawatts of fusion energy from an input of 24 megawatts. This is the closest anyone has got to breaking even – getting as much energy out as that pumped in – but the reaction lasted for only a few hundredths of a second.

Back then, break-even seemed around the corner, but strange instabilities appeared in JET’s plasma that worked to cool down its centre and stymie the plans. Now, after years of upgrades, changes in design and materials, the reactor is back. In November 2020, JET is set to power its first fusion reaction in more than 20 years, aiming to beat its previous energy record and sustain the reaction for longer.

Meanwhile, other players have been getting in on the act. In 2018, China’s Experimental Advanced Superconducting Tokamak (EAST) sustained a plasma at temperatures of 15 million °C for 100 seconds, the longest confinement time yet.

EAST plans to start operating again in 2020, but is comparatively small fry. The heavily backed favourite in the race is the huge International Thermonuclear Experimental Reactor, or ITER. Founded in 1985 as a collaboration between 31 nations including China, the US, Russia and the European Union, ITER was originally expected to start experiments in 2016, but design challenges mean it is likely to remain under construction in France until 2025. “ITER is a first-of-a-kind facility,” says Howard Wilson at

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the University of York, UK. “It will take 10 years to learn how to bring it up to its full performance.”

ITER currently aims to begin fusion reactions in 2035, and it has big goals: pushing beyond break-even to produce 10 times as much power as goes in. Despite the delays, there is confidence that ITER will achieve this. “The question now is, do we have the technology to make a commercially viable power plant?” asks Simon Pinches, head of the plasma physics division at ITER.

Even if ITER achieves its goals, its journey will be far from over. The reactor isn’t set up to capture the energy it produces as electricity. Instead, the idea is that it will pave the way for demonstration power plants down the line. One is the China Fusion Engineering Test Reactor (CFETR), a follow-up tokamak to EAST three times the size, which is expected to be built in the late 2020s.

But with climate change looming ever larger, the need to find alternatives to fossil fuels has become more urgent. That has coincided with a flurry of innovation across the fusion industry, aiming to make cheap, sustainable reactors a reality within years, not decades. Most important has been the discovery of superconductors that work at higher temperatures, and so can generate strong magnetic fields with less dramatic refrigeration. Such superconductors allowed magnets to become smaller, and tokamaks to be more compact.

Other recent breakthroughs in technology, ranging from improved construction techniques to robotic systems that can inspect and maintain parts of the reactor, have made it cheaper to get into the fusion business. “It’s gone from being a purely academic activity that only government-funded research labs can fund, to something that private individuals are prepared to invest in,” says Pinches.

This has sparked a race between private companies to be the first to achieve sustainable fusion. One prominent competitor aiming to exploit the same tokamak concepts as JET, ITER and EAST is Commonwealth Fusion Systems. A spin-off from the Massachusetts Institute of Technology, it is partly funded by billionaires including Bill Gates, Jeff Bezos, Jack Ma and Richard Branson and is aiming to produce a reactor within the next 10 years. Other challengers, like Windridge’s Tokamak Energy, are also aiming to provide power to the grid by 2030.

Some are wary of promises given by private companies. “Even with those companies which have been around for a longer time, it’s still the promise

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of a reactor in 10 years from now," says Tony Donné, programme manager for EUROfusion, the consortium in charge of JET. Partly, these timescales are given to keep investors happy. "I'm sceptical that they will deliver a fusion reactor much faster than we have," says Donné. "If the community thought there was an easier way of doing it, they'd be doing that," says Pinches.

Whether public or private, everyone designing tokamaks is facing the same problems. Chief among them is how to handle instabilities in the plasma. When hot plasma is contained within the magnetic fields of a tokamak, it behaves weirdly. Sometimes small ripples appear like on the surface of a lake, while at others huge tidal waves send the plasma shooting towards the reactor walls. It is enough for some people to seek alternatives to the magnetic confinement technique, which depends on the plasma remaining stable for a long time (see "They do it with lasers").

