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

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ASIA PACIFIC

National guide for safe workplaces—COVID-19

2020-08-20

Safe Work Australia has developed a new guide to help businesses decide how to manage the risk of COVID-19 in the workplace.

The **National guide for safe workplaces - COVID-19** is now available on the Safe Work Australia website.

The Guide provides practical guidance for work health and safety (WHS) duty holders about how to work safely during the pandemic.

It can be used by any duty holders under the model WHS laws who have a role in managing the risk of COVID-19, including persons conducting a business or undertaking, persons with management or control of the workplace and officers.

The Guide aligns with and complements Safe Work Australia's more detailed **COVID-19 information for workplaces**.

Go to the **National guide for safe workplaces – COVID-19**.

Safe Work Australia, 20 August 2020

<https://safeworkaustralia.cmail19.com/t/j-l-qutirdd-tuulidtrlu-m/>

22 October 2019

Decisions on requests to vary the draft evaluation report for Ethanol, 2-[2-(2-methoxyethoxy)ethoxy]-, 1,1,1"-triester with boric acid (H3BO3)

2020-08-21

The Executive Director has made a decision on each request to vary the draft evaluation report for Ethanol, 2-[2-(2-methoxyethoxy)ethoxy]-, 1,1,1"-triester with boric acid (H3BO3), CAS No. 30989-05-0.

You can read about these decisions on this page or download the document.

The draft evaluation report for Ethanol, 2-[2-(2-methoxyethoxy)ethoxy]-, 1,1,1"-triester with boric acid (H3BO3) was published on the AICIS website on 9 July 2020.

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The decisions are being published under the Industrial Chemicals Act 2019 (IC Act) in accordance with the Industrial Chemicals (Consequential Amendments and Transitional Provisions) Rules 2019 (Transitional Rules).

Full Article

Australian Industrial Chemicals Introduction Scheme, 21 August 2020

<https://www.industrialchemicals.gov.au/news-and-notice/decisions-requests-vary-draft-evaluation-report>

New decision tool to help you work out your human health exposure band

2020-08-21

We've published a new self-guided tool to help you categorise your chemical importation or manufacture. It will help you work out your human health exposure band (HHEB), part of Step 4.3 of the categorisation process.

Australian Industrial Chemicals Introduction Scheme, 21 August 2020

<https://www.industrialchemicals.gov.au/news-and-notice/new-decision-tool-help-you-work-out-your-human-health-exposure-band>

AMERICA

Wisconsin board delays rules setting new restrictions on PFAS chemicals

2020-08-17

Environmental regulators in Wisconsin have voted to table rules setting new restrictions on firefighting foam containing PFAS chemicals.

The Department of Natural Resources' policy board made the decision in a unanimous vote, the Wisconsin State Journal reported. The department has estimated local governments and businesses would have to spend about \$2.3 million annually to comply with the regulations on containment and disposal of the chemicals amid objections from industry groups and Republican lawmakers.

We've published a new self-guided tool to help you categorise your chemical importation or manufacture.

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Full Article

Insurance Journal, 17 August 2020

<https://www.insurancejournal.com/news/midwest/2020/08/17/579338.htm>

As Michigan makes PFAS strides, Oscoda residents say Air Force is stalling

2020-08-17

Michigan's new, stricter drinking water standards for the toxic "forever chemicals" known as PFAS have been lauded as among the toughest in the nation and as good news for residents who live near contaminated sites that now will require cleanup.

But for residents of Oscoda Township, where the federal government's activities at a former air force base have contaminated area groundwater, surface water, and even the flesh of fish and wildlife, the celebration over the stronger standards is tempered by frustration.

A decade since scientists first discovered contamination caused by past firefighting activities at now-defunct Wurtsmith Air Force Base, Michigan's first known PFAS site, Air Force officials say they will not commit to meeting the state's tougher cleanup standards. And in the meantime, residents say, the military branch is using federal money intended for PFAS cleanup to instead conduct more studies of a well-documented problem.

Full Article

Michigan Environment Watch, 17 August 2020

<https://www.bridgemi.com/michigan-environment-watch/michigan-makes-pfas-strides-oscoda-residents-say-air-force-stalling>

Report shows overall decline in nitrogen, sediment pollution reaching the bay

2020-08-13

Today, the Chesapeake Bay Program announced that the amount of nitrogen and sediment pollution entering the Chesapeake Bay continued to decrease, while phosphorus pollution slightly increased from the previous assessment period. Each year, the seven watershed jurisdictions—Delaware, Maryland, New York, Pennsylvania, Virginia, West Virginia and

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the District of Columbia—report the practices they have implemented to decrease the amount of pollution entering the Chesapeake Bay.

The modeling team at the Chesapeake Bay Program runs this information through a sophisticated suite of modeling tools that generate estimates of how far our partners have come toward meeting their individual pollutant reduction goals as outlined in the Chesapeake Bay Total Maximum Daily Load (Bay TMDL).

Full Article

The Southern Maryland Chronicle, 13 August 2020

<https://southernmarylandchronicle.com/2020/08/13/report-shows-overall-decline-in-nitrogen-sediment-pollution-reaching-the-bay/>

OIG concludes that lack of planning risks EPA's ability to meet TSCA deadlines

2020-08-17

On August 17, 2020, the U.S. Environmental Protection Agency's (EPA) Office of Inspector General (OIG) published a report entitled **Lack of Planning Risks EPA's Ability to Meet Toxic Substances Control Act Deadlines**. OIG conducted the audit to determine whether EPA met the deadlines already imposed by the Frank R. Lautenberg Chemical Safety for the 21st Century Act (Lautenberg Act) in 2016, which amended the Toxic Substances Control Act (TSCA), and has the staff, resources, and management controls in place to meet future statutory deadlines. The Lautenberg Act required EPA to develop new rules for chemical prioritization for risk evaluation and risk evaluation for existing chemicals and to review all new chemical submissions and make a regulatory determination. OIG found that while EPA met several of its TSCA deadlines, it did not complete all ten required existing chemical risk evaluations by the June 19, 2020, deadline. OIG notes that because of statutory requirements, the number of required existing chemical risk evaluations doubled at the end of 2019, "risking the EPA's ability to meet TSCA deadlines."

Full Article

Toxic Substances Control Act Blog, 17 August 2020

<http://www.tscablog.com/entry/oig-concludes-that-lack-of-planning-risks-epas-ability-to-meet-tsca-deadlin>

And in the meantime, residents say, the military branch is using federal money intended for PFAS cleanup to instead conduct more studies of a well-documented problem.

OIG found that while EPA met several of its TSCA deadlines, it did not complete all ten required existing chemical risk evaluations by the June 19, 2020, deadline.

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EUROPE

Northern Ireland news update: COVID-19 support scheme; emergency use application for Diquat

2020-08-17

The Newsroom at Farming Life published an article today in which a number of current issues are brought to the attention of potato growers and other stakeholders in the arable and horticulture industries. We provide a brief summary of some of these here – read the extensive report with more details on the [Farming Life website](#).

COVID-19 potato support scheme

Funding of up to £1.6m is available to potato growers who specialise in supplying potatoes for processing to meet food service and hospitality industry needs. This funding will help offset losses caused by the closure of these market outlets and subsequent market disturbance during the COVID-19 pandemic.

COVID-19 financial support

The Ulster Farmers' Union (UFU) have welcomed the coronavirus (COVID-19) financial support package for both processing potatoes and ornamental horticulture/cut flower producers. The full details for both schemes are expected shortly.

Emergency Use application – UFU support NI potato industry

The Northern Ireland potato industry supported by UFU, have submitted an Emergency Use application with Chemical Regulation Division, Health and Safety Executive (CRD) for Diquat use in 2020. With the Northern Ireland salad potato crop reportedly lost, the industry have presented a comprehensive emergency use application to CRD. Northern Ireland are not alone experiencing desiccation problems and it is understood that other countries have secured emergency use approval.

Potato News Today, 17 August 2020

<https://www.potatonewstoday.com/2020/08/17/northern-ireland-news-update-covid-19-support-scheme-emergency-use-application-for-diquat/>

Funding of up to £1.6m is available to potato growers who specialise in supplying potatoes for processing to meet food service and hospitality industry needs.

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REACH Update

AUG. 28, 2020

ECHA upholds animal tests for cosmetics

2020-08-18

REACH regulation requires registrants to perform studies on vertebrate animals.

The European Chemical Board of Appeals (**ECHA**) has rejected two appeals to its decision to require animal testing for REACH authorization. The Board of Appeal adopted two decisions concerning compliance checks of registration dossiers for homosalate and 2-ethylhexyl salicylate, which are used exclusively as ingredients in cosmetic products (cases A-009-2018 and A-010-2018).

“The two decisions published today are among the most important taken by the Board of Appeal to date. The relationship between the information requirements in REACH and the marketing and testing ‘bans’ in the Cosmetics Regulation have been an issue for many years with several different interpretations,” said Andrew Fasey, technically qualified member of the board of appeal and rapporteur for the cases. “The two decisions adopted today are based on a rigorous analysis of the wording and objectives of the two pieces of legislation. I don’t expect that everyone will agree entirely with these decisions. We have however tried to set out as clearly as possible how and why we have arrived at our conclusions.”

In the contested decisions, ECHA had required a registrant to carry out several studies on vertebrate animals on the substances to fulfil registration requirements for human health endpoints, namely a 90-day subchronic toxicity study, two PNDT and two EOGRT studies. In one of the two cases, ECHA also required the registrant to carry out a fish sexual development test.

The registrant argued before the Board of Appeal that ECHA cannot require studies on vertebrate animals for human health endpoints because the substances are used exclusively as ingredients in cosmetic products.

The Board of Appeal found that the REACH Regulation requires registrants to perform studies on vertebrate animals even if the substance is used exclusively as an ingredient in cosmetic products. The REACH Regulation does not contain an automatic exemption from the information requirements for registration if a substance is used as an ingredient in cosmetic products. A registrant can benefit from an exemption only if it

“The two decisions published today are among the most important taken by the Board of Appeal to date. ...”

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REACH Update

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shows that the conditions for an adaptation (for example, a waiver for the studies) are fulfilled.

HAPPI, 18 August 2020

https://www.happi.com/contents/view_breaking-news/2020-08-19/echa-upholds-animal-tests-for-cosmetics/

ECHA decision on animal tests for cosmetic ingredients angers campaigners

2020-08-20

The relationship between the EU's REACH requirements and the Cosmetics Regulation's marketing and testing bans continue to cause friction

The European Chemicals Agency's (ECHA) Board of Appeal has disappointed cruelty-free campaigners by rejecting two appeals concerning vertebrate animal testing on cosmetic ingredients.

In the contested decisions, ECHA had required a registrant to carry out several studies on vertebrate animals on two substances: homosalate and 2-ethylhexyl salicylate, which are both used exclusively as ingredients in cosmetic products.

According to ECHA, the studies are required to fulfil registration requirements for human health endpoints and include a 90-day subchronic toxicity study, two PNDT and two EOGRT studies. In one of the two cases, ECHA also required the registrant to carry out a fish sexual development test.

The European Union's Cosmetics Regulation contains restrictions for vertebrate animal testing on ingredients for cosmetic products, but these restrictions do not prevent the carrying out of tests in order to comply with the information requirements of the EU's pan-industry chemicals regulation REACH.

Full Article

Cosmetics Business, 20 August 2020

https://cosmeticsbusiness.com/news/article_page/ECHA_decision_on_animal_tests_for_cosmetic_ingredients_angers_campaigners/169049

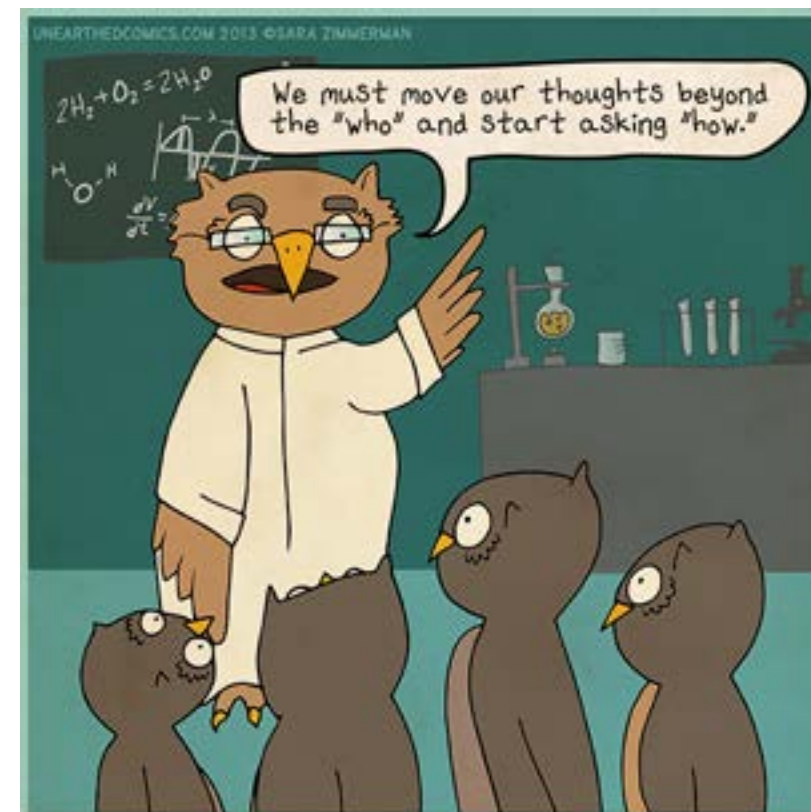
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Janet's Corner

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Science Class

2020-08-28



In one of the two cases, ECHA also required the registrant to carry out a fish sexual development test.

<http://unearthedcomics.com/comics/science-class/>

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Hazard Alert

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Nitrogen Dioxide

2020-08-28

Nitrogen dioxide is part of a group of gases called nitrogen oxides. In liquid form, it has a yellow-brown tinge; as a gas, it is reddish-brown. More commonly, it is a gaseous air pollutant, made up of nitrogen and oxygen. Its chemical symbol is NO₂, and it has an irritating smell. It is highly reactive and is produced from the burning of fuel. This includes the emissions of vehicles (cars, trucks, buses, motorbikes), power plants, and off-road equipment. In an indoor environment, it can be caused from the burning of fossil fuels, including wood or natural gas. (1,2,3,5)

USES [3]

Nitrogen dioxide is used in a wide range of chemical applications. It is primarily used in the production of nitric acid. It is also used as an oxidising agent, a catalyst, a nitrating agent and in the production of sulfuric acid. In addition, the gas is used to bleach flour, and as an oxidiser for rocket fuel.

ROUTES OF EXPOSURE [2,3,4]

- The main route of exposure for nitrogen dioxide is inhalation.
- Indoor and outdoor burning of fossil fuels are sources of the gas.
- Outdoor sources include the burning of coal and gas at power plants and cars and other vehicles on the road.
- Kerosene or gas heaters and gas stoves can cause a build-up of nitrogen dioxide if the area is not properly ventilated.

HEALTH EFFECTS

Nitrogen dioxide poisoning affects a range of systems, including the respiratory system.

Acute Effects [6]

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

Acute doses of NO₂ can cause problems in occupational settings. Short term exposure can aggravate respiratory conditions, such as asthma. Direct contact with the gas can cause inflammation and burns. If people are exposed to the gas in very high concentrations, it can cause bronchitis, pneumonia, or even death. Often, there are few or no symptoms at the time of exposure, but symptoms develop over time.

