War in Ukraine Disrupts Space Science | Peanut Allergy Pill Tested

ScienceNews

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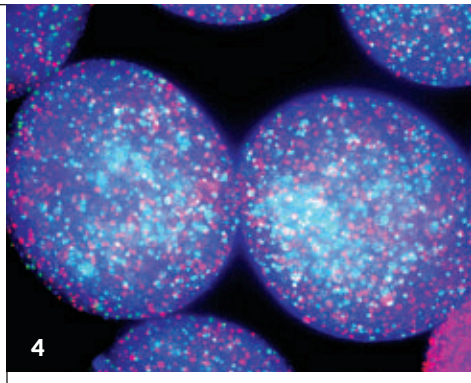
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COVER *Science News* has kept readers informed on general relativity, vaccine developments, genetics and more. *Photo illustration by E. Otwell*

FROM TOP: NSF; ANDREA WEISS; ZACH HOLMES; YUANCHI HA; CC-BY SUZANNE REITZ, DEN ARNAMAGNÆANSKE SAMLING (COPENHAGEN)

An extraordinary era in 80,000-plus articles

This issue marks a milestone for *Science News* — the 100th birthday of our magazine.

It's been an extraordinary century, both for science and for us as a news organization. One of the first big stories we covered was the 1922 discovery that insulin could successfully treat diabetes in people. There have been so many more milestones since then, including cracking the atom, the synthesis of new materials like nylon and carbon fiber, explorations of space, the computer revolution and gene editing. You can explore them on our Century of Science website at www.sciencenews.org/century, which augments our archive of more than 80,000 original news reports chronicling this remarkable time.

In this issue, we mark our 100th birthday by telling the "history of us" (Page 16). It starts with newspaper magnate Edward W. Scripps and zoologist William E. Ritter deciding that a public well-versed in science was essential for a democratic society. What was needed, they determined, were journalists who specialized in science and could describe its complexities accurately and clearly.

When I started out in journalism, science was a robust beat, with dedicated newspaper sections, magazines, radio and TV shows. But back in the 1920s, there was no such beat. Our predecessors were inventing it, article by article.

And as science journalism evolved, so did the technology we used to connect with our audiences. At first, a paper bulletin was mailed to newspaper editors so they could reprint our articles. Readers clamored for a publication they could subscribe to, which eventually morphed into the magazine we print today. Then there's that internet thing. Last year, more than 23 million people read our stories online, most often on their smartphones, and many through social platforms. Facebook and Twitter were launched less than 20 years ago. I can't imagine how we'll be reporting to you 20 years from now, let alone 100.

Our journalism has also changed. In the early decades, our editors and reporters could often be science boosters, eager to convince the public that discoveries would change life for the better. That approach seems weirdly naïve, as when we reported that wall paint infused with the pesticide DDT would make a great home upgrade. We also ran stories that today we recognize as racist, sexist and morally wrong in other ways (Page 26). Our failure to challenge the false science of eugenics, which was used to justify the atrocities of Nazi Germany, will remain an enduring stain on *Science News*.

Now we are well aware of the harms that can come from science. Our imperative as journalists is twofold: to be skeptical and questioning while looking broadly and deeply at the potential impacts of science and to explain how scientific research can help people better understand themselves and the world around them. That's true today, as we cover what Russia's attack on Ukraine means for space science (Page 6). And it will be true for decades to come, as we continue to cover climate change and the future of our planet (Page 7).

I'm honored to be part of the extraordinary crew of journalists launching *Science News* into its next century and am grateful to you, our readers and supporters, for making our work possible. — *Nancy Shute, Editor in Chief*

Science News
1719 N Street NW, Washington, DC 20036
(202) 785-2255

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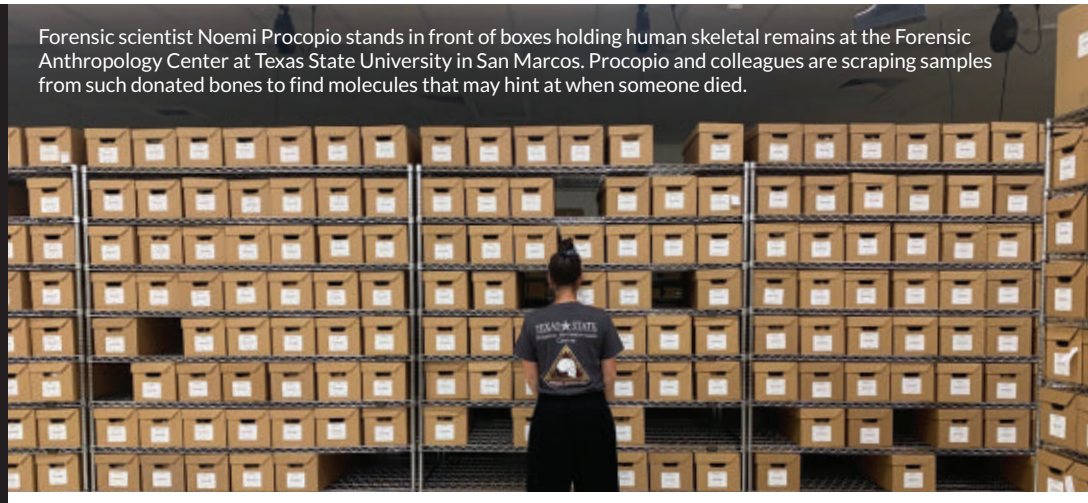
Excerpt from the March 25, 1972 issue of *Science News*