Starting in the 1980s, some researchers looking for such alternatives dived into the past, dusting off the long-abandoned stellarators. Their more complex design generated magnetic field patterns capable of stabilising the plasma, says Amitava Bhattacharjee at Princeton University. What's more, increases in computing power meant it was becoming possible to model how plasma behaved within their more complex configurations, and so potentially create more effective designs. "This produced a renaissance in stellarator research," says Bhattacharjee. At the same time, new materials and construction methods mean building a stellarator has never been easier.

And while stellarators still lag decades behind tokamaks, they are starting to catch up. In 2015, Wendelstein 7-X, the largest stellarator in the world, was switched on at the Max Planck Institute for Plasma Physics in Greifswald, Germany, and is gearing up to maintain a plasma for 30 minutes, with this milestone expected in 2021. After that, the aim will be to start fusion.

It is still a hugely complex, time-consuming business trying to work out how best to build a fusion reactor, however. "Finding the optimum design of stellarators typically requires playing around with about 50 parameters until the best design is arrived at," says Bhattacharjee. Plasma instabilities can plague any reactor design, and understanding the complex behaviour involved requires a lot of data and time. "A fully integrated predictive simulation for ITER could take many weeks to run at present," says Pinches.

That is why, over the past few years, plasma physicists have been turning to a new partner to help haul a sustainable reactor design over the

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finishing line: machine minds. "Artificial intelligence can give us much greater speed and a much deeper exploration of the range of possibilities," says Bhattacharjee.

TAE Technologies, a California-based fusion research company, has had a partnership with Google's DeepMind AI set-up since 2014, while Canada's General Fusion is working with Microsoft. Improvements are already emerging, says David Ewing at TAE, particularly with regard to modelling how the plasma reacts to different configurations of temperature, density and magnetic field. "Previous to our advancements in machine learning, optimising the performance for a particular experiment set-up could take well over a month," says Ewing. "These can now be achieved within hours."

"Calculations that once took a month can now be performed within hours"

Key to this speed-up is AI's ability to recognise patterns and make predictions about future behaviour. You can't put a thermometer inside a tokamak to understand its workings, so the temperature has to be inferred from other properties, like how much light is coming out. This can be a difficult task for a human researcher, but an AI trained on mountainous data sets can dramatically cut the time it takes – and also up the efficiency. In 2019, a team at Princeton paired the US's fastest supercomputer with a neural network to predict plasma disruptions with an unprecedented 95 per cent accuracy.

Artificial intelligence could also be a rocket booster for ITER, too. For some tasks, like modelling the consequences of small ripples in the plasma, AI has already made the job 10 million times faster, says Pinches. Now the key is to boost the speed of the whole simulation, allowing researchers to predict problems and avoid them without needing to run the experiment.

Such innovations, and the speed at which they are now happening, is bringing a new optimism that fusion's time could, finally, be nearing. "In the last decade, we've seen exponential progress in the science," says Ewing. "That, coupled with the emergence of critical support technologies like AI, has now created the proper tool chest to bring us to the cusp of a breakthrough." The old joke about fusion hasn't dated, but this time its backers may have the last laugh.

newscientist.com, 10 June 2020

<https://www.newscientist.com>

**Pretty much every drug available in psychiatry, we don't really know how they work in the brain.**

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**How brain scanners can help up revolutionise psychiatric drugs**

2020-06-10

WHEN it comes to treating mental health conditions, you could say we have been working in the dark. The drugs we use to treat them are notoriously problematic. Almost every one of them was developed before the advent of brain scanners, and Mitul Mehta believes these powerful machines offer an unrivalled chance to open a window onto brain conditions and see how the brain responds to treatments. This could ultimately help us find better medications. Pushing the boundaries of conventional drug discovery methods, Mehta, who is a professor of neuroimaging and psychopharmacology at King's College London, is using scanners to explore how psychedelic drugs and even hypnosis influence the brain in an effort to find new ways to treat psychiatric and neurological conditions. What he is finding is unmasking much about the way the brain works, and causing us to reconsider the way we think about mental illness.