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Hazard Alert

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Chronic Effects [1,2,3]

Chronic exposure to nitrogen dioxide is toxic to multiple body systems. Long term exposure to the gas can result in the development of respiratory diseases, such as asthma (especially in children), and can also contribute to the susceptibility of respiratory infections. It can also result in an increased allergy response.

SAFETY

First Aid Measures [7]

- Ingestion: As nitrogen dioxide is a gas, refer to the "Inhalation" section.
- Skin contact: Immediately rinse affected areas with plenty of water, followed by soap and water for at least 15 minutes. Remove all contaminated clothing, footwear and accessories. Do not re-wear clothing until it has been thoroughly decontaminated. Contact a doctor immediately.
- Eye contact: Flush eyes (including under the eyelids), with water for at least 15 minutes. Check for, and remove, any contact lenses (if easily removed). Get medical attention immediately.
- Inhalation: Take victim to the nearest fresh air source and monitor their breathing. Keep the victim warm. If the rescuer believes there are still fumes present, they should wear a mask. If the victim is not breathing, and you are qualified, you may perform CPR with a one-way valve or protective mask. It may be dangerous to perform CPR, due to the dangerous nature of nitrogen dioxide. Immediately contact a medical professional.
- General: Never administer anything by mouth to an unconscious, exposed person.

Exposure Controls/Personal Protection [7]

- Engineering controls: Emergency eyewash fountains and safety showers should be accessible in the immediate area of the potential exposure. Ensure there is adequate ventilation. Use a local exhaust ventilation (with a HEPA-filter dust collection system), or process enclosure, to limit the amount of nitrogen dioxide in the air.
- Personal protection: Safety glasses, protective and dustproof clothing, gloves, an apron and an appropriate mask or dusk respirator. For specifications regarding other PPE, Follow the guidelines set in your jurisdiction.

Nitrogen dioxide is part of a group of gases called nitrogen oxides.

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REGULATION [8]

United States:

The Occupational Safety and Health Administration (OSHA) has set an 8-hour time weighted average (TWA) concentration limit for nitrogen dioxide of 5ppm.

Australia [9]

Safe Work Australia has set an 8-hour time TWA for nitrogen dioxide of 3ppm.

REFERENCES

1. <https://www.lung.org/clean-air/outdoors/what-makes-air-unhealthy/nitrogen-dioxide>
2. <https://www.epa.gov/no2-pollution/basic-information-about-no2#What%20is%20NO2>
3. <https://byjus.com/chemistry/nitrogen-dioxide/>
4. https://chem.libretexts.org/Bookshelves/Environmental_Chemistry/Supplemental_Modules_%28Environmental_Chemistry%29/Acid_Rain/Sources_of_Nitrogen_Oxides
5. <http://www.npi.gov.au/resource/oxides-nitrogen-0>
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8. <https://www.cdc.gov/niosh/idlh/10102440.html>
9. <http://hcis.safeworkaustralia.gov.au/ExposureStandards/Document?exposureStandardID=445>

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Gossip

AUG. 28, 2020

Hundreds have been evacuated after wildfires destroy more than 90,000 acres across 3 states

2020-08-14

Firefighters across three Western states are battling wildfires that have destroyed more than 90,000 acres. Evacuation orders have been issued in areas threatened by the Lake Fire and Ranch2 Fire in California's Los Angeles County; the Mosier Creek Fire in central Oregon; and the Pine Gulch, Grizzly Creek and Cameron Peak fires in Colorado. More than 100 homes were evacuated in the rugged hills near Lake Hughes in LA County as the blaze exceeded 11,000 acres. Three structures have been destroyed, and more than 5,000 others are threatened, according to the LA County Fire Department.

The fire was 5% contained on Thursday evening, a day after it was reported, fire officials reported.

"Overnight firefighters continued to provide structure defense with ground crews as well as providing aerial fire suppression," according to an incident update Thursday from the LA County Fire Department. "Today, hot air temperatures in the 90s to 100s, lower relative humidities, and drying fuels will bring elevated fire weather conditions."

A second fire in the county, The Ranch2 Fire, has forced more than 300 homes to be evacuated. It has consumed more than 3,000 acres and is 0% contained.

Friday's forecast for the area is hotter and drier, CNN meteorologist Michael Guy said, which will likely last well into next week. Across the West Coast and parts of Texas, around 80 million are under some form of a heat alert, CNN meteorologist Rob Shackelford said.

From worsening drought to "weather whiplash" that brings wetter wet seasons and drier dry seasons, climate change is hitting California harder than almost anywhere else in America, CNN meteorologist Brandon Miller said. Wildfires are one of the most apparent, and destructive, examples of this. Numerous studies have tied increasing CO2 emissions and climbing temperatures to increased acreage of burning across the Western US, particularly in California.

More than 1,000 fire personnel have been assigned, fire officials said, and evacuation centers were set up at a high school and a sports complex.

Heat builds in other wildfire zones

Three structures have been destroyed, and more than 5,000 others are threatened, according to the LA County Fire Department.

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In neighboring Oregon, the Mosier Creek Fire has also prompted evacuations. Several large air tankers were en route to help control the blaze, which by Thursday had consumed about 800 acres, according to the Oregon Department of Forestry's Central Oregon District.

The heat is just building there and will last into the beginning of next week, Guy said, along with dry conditions.

The Mosier Creek Fire has forced at least 564 homes to be evacuated and four structures have burned, according to the Oregon Department of Forestry. Authorities believe the fire was human-caused.

In Colorado, Gov. Jared Polis visited incident command locations Thursday for the Pine Gulch and Grizzly Creek fires.

The Pine Gulch Fire had consumed more than 69,000 acres by Thursday evening, with only 7% containment, fire officials reported.

Less than 100 miles away, the Grizzly Creek Fire had destroyed more than 6,200 acres by Thursday evening, according to the US Forest Service. The fire, which ignited Monday, crossed the Colorado River and Interstate 70 on Wednesday, prompting the interstate to shut down east of Glenwood Springs.

"This fire is in a really tough spot, and it's really tough to fight," White River National Forest supervisor Scott Fitzwilliams said Wednesday during a community briefing.

Nearly 900 people are working to contain the two fires. "We're going to be here for a while," Fitzwilliams said.

About 250 miles east in Larimer County, the Cameron Peak Fire has consumed more than 1,500 acres.

Colorado is heating up as well, Guy said, with high temperatures for the next seven days. A chance of daily rain in the region could bring some relief, but with it comes the risk of new fires from lightning.

edition.cnn.com, 14 August 2020

<https://www.edition.cnn.com>

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Gossip

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BSEF and Partners to use new recycling approach for brominated flame retardants

2020-08-13

Security Matters Limited, a company focused on digitizing physical objects on the blockchain to enable the tracking and tracing of materials, announces that the International Bromine Council (BSEF), the North American Flame Retardant Alliance (NAFRA), and its member companies will use SMX's technology to advance research and approaches that support the tracking and tracing of brominated flame retardants.

Improving Recycling of Materials Containing BFRs

As part of its global Circular Economy Action Plan, BSEF and its member companies are engaged in several projects and studies to improve end of life recycling of materials containing brominated flame retardants (BFRs).

BSEF, NAFRA and its member companies are supporting an exciting new approach to sorting and separating brominated flame retardants using a chemical-based hidden "barcode" system, alongside a unique "reader" to identify these codes. These codes will enable a blockchain record to be developed to store and protect ownership data. The technology for this project has been pioneered by Security Matters.

SMX's marking technology will be used to differentiate current and new BFR technologies from the legacy BFRs chemistry.

Joel Tenney, BSEF board member comments, "Developing a technology that can rapidly differentiate new BFRs from old BFRs will dramatically increase recycling efficiency, provide a mechanism for traceability, and contribute to circular economy goals."

Haggai Alon, founder and CEO, Security Matters comments, "For SMX this is a great opportunity to be an enabler on the journey of transforming base chemical production from a linear model to a sustainable model. This project is part of our belief that sustainability will be led by the industrials sector."

polymer-additives.specialchem.com, 11 August 2020

<https://www.polymer-additives.specialchem.com>

The protective layer was formulated to minimize performance degradation and eliminate safety concerns.

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Gossip

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Longer lithium-ion battery life with new cathode coating

2020-07-14

A longer, safer life for lithium-ion batteries is promised with a new conductive polymer coating for cathodes developed by researchers from U.S. Argonne National Laboratory and Hong Kong University of Science and Technology. The protective layer was formulated to minimize performance degradation and eliminate safety concerns.

Coatings currently applied for this purpose tend to hinder passage of lithium ions, resulting in reduced efficiency. This is attributed to film formation by excess oxygen generated at the cathode under high voltage conditions and subsequent reactions with the electrolyte.

The new poly(3,4-ethylenedioxythiophene) polymer coating instead enhances battery performance by facilitating lithium ion and electron transport in and out of the cathode. Application by oxidative chemical vapor deposition technique layers every particle of a metal oxide cathode with the protective conductive skin on layered oxide cathode materials. The improved stability of the cathode-electrolyte interface supported an increase in battery operating voltage from 4.2 to 4.6 V during tests, a gain that could translate into lower battery costs, extended service life and greater driving range for electric vehicles.

insights.globalspec.com, 14 July 2020

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

Don't wear masks with valves, CDC says

2020-08-14

People should wear masks to prevent the spread of COVID-19, but not those with exhalation valves or vents, the Centers for Disease Control and Prevention says.

Masks with these one-way valves are intended for use in construction work, allowing users to breathe in filtered air and exhale warm, moist air through the valve, according to The Washington Post. These valves reduce heat and moisture inside masks, making them more comfortable to wear for long periods.

But this design doesn't prevent the spread of infectious diseases. The main reason for wearing masks in the COVID-19 era is to prevent respiratory droplets from traveling into the air when a person coughs, sneezes or talks,

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the CDC says. But when a mask has a valve, respiratory droplets from the wearer are expelled into the air and could reach other people.

"This type of mask does not prevent the person wearing the mask from transmitting COVID-19 to others," the CDC says on its website.

Many airlines have already banned customers from wearing masks with valves on flights, the Post reported. American Airlines is the latest airline to announce a ban, which takes effect on Aug. 19, according to a statement from the airline issued Wednesday (Aug. 12).

The CDC does recommend wearing cloth masks when in public, and notes that surgical and N95 masks should be reserved for health care workers and first responders.

livescience.com, 14 August 2020

<https://www.livescience.com>

Death Valley hits 130° F, the hottest recorded temperature on Earth since 1931

2020-08-17

Amid a sweltering heat wave across the western United States, a remote spot in Death Valley, Calif., may have just earned the title of hottest place on Earth in nearly a century.

On August 16, the Death Valley spot — appropriately named Furnace Creek, with a population of 24 — logged a temperature of 130° Fahrenheit (54.4° Celsius). If verified by the World Meteorological Organization, or WMO, that temperature will be the hottest recorded since 1931, and the third hottest since record keeping began.

Furnace Creek also holds the record for hottest recorded temperature on Earth, logged in 1913 at 134° F (56.7° C). In second place is Kebili, Tunisia, with a logged temperature of 55.0° C (131° F) on July 7, 1931.

The verification process for such global records of weather extremes, which are archived at WMO, may take months, says archive chief Randall Cerveny, a meteorologist at Arizona State University in Tempe (*SN*: 7/1/20). Substantiating a record involves an international committee of atmospheric scientists poring over the original observations, the equipment used to make it and the calibration practices. But "based on available evidence, we are preliminarily accepting the observation," Cerveny says.

On August 16, the Death Valley spot — appropriately named Furnace Creek, with a population of 24 — logged a temperature of 130° Fahrenheit (54.4° Celsius).

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Some scientists have contested the 1913 observation. In 2016, [an analysis posted online at Weather Underground](#) suggested that the logged temperature was “essentially not possible” based on meteorological conditions, including that there was no evidence of a particularly intense heat wave from any other stations in the area at the time. For now, though, the record stands, because “no credible substantial evidence” supporting this claim has been submitted to WMO, Cervený says.

There is precedent for previous records being dismissed once disproven. In 2012, WMO determined that what was then thought to be the hottest recorded temperature, a 1912 observation of 57.8° C (136° F) in Libya, was not valid. That was supported by the discovery in 2010 of the original, mislogged observation sheet bearing five separate errors.

[sciencenews.org](https://www.sciencenews.org), 17 August 2020

<https://www.sciencenews.org>

How ‘COVID-washing’ became the new greenwashing

2020-08-17

An onset of consumer goods that feed off the fear of coronavirus reveals a disheartening reality: There’s no better time for capitalism to shine than during a pandemic.

From dietary supplements to juices to pants (yes, pants) and bedsheets, brands are employing a cruel kind of marketing to sell their products. The strategy, unique to the year 2020, might be dubbed “COVID-washing.” Like greenwashing before it, where companies convey misleading information that their products are sustainable, COVID-washing draws in consumers by conveying the false impression that a certain product can cure or repel COVID-19. There’s a range within which brands can implement COVID-washing, from explicitly advertising an antiviral power to associating with the concept of “immunity boosting.”

Dietary supplements, already an [infamously scammy](#) industry, often play on the artless side of COVID-washing, outright promising to derail the spread of coronavirus. According to a [warning letter issued by the Food and Drug Administration in early March](#), a company called Vivify Holistic Clinic offered supplements, teas, and tinctures that promoted antiviral benefits; some claimed to prevent infection from coronavirus. (According to the warning letter, the company directed its consumers to a website entitled [CoronavirusDefense.com](#) to purchase its products; the site is now defunct.)

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This product is promoted with unapproved claims to prevent, treat, mitigate, or cure COVID-19. FDA warns consumers to avoid unproven and potentially unsafe products. Since there is currently no cure for the coronavirus, it’s clear that many products are preying on consumer distress, making claims that are unequivocally false. [Since early March](#), the FDA has issued warning letters to [more than 107](#) companies for selling unapproved or misbranded products related to COVID-19. Amazon has allegedly taken down 6.5 million [unauthorized coronavirus products from its site](#) since March, but even with FDA and FTC regulation, some of these products are still [falling through the cracks](#).

Companies are not permitted to make medical claims—that their product can treat or cure coronavirus, for instance—unless their product has been approved by the FDA. Some get around this with semantics, using language that suggests a product can benefit the immune system, then noting how a strong immune system is key to warding off the virus.

A company called NeoLife, for example, promoted a “daily phytonutrient pack” called “[My Corona Defense](#),” asserting it could “[help boost immunity](#) to fight COVID-19 pandemic situation” on its Facebook page. Similarly, a company called [78Minerals](#) is advertising a product that it says can “help fight the coronavirus and strengthen your immune system.”

When reached for comment, Dennis Cullison, owner of 78Minerals, denied providing any false information in regards to the products sold on the company website. “We only say that (which is a fact) by taking minerals strengthens and boost your immune system, never said that it cures Covid so make sure your have your story straight [sic],” he wrote in an email, errors and all. He continued: “When you say can HELP fight off the corona virus is not the same does or can or will. Our product is made in a FDA lab. [sic]”

Even without using the C word directly, brands are beefing up on tactics that scratch at our desire to stay healthy and buck sickness. One common strategy? Capitalizing on the unspoken implications of phrases like “immune-boosting” and “immune strengthening,” as 78Minerals’ Cullison does. Take [Bolthouse Farms’ immunity shot](#), a new product that raises the question why a salad-dressing brand is making immunity drinks. The two-ounce beverage and many like it play into the belief that we can individually strengthen our immune systems to prevent illness. Purported immunity boosters are surging in popularity; an analysis from [Nutrition Business Journal](#) predicts that the sale of cold, flu, and immunity

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supplements will hit \$5.2 billion by the end of 2020, up more than 50% from 2019.