**Clare Wilson: Why do we need to study psychiatric drugs using brain scanning?**

**Mitul Mehta:** Pretty much every drug available in psychiatry, we don't really know how they work in the brain. There is a huge unmet need in the treatment of psychiatric disorders. For example, we might be interested in a potential new treatment that might impact the reward system in the brain. You might have a symptom of low motivation, which is quite common across the psychiatric spectrum, for instance in schizophrenia and depression.

One of the questions is: is low motivation mediated by the same circuits in the brain? If it is, then maybe it might be responsive to the same or similar treatments. So there might be benefits in looking at symptoms and how to understand particular symptoms better, and then how to treat those symptoms better, because you might benefit more than one diagnosis.

**So, rather than dealing with specific psychiatric illnesses that fit our current labelling system, you are almost looking at things that run deeper below them?**

For sure. I think this is the way to go. Psychiatric diagnoses are clinically useful, but they are not based on a neurobiology, they are not based on a functional understanding of the brain. If we are going to base new treatment development on a neurobiological understanding of the

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brain, we want to look at processes and symptoms, and they may cross diagnostic boundaries.

**Have you had any particular successes so far with your approach of using brain scanning to investigate psychiatric conditions?**

The timescale that we have been working to is the timescale it takes to develop a new drug, so we wouldn't expect big successes yet, but hope to in the next 10 years.

Take, for example, Parkinson's disease, which is a movement disorder, but in which up to half of patients also experience psychosis. They will often experience hallucinations, and that might develop into experiencing delusions. That can cause a lot of distress, not only to the individual affected, but also to their partner or carer.

How can we reduce their symptoms? One of the models that we have been working with is using psychedelic drugs. Drugs like psilocybin [the active compound in magic mushrooms] hit a particular receptor in the brain called the 5-HT<sub>2A</sub> receptor and we think that is instrumental in its psychedelic effects.

One of the features of psychedelic effects is visual distortions or hallucinations. What's interesting is that when you study individuals with Parkinson's disease psychosis, you find an elevation in the number of 5-HT<sub>2A</sub> receptors, especially in a visual processing pathway in the brain. We have seen this in patients who have had PET scans, and we have seen it post-mortem as well.

We came across a drug that had been developed for cancer, but which reduces the impact of 5-HT<sub>2A</sub> receptor stimulation. It does it through a novel method, which we think might be quite successful.

**Have you tested this drug in people with Parkinson's disease?**

First we have tested it in healthy volunteers given psilocybin. This is like a simpler test of our hypothesis, as we are not as sure about the role of 5-HT<sub>2A</sub> in Parkinson's. It is also harder to work with patients than healthy volunteers. We gave the volunteers the cancer drug first, then put them in the brain scanner and then gave them psilocybin. It did reduce the impact of the psychedelic experience.

That is very promising. If it is reducing the impact of the psychedelic experience, that suggests it is getting into the brain with sufficient success to actually have an effect on the brain physiology. Now we can go into the

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scanner with patients who have Parkinson's psychosis. We are running a study where they are given this drug for a couple of weeks. At the end of those two weeks, we put them in the scanner to see if the activity in this visual processing pathway has been normalised by this compound.

### **What made you work with psychoactive recreational drugs? Is that a useful way to shed light on how the brain works?**

Oh, very much so. We are already discovering through colleagues of mine that psilocybin may be beneficial as a treatment in depression. We are learning that MDMA, also known as ecstasy, may be beneficial in helping the treatment of post-traumatic stress disorder. And we are also learning that compounds within cannabis may be beneficial in various conditions – sleep, pain and psychosis, to name just three.

“Healthy people who are highly suggestible can also experience this alien control of movement”

Ketamine is very interesting at the moment, because it appears to be successful as an antidepressant, particularly in people for whom other existing treatments just haven't worked. But ketamine is also interesting because it produces a set of experiences which, for a long time, we thought looked a bit like psychosis – one of the main symptoms you have in schizophrenia. If you give someone ketamine and then you use a scale that you would use to measure symptoms in schizophrenia, they would score very highly on this scale.

It tells us something very important: that if you manipulate one system in the brain, and with ketamine we are manipulating mainly the glutamate system of the brain, then you can actually create a set of experiences, which you know are mediated by glutamate, that look a bit like psychosis. So we have been using ketamine to try to develop an assay to test new treatments for schizophrenia, which work on the glutamate system.

### **So you are using the mind-altering effects of ketamine as a proxy for schizophrenia?**

You can give otherwise-healthy people ketamine, you can put them in the scanner and you can give them other drugs on top of it and see if it reverses the effects of ketamine. You can find out, first of all, if the other drugs work, if they get into the brain sufficiently to reverse the effects of ketamine, and you can find out which dose is most successful. Then you can test patients with real confidence, because if you can't reverse

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the effects of ketamine, then you are probably not hitting the glutamate system enough to be beneficial to patients.

### **You also work with hypnosis. How can it help us understand neurological issues?**

We have put hypnotised people in the scanner so we can look at the brain systems involved in hypnosis generally.

We can also give people particular suggestions in order to study certain experiences in isolation [a suggestion in hypnosis might be something simple, for instance that a person's eyes are heavy and they feel relaxed, or more specific, such as paralysis. Some people are more suggestible than others]. One thing we did was to suggest paralysis. We would suggest to people that their left arm cannot move and is paralysed, and then we might ask them to try to move a joystick whilst they are lying in the scanner. Then we can look at their behaviour and they aren't moving the joystick.

Fine, maybe they are being very compliant, maybe these are the best volunteers in the world and they are behaving exactly as we ask them to do [with the suggestion]. Or maybe they genuinely are experiencing a paralysis. Maybe they really want to move, but somehow their arm is not moving. That's what they describe to us. We can believe them, but that can only take us so far.

If we can look in the brain during that experience, then we can compare that with what's happening in the brain when we ask them to simulate not being able to move their hand.

### **Does it look different in the brain when they are hypnotised compared to when they are simulating it?**

It is completely different. What you find is decreased activity in some of the areas involved in motor planning. This is amazing, really. It tells us that, through hypnosis and this suggestion, we are actually downregulating parts of the motor network. This experience that people are describing is matched by what we are seeing in the brain.

What we did next was we suggested that someone else is controlling their movements. So this idea that they have got agents of control or loss of agency, that it's not actually them controlling their arm. We can have a look at the areas of the brain involved in that experience.

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We can even go a step further, and we have done this as well, where we can ask people to write down the end of sentences. We can tell people that the thoughts they are having – the words they are choosing – are not their own words, but are someone else's words that they are writing down. People do claim to have less control over the words they are selecting and they feel like someone else is giving them the words to write down. We see changes in the language areas in the brain during those experiences.

### **Isn't that a symptom that is sometimes seen in schizophrenia, too?**

Yes. Passivity phenomena is what we call this and that is a very common symptom in schizophrenia. So this is really an opportunity to study these phenomena in isolation. They tell us a few really important things. First of all, they tell us that otherwise-healthy people who are highly suggestible can experience passivity phenomena. They can experience this alien control of movement, these thought insertion experiences.

We can study the brain areas involved in that particular symptom. It's also reversible, which is amazing – we can have a look at the brain circuits involved and we know it's a safe environment in which people can have these experiences.