You're not alone if you're drawn to so-called immune boosters and believe in the cold-fighting powers of vitamin C; [orange juice sales](#), too, are up 46%, a major spike credited to the pandemic. [There's no evidence](#) the beverage can cure a cold or ward off viruses, but everyone and their mother will tell you it works. [Anti-vaxxers](#) have gone a step further, pushing a narrative that vitamin C is a coronavirus cure.

So, what does it really mean to boost one's immunity? Pretty much nothing, it turns out, when it comes to over-the-counter elixirs. "There is not a magic immunity booster for coronavirus," says Purvi Parikh, an allergist and immunologist with the [Allergy & Asthma Network](#). "The things that we recommend for 'boosting your immune system'—if you want to use that phrase—are a healthy lifestyle, having a well balanced diet, exercise . . . all of the things you should already be [working on]." The only supplement Parikh recommends for her patients is vitamin D, which she says can help maintain a healthy immune system, especially for those in the northeast who probably lack access to sunlight.

Even more slick, other companies are mining the current momentum of fear without needing to make any direct immunity-boosting proclamations. [Sunlighten's Solo System](#)—which the company calls a "sleeping bag for your soul"—is an in-home infrared sauna that it says promotes benefits ranging from happiness to [detoxification](#) to [natural anti-aging](#). The Solo System is hardly the only wellness product to make these declarations, but its real COVID-washing egregiousness comes from attempting to profit from CNN anchor Chris Cuomo's COVID-19 diagnosis. In a recent pitch email, a marketing representative for the product wrote, "Chris Cuomo used a Sunlighten sauna every day to treat his COVID-19 symptoms." The pitch linked to a [blog post](#) authored by Cuomo's wife, which reads "[Chris] has also been sitting in the Sunlighten sauna every day, which seems to make him feel better and has helped with his fever." Sunlighten did not respond to a request for comment.

The company circumvented making any true medical claims by pointing to a trusted figure's treatment strategy. The email noted "how infrared saunas are the newest, timely, at-home wellness essential, as infrared saunas [enhance immunity](#) (to prep one's body against potential COVID-19), [mitigate stress](#) (that can be caused by the pandemic)."

While there is a small body of research that touches upon the [possible health benefits of sauna use](#), there is no specific science

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to suggest that at-home sauna systems can prevent the spread of coronavirus or mitigate its symptoms. To make such claims is an enormous jump—but one that might just work in an age of consumer despair.

The COVID-washing strategy is not specific to wellness products; it has also made its way into fashion. "Virus-fighting" denim stands out for being so bewilderingly (and hilariously) deplorable. In July, [Diesel announced](#) a partnership with Polygiene, a chemical company that can apply a technology that prevents 99% of viruses from attaching to fabric. ViralOff, the finishing treatment, will be applied to select garments in the Diesel spring/summer 2021 collection. Concerningly, this kind of new-age COVID clothing will provide consumers with a [false sense of security](#); the coronavirus is transmitted from person to person through [respiratory droplets](#) . . . not jeans. Plus, even if pandemic pants could be effective, how many of us would willingly put on a pair of jeans right now? Unabashedly wearing soft pants at every hour of the day is just about the only good thing to happen during these arduous times.

New "antiviral sleep protection" similarly exploits consumer miseducation. MagniProtect's antiviral and antibacterial mattresses, toppers, and pillows are made with fabrics that can successfully eliminate 99% of the coronavirus within 60 minutes, according to a [press release](#). There is seemingly more benefit to having an antiviral mattress than an antiviral pair of jeans, since these could find a place in hospitals. But even so, these products are marketed under the false implication that the virus is spread through contact with fabrics. If we want to be all doom and gloom, we could worry that maybe the next pandemic will infect through our jeans and sheets, but there's no evidence that this is the case.

For what it's worth, [some antiviral fabrics](#) and chemical treatments are lab-tested and proven effective in suppressing viruses, and they could ultimately be useful. Some companies have rallied around copper for its antiviral properties; the material has shown up on [phone cases](#) and [hospital equipment](#), and it has been used in high-trafficked surfaces, such as in water fountains and tabletops, to lower the risk for infection. The problem with the jeans and the bedsheets, however, is that the marketing suggests to consumers that the products are necessary investments for protection, glossing over the science that points to how the virus actually spreads.

In a time when people are fraught with anxiety over their health, companies are callously wielding COVID-washing to sell snake oil. As the FDA continues to send warning letters to companies for phony claims,

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it'll be up to the consumer to examine products with a skeptical eye and decide what works and what's a farce. For right now, the best bet may be to stick to CDC guidelines—social distancing, wearing masks, and washing hands—and save the money you would've spent on potentially quack remedies for a vacation when this is all over.

fastcompany.com, 17 August 2020

<https://www.fastcompany.com>

From farm to factory: the unstoppable rise of American chicken

2020-08-17

A century ago, Americans would not recognise our modern hunger for chicken. The year-long market for tender but relatively bland chicken meat is a newish phenomenon, and without it the idea of chicken cutlets, \$5 rotisseries, or the McNugget would be a fantasy.

How did America go from thinking of chicken as an “alternative” meat to consuming it more than any other meat?

The story starts with corn.

How American corn fueled a taste for chicken

At the turn of the 20th century, chicken was almost always eaten in the spring. The priority for chicken raisers at the time was egg production, so after the eggs hatched, all the male birds would be fed up and then quickly harvested as “spring chickens” – young, tender birds that were sold whole for roasting or broiling (hence the term “broilers”). Outside the spring rush, you might be buying a bigger, fatter fryer or an old hen for stewing.

“Farmers were sending chickens of all sorts of ages, different feather colours, and tremendous variety to the marketplace in the early 20th century,” says Roger Horowitz, food historian and author of *Putting Meat on the American Table*. But almost all chickens in the market were simply surplus to egg production, making them relatively uncommon – even rare. Tender spring chickens in particular could fetch a good price. But it is worth noting, Horowitz says, that the higher price wasn't necessarily coming from pent-up demand.

“It's not as if consumers were clamoring for broilers,” he says. Though there was some consumer demand for chickens, the relatively high price

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for broilers likely had more to do with the limited, seasonal supply than a passion for poultry.

During the second world war, however, red meat was rationed, and a national campaign encouraged the consumption of poultry and fish to save “meat” (beef, pork and lamb) for “the army and our allies”. Eating chicken became more common, but the preference for young broilers, and white breast meat, persisted.

As the war drew to a close, feed millers, which buy and grind corn and other grains to feed livestock, saw a big opportunity to spur that demand for meat chickens, which consume large amounts of corn. When traditional banks refused to finance new-fangled “chicken farms”, the feed companies themselves offered farmers loans to buy feed and equipment, putting the pieces of the modern contract poultry system in place.

Consumer acceptance of broilers out of season was not automatic. In the 1930s, the average American ate 10lbs (4.5kg) or less of chicken annually; by 2017 that had risen to 64lbs (29kg), according to the Economic Research Service at the United States Department of Agriculture (USDA). For decades chicken battled to be seen as a “meat”, and did not surpass its most expensive competitor, beef, in terms of overall consumption until 2010. A strong USDA-funded marketing campaign helped out.

“In the 50s and 60s, you see where these agricultural extension operations start pushing out recipes very aggressively about broilers,” Horowitz says, and as feed companies and hatcheries (most of which would eventually become so-called “integrators”, which own several of the businesses involved in chicken production) continued to consolidate the industry, they were able to more carefully calibrate the chicken itself to what would sell most profitably, focusing on lowering costs and raising proportions of the highest-demand cuts, namely breast meat.

Don Tyson, the late president of Tyson Foods, famously said: “If breast meat is worth two dollars a pound and dark meat is worth one dollar, which would I rather have?” But for generations, the idea of buying just the most coveted cuts of chicken was foreign to most consumers. It wasn't until the 1980s that preferences began to switch to cuts of meat over the whole bird.

These companies owned and understood their chickens from egg to table and were able to exert unprecedented control over the biology of their

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flocks. Now, not only are they able to fine tune the birds' characteristics with incredible accuracy, they can also map interactions with feed, environment, and processing to maximise profits.

For integrators and corn farmers alike, the investment paid off. In 2019, 9.2 billion 6lb (2.7kg) broiler chickens were harvested in the US, consuming about 1.8lbs (820g) of grain for every pound of chicken.

But the impact on chickens from the changes in production is troubling.

The modern industrial chicken

Over the past 70 years, the poultry industry has measured its success in terms of how many pounds of meat a chicken can produce for a given amount of feed. Modern chickens are more efficient than ever, with producers able to calculate to the ounce how much "input" of food, water, air and time are required to get a set amount of white and dark meat.

The modern chicken is fully industrialised.

With more than 500 chicken breeds existing on Earth, it might surprise you to learn that every nugget, breast, and cup of chicken noodle soup you've ever eaten likely came from one breed, a specialised cross between a Cornish and a white rock.

The genetic lineages of chickens grown by the world's biggest poultry companies are a closely guarded secret. But one common commercial line, the Cobb 500, originated from a contest held by the USDA's Agricultural Extension Service in the 1940s, aptly titled the "chicken of tomorrow" competition. The winner, the Vantress chicken, would become the standard meat chicken by the 1950s. This chicken and its many descendants were optimised for a few key factors: large breasts, white feathers, fast and efficient growth, consistent sizes and gentle dispositions.

The average size of a grocery store chicken in the 1920s was about 2.5lbs (1.13kg). Today it hovers around 6lbs (2.7 kg), which a broiler chicken can reach in about 47 days, according to the National Chicken Council (even younger, smaller birds are used for fast food restaurants).

The use of naturally double-breasted breeds and millions of dollars in research has produced birds with massive breasts, but gaining that muscle mass quickly requires near constant food consumption, and leads the birds to have much lower activity levels. Growing pains lead to sedentary birds.

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"They actually have robots on wheels that go around the [poultry] house and inspect the birds with a camera and force the birds to move so that they walk more," says Phillip Clauer, associate teaching professor at Penn State Extension.

White feathers are key for marketing, because pin feathers and follicles of birds with coloured feathers can hang on to pigmentation, and coloured bird carcasses don't appear as "clean" or sell as well to picky consumers.

Consistent sizing is required to ensure that slaughterhouse line speeds can stay high. Processing chickens is one of the biggest bottlenecks in getting chickens from farms to grocery stores, and consistently sized birds keep the machines running smoothly.

Gentle dispositions are also a must as chickens are naturally aggressive and even cannibalistic, especially in confined spaces and large numbers. Poultry houses are more profitable the more birds are inside, so reducing the chickens' natural disposition to fight and eat one another is key to facilitating modern poultry rearing. Faster-maturing birds also tend to be gentler, because aggressive behavior is more common among sexually mature chickens, a milestone most broilers never reach.

With limited diets, these industrial birds can live semi-normal lifespans, but if allowed to eat continuously, as they are genetically designed to, they tend to have extremely high mortality rates beyond the ideal harvest date.

Niche markets

Counterintuitively perhaps, the industrialisation of chicken led to far fewer choices when buying poultry.

"If you look at cookbooks in the 20s and 30s – for a certain kind of dish you get a fat chicken, for another you get a fryer or broiler. And the marketplace distinguished between those kinds of chickens," Horowitz says. The industry's obsession with perfecting the broiler machine came at the cost of the consumer's ability to choose other varieties of chicken.

As chickens became more commonplace in grocery stores, brands started to reintroduce variety by offering individual cuts, skinless and boneless meats, and processed products (which also allowed them to improve the flavour, which had become decidedly bland over time). But as consumers' interests trend away from more highly processed foods in search of story and connection to place, a niche may be opening for birds other than the Cornish cross.

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Growing food movements around the world are already spurring conversations about the possibility of making slower-growing chickens of different breeds, harvested at a larger variety of ages, more widely available. Even the company that grows Cobb 500 chicks is offering a new “rustic” variety with golden plumage, rather than the standard white.

The conventional poultry industry may actually be poised to lead this trend, as it currently makes chickens of various sizes and ages available to institutional customers (fast food fried chicken, for example, is usually made from smaller, younger birds than are available in the grocery store).

In the meantime, breeders and geneticists at the world’s largest poultry companies will continue refining their lines of Cornish cross broilers, in particular to grow quickly in harsh environments or on lower-quality feeds, conditions that might be more common in the developing world.

“Instead of just selecting birds for maximum growth and size,” says Clauer, “now the genetic companies can look at 20, 30, 40 parameters and look very closely at the bird’s anatomy, health, structure, all the things that go into a modern bird that makes it much more efficient and have better liveability.”

Though competition will likely come as technologies around lab-cultured and cell-based meats continue to progress and gain consumer acceptance, the sheer efficiency and short growth time of chickens is insulating the industry for now.

[theguardian.com](https://www.theguardian.com), 17 August 2020

<https://www.theguardian.com>

Massive ‘Darth Vader’ sea bug pulled from waters near Indonesia

2020-08-18

Buglike marine creatures that skitter across the sea bottom can grow to be as big as puppies, and a newly described species is one of the largest ever seen.

These crustaceans are known as isopods; the order Isopoda includes around 10,000 species that live in diverse habitats on land and in the ocean, and they can range in size from just a few millimeters to nearly 20 inches (500 mm) long. Of the ocean-dwelling isopods, the genus *Bathynomus* contains the biggest species; the newfound isopod,

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which turned up in the Indian Ocean in 2018, is among the largest of the *Bathynomus* species ever seen in the wild.

Named *Bathynomus raksasa* (“rakasa” is the Indonesian word for “giant”), the sizable sea bug measures about 13 inches (330 mm) in length, on average. It is the first new giant isopod species to be described in more than a decade, and is the first of these isopod behemoths to be found in waters near Indonesia, scientists reported in a new study.

Big or small, all isopods share many features, such as four sets of jaws, compound eyes, two sets of antennae, and a segmented body with seven sections, each with its own pair of legs, according to the National Oceanic and Atmospheric Administration.

Of the 16 previously described *Bathynomus* species, seven are considered to be “supergiants” — maturing at more than 6 inches (150 mm) long and then growing to be 12 inches (300 mm) or more, according to the study, published online July 8 in the journal ZooKeys.

Researchers identified *B. raksasa* during the South Java Deep Sea Biodiversity Expedition; they collected two specimens, a male and a female, off the southern coast of Java, at ocean depths between 3,117 and 4,134 feet (950 and 1,260 meters). The unique shape of *B. raksasa*’s head shield and abdominal segments, as well as the large number of spines — 11 to 13 — on its abdomen, indicated the supergiant is a new species, the scientists wrote in the study.

During the 2018 expedition, scientists were excited to discover the deep-sea *Bathynomus* isopods, a genus sometimes «affectionately» referred to as «Darth Vader of the Seas» (perhaps for their heads that resemble the Sith Lord’s helmet), according to the Lee Kong Chian Natural History Museum’s website. Museum collections specialist and expedition member Muhammad Dzaki Bin Safaruan held up a giant isopod while onboard the Indonesian research vessel Baruna Jaya VIII, in a photo shared by the museum on Instagram that year. «The staff on our expedition team could not contain their excitement when they finally saw one,» museum representatives wrote in the post.

“The identification of this new species is an indication of just how little we know about the oceans,” said study co-author Helen Wong, a researcher with St. John’s Island National Marine Laboratory, part of the Tropical Marine Science Institute at the National University of Singapore.