### **Do you hope to one day be able to help develop drugs to cancel out those symptoms?**

Yes. We are already looking at how drugs might modulate some of them. I think with this new understanding, we can start to think about better ways to use existing drugs, but we can also start to develop the techniques to look at novel drugs and novel treatments, so we can accelerate their development.

newscientist.com, 10 June 2020

<https://www.newscientist.com>

### **Farmers say they need alternatives if herbicide glyphosate is weeded out**

2020-06-11

While dairy farmer Jeff Hamilton has glyphosate (pronounced gli-fa-sate) sprayed on his crops every spring, he's made peace with the herbicide prevalent in farming across Canada.

"When you're using millilitres per acre, for me, I'm not concerned," he said on his farm in late September.

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His family has lived on the same property, east of Ottawa, for nearly a century. His father and grandfather were dairy farmers. His son was expected to join the business.

On his 250-acre farm, he grows hay, corn, barley, wheat and soybeans. While farming technology has changed since his grandfather ran the business, the weeds are still around. He said he could lose up to 50 per cent of a given yield if the weeds aren't controlled.

Hamilton has heard about the dangers of handling glyphosate, but he says it's a necessary evil as long as there's no viable alternative. He believes it is safe to use, as long as farmers follow the guidelines. He's been using it on his crops for up to 40 years, he said.

He keeps his distance however. He makes sure the chemical isn't sprayed near the well where he draws water for his farm and home.

"We don't have much choice," he said. "How do you control your weeds if you don't have these chemicals?"

But scientists are researching the effects of chemicals in Roundup, a weed killer that contains glyphosate.

### **A troubled legal history**

Roundup — which Germany is to ban in 2023 — is the brand-name product marketed by Monsanto, which is owned by the German chemical and pharmaceutical company Bayer, as safe for human use and as a less labour-intensive way of dealing with weeds. Roundup went on the market in the 1970s and was registered for use in Canada in 1976.

These days farmers can plant seeds that are modified to resist glyphosate so that when the herbicide is applied, all that's left are the crops grown from those treated seeds.

According to the most recent sales data from the federal government, more than 50 million kilograms of glyphosate were sold in Canada in 2017. Glyphosate was also the most common active ingredient in all pesticides sold that year. The sales data also noted an upward trend in the overall quantity of pesticides sold in the country.

In August 2018, a California judge ordered Monsanto to pay \$289 million US in damages after a jury found a school groundkeeper's cancer was linked to Roundup. Another judge later reduced that amount to \$78 million. The verdict is being appealed by Bayer in the California Court of Appeal.

**He said he could lose up to 50 per cent of a given yield if the weeds aren't controlled.**

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Two other court cases in the United States have ruled that Roundup led to cancers in plaintiffs, who were both given multimillion-dollar awards. Bayer is also appealing those decisions.

In 2015, the International Agency for Research on Cancer (IARC) — an intergovernmental agency part of the World Health Organization — labelled the chemical as “probably carcinogenic to humans.”

Individual lawsuits against Monsanto and Bayer have been launched in B.C. and Quebec, with class-action suits being filed, but not necessarily certified, in Saskatchewan, Ontario, Alberta, B.C. and Manitoba. Three of those proposed class action lawsuits in Ontario, Alberta and British Columbia, were filed by a national personal injury law firm Diamond & Diamond against producers of glyphosate, including Bayer. In total, those three lawsuits seek more than \$500 million in damages for more than 60 plaintiffs.

In addition to questions raised by the lawsuits, there are also questions about water.

Bruce Dewar, who runs a supply store that sells glyphosate for poison ivy, doesn't think that runoff is an issue because its use, per acre, is so small. The risk with glyphosate, he said, comes from trace amounts in the food we eat.

He, like the Ottawa-area dairy farmer Jeff Hamilton, agrees that glyphosate should be sprayed early in the farming season to minimize the risk of exposure.

### Found in surface water

According to research from the Université de Montréal in 2019, 99 per cent of the surface water samples collected from the tributaries of the St. Lawrence River, including the Ottawa River, were positive for at least one of the chemicals scientists targeted — one of which was glyphosate.

The researchers looked at surface water samples collected along the Ottawa River between Montreal and Ottawa. When they tested those samples, they found glyphosate in 84 per cent of the water they tested.