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“There is certainly more for us to explore in terms of biodiversity in the deep sea of our region,” Wong said in a statement.

Another team of scientists in 2019 captured rare — and gruesome — evidence of deep-sea isopod behavior, Live Science previously reported. Underwater video showed a group of these giant sea bugs as they ripped apart and feasted on the corpse of an alligator, which the researchers had submerged in the Gulf of Mexico to observe how bottom dwellers might consume this windfall of a meal.

Giant marine bugs that gorge on alligator carcasses may sound unsettling, but massive isopods’ much-smaller cousins are arguably even more terrifying. Parasitic isopods known as tongue biters or tongue-eating louses devour fishes’ tongues by siphoning off the tongue’s blood supply as the organ slowly withers; the parasites then take the tongue’s place in a still-living host’s mouth.

livescience.com, 18 August 2020

<https://www.livescience.com>

The palm-sized elephant relative was just sighted for the first time in 50 years

2020-08-19

A teensy animal, with a long nose, a fur tuft on its tail and big, spectacled eyes hadn’t been seen in nearly half a century. That is, until a whiff of peanut butter lured the wee mouse-sized mammal out from the rocky, rugged lands of Djibouti in the Horn of Africa.

The recently “rediscovered” mammal, called a Somali sengi (*Elephantulus revoilii*), is a species of elephant shrew. While elephant shrews are related to elephants, armadillos and manatees — they’re not elephants and they’re not shrews.

The Somali sengi has not been seen since 1973. Everything known about the obscure mini mammal came from 39 individual specimens that were collected decades and centuries ago and that are now stored in museums, according to a statement from Global Wildlife Conservation.

In 2019, a group of scientists from the U.S. and Djibouti set out to look for the species after receiving tips that the creatures could be hiding in Djibouti, although the animals had only previously been found in Somalia, according to the statement.

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“For us living in Djibouti, and by extension the Horn of Africa, we never considered the sengi to be ‘lost,’ but this new research does bring the Somali sengi back into the scientific community, which we value,” co-author Houssein Rayaleh, a research ecologist and conservationist with the nonprofit organization Association Djibouti Nature, said in the statement. Rayaleh had seen the creature before — and locals had too, correctly identifying it in photos during interviews with the scientists, according to the statement.

Using information from interviews, analysis of dung piles at candidate sites and assessments of terrain and sheltering potential, the researchers set up 1,259 traps at 12 different locations across the rocky terrain. They lured the animals to the traps by setting out peanut butter, oatmeal and yeast. They caught one of the elusive mammals in the first trap they set.

In total, they found 12 Somali sengis, which they could distinguish from a similar species by the tuft of fur on their tails, according to the statement. “For Djibouti, this is an important story that highlights the great biodiversity of the country and the region and shows that there are opportunities for new science and research here,” Rayaleh said.

They found all of sengis by rocky outcrops and relatively sparse vegetation, areas that are typically inhospitable to human activities, meaning the tiny creatures are not likely to experience habitat destruction, according to the statement. Because they found comparable numbers to other sengi taxa and because they now know that the creatures live beyond just Somalia, the authors recommended that the IUCN Red List of Threatened Species change the Somali sengi’s current «data deficient» status to «least concern,» according to the statement.

“Usually when we rediscover lost species, we find just one or two individuals and have to act quickly to try to prevent their imminent extinction,” Robin Moore, one of GWC’s Search for Lost Species program leads, said in the statement. “This is a welcome and wonderful rediscovery during a time of turmoil for our planet, and one that fills us with renewed hope for the remaining small mammal species on our most wanted list.” (GWC crafted a list of 25 of the most wanted “lost” species.)

livescience.com, 19 August 2020

<https://www.livescience.com>

Humans can catch the plague through flea bites or through contact with the tissue or bodily fluids of an infected animal, the CDC says.

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California reports first human plague case in 5 years

2020-08-19

A California resident has tested positive for plague, marking the state's first human case of the disease in five years, according to health officials.

The case was confirmed on Monday (Aug. 17) in a resident of South Lake Tahoe, according to a statement from the El Dorado County Department of Health and Human Services.

The individual is described as an "avid walker" who may have been bitten by an infected flea while walking their dog in the Tahoe Keys area or along the "Truckee River Corridor" north of Highway 50, the statement said.

"Plague is naturally present in many parts of California, including higher elevation areas of El Dorado County," Dr. Nancy Williams, the El Dorado County public health officer, said in the statement. "It's important that individuals take precautions for themselves and their pets when outdoors, especially while walking, hiking and/or camping in areas where wild rodents are present. Human cases of plague are extremely rare but can be very serious."

The patient is currently recovering at home under the care of medical professionals, the statement said.

The plague is caused by bacteria called *Yersinia pestis*, and the disease is perhaps best known for causing the Black Death in Europe in the 1300s. The infection still occurs today, although it is relatively rare and usually treatable with common antibiotics. In the U.S., about seven cases of plague occur each year, on average, according to the Centers for Disease Control and Prevention (CDC).

Humans can catch the plague through flea bites or through contact with the tissue or bodily fluids of an infected animal, the CDC says.

The last known cases of plague in California occurred in 2015 in two visitors to Yosemite National Park, the statement said. A number of factors may play a role in when and where cases of plague pop up, including the behavior of people or rodents, as well as weather patterns since warmer temperatures are favorable for flea activity, Live Science previously reported.

The most common type of plague in the U.S. is known as bubonic plague, which can cause fever, nausea, weakness, and swollen and painful lymph

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If we ever make a covid-19 vaccine who should be first to get it?

2020-08-12

IT IS August 2021, and the moment the world has been waiting for has finally arrived. After many false dawns, a vaccine against covid-19 has passed all the tests and is ready to be rolled out.

It has been an arduous journey, but at last vaccine manufacturers around the world are cranking out thousands of doses a day. The end of the pandemic is on the horizon.

But this isn't the end. It isn't even the beginning of the end. There are more than 7.5 billion people in need of vaccination but perhaps only a billion doses available in the first six months of production.

Who gets one? Everyone agrees that front-line healthcare workers must be first in the queue. But who should be next? What is the best way to attain herd immunity? Will people accept the vaccine? And is it possible to stop rich countries from hoarding the supplies?

The answers to these questions depend largely on decisions being made now, in 2020, long before a successful vaccine has been developed. Of course, that day may never arrive. But let us assume that it does. What happens next?

No single approach

Even if a vaccine works, there is no one-size-fits-all vaccination regime. The two newest vaccines to be developed give a flavour of the problem facing epidemiologists. These are the Ebola vaccine Ervebo, approved in November 2019, and a dengue fever vaccine Dengvaxia, approved in 2015.

Consider Ervebo. Before covid-19 stalled its roll-out there was enough time to devise and test containment strategies. These show that the most effective approach is ring vaccination. That means tracking down confirmed cases and vaccinating all of their contacts and all of their contacts' contacts, thus throwing a ring of immunity around the virus.

For Dengvaxia, however, the most effective strategy depends on local circumstances. When the virus is rampant, mass vaccination offers the most protection to the largest number of people. But where transmission rates are lower, it is better to selectively vaccinate adults who have already had the virus. This is because a second bout is more dangerous than the first one due to the way the immune system ratchets up. That also means

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that vaccinating infants, who are unlikely to have had the virus, can backfire because the vaccine acts like a first bout.

So what works for one disease might be less than optimal for another, because diseases and vaccines are all different. For covid-19, the absence of both a vaccine and full understanding of the disease means that designing a strategy is a very inexact science.

A team led by Emma McBryde at James Cook University in Australia has started modelling possible scenarios, but the results are still under wraps. One thing we can say, however, is that ring vaccination isn't going to work. Ebola is transmitted by contact with bodily fluids, so spreads relatively slowly, whereas covid-19 is a respiratory disease that spreads very rapidly.

Regardless of the specifics, the overwhelming rationale for introducing any new vaccine is to reduce severe illness and mortality. That holds true for covid-19. But there are other considerations, says Nicholas Grassly, a vaccine epidemiologist at Imperial College London who sits on the Strategic Advisory Group of Experts covid-19 vaccine group for the World Health Organization (WHO) but spoke to *New Scientist* in a personal capacity. "Vaccination for covid-19 is not just about health, it is about the economy and protecting essential services, too," he says. "That is a little bit different from how vaccines are traditionally looked at. So the question is, who should we vaccinate to maximise the health benefits, facilitate a return to productivity and protect health and education services?"

That decision would be more straightforward if vaccine stocks were unlimited. But they won't be, at least not at first; the most ambitious scale-up plan so far is by a vaccine team in Oxford, UK, which says it could produce 2 billion doses within 12 months of approval. It is possible that two doses will be needed per person, so that would only be enough shots for fewer than 1 billion people, allowing for a 15 per cent wastage rate.

"It is quite unlikely that there is going to be enough vaccine for the entire world," says Beate Kampmann, director of the Vaccine Centre at the London School of Hygiene & Tropical Medicine (LSHTM). That means tough choices await.

The hard work has already started. The WHO published a preliminary vaccine allocation plan in June. It prioritises healthcare workers, of which there are about 50 million worldwide. Next are the 600 million adults over the age of 65, and then the 1.1 billion adults over 30 with cardiovascular disease, cancer, diabetes, obesity or respiratory disease.

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Individual countries are also formulating plans. In the UK, the Joint Committee on Vaccination and Immunisation held an extraordinary meeting on vaccine prioritisation on 18 June. It started from the premise that the priority is to "save lives and protect the NHS", a familiar slogan to anyone who has been watching the UK response to the pandemic.

To that end, the committee decided that healthcare workers must be the highest priority, followed by care workers. Next in line should be people at increased risk of disease and death from covid-19, which means older people and those with pre-existing conditions. Everybody else will have to wait, although perhaps not as long as people in lower-income countries (see "Vaccine nationalism").

Herd immunity

The US Centers for Disease Control and Prevention is also exploring the options. Its plan similarly puts 12 million "critical health care and other workers" at the head of the queue, followed by 110 million other health workers and high-risk individuals. The general population – 206 million people – go to the back.

It is notable that none of these plans mention herd immunity, which arises when there are enough immune people in the population to stop a virus from circulating. Despite its somewhat tarnished reputation after "natural" herd immunity was briefly and unscientifically touted as an exit strategy in some countries including the UK, vaccine-induced herd immunity is still our best bet for ending the pandemic and even eradicating the virus. "We are going to need global herd immunity," says Gavin Yamey at the Duke University Global Health Institute in Durham, North Carolina.

In short supply

Even if an effective vaccine is developed, it will take years to produce the estimated 14 billion doses needed to protect the global population. Why so slow?

Making vaccines at scale is a laborious process, with quality control taking up a big share of the resources. The world's largest vaccine manufacturer, the Serum Institute of India, produces about 1.5 billion doses of various vaccines a year, which shows the scale of the challenge.

"Trying to come up with an approach for 7 billion people is an enormous undertaking," says Robin Shattock, who leads the vaccine team at Imperial College London. "Currently the biggest number of vaccines that are made

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a year is about half a billion doses of polio vaccine. Nobody has made a billion doses of any vaccine globally in any single year.”

There is a reason that vaccine-induced herd immunity hasn't yet been incorporated into planning, says Grassly. It is often taken for granted that mass vaccination covering between 60 and 70 per cent of the population will lead to herd immunity to the coronavirus, but it may not.

Vaccines are designed to protect individuals from severe illness or death, not to induce herd immunity. They sometimes produce it by preventing infection and transmission, but that is a happy accident. The nasal flu vaccine, for example, halts transmission of the virus and can therefore create herd immunity. For this reason, it is principally given to children to prevent them from infecting vulnerable older relatives who are unlikely to respond strongly to a vaccine.

But as yet we don't know whether a covid-19 vaccine will work this way. “If vaccines become available, it will be because they are protective against disease,” says Grassly. “They may, or may not, also be protective against infection or transmission, but we don't know yet.”

“Vaccination for covid-19 is not just about health, it is about the economy and protecting vital services”

If a vaccine does promise herd immunity, it would probably be worth revising the vaccination priorities to take advantage, says Grassly. We know, for example, that some people who don't develop symptoms can still be highly contagious. There are also “superspreaders” who infect many more people than average. The difficulty will lie in identifying who those people are, but it may pay to prioritise vaccination for teachers and those working on public transport or in supermarkets, he says.

There would also be an argument for vaccinating children rather than vulnerable adults. “Healthcare workers should be first, then the intuitive thing is to prioritise the elderly,” says Alberto Giubilini of the Uehiro Centre for Practical Ethics at the University of Oxford. “But, paradoxically, the best strategy might be to vaccinate children. Their immune system responds better to vaccines. To reach herd immunity you want to give the vaccine to the people for whom it works best.”

It is even possible that the vaccine might not work in older people, in which case the strategy would be to vaccinate the people around them.

Another factor that could scupper herd immunity is what researchers call vaccine hesitancy. According to Heidi Larson, director of the Vaccine

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Confidence Project at the LSHTM, covid-19 anti-vaccine posts on social media outnumber positive voices by about four to one.

In denial

There are signs that the anti-vaccination misinformation is cutting through. In the UK, for example, Larson's team has been asking samples of more than 2000 people whether they would be willing to be vaccinated. In late March, 80 per cent of people said yes. By the end of May, that had fallen to 67 per cent.

In the US, a poll conducted in May found that 42 per cent of people would definitely get vaccinated against coronavirus, 27 per cent definitely wouldn't and the rest were unsure.

A similar obstacle is the growing number of people who refuse to accept that covid-19 even exists, says Leesa Lin at the LSHTM. “Covid-19 denialism is likely to pose a threat to convincing people to take a vaccine. There is a significant association between perception of the disease risk and vaccine uptake,” says Lin.

All told, then, the outlook remains highly uncertain. A vaccine may not even be possible. If it is, there won't be enough to go round, at least at first. Even when there is, it may not induce herd immunity. And even if it does, too few people may choose to take it. The beginning of the end? Not likely. “If this was a 100-metre race, we have only run the first few metres,” says Yamey.

newscientist.com, 12 August 2020

<https://www.newscientist.com>

Kao develops UV scattering film to control adhesion of dust and pollen to skin

2020-08-11

Kao Corporation's Skin Care Research Laboratory and Material Science Research Laboratory discover that adhesion of airborne particulates, such as dust and pollen to skin can be inhibited by use of a surface covering film with an irregular convexo-concave microstructure.

Fine Particles Cause Skin Problems

Fine particles can easily attach to skin, causing problems, such as irritation and dullness. Long-term exposure to such particulates has

Long-term exposure to such particulates has been reported to accelerate skin aging factors like flecks and wrinkles.

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been reported to accelerate skin aging factors like flecks and wrinkles. A survey conducted by Kao showed that some respondents in Japan were concerned about adhesion of these particles during the pollen season, while more than 80 percent of respondents in China, Thailand, and Vietnam, where air pollution levels are high, answered that skin condition deterioration was caused by fine pollutant particulates.

For fine particles ranging from 2.5-30 μm , Van der Waals force is the most important type of force. Thus, Kao has focused attention on understanding how to reduce Van der Waals force between fine particulates and skin in order to develop a technology that controls fine particle adhesion.

Van der Waals Force Contributes to Adhesion

The strength of Van der Waals force is characterized as, “the closer the distance between interacting substances, the stronger the force becomes”. Thus, Kao examined the effect of extending the distance between the spherical object (particle) and adhesion surface (skin). In order to, simulate this force, convexo-concave irregularities with varied roughness on the surface were prepared. This led to identification of areas where fine particles sized 2.5-30 μm showed lower levels of adhesion.

Results of the simulation revealed that formation of fine convexo-concave irregularities on a flat surface clearly inhibited adhesion of fine particles. Based on these findings, Kao investigated how to form a film with a fine irregular convexo-concave microstructure on the surface of skin. Utilizing UV scattering agents, such as titanium oxide and zinc oxide, it was possible to form film on the skin surface with a fine irregular convexo-concave microstructure, which demonstrated significantly reduced adhesion of fine particulates, like pollen and dust.

Convexo-concave Film with UV Scattering Agents

The researchers discovered that when UV scattering agents are blended under practical conditions, the ability to reduce adhesion is generally lost because the surface of the film is submerged under compounding oil. Kao overcame this problem by making the UV scattering agents difficult to wet with an oil agent. This led to successful formation of a fine convexo-concave film with UV scattering agents on the surface.

Experiments conducted with an artificial leather surface to which a sunscreen with the new technology had been applied clearly confirmed the ability to inhibit adhesion of model pollen, as the level of adhesion was significantly reduced as compared to untreated

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leather.

Additional experiments were conducted with the novel sunscreen applied to one side of the face of subjects and sunscreen without this technology applied to the other side. After five hours of exposure, dirt containing fine particulates was wiped from the skin with a nonwoven cloth and quantified. The results confirmed that the quantity of particulate dirt was significantly less on skin applied with sunscreen that included a fine convexo-concave film coated with UV scattering agents as compared to the conventional sunscreen film.

Development of technology based on this discovery paves the way for unique products, such as sun care applications that effectively protect skin from particulate irritants and pollutants.

cosmetics.specialchem.com, 11 August 2020

<https://www.cosmetics.specialchem.com>

The surprising ways little social interactions affect your health

2020-08-12

AT THE beginning of the UK lockdown, I woke each morning with a feeling of impending doom. I was scared about covid-19, of course, but also worried about isolation. How would I cope without seeing friends and family? How could I perform my job as a journalist if I couldn't meet people?

These weren't baseless fears. In recent decades, a raft of research has shown that individuals with richer social worlds tend to have better mental well-being and lower stress, and to perform better at work. Missing out on our interactions with friends, colleagues and even shopkeepers can have a surprisingly powerful impact on our health.

WhatsApp conversations and Zoom “parties” have helped me to maintain a sense of connection, but these tools can't replace aspects of interaction – like social touches and impromptu chats by the water cooler – that can boost mood and strengthen relationships.

Microsoft CEO Satya Nadella suggested as much in a recent interview with The New York Times. Although he felt the shift to digital interactions was going relatively smoothly, he wondered if we were burning through the “social capital” built up over years. He suspected that social bonds might start to evaporate. “What I miss is when you walk into a physical

Missing out on our interactions with friends, colleagues and even shopkeepers can have a surprisingly powerful impact on our health.

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meeting, you are talking to the person that is next to you, you're able to connect with them for the two minutes before and after," he said.

"A wealth of studies have shown that high 'social capital' enhances our quality of life"

As many of us continue to work remotely, the long-term effects of social distancing could be serious. What can science tell us about social capital and its resilience? And how can we mitigate any ill effects?

First, some definitions. When people like Nadella talk about social capital, they are describing "the various connections that an individual might have that provide them with some kind of resource", says Vanessa Parks at the University of Mississippi. For sociologists and psychologists, this can include emotional support, important information learned through the grapevine or practical help, such as a lift to the hospital or cooperation at work. Having high social capital isn't just a matter of being popular and well-liked, though. As well as having a dense web of connections that includes close friends and more distant acquaintances, people with more social capital tend to be more engaged in building their community.

There are various ways to measure social capital. Scientists may ask people to estimate the number and strength of the links in their social network, count their direct participation in community events or use questionnaires that examine their general feeling of trust in the people around them.

Over the past 20 years, a wealth of studies have confirmed that social capital makes a huge difference to our quality of life. People with high social capital may both perform better at work and find it easier to land a new job, for instance, thanks to the greater possibility of constructive collaborations.

Social capital can also soothe our stresses and help us live more healthily, leading to a lower risk of mental illness and physical disease, and a longer lifespan. One famous meta-analysis, by Julianne Holt-Lunstad at Brigham Young University in Utah, found that a lack of social connection presents as large a risk to our health as obesity or smoking up to 15 cigarettes a day.

"Seeing even just vague acquaintances can have a surprisingly big impact on our happiness"

There is no doubt that technology has helped to preserve some of these essential links amid the pandemic. "It's not like our social bonds have disappeared because of covid-19," says Parks. But a close look at the

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psychological literature suggests there may be three distinct ways that our social capital is nevertheless leaking away.

The first is the loss of "shared experience". Although straightforward one-on-one conversations may be our primary means of maintaining a friendship, much of our time is also spent in joint activities such as cooking and eating, playing football or golf. The act of doing the same things at the same time appears to create a bond that is independent of the words spoken.

Samuel Roberts at Liverpool John Moores University and Robin Dunbar at the University of Oxford, both in the UK, followed a group of students during their final year of school and first year of university, and questioned them about their feelings of emotional closeness to different members of their social network throughout this period. They found that the frequency of communication – either face-to-face conversations or phone calls and email – was more important for keeping female friendships alive. But for men, it was the continuation of shared activities that better predicted feelings of emotional closeness during the transition. Many of our current interactions – Zoom and Skype calls – are relatively weak shared experiences, and may fail to preserve a profound sense of connection in the long-term. Given Roberts and Dunbar's findings, it is possible that men will find it especially hard to maintain their social relationships during lockdowns.

The second element to consider is our non-verbal communication, such as physical touch. Various studies have found that non-sexual physical touch – rubbing someone's arm if they are sad, say – triggers profound neurological and physiological changes, including the release of endorphins. These painkilling compounds can produce a natural high that helps create a sense of bonhomie and goodwill. Social touch also appears to buffer our responses to stress, reducing the release of the hormone cortisol and calming our heart rate following an unpleasant experience like public speaking.

Interestingly, we don't seem to get these benefits from other types of support. People hearing kind, encouraging words, for example, recover from stress more slowly than those who get a hug from their partners, suggesting that the sense of physical closeness may be one of the most important ways that social capital benefits health. Ongoing research at University College London and Royal Holloway, University of London, shows that many people are now missing this vital source of comfort. "The deprivation of intimate touch during covid-19 is associated with

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worse psychological well-being, including feelings of loneliness, anxiety, less emotional tolerance for social isolation and poorer mental health in general,” says Mariana von Mohr, who is working on this research.

Are you there?

Most of our relationships aren't touchy-feely, of course. But due to the delays, interruptions and slight awkwardness of remote conversations, we may also be lacking spontaneous laughter, which, like touch, is a kind of social grooming known to trigger endorphins and encourage bonding. “My hypothesis would be that when people are face to face, they laugh more than when they're on the phone or when they're on a video chat,” says Roberts. With work colleagues, in particular, it may be hard to share an informal joke from the opposite ends of an internet connection.

Third, and perhaps most surprising, we may be missing our “weak ties”. These are vague acquaintances and fleeting interactions, say with a barista or the distant colleague queuing next to us at the coffee machine. “You might have a sort of mutual recognition, but you wouldn't necessarily know their name,” says Gillian Sandstrom at the University of Essex in the UK – so they aren't the kind of person you would now arrange to catch up with on Zoom. Before the pandemic, people had an average of between 11 and 16 of these interactions on a typical day. Their importance to our well-being and work success shouldn't be underestimated.

In a series of studies published six years ago, Sandstrom and Elizabeth Dunn at the University of British Columbia in Canada asked students to count the number of interactions with strong ties and weak ties over the course of their day. They found that both were important independent predictors of subjective well-being and a sense of belonging. In other words, someone with many close friends would be happier still if they had lots of vague acquaintances. And even a small effort to build on those interactions can pay great dividends. When participants were encouraged to make small talk to a stranger, for example, they reported a 17 per cent increase in a measure of happiness.

These apparently inconsequential ties may also be essential for successful collaborations. Consider an experiment by Bernardo Monechi at the Sony Computer Science Laboratories in Paris: a few years ago, he set up an installation at the Palazzo delle Esposizioni, a museum in Rome, with an almost limitless supply of Lego and three platforms for visitors to build sculptures on. Participants were given an RFID tag, which tracked how they interacted with each other as they worked. Some of the constructions were built by groups who already knew each other and interacted very

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closely, but Monechi found that the most impressive and elaborate structures were created by those with a large number of weak ties.

Monechi points out that groups of people who are close often share a similar background and outlook, while relative strangers may bring fresh ideas and different perspectives. He estimates that the optimal ratio of strong to weak ties is about 50:50. The results fit with historical analyses of scientists' and artists' networks, finding that the most productive collaborations are often forged between people of different experiences and backgrounds. Without a queue in the canteen or a backroom chat at a work conference, it is now far harder to strike up these kinds of fruitful conversations.

Sandstrom describes many of our current efforts as “social snacking” that creates a relatively superficial sense of connection without necessarily providing the nourishment we need. “You can keep snacking, but at some point you're going to feel unsatisfied if you never have a full meal,” she says.

So what should we be doing instead? Given the importance of shared experiences, we might change how we interact with our existing friends. Whether meeting virtually or physically, we need to turn it into a joint activity that will help to cement our bonds. If you used to go to the cinema together, for example, you might arrange to watch the same film at the same time and then catch up through video chat afterwards.

Replacing the comfort of physical touch, while social distancing, will be much harder to correct, but von Mohr believes we might be able to enjoy some of the benefits vicariously. An ongoing study of hers has found that simply watching videos of people holding hands or stroking cats and dogs has helped to reduce some people's anxiety during the crisis. “It suggests that vicarious touch can work as an important substitute for actual touch during the pandemic,” she says.

While we may be unable to easily forge new weak ties, we could attempt to make the most of the chance encounters we do have, whether striking up a conversation with someone we see regularly in the park, reaching out to a colleague whose work you have admired from afar or perhaps sending out an open invitation for a video conference with people who work in the same field. Although you may be nervous about their reaction, Sandstrom's research suggests that most people respond very well to an attempt to build new bridges – and you will feel much better afterwards.

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From our closest friends to our most distant acquaintances, there has never been more reason to recognise the importance of the people around us, and our need to cherish those relationships – and that is a lesson that will be well worth remembering long after the threat of covid-19 has passed.

newscientist.com, 12 August 2020

<https://www.newscientist.com>

Why flu vaccines don't protect people for long

2020-08-13

The annual influenza vaccine saves lives and spares many people from severe disease, which is why governments and employers promote and subsidize its use. But it's hardly an ideal vaccine, offering so-so protection that wears off rapidly. A new, one-of-its-kind study, published today in *Science*, helps explain those shortcomings: A key cell type hidden in bone marrow that quickly kicks into activity after vaccination fades within a few months, researchers found. The discovery could lead to new strategies to increase the vaccine's durability.

The best vaccines—such as the ones for measles, rubella, and diphtheria—provide almost 100% protection for life. Flu vaccines, however, often don't exactly match the rapidly evolving influenza virus, so their effectiveness changes each year: In the United States between 2009 and 2019, it ranged from a low of 19% to a high of 60%. And protection wanes quickly: If you live in a temperate region of the world and receive the shot in the early fall, immunity can disappear before the end of that winter.

To better understand the durability problem, Rafi Ahmed, an immunologist at Emory University School of Medicine, homed in on a type of B cell that resides in the bone marrow and whose role Ahmed helped uncover in 1996. B cells make antibodies that can attach to and disable viruses. Ahmed focused on a type of B cell called bone marrow plasma cells (BMPCs), which continuously produce antibodies after an infection or vaccination. So-called memory B cells also produce antibodies and are created the same way, but in contrast to BMPCs, they do not steadily pump out the protective proteins. Instead, as their name implies, memory B cells that are trained to recognize a specific virus kick into gear only when they're re-exposed to it. It takes them several days after an infection to produce high levels of antibodies—a disadvantage in influenza, which can cause disease rapidly.

The best vaccines—such as the ones for measles, rubella, and diphtheria—provide almost 100% protection for life.

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To the surprise and disbelief of many, Ahmed's group showed in 1996 that some BMPCs can live for many years, meaning they could, in theory, confer long-lasting immunity. Whether influenza vaccines trigger high levels of BMPCs and if so, whether the cells are the long-lived variety was a mystery, however.

Ahmed and colleagues repeatedly examined the bone marrow and blood of 53 volunteers aged between 20 and 45 years old in the weeks and months before and after they received influenza vaccines. (Some people participated over more than one flu season.) The study was no fun for the participants: Removing fluid from within a bone is a challenging and painful procedure that involves piercing the pelvic bone with a special needle. "The logistics ... were very difficult, and I think nobody will ever try to do the same thing again," Ahmed says.

Rino Rappuoli, chief scientist at GlaxoSmithKline Vaccines, says he knows of no other study that sampled bone marrow for vaccine research. "Rafi's work is great and pioneering," Rappuoli says.

The researchers found spikes of BMPCs specific for influenza 4 weeks after immunization. But after 1 year, the new cells were virtually gone. Rappuoli and others aren't particularly surprised by this but welcome the evidence. "This finding tracks nicely with the observed rapidly waning [blood] antibody titers and decreasing protection in humans after getting the flu vaccine," says Adam Wheatley, an immunologist at the University of Melbourne. "It's a really nice piece of work."

The study "helps define the landscape" of the flu vaccine's lousy durability, says Mark Slifka, an immunologist at Oregon National Primate Research Center who earned his Ph.D. with Ahmed more than 20 years ago but was not involved with this work. "They chipped away at the stone in terms of understanding why the immune response is short-lived," Slifka says.

But Slifka thinks the BMPC population stimulated by vaccines likely has a small proportion of long-lived cells, undetected in this study, that could offer more enduring protection. The way to boost their presence is to goose the system so that it makes more BMPCs overall, he says. One possible way to do this is with adjuvants, additives to vaccines that act as irritants, ramping up the immune response. It also may help to increase the amount of viral proteins in the vaccines, he says.

The first influenza vaccines, developed in the 1940s, used adjuvants. They contained killed flu viruses mixed it with a water-in-oil emulsion called "incomplete Freund's." But the adjuvant caused ulcers at the injection

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site, so it was dropped from later vaccines. To further reduce unwanted reactions, researchers also stopped injecting the entire killed virus, replacing it with only the surface proteins from the virus. The resultant vaccines had fewer viral proteins and no immune-boosting agents. These vaccines, used widely today, cause far fewer side effects—but they came at a steep cost, says Slifka, who last year published a [review article](#) that hammered in these points. “We’ve damaged the immunogenicity and the durability of the response.”

But for the past 2 decades, improved adjuvants have found their way into licensed vaccines. A revamped influenza vaccine that has an oil-in-water adjuvant—the water shields the oil and makes it safer—has been used in Italy since 1997 and was approved by European and U.S. regulators in 2000 and 2015, respectively. But whether it’s able to trigger long-lasting BMPCs is unclear. No one in Ahmed’s study received this product—when the project began, it wasn’t even licensed in the United States—which is “a pity,” Rappuoli says.