Still, the researchers didn't look at how much of that surface water might be used for drinking.

“I don't think with what I've seen, in terms of (glyphosate in drinking water), that this is in an area of concern,” said Sébastien Sauvé, an

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environmental chemistry professor at the school. He was supervising the work of Juan Manuel Montiel-León, a recent PhD graduate.

Still, Sauvé said concentrations of any substance are typically lower in drinking water than in unprocessed surface water, even if the drinking water is drawn from the same area, and the levels the two scientists detected in surface water were fairly low.

“Close to Montreal, it was between about two and 200 (nanograms per litre). And in rivers, from intensive agriculture area up to 3,000 nanograms per litre.”

But Sauvé, noting the two areas tested are downstream from where crops are grown, said it's still uncertain what safe levels of glyphosate are for drinking water.

The real question people should be asking, he said, is how safe are farmers who have long-term exposure?

He believes this substance is also creating a dependency within the farming industry that could lead to serious problems.

“You're stuck in a system where you need to buy the seeds from the supplier who is also happy to supply the pesticide,” Sauvé said. “And those seeds are usually not fertile, so that you will not be able to reuse those seeds.”

He calls this a “vicious cycle,” where farmers become dependent on suppliers.

### 'We've never detected it'

At least one City of Ottawa worker isn't concerned about glyphosate in drinking water.

“Glyphosate, we've tested for 25 years,” said Ian Douglas, a chemical engineer working in the city's water treatment plants. “We've never detected it in the river or our drinking water.”

Glyphosate is primarily applied to crops in the springtime, but when these water facilities send off samples for testing as the weather gets warmer, they find no trace of the substance.

The rivers are also higher in the spring, with more water flowing to dilute glyphosate, even if it were to be found in higher concentrations.

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But another study Sauv  was part of observed that chemicals like glyphosate can have higher concentrations during different seasons, with peaks being observed in spring and fall.

S bastien Sauv , an environmental chemistry professor at the school, says concentrations of the herbicide in water varies according to the time of year.

Health Canada has set the acceptable level of glyphosate at .28 milligrams per litre, Douglas said.

Still, if glyphosate is found in Ottawa's water, the treatment centres are not currently capable of removing it, the city engineer said.

### 'It's more of an environmental issue'

"In terms of being a problem here, there's a lot of opposition to how widespread it is used," said Kathleen Cooper, senior researcher at the Canadian Environmental Law Association, "particularly among people who are opposed to genetically modified crops."

Cooper said the science is still out on what the long-term effects of glyphosate are on both seeds and people.

She said the chemical is "heavily, heavily used" and infused in both Ontario's agriculture and forestry sectors.

Still, she said the chemical seems like the only solution to handle certain problems, like phragmites, an aggressive reed that is highly invasive in Ontario wetlands and chokes out other plants for water and nutrients.

The reed often grows near wetlands or beaches where glyphosate should only be applied carefully. While glyphosates can be sprayed directly on the plant, it's recommended to be diluted to five per cent or less of the mixture.

As well, Cooper said some weeds are developing resistance to glyphosate, which might suggest the farming industry will need a new approach to handle certain weeds or have to rely on older, more toxic, solutions.

Dewar said that glyphosate needs to be mixed with other chemicals to remain an effective weed killer. Canada fleabane, for example, has been shown to have developed glyphosate-resistant populations in nine U.S. states and is also present in Ontario.

"Mother Nature is amazing in the way it can adapt," he said.

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Glyphosate's continued use is also leading to monocultures, only growing one single crop or plant in a field, which could leave crops vulnerable if disease begins working its way through a specific crop species in which there is little genetic diversity.

If glyphosate is part of runoff, it's unlikely to affect people's drinking water, Cooper said.

"It's more of an environmental issue," she said.

"It (glyphosate) breaks down quickly. It's just used in such high volume," she said.