“It’s totally crazy” that most commonly used influenza vaccines don’t include an adjuvant, Ahmed says. “I’m hoping that things will change in the influenza vaccine world, and 10 years from now, you will not be getting any nonadjuvanted vaccines. This has been going on for years. It’s hard to change the industry.”

sciencemag.org, 13 August 2020

<https://www.sciencemag.org>

New guidance on brain death could ease debate over when life ends

2020-08-10

When your brain stops working — completely and irreversibly — you’re dead. But drawing the line between life and brain death isn’t always easy. A new report attempts to clarify that distinction, perhaps helping to ease the anguish of family members with a loved one whose brain has died but whose heart still beats.

Brain death has been a recognized concept in medicine for decades. But there’s a lot of variation in how people define it, says Gene Sung, a neurocritical care physician at the University of Southern California in Los Angeles. “Showing that there is some worldwide consensus, understanding and agreement at this time will hopefully help minimize misunderstanding of what brain death is,” Sung says.

The minimum requirement for determining brain death is “a good, thorough clinical examination,” Sung says.

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As part of the World Brain Death Project, Sung and his colleagues convened doctors from professional societies around the world to forge a [consensus on how to identify brain death](#). This group, including experts in critical care, neurology and neurosurgery, reviewed the existing research on brain death (which was slim) and used their clinical expertise to write the recommendations, published August 3 in *JAMA*. In addition to the main guidelines, the final product included 17 supplements that address legal and religious aspects, provide checklists and flowcharts, and even trace the history of relevant medical advances. “Basically, we wrote a book,” Sung says.

The minimum requirement for determining brain death is “a good, thorough clinical examination,” Sung says. Before the exam even occurs, doctors ought to verify that a person has experienced a neurological injury or condition that could cause brain death. Next, clinicians should look for other explanations, conditions that could mimic brain death but are actually reversible. Cooling the body, a procedure for treating heart attacks, can cause brain function to temporarily disappear, the report points out. So can certain drugs, alcohol and other toxins.

Bottom of Form

A brain death assessment ought to include a series of tests for physical responses that require a functional brain: eye movement, pain responses and gag responses, among others. Physicians also ought to see whether a person attempts to breathe independently, a life-sustaining process that relies on the brain stem. If none of these signs are present, a person could be considered brain-dead. Extra tests, such as those that look for blood flow or electrical activity in the brain, may provide useful information, but their interpretation isn’t always straightforward, the authors caution.

Identifying brain death in adults should include a single neurological exam; children should receive two, the guidelines suggest. “Children can recover from a lot of different things differently from adults,” Sung says. “We want to really make sure they have had a devastating injury.”

Clarity from medical professionals on brain death is long overdue, says pediatric neurologist Paul Graham Fisher of Stanford University. But that’s only a first step, he says. “The snag is that the nonmedical part of the world has to buy in, too.”

Complex cultural, religious and even legal forces thwart a simple and universally accepted definition of brain death, Fisher says. “You’re still going to have people, on an individual level or a societal level, who may

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not buy in," Fisher says. He points to the case of Jahi McMath, an Oakland, Calif., teenager whose parents refused to accept that she was brain-dead after complications from a 2013 tonsillectomy. She remained on a ventilator and tube feedings for nearly five years. Her liver failed in 2018, according to a statement from her family's lawyer.

Different regions, and even different hospitals, have their own rules about determining brain death. New Jersey, for instance, allows family members to object to a brain death determination based on religious or moral beliefs. A person can be brain-dead in Pennsylvania, Fisher points out, "but as soon as you cross the Delaware River, you can say, 'I object to it.'"

Other countries do things differently, too. Some incorporate brain scans into the process of determining whether someone is brain-dead, for instance. As research evolves, the guidelines may change. "We can always learn more," Sung says. "And if we learn more, we may have to change our recommendations." But for now, "this is the best that we know."

sciencenews.org, 10 August 2020

<https://www.sciencenews.org>

What does the COVID-19 summer surge mean for your cats and dogs?

2020-08-14

Last month, the **first U.S. dog to definitively test positive** for COVID-19 died in New York City. The canine—a German shepherd named Buddy—**likely had lymphoma**, but the case served as a reminder that pets, too, are at risk.

Now, COVID-19 cases are surging in some areas of the United States, including in places that had largely escaped the virus in the spring, and some countries around the world are grappling with **renewed outbreaks**. People are also wondering and worrying about their pets.

Scientists are, too. It remains unclear, for example, how often cats and dogs become infected with the virus, what their symptoms are, and how likely they are to pass it along to other animals, including us. Yet veterinarians are hard on the case, and a handful of studies are starting to provide some answers. Experts have some concrete advice based on what we know so far.

We're a much bigger risk to our pets than they are to us.

It remains unclear, for example, how often cats and dogs become infected with the virus, what their symptoms are, and how likely they are to pass it along to other animals, including us.

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Federal health agencies and veterinary experts have said since the beginning of the pandemic that **pets are unlikely to pose a significant risk to people**. Hard evidence from controlled studies for this assertion was lacking—and still is—but everything scientists have seen so far suggests cats and dogs are highly unlikely to pass SARS-CoV-2 to humans. "There's a lot greater risk of going to the grocery store than hanging out with your own animal," says Scott Weese, a veterinarian at the University of Guelph's Ontario Veterinary College who specializes in emerging infectious diseases and who has dissected nearly every study on COVID-19 and pets on **his blog**.

Indeed, pets are much more likely to get the virus from humans than the other way around. "Almost all pets that have tested positive have been in contact with infected humans," says Jane Sykes, chief veterinary medical officer at the University of California, Davis, and a founder of the International Society for Companion Animal Infectious Diseases, which is providing COVID-19 information to both pet owners and veterinarians. A genetic study of the viral sequences in the first two dogs known to have COVID-19 indicates **they caught it from their owners**. Even tigers and lions infected at New York City's Bronx Zoo in April appear to have **contracted the virus from humans**.

But some researchers caution that this finding may be due in part to limited testing: Most of the pets that have been evaluated got the tests because they lived with humans who had already tested positive. "It's a stacked deck," says Shelley Rankin, a microbiologist at the University of Pennsylvania School of Veterinary Medicine, whose lab is part of the U.S. Food and Drug Administration's Veterinary Laboratory Investigation and Response Network.

Still, most researchers think pets pose little risk to people—and to other pets as well. A few studies have shown that **cats can transmit** SARS-CoV-2 to other cats, but all were conducted in an artificial laboratory setting. And, like many COVID-19 studies in humans, most studies are preprints that have yet to be published in peer-reviewed journals. What's more, Sykes notes there have been multiple reports of households where one pet tested positive and others didn't. "Everything we've learned so far suggests that it's unlikely that pets are a significant source of transmission," she says.

COVID-19 symptoms in pets are likely mild to nonexistent.

Because pet testing remains rare, it's unclear how many cats and dogs have been infected with SARS-CoV-2. A serological preprint published last month indicated that 3% to 4% of cats and dogs in Italy **had been**

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exposed to the virus at the height of the pandemic there—comparable to the rate among people.

But even if the numbers are really that high, there hasn't been a concomitant uptick in symptoms. The Seattle-based Trupanion, which provides health insurance for more than half a million dogs and cats in North America and Australia, says it has not seen an increase in respiratory claims—or any other type of health claim—since the pandemic began. “No big trends are jumping out,” says Mary Rothlisberger, the company's vice president of analytics, even when she looked at pandemic hot spots. Two recent studies have also shown that cats, at least, are **unlikely to exhibit symptoms**. “My gut sense is that [the disease is] much more minor than we're seeing in people,” Sykes says.

That could mean **pets are silent transmitters of the virus**, as some scientists have suggested, but so far there's no direct evidence for this.

It probably doesn't make sense to get your pet tested.

Several pet tests are available, but they aren't widely used because the priority has been on human testing. Agencies like the United States Department of Agriculture have **cautioned against routine testing** of cats and dogs.

Even if your pet does test positive, Weese says, “What are you going to do with the results?” If your dog or cat has COVID-19, it's probably because you do too, he says. “It doesn't change anything for the pet or the family.” And because there aren't any drugs for the disease, he says, “We wouldn't prescribe anything” for the pet.

Safety precautions for pets haven't changed.

Whether it comes to taking your dog to a dog park or petting an outdoor cat, the **standard advice still holds**: Wear a mask, wash your hands, and social distance. “If you are not taking precautions ... you are putting both yourself and your animal at risk,” Rankin says. But, she says, “If you are a responsible pet owner, then it is probably safe to say that your animal's risk [of infection] is lower than yours.”

Weese agrees that people should be more concerned about other humans than about pets. “The risk from people present at dog parks or vet clinics is much higher than the risk from dogs at those locations,” he says.

Scientists still have more questions than answers.

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Researchers are just beginning to understand how companion animals play into the pandemic. The pet studies so far “are all part of a puzzle we're still trying to put together,” Sykes says.

And they're preliminary. “Almost every preprint I have seen is flawed in some way,” says Rankin, who dings small sample sizes, incomplete data, and a lack of vigorous testing. That doesn't necessarily invalidate the results, but she and others would like to see more robust studies.

Sykes and Weese, for example, want more research done in the home. That could give scientists a better sense of how likely pets are to transmit the virus to other pets, how long pets remain contagious, and what—if any—clinical signs of COVID-19 show up.

Rankin is part of a project to do what she calls “full-on epidemiology” of the complete medical backgrounds, including any COVID-19 cases, of 2000 pets that have been seen at her vet school for various reasons, or just for routine checkups. The hope is that such an approach will weed out some of the biases of previous studies—such as those that only looked at pets in COVID-19–positive homes—and get a better sense of the true risk factors for the disease.

Sykes and Weese are involved in similar endeavors. Weese also hopes to investigate whether pets, especially feral and outdoor cats, pose a risk to wildlife. “If we want to eradicate this virus,” he says, “we need to know everywhere it might be.”

Other researchers are exploring whether drugs that treat other coronaviruses in cats **could also combat COVID-19** in both pets and people. “Answering these questions isn't just important for companion animal health,” Sykes says. “It could help us, too.”

sciencemag.org, 14 August 2020

<https://www.sciencemag.org>

Scientists are trying to find out exactly how much plastic is in our bodies—and what it's doing to us

2020-08-17

Plastic is everywhere, and there's basically no way to avoid it. When broken down into microplastics, which are pieces less than 5 millimeters in length, and nanoplastics—even smaller fragments less than 0.001 millimeter—plastic infiltrates our food, from seafood to produce; swirls around in our wind; and is found in our tap water. We consume tens of thousands of

We consume tens of thousands of microplastic particles every year—but how many of those microplastic particles are staying stuck in our lungs and livers, and what health impacts are they having on our bodies?

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microplastic particles every year—but how many of those microplastic particles are staying stuck in our lungs and livers, and what health impacts are they having on our bodies?

Scientists don't yet know, but they're working on finding out. Microplastics have already been discovered in human stool, so we know they pass through our bodies. Similarly, plastic components such as bisphenol A, aka BPA, have been discovered in urine—but also in samples of human tissue including lungs, meaning they linger in our bodies, not just pass through them. Knowing that, the question for researchers at Arizona State University was whether microplastics linger in our organs as well, so they developed a way to detect them.

Charles Rolsky and Varun Kelkar, graduate students under Rolf Haden, director of the Center for Environmental Health Engineering at the Biodesign Institute at ASU, who are presenting their findings at a virtual meeting of the American Chemical Society on Monday, spiked samples of human livers, kidneys, lungs, and spleens with microplastic beads. Those organs were chosen, they explain, because of how they filter out unwanted materials from our bodies, making them the most likely organs to be contaminated with microplastics, and because plastics have been found in these organs in animals. Then they recovered those beads by using a strong acid and a filtration system that left behind everything but the plastic.

This proves that microplastics can be recovered from human samples in a reliable way, and the researchers say they're among the first to develop a way to examine micro- and nanoplastics in human organs. Now, the researchers are using this method to try to detect microplastics in tissue samples from human lungs, kidneys, spleens, and livers, in collaboration with Plastic Oceans International and the Banner Sun Health Research Institute Brain and Body Donation Program. Those samples, 47 in total, come with detailed information about the donors' diet, lifestyle, and occupational exposure—for example, if someone worked in a textile plant with polyester or nylon—that could help the researchers understand how microplastics get into our bodies.

But to make sense of those findings, they also need a way to quantify the microplastic amount. That's why the researchers also created a tool that can convert the number of plastic particles found in human tissue to one standard measurement of contaminant mass and volume. Different researchers can report the presence of microplastic in a variety of ways, such as by counting the number of microplastic particles per square inch.

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"But the size range of contaminating plastics varies greatly, so the count of particles may tell you little about the sizes and shapes detected," Rolf Haden, director of the Center for Environmental Health Engineering at the Biodesign Institute at ASU, says by email. With this tool, researchers across organizations can better compare their findings because they use the same metric, and they'll have access to an interactive database on microplastic pollution.

Why the need to figure out if microplastics are stuck in our lungs, and how many particles could be accumulating in our organs? "Given the massive amount of plastic we use as humans daily, plastic contamination within our bodies is not a huge surprise, although the toxicological implications are still uncertain," Holden says. "This contamination is not going away; on the contrary, it is growing continuously. It thus behooves us to find out where these polluting polymers travel and how they impact our health and well-being. Plastic pollution is not 'just' an environmental issue. It is personal."

[fastcompany.com](https://www.fastcompany.com), 17 August 2020

<https://www.fastcompany.com>

What would happen to Earth if humans went extinct?

2020-08-16

Deep within Guatemala's rainforest sits one of the most famous remnants of the Maya civilization: a roughly 2,000-year-old citadel turned to ruins called Tikal. When Alan Weisman hiked through the surrounding region, he discovered something fascinating along the way: "You're walking through this really dense rainforest, and you're walking over hills," said Weisman, author and journalist. "And the archaeologists are explaining to you that what you're really walking over are pyramids and cities that haven't been excavated."

In other words, we know about sites like Tikal because humans have gone to great efforts to dig up and restore their remains. Meanwhile, countless other ruins remain hidden, sealed beneath forest and earth. "It's just amazingly thrilling how fast nature can bury us," Weisman told Live Science.

This scene from the rainforest allows us a glimpse of what our planet could look like, if humans simply stopped existing. Lately, that idea has been especially pertinent, as the global COVID-19 pandemic has kept people inside, and emboldened animals to return to our quieter

"It's just amazingly thrilling how fast nature can bury us," Weisman told Live Science.

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urban environments — giving us a sense of what life might look like if we retreated further into the background. Weisman, who wrote «The World Without Us» (Thomas Dunne Books, 2007), spent several years interviewing experts and systematically investigating this question: What would happen to our planet — to our cities, to our industries, to nature — if humans disappeared?

Y SOUND

A different kind of skyline

There are several developing theories for what could drive humanity to extinction, and it is unlikely that we'd all simply disappear in an instant. Nevertheless, imagining our sudden and complete eradication from the planet — perhaps by an as-yet undiscovered, human-specific virus, Weisman said — is the most powerful way to explore what could occur if humans left the planet.

In Weisman's own research, this question took him firstly into cities, where some of the most dramatic and immediate changes would unfold, thanks to a sudden lack of human maintenance. Without people to run pumps that divert rainfall and rising groundwater, the subways of huge sprawling cities like London and New York would flood within hours of our disappearance, Weisman learned during his research. "[Engineers] have told me that it would take about 36 hours for the subways to flood completely," he said.

Lacking human oversight, glitches in oil refineries and nuclear plants would go unchecked, likely resulting in massive fires, nuclear explosions and devastating nuclear fallout. "There's going to be a gush of radiation if suddenly we disappear. And that's a real wildcard, it's almost impossible to predict what that's going to do," Weisman said. Similarly, in the wake of our demise, we'd leave behind mountains of waste — much of it plastic, which would likely persist for thousands of years, with effects on wildlife that we are only now beginning to understand.

Meanwhile, petroleum waste that spills or seeps into the ground at industrial sites and factories would be broken down and reused by microbes and plants, which would probably take decades. Persistent organic pollutants (POPs) — human-made chemicals such as PCBs that currently can't be broken down in nature — would take much longer, Weisman says. «Some of these POPs may be around until the end of time on Earth. In time, however, they will be safely buried away.» The combined rapid and slow release of all the polluting waste we leave behind would

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undoubtedly have damaging effects on surrounding habitats and wildlife. (But that doesn't necessarily mean total destruction: We need only look at the rebounding of wildlife at the site of the Chernobyl nuclear disaster to understand that nature can be resilient on short timescales, even under such extremes.)

While that polluting legacy unfolds, water running underground in cities would corrode the metal structures that hold up the streets above subterranean transport systems, and whole avenues would collapse, transformed suddenly into mid-city rivers, Weisman explained. Over successive winters, without humans to do regular de-icing, pavements would crack, providing new niches for seeds to take root — carried on the wind and excreted by overflying birds — and develop into trees that continue the gradual dismemberment of pavements and roads. The same would happen to bridges, without humans there to weed out rogue saplings taking root between the steel rivets: coupled with general degradation, this could dismantle these structures within a few hundred years.

Related: Are trees vegetarian?

With all this fresh new habitat opening up, nature would stoically march in, pasting over the formerly concrete jungle with grasslands, shrubbery and dense stands of trees. That would cause the accumulation of dry organic material, such as leaves and twigs — providing the perfect fodder for fires sparked by lightning, which would go roaring through the maze of buildings and streets, potentially razing whole parts of cities to the ground. "Fires are going to create a lot of charred material that will fall to the street, which is going to be terrific for nurturing biological life. The streets will convert to little grasslands and forests growing up within 500 years," as Weisman tells it.

Over hundreds of years, as buildings are subjected to sustained damage from erosion and fire, they would degrade, he said. The first to topple would be modern glass and metal structures that would shatter and rust. But tellingly, "buildings that will last the longest are the ones made out of the Earth itself" — like stone structures, Weisman added. Even those would become a softened version of their former selves: eventually the defined, iconic skylines we know so well today would be no more.

Where the wild things are

Looking beyond the city limits to the great swathes of farmland that currently cover half of Earth's habitable land, there would be a swift

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recovery of insects, as the application of pesticides and other chemicals ceases with humanity's demise. "That's going to start a real cascade of events," Weisman said. "Once the insects are doing better, then the plants are going to do much better, then the birds." Surrounding habitats — plant communities, soils, waterways and oceans — will recover, free from the far-reaching influence that chemicals have on ecosystems today. That, in turn, will encourage more wildlife to move in and take up residence.

This transition will precipitate an increase in biodiversity on a global scale. Researchers who have modeled the diversity of megafauna — the likes of [lions](#), [elephants](#), [tigers](#), [rhinoceroses](#) and [bears](#) — across the planet have revealed that the world used to be exceptionally rich in these species. But that changed when humans began to spread across the planet, hunting these animals and invading their habitats. As humans migrated out of Africa and Eurasia to other parts of the globe, «we see a consistent increase in extinction rates following the arrival of humans,» explained Søren Faurby, a lecturer in macroecology and macroevolution at the University of Gothenburg in Sweden. "In Australia, there is an increase in extinction near 60,000 years ago. In North and South America, an increase is seen [about] 15,000 years ago, and in Madagascar and the Caribbean islands a drastic increase is seen a few thousand years ago."

Without humans spreading to the far corners of the Earth and driving down megafauna populations, the entire planet could have been as diverse in these species as the famed [Serengeti](#) in East Africa is today, Faurby told Live Science. "Effectively, there used to be large animals everywhere, and there would be large animals everywhere around the globe without human involvement." [His research](#) has revealed that without humanity's heavy species impact, the central United States, and parts of South America, would be the most megafauna-rich places on Earth today. Animals like elephants would be a common sight in the Mediterranean Islands. There would even be [rhinoceroses](#) across most of northern Europe.

Without humans, could Earth reclaim that diversity? Even if we did suddenly disappear from the picture, it would still take millions of years for the planet to recover from those past extinctions, Faurby and his colleagues have calculated. They investigated what it would take to return to a baseline level of species richness and a distribution of large-bodied animals across the planet that mirrors what we had before modern humans fanned out across the globe. They estimate it would take "somewhere between [3 and up to 7 million](#) or more years to get back to the pre-extinction baseline,» explained Jens-Christian Svenning, a professor of macroecology and biogeography at Aarhus University in

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Denmark, and a colleague of Faurby's who has worked on the same body of research.

Basically, "if there weren't human impacts, the whole world would be one big wilderness," Svenning told Live Science.

Nature finds a way

The planet might eventually become lush and more diverse — but we can't dismiss the effects of [climate change](#), arguably humanity's most indelible impact on the planet. Weisman notes the inherent uncertainty in making useful predictions about what will unfold. For instance, if there are explosions at industrial plants, or oil or gas wellheads that continue to burn long after we're all gone, huge amounts of heat-trapping [carbon dioxide](#) would continue to be discharged into the atmosphere, he explained.

Carbon dioxide doesn't stay suspended in the atmosphere forever: Our oceans play an essential role in absorbing vast amounts of carbon dioxide from the air. But there are still limits to how much of it the ocean can take up without its own waters acidifying to unhealthy levels — potentially to the detriment of thousands of marine species. There's also [a cap on how much the sea can physically absorb](#), meaning it isn't simply the bottomless carbon sink it's often thought to be.

Related: [What are the ingredients of life?](#)

As it stands, current levels of CO₂ in our atmosphere will already take thousands of years to be fully removed from the atmosphere. (Based on the research he did for his own book, Weisman found it could take upwards of 100,000 years.) And if the sea reaches its cap and more [greenhouse gases](#) stay suspended up in the atmosphere, the resulting continuous warming will lead to further melting of the polar ice caps, and the release of even more greenhouse gases from softening permafrost. This will cycle into an ongoing, climate-altering, feedback loop. All this means that we can confidently assume that climate changes impacts will last long after we leave.

But to this, Weisman offered a word of hope. During the [Jurassic period](#), he said, there was five times as much carbon dioxide in the atmosphere as there is today, which led to a dramatic increase in [ocean acidity](#). Evidently, however, there must have been marine species that coped with these extremes, and went on to evolve and be part of the planet we know today.

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Which is to say that ultimately, despite climate extremes and the immense losses they can incur, “nature always finds a way,” Weisman said.

There might one day be a world without humans, but that won’t stop the rest of the planet from soldiering on.

Moving forward

Is there any point in us pondering what our planet will look like, without us here? Well, on the one hand, we might simply take comfort in the knowledge that, free of people, our planet would ultimately be fine, as Weisman said. In fact, it would ultimately thrive.

But taking a glimpse at this imagined future might also prompt us to be more mindful of our actions, in a bid to preserve our own spot on the planet, too. Weisman sees an inherent value to visualizing a world without us, which is why he decided to write his book in the first place. He explained that when he started out, he was conscious that many people avoid environmental stories because it makes them feel bad about the damage that humans are doing to the planet, and how in turn, that’s hastening our own demise. “I found out a way to get rid of the fear factor was just to kill [humans] off first,” he said, with humor.

With that distraction gone, he found, he could focus people’s attention on the planet, and the real point he wanted to make: “I wanted people to see how beautifully nature could come back, and even heal a lot of the scars that we’ve placed on this planet. Then to think, is there possibly a way to add ourselves back into this picture of a restored Earth?”

livescience.com, 16 August 2020

<https://www.livescience.com>

What will the future of sustainable cities look like?

2020-08-12

As more people move into urban areas and environmental issues become more pressing, cities will have to rethink their systems and their environmental impacts. Many cities around the world have already begun to adopt more eco-friendly practices, and some trends are starting to emerge. The sustainable cities of the future will build on these, taking today’s environmental practices a step further.

It is difficult to overstate the importance of green urban areas. According to the UN, **68 percent of the population** could live in cities by 2050,

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adding another 2.5 billion people to these areas. In the face of this rising urbanization, cities that do not emphasize sustainability could present a substantial threat to the environment.

Sustainable cities in the future could turn out to look nothing like today’s. Given current trends and developments, though, here is what they could likely involve.

Zero-Emissions Transportation

Transportation contributes more to carbon emissions **than any other sector**, generating almost two metric tons of greenhouse gasses in 2018. In response, green cities will make emissions-free transport a priority. Lowering emissions is already a focus today, but in the future, this could extend towards eliminating them entirely.

Copenhagen, Denmark, reorganized its road system to prioritize and encourage bicycle traffic. Now, **62 percent of their residents** ride their bikes every day, and only 9 percent drive daily. This shift has helped them transition into favoring zero-emissions traffic before electric vehicles have become standard.

eponline.com, 12 August 2020

<https://www.eponline.com>

A tuna’s worth

2020-08-18

Are your feet on red dirt yet?”

I gaze down at my feet. An hour after landing in Charlottetown, the soles of my boots are already stained the ocher of Prince Edward Island, Canada’s smallest province, off its southeast coast.

“I’ve got a fish hailed for 2 p.m. at North Lake,” Jason Tompkins continues, over my cellphone. “If you leave right now, you might just make it.” I start the car before he can finish and drive like hell, past the oil tanker in the Charlottetown harbor, past the American-owned blueberry processing plant, past the yellow autumn leaves still clinging to trees along the two-lane highway, toward the island’s eastern tip.

Sixty kilometers from North Lake, Tompkins blows past me in a blue flatbed truck, bandaged with duct tape and heavy with tanks of salt water and ice. He’s got one fish in the brine already, landed this morning in the village of Morell.

A boat pulls in and the crowd surges forward. The fish has arrived.

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A crowd has gathered by the time we reach the wharf. It's October 14, Canadian Thanksgiving, a day most people spend with their families. Across the harbor, the Pirates Boathouse Cafe has sold out of turkey dinners. Seagulls wheel and cry and the ocean slaps the docks. The sun is out and everyone is in a holiday mood. Everyone, that is, except Tompkins. He is all business all the time. "This is my workplace," he grumbles as he tries to back a forklift into the crowd.

A boat pulls in and the crowd surges forward. The fish has arrived.

Tompkins steps into a pair of waders and pulls out a chainsaw. Red flesh from the last fish is still caught in its teeth.

North Lake, a community too small to support an ATM, calls itself the tuna capital of the world. In the 1960s and 1970s, anglers here regularly landed bluefin that broke world records. People came from all over the planet to hunt the storied giants, which swam faster and fought harder and grew bigger than any other sport fish. In 1979, a North Lake fisher named Ken Fraser caught the largest in history, at 679 kilograms. In a black-and-white photo commemorating the event, Fraser stands wide-eyed, blood-spattered, and completely dwarfed by the hanging behemoth—as if he were the prey, not the predator.

Victorious fishers would suspend their trophies from the bridge connecting the two sides of the harbor, but locals rarely bothered to eat them. The fatty meat went rancid quickly and tasted greasy when cooked. When the stench of rotting fish became unbearable, the tuna were dragged out to sea or buried in farmers' fields.

On the other side of the world, in Japan, bluefin was well on its way to becoming the most expensive item on sushi menus. Toro, the meat cut from the belly, was especially sought after. Japanese diners were developing a taste for fattier flavors, perhaps in response to new foods introduced by American soldiers stationed on the island after the Second World War. New refrigeration technologies helped prevent the flesh from going rancid.

As demand and prices rose, so did fishing effort. In 1956, Japanese fishers pioneered the use of longlines for catching tuna, spooling out lines with thousands of hooks for up to 100 kilometers behind boats. Japanese, Korean, and Taiwanese factory trawlers with new refrigeration capacities were soon headed to faraway fishing grounds. Catches quickly began to decline. In the Atlantic, scientists predicted that Japan's appetite for bluefin would threaten the entire stock. That's because tuna are long-

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distance travelers: fishing them off one coast can affect the populations on another. Atlantic bluefin swim from the Gulf of Mexico to Newfoundland along North America's Atlantic coast, and fish tagged in Canadian and US waters have been caught off France and Norway. Like most large predators, tuna are slow to reach maturity; killing many, quickly, can lead to steep population declines. And taking the largest individuals—the mega-spawners—can affect reproduction rates disproportionately.

By 2006, western Atlantic bluefin stocks had dropped by 80 percent, despite desultory efforts to regulate fisheries through the International Commission for the Conservation of Atlantic Tunas (ICCAT), which sets quotas for its member countries. One scientist estimated there was now a single bluefin for every 50 that swam in the Atlantic in 1940. An effort to ban international trade of Atlantic bluefin was proposed and abandoned. But an accompanying public relations campaign took off.

Environmentally minded restaurants in North America and the United Kingdom dropped tuna in general and bluefin in particular from their menus. Even in Japan, where people generally consider fishing and eating tuna to be their prerogative, organizations like Chefs for the Blue and Seafood Legacy worked to raise awareness about tuna's vulnerability. Meanwhile, ICCAT and countries on both sides of the Atlantic doubled down on regulating catches.

A few years ago, North Lake bluefin began reappearing on ethical menus. Many chefs remained skittish, but several food writers I respect talked about a rod-and-reel operation that took just one fish at a time, with zero by-catch. Quotas were strictly enforced and stocks closely monitored.

Curious, I called Jason Tompkins, Prince Edward Island's only full-time tuna broker.

"The most sustainable bluefin fishery in the world," he said proudly. Its success is about value, not volume, he explained. If you take fewer fish, you can sell them for a higher price. "Catch less, take better care."

Sylvie Lapointe, Canada's assistant deputy minister for fisheries and harbor management, echoed Tompkins's optimism. Western Atlantic bluefin biomass had increased 60 to 66 percent between 1990 and 2019, bucking global tuna trends.

I was intrigued. Was it possible Tompkins's claim had some merit? And if the fishery was considered sustainable, did that fact justify flying these

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giants halfway around the world for sale to the highest bidder? Who, exactly, was benefiting from this arrangement?

“Come see for yourself,” Tompkins said. I told him I’d meet him in North Lake.

The crowd waits expectantly as the crew ties up at the dock. The captain, Jansen McKinnon, attaches a cable to a green rope at the boat’s stern. Miranda, his red-haired teenaged daughter, watches intently as he works. She fought this fish. She will feel the long struggle tomorrow, in the soreness of her muscles.

This fish.

The crane slowly pulls the forked tail out of the water. Even dead, the tuna is more beautiful than I imagined, muscular and glistening, with iridescent silver skin. Bright yellow fins run the length of its spine.

“Different tuna have different coloring,” says Tompkins, sizing up the fish with his large blue eyes. “Just like people.” A tuna changes color as it dies. “They call it flashing. A fish will go almost all white for five to 10 seconds. As soon as it’s dead, it comes back to a brilliant sheen.” Blood drips from the tuna’s mouth as the crane swings it ponderously over land. I imagine the fish darting easily through the water at 80 kilometers per hour, chasing roiling schools of herring and mackerel, hunting by sight.

Now the bluefin’s great eyes stare unseeing, and the onlookers stare back through their screens. They hold their phones in front of them as if in ritual offering. Most have never been so close to such a large wild creature. Maybe they are wondering, too, where it was born, how long it lived. There is no tag to tell us. It could have hatched in the Gulf of Mexico or the Mediterranean.