Such selective breeding could alter the food we eat in unforeseen ways, she said.

With phosphorus being one of its core components, it will instead lead to harmful algae blooms, which sucks up the oxygen from a body of water, and could indirectly affect ecosystems by leaving fish and plant-life oxygen-starved.

This is particularly troubling, as phragmites — the reed the herbicide is particularly suited to kill — grows in wetlands.

### Classification of glyphosate

The regulation and oversight of agricultural chemicals such as glyphosate is split between two levels of government.

When it comes to how glyphosate is regulated, the provincial government decides when and where the chemical can be used. The federal government decides whether you can use it at all.

A re-evaluation of glyphosate is required every 15 years.

Following a 2015 re-evaluation by the Pest Management Regulatory Agency, a federal government agency under Health Canada that regulates pest control products, it approved the substance's continued use in 2017.

"The World Health Organization's International Agency for Research on Cancer recently assigned a hazard classification for glyphosate as 'probably carcinogenic to humans.' It is important to note that a hazard classification is not a health risk assessment," the agency's summary of its 2015 assessment reads.

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What these risk assessments do is take hazard assessment information, like the one completed by IARC, and multiply it by a risk of exposure, Cooper said.

“The level of human exposure, which determines the actual risk, was not taken into account by (IARC),” the agency stated in 2015. “Pesticides are registered for use in Canada only if the level of exposure to Canadians does not cause any harmful effects, including cancer.”

In 2019, Health Canada released another statement in reaction to growing public concern about glyphosate use.

“No pesticide regulatory authority in the world currently considers glyphosate to be a cancer risk to humans at the levels at which humans are currently exposed,” its statement reads.

However, some independent scientists disagree.

Chemistry professor Sébastien Sauvé is concerned regulatory bodies are offering contradictory information on glyphosate, which he believes means someone has to be wrong.

“(It’s) a very good example that they cannot all be trusted,” he said.

**No change coming**

Still, despite the debate over its use, dairy farmer Jeff Hamilton doesn’t see a change coming any time soon for agriculture. While he’s heard of farmers using steam, dry ice and even robots to eliminate weeds, none of these seem to be game-changers, in terms of effectiveness or being market-ready, compared to Roundup.

“There’s all kinds of ideas out there, but it has to be economical,” he said, “and you have to be able to cover a lot of acres quickly.”

While he used to apply the chemical himself, he’s let his licence lapse. Now he pays an agronomist to determine the mix needed for his crops and hires a company to come in and apply it evenly.

Although the chemical is necessary for the industry’s health right now, Hamilton said farmers have to be flexible.

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“Put the money into research to replace it,” he said, snapping his finger, “and then it will be adopted like that.”

capitalcurrent.ca, 11 June 2020

<https://www.capitalcurrent.ca>

**UK faces a climate ‘crunch decade’**

2020-06-11

Reaching net zero emissions by 2050 is going to mean drastic changes to everyday life.

That’s according to the U.K. Committee on Climate Change (CCC), an independent government advisory body, which will give recommendations in December for Britain’s next emissions target for the mid-2030s. It will also for the first time outline a plan on how the country can reach climate-neutrality by mid-century, CCC Chief Executive Chris Stark told POLITICO.

“Net zero — of course, an energy transition is a big part of it, but it’s a whole economy transition, really,” he said, adding, “The most interesting things [in December’s recommendations] are not really about the energy transition ... but it’s the societal transition that goes with it.”

That means changes to how the U.K. uses agricultural land, what people eat and how they travel.

“We’ll be looking a lot more at using cycling, and walking in cities, how public transport plays a role, how we can change patterns of air travel, so that air travel’s impact is reduced,” Stark said. December’s advice “will give a full set of pathways from today out to 2050 in each sector ... it demonstrates how society will need to shift.”

The COVID-19 pandemic temporarily kicked climate change off the political agenda. But efforts to dig economies out of the crisis-induced hole are increasingly tied to climate neutrality objectives.