Red numbers flicker on the scale, and McKinnon and the crowd watch, rapt, the way gamblers watch slot machines. The weight of the fish gives the first clue to its worth on the global market.

228 kilograms.

McKinnon is optimistic. This fish won’t break any records, but sometimes smaller fish fetch higher prices at the Tokyo auction.

Japan still imports about 80 percent of the world’s bluefin catch, and Tokyo’s fish market is the largest in the world, the epicenter of the global seafood system. Since 1972, when the first North Lake bluefin left for Japan in a wooden box built by undertakers and filled with chipped ice,

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North Lake commercial fishers have dreamed of sending their catches there. By the 1990s, they could earn CAN \$60 to \$70 per kilogram. A broker might pay \$20,000 for one bluefin—roughly equivalent to the average income in Prince Edward Island at that time. Some tuna went for \$40,000. Then Japan’s bubble economy burst, and tuna ranching flooded the market with cheaper farmed fish. Twelve distributors in North Lake were whittled down to just two: Tompkins and his former employer, a San Diego-based company called Chubby Fish. In the last five years, the highest price Tompkins has paid for a wild-caught bluefin is \$10,000.

A fish caught off Prince Edward Island on this particular day is of even more uncertain value. Typhoon Hagibis, soon to be deemed Japan’s costliest, has been wreaking havoc in the Pacific. Flights to and from Japan have been grounded for two days. Atlantic tuna have been sitting on the tarmac on North America’s east coast, losing freshness, losing value. In another six months, as the COVID-19 pandemic throws the global economy into a tailspin and kills hundreds of thousands of people, this will seem like an insignificant hiccup. But right now, the two-day grounding is a big deal. McKinnon has only one chance to catch a tuna each season, according to Canada’s complicated quota system. It’s for this reason that Tompkins opened a processing facility a few months earlier, so he can cut and freeze tuna when the market is saturated, and sell pieces to smaller buyers without depending on Tokyo’s auction.

Tompkins’s chainsaw begins to whirl. The fish must be cut to fit the insulated cardboard box that will carry it. Fins first, then tail. The head rolls into a bucket. The gills are beautiful and intricate, like pages in a book fanned open. Tompkins pulls out organs with both hands. The action calls to mind a doctor delivering a baby, except Tompkins is midwifing death, not life. Later, he will hose himself down, but it’s impossible to get rid of the fresh tuna smell: bloody and meaty and almost earthy.

How and when the tuna is killed greatly affects the quality of the meat. A tuna needs to cool down for 45 minutes to an hour after the long fight, just as an elite athlete would take an ice bath after a race. This dispels the lactic acid that builds up in the muscles. A well-treated fish might fetch three times the price. Life history also matters: what a fish ate and where it swam will affect its color and flavor and the grade that a tuna broker like Tompkins will give it. If he sees any “white cloud” in the tail flesh, it may devalue the fish considerably. White cloud indicates scar tissue—a tussle with a shark, maybe.

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Tompkins cuts a slice off the tail and kneads it with his fingers. “Pretty good color, good marbling,” he says. “But I’d like a gummier texture.” Later, he’ll grade tail pieces and core samples and photograph them. Then his real work begins: calling up buyers of premium fish in Japan and New York. Toronto and Montreal may take lesser specimens.

When all is said and done, McKinnon will receive \$3,880 for his tuna. For comparison, a single Japanese fish went for US \$1.8-million at Tokyo’s fish market at the beginning of 2020. What money there is to make in the global tuna trade isn’t necessarily going to fishers. At North Lake, tuna fishers make most of their living doing other things: hauling lobster traps, taking tourists on charter tours, working office jobs. McKinnon works for an insurance company.

In 2009, Fisheries and Oceans Canada (DFO) established a catch-and-release bluefin fishery to increase local tuna profits. Wealthy sportfishing tourists spend lavishly to catch a trophy—thousands to charter a boat for the day, not to mention money on food and lodging. The charter fishery now brings more revenue to the province than the entire commercial tuna fishery. About 25 of the 350 or so fishermen in North Lake hold catch-and-release licenses.

If charter captains hold a kill tag, they can also sell the catch, but that doesn’t always mean extra money. Boat captains send their tuna to Tokyo on consignment when a broker won’t take on the financial risk. Sometimes the fish ends up selling for less than the cost of shipping. “This year, well, I’m lucky if I don’t get a bill,” says Troy Bruce, who has been fishing at North Lake for four decades. “We shouldn’t be killing fish for that reason. They’re amazing creatures. They deserve respect.”

Other people on this small wharf in this small community prefer to talk about the good old days, the days when big fish were plentiful and tuna fishers could earn a good living. I listen and nod. But I can’t help feeling that the tuna capital—and the globalized food system that hungrily swallows its giants—is clinging to the past without much thought for the future. “Everyone is obsessed—possessed, if you want to call it like that,” says Bruce. “My mother always said they were the devil’s fish. They just make men do stupid things.”

By the time the last fish of the day arrives at the wharf, the crowd has thinned to a few tanned men drinking Coors Light. They offer me a can. We chat. They are here to hunt and fight and kill a giant. Before I can finish my beer, I have an invitation to tag along.

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We meet on the wharf at dawn. The *Good Enough* is sparkling clean, pool blue and white. When the tuna season finishes, Captain Lorne Bonnell will outfit the boat to haul lobster, but today it is set up as a pleasure palace for sport fishers. Lobster rolls and cold beer fill the coolers, and the black-and-gold fishing rods gleam in the early morning light. The speakers blast classic rock. Bonnell steers us out of the flat-water harbor under a cloudless sky.

Bonnell’s client is also a peer. Jack Carlson runs a flashy 11-boat sportfishing operation out of Marathon, Florida. He also stars in his own reality television show. He has agreed to pay \$3,000 for this day-long expedition. If he lands a bluefin, he won’t keep it; Bonnell, who technically holds the kill tag, will sell the fish to Tompkins.

Captain Jack, as Carlson calls himself, has brought three of his younger captains with him. Their excitement is palpable: none has ever caught a bluefin. They huddle together, hoods over baseball caps, rolling smokes. Meanwhile, Captain Jack chats on his cell in the wheelhouse, booking clients and talking to GoPro reps and designers for his new clothing line. “I want the hook on the left sleeve and the logo on the chest *and* on the back,” he says, flashing me a whitened smile.

To catch a tuna, first you must catch some bait—herring or mackerel, still very much alive and not too small. But those fisheries have their own troubles. Protections for mackerel and herring could be much stronger, and the lucrative lobster fishery depends on the same bait for its traps. There is talk of bait stocks collapsing—a blind spot in otherwise stringent government efforts to protect bluefin. Even with a fish finder that tracks animals underwater using sonar, it takes the younger captains the better part of the morning just to catch a dozen mackerel, their rods nodding down and up like Texas pump jacks.

Bonnell consults the fish-finder screen, filled with red crosses marking all the bluefin it has detected this season. He shrugs his shoulders—who knows where the tuna will be today—and cuts the engine. He and business partner Chris Mellish rig the bait. The idea is to use triangulating fishing lines and a kite to keep the bait mackerel swimming within sight, at the water’s surface. But the kite keeps lifting the wriggling mackerel into the air.

Bonnell worries that we are drifting too slowly to interest the tuna. We move to another site. To pass the time, the men jig for more bait and listen to crackling voices on the ship radio. Someone spots a massive basking

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shark, its large fin cutting majestically through the swell. We all pause to watch.

By 5 p.m., the captains have still caught nothing. Their window of opportunity is closing. Bonnell calls Tompkins: it doesn't look promising.

Then, suddenly, a bluefin lurches out of the water at one of the baits.

The captains elect Mike Macko to fight. He stands facing the water, bracing himself at the edge of the boat, two hands on the rod. The hook sets in the fish.

"Golden hour hook up," the men crow. They FaceTime Macko's girlfriend.

Bonnell brings Macko a glove so the friction doesn't blister his hand as he hauls on the line. The gears of the reel strain as he winds the handle. The rod dips, its line like an umbilical cord, connecting man to fish.

Sportfishing gear is designed to maximize feeling, this sense that the fisher and the fish are connected to one another. "You can feel every tail beat, every head shake," Bruce tells me later. "You feel the pain, too. I've seen guys on the floor crying afterward, their legs all charley horsed up and feet soaking in buckets of water." And all they can talk about is how it was the best day of their life.

Bonnell stands next to Macko—to steady the rod and keep it from swiveling too much, but also, it seems, to feel the fish, to feel like he has a part in this fight.

Minutes stretch into an hour.

Captain Jack accuses Macko of fishing like a girl. "We should get you a pink reel," he says.

"I like pink," counters Macko. "It's the color of pussy."

Captain Jack looks at me and seems to realize they've crossed a line. "You're one of the guys now," he says. "You're gonna go home to your husband and tell him what a saint he is."

The sun begins to set and the air grows cold. Macko takes his jacket off: he's sweating now. The other captains hold beer cans and smokes to his lips for relief.

Time passes and so does the celebratory mood. Can't he just bring in the fish already?

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A pale light glimmers in the dark water, then is gone.

When the tuna finally breaks the surface, it's swimming on its side.

Bonnell tells me to watch out when the fish comes up. "Just be careful 'cause it's madness." Stand in the wrong spot, and I can easily get knocked overboard.

He and Mellish hang over the edge of the boat and slip a rope around the tuna's thrashing tail. The gaff through its mouth resembles the bit a rider uses to control a horse. The clients hang over the edge, too. Everyone wants a picture. Bonnell and Mellish lift the fish up. It stares into dry air. I wonder what it sees in this suffocating world above water; it's used to a more compressed view.

Then they let the line out again so the fish can swim slowly behind the boat to cool down.

The sun is slipping below the horizon, but the boat still proceeds at a funeral pace. The clients grow antsy. It's dinner time, and the beer cooler is almost empty. Mellish leans over and cuts the tuna's throat with a knife, then hoists it into the boat and hoses down the fish. Blood rushes down the drain holes in the stern. He needs to make three incisions, so Tompkins can more easily remove the innards at the wharf. But he can barely get to the fish. The clients are in his way, frenzied now, drunk on beer and drunk on the kill, kneeling by the creature as it enters its final death throes. Patting, taking selfies. They are in an alternate state, hyperaroused, hyperstimulated.

The tuna's color flashes.

It goes pale, white.

Then silver blue again.

On my last day on the island, I head to the Inn at Bay Fortune, celebrity chef Michael Smith's swish hotel outside of Souris. The tourists have all gone home for the season, and the property has been taken over by Forage, a two-day gathering of the province's food community. To kick off the event, Chef Smith teaches a young man how to saber a bottle of sparkling wine from Nova Scotia.

Newfoundland's most celebrated chef, Jeremy Charles, grills whelks over an open fire. A chef-instructor and his students demonstrate how to bake lobsters in a pit with hot rocks and smoldering seaweed, buried under a tarp. People shuck their own Prince Edward Island oysters and help

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themselves to fermented vegetables, grown and pickled at the inn. They are here to connect, with each other, with their food.

In the afternoon, Tompkins gives a talk about North Lake's bluefin fishery while cooks prepare tuna belly in the open kitchen behind him. "We want you to know the whole story," he says, imagining the life of this fish for his audience and the dangers it would have encountered. "It had quite an interesting shark bite on the tail." Then he describes the tuna's final fight with Dominic Eloquin, the Magdalen Islands fisherman who caught it. He holds up a laminated paper, the equivalent of a baseball card for each tuna he sells. There is a photo of the fish arriving at the wharf and its weight, the boat's name, and the captain's name. "This is more than just meat on a plate; it's memories," Tompkins says. "This is really a boat-to-plate full-circle experience."

It's easy to understand the allure. In his 2007 book, *The Sushi Economy*, Sasha Issenberg observes that "eating seafood is an ongoing flirtation in a long, unconsummated romance with the open water, the only terrain on Earth able to resist civilization." When the fish on the plate comes with an origin story, it offers consumers a way to more intimately experience a place, an ecosystem, a natural world that sometimes feels far away. It may also help them learn to value that world.

Of course, fishing is more than romance for many people; artisanal and subsistence fishing may account for as much as a quarter of the global catch. It's rooted in economic necessity and suffused with deep cultural meaning. But once a fish is sold into the global food system, it becomes a commodity. So do the stories used to sell it.

And what exactly is for sale? Even at North Lake, the tuna population is still just a fraction of what it was, despite increases in biomass. Western Atlantic bluefin stocks are only 17 to 20 percent of what they were in 1970, the year that traditional stock assessments began. No one knows how current numbers compare with 1864—the year considered the stock's "virgin" state. "It's challenging to manage a migratory fish at the local level," Sylvie Lapointe will tell me later. Warming waters seem to be pushing bluefin farther north. Just because there are more bluefin around North Lake, she says, "that doesn't mean the bluefin population overall is as healthy as one might think."

And yet, Canada upped its total allowable catch in 2017, and may do so again. Other countries in the western Atlantic are also upping their quotas, following ICCAT's lead. In January 2020, a sustainable seafood ratings program, Ocean Wise, announced it would begin recommending

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Atlantic bluefin caught by harpoon or handline to consumers, as long as a restaurant could provide documentation. Meanwhile, two longline bluefin operations in Japan and France have applied for an ecolabel from the Marine Stewardship Council, a certification program. Conservation scientists worry it may all be too much too fast.

And for what purpose? Bluefin is neither a staple nor a necessity. It's a luxury. The person who dines on North Lake's bluefin may want to connect to the people who caught it and the ocean it came from, but they are also buying a trophy, just as surely as Captain Jack did when he shelled out \$3,000 for his charter experience. The word trophy comes from the Greek *tropaion*, a "monument of an enemy's defeat." It is, by definition, a spoil of war. North Lake's relationship to bluefin tuna has always been adversarial. Fishermen are said to "fight" the fish, and they are celebrated as heroes when they win this unequal battle, armed with technologies that make the finding and killing ever more efficient, despite diminishing financial returns and the dwindling size of the catch. Commercial cod and lobster fishermen have also long seen themselves in competition with bluefin—hungry giants that feed on the same fish they needed to fatten up their catches.

This vision of wild creatures as targets of conquest or competition to be eliminated may have made some sense when human beings felt their everyday lives to be at the mercy of the natural world. But in the Anthropocene, the environment is often at *our* mercy, even when the ways we alter it ultimately harm our own species. Not only do humans en masse have the means and numbers to fish out entire species, we also have the power to change migration patterns by destroying habitat and warming ocean waters.

Tompkins's fish tale makes sense when you are in a coastal hotel on a beautiful evening. But it blurs to abstraction when brokers fly a fish halfway around the world to be auctioned off at a market in Tokyo. Or even when they truck it to landlocked Toronto, where I live, and where the fish caught on the *Good Enough* will head in the morning. The distributor who bought it from Tompkins plans to parcel it out to sushi restaurants that may or may not mention its provenance on the menu. The much-vaunted connection is severed just a step or two down the global supply chain.

Tompkins finishes his sales pitch and the cooks set out little squares of tuna tataki. The crowd eyes the food hungrily. Troy Bruce, who has been sitting across a pine table from me, pushes back his chair and stands up. He wants a piece of Eloquin's tuna belly before it disappears. In 40 years of

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fishing, he says, he has only once tasted toro—it's the most valuable part of the fish, the one most prized in Japan. The only part of the tuna he's ever taken home is the head, because it's worthless to the global system. There's not enough meat in it to pay for the extra cost of shipping.

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