That’s also fueled by a growing understanding among governments that trillions in recovery cash could either transform the economy and curb emissions, or lock in polluting infrastructure for decades.

“This is really the crunch decade. We’re going to have to move from a point where these plans are only on paper, to actually developing, in every sector, the policies and ultimately the investments that will drive all of this,” Stark said over the phone. “Unless it’s done this decade, we will not meet

**“We’ll be looking a lot more at using cycling, and walking in cities, how public transport plays a role, how we can change patterns of air travel, so that air travel’s impact is reduced,” Stark said.**

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the [Paris Agreement] targets, and globally that's true as well. It's really [a] crunch moment."

The U.K. legislated for climate-neutrality by 2050 last June, following the CCC's recommendations. The committee is the only European government-affiliated body that's really mapped what climate-neutrality means in practice — leading the way for other European and developed economies.

The European Commission is currently negotiating to put the 2050 goal into law, and assessing the impact of higher 2030 targets.

The CCC's task now is to come up with the "best, most cost-effective, most achievable strategy to achieve that target," Stark said.

No wiggle room

But as temperatures rise, and local communities are more frequently exposed to climate-related impacts such as droughts and floods, politicians have less room to maneuver.

"We are more and more vocal, and spiky, with government about what they must do ... we say the things they can't or won't. As you get closer to the date by which you need to achieve the target, the uncertainty of how you achieve it starts to reduce," said Stark. "Twenty years ago, you could say there were lots and lots of possibilities for how you may achieve the goal. As you get closer to it, those start to narrow down."

Emissions will have to radically shrink across the economy to hit the 2050 target.

Until now, politicians, campaigners and companies have largely focused on greening the energy sector, squeezing out coal in favor of less polluting gas, renewables and — in the case of the U.K. — nuclear. As a result of that effort, Britain ran for two full months without coal-generated power as of Wednesday, the first time that's happened since the Industrial Revolution.

That's going to have to become the norm in the future.

"We're relying a lot on electrifying the economy, at least a doubling of demand for electricity — so it's a doubling of size of the electricity system, all of which needs to be zero carbon," he said.

Hydrogen plays a key role in greening the one-third of the economy that can't be easily electrified.

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"That would make the hydrogen sector as big as the electricity sector is today. That gives you a sense of the scale of it, and that needs to be achieved over a few decades. It's enormous, absolutely enormous," Stark said.

Even that scale of change may need help from more esoteric technologies to soak up remaining emissions.

"There's a big story about greenhouse gas removals," Stark said.

[politico.eu](https://www.politico.eu), 11 June 2020

<https://www.politico.eu>

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## Technical Notes

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

### CHEMICAL EFFECTS

[Urinary biomarkers of nucleic acid oxidation and methylation in workers exposed to low concentrations of benzene](#)

[Metal oxide nanoparticle-decorated few layer graphene nanoflake chemoresistors for the detection of aromatic volatile organic compounds](#)

### ENVIRONMENTAL RESEARCH

[Determination of Neonicotinoids and Butenolide residues in Avian and Insect pollinators and their ambient environment in western Canada](#)

[A radon chamber specifically designed for environmentally relevant exposures of small animals](#)

[Developing a low-cost passive method for long-term average levels of light-absorbing carbon air pollution in polluted indoor environments](#)

### PHARMACEUTICAL/TOXICOLOGY

[Synthesis of quenchbodies for one-pot detection of stimulant drug Methamphetamine](#)

[The association between metal exposure and semen quality in Chinese males: the mediating effect of Androgens](#)

[Per-and Polyfluoroalkyl substances in early pregnancy and risk for Preeclampsia: A case-control study in southern Sweden](#)

### OCCUPATIONAL

[Polymorphisms in XPC and XPD genes modulate DNA damage in pesticide-exposed agricultural workers of Punjab, north-west India](#)

[Simulation of lead fume emissions in the workplace using computational fluid dynamics in the electronics industry](#)