50 YEARS AGO

Shrub may save the sperm whale

The sperm whale is an endangered species. A major reason is that the whale oil is heat-resistant and chemically and physically stable. This makes it useful for lubricating delicate machinery. The only substitute is expensive carnauba wax from the leaves of palm trees that grow only in Brazil ... [but] wax from the seeds of the jojoba, an evergreen desert shrub, is nearly as good.

UPDATE: After sperm whale oil was banned in the early 1970s, the United States sought to replenish its reserves with eco-friendly oil from jojoba seeds (*SN: 5/17/75, p. 335*). Jojoba oil's chemical structure is nearly identical to that of sperm whale oil, and the shrub is native to some North American desert ecosystems, making the plant an appealing replacement. Today, jojoba shrubs are cultivated around the world on almost every continent. Jojoba oil is used in hundreds of products, including cosmetics, pharmaceuticals, adhesives and lubricants. Meanwhile, sperm whale populations have started to recover under international anti-whaling agreements (*SN: 2/27/21, p. 4*).



Forensic scientist Noemi Procopio stands in front of boxes holding human skeletal remains at the Forensic Anthropology Center at Texas State University in San Marcos. Procopio and colleagues are scraping samples from such donated bones to find molecules that may hint at when someone died.

THE SCIENCE LIFE

Death's time stamp might show up in our bones

On a body farm in Huntsville, Texas, Noemi Procopio carefully drills into human bones. With each cut, Procopio collects minuscule amounts of material and places it in tubes. That powder may hold clues to when its donor died and the person's age at death.

Many methods for working out time of death, such as analyzing insects that colonize a corpse (*SN: 12/20/08, p. 12*), don't work for remains that are mostly bare bones. The primary method for skeletal remains, inspecting bones for their degree of weathering, is subjective. Analysts commonly reach different conclusions for the same bones, says Procopio, a forensic scientist and molecular biotechnologist at Northumbria University in Newcastle, England.

Those difficulties inspired Procopio to look for molecules in bones that could provide an objective, dependable way to tell time. She and colleagues have already identified several candidates. Now, in one of the largest studies of its kind, the team is tracking these timekeepers and searching for others in bones from more than 100 people who donated their bodies to science.

Analyses of samples cut from human bones, such as this shinbone, suggest that postmortem changes in certain proteins could provide a more precise way to determine when a person died.

Proteins in bones can be used to track time a couple of ways, Procopio has found. When certain proteins decay, one of their building blocks loses a specific chemical group over months to years. The missing bits can clue scientists in to how long a protein has been decaying.

Populations of proteins also change in composition after death. In a pilot study with four bodies, the abundances of several proteins in bones, including some that give bones their structure, decreased with time since death, Procopio's team reported in 2021 in the *Journal of Proteome Research*.

For Procopio's latest endeavor, her team is sampling shinbones from 120 cadavers at three body farms in Tennessee and Texas. These people have been dead for months to decades. Besides protein timers, the team is searching for molecules that result from proteins degrading. Together, the clues may sketch a detailed picture of how long a body has been dead and in what environment.

Procopio hopes to incorporate the markers she finds into an equation that can estimate time of death. Such a tool could someday help resolve the world's backlog of unidentified bodies. In the United States, 4,400 such bodies turn up each year, the Department of Justice estimates. And most can't be identified using current methods, Procopio says. — *Carolyn Wilke*

BOTH: COURTESY OF N. PROCOPIO

FIRST

A crocodile ancestor dined on dinos

Scientists now have indisputable evidence that an ancient crocodile ancestor chowed down on a dinosaur.

Preserved within a fossilized crocodyliform, a member of a newfound species dubbed *Confractosuchus sauroktonos*, are the partially digested remains of a young two-legged ornithopod. Paleontologist Matt White of the University of New England in Australia and colleagues describe the fossil February 21 in *Gondwana Research*.

Crocodyliforms include modern species like crocodiles and alligators as well as their ancestors. Those ancestors lived alongside dinosaurs for millions of years, and previous evidence, such as bite marks on fossilized dinosaur bones, had hinted that croc ancestors dined on dinosaurs when the opportunity arose (*SN: 10/27/01, p. 260*). But fossils with actual preserved stomach contents are extremely rare (*SN: 9/12/20, p. 17*). In fact, the preserved *C. sauroktonos* is only the second extinct crocodyliform fossil with identifiable stomach contents and the first to reveal a dinosaur meal.

A crocodile ancestor that lived about 100 million years ago had a young dinosaur for its last meal, as shown in this artist's illustration.

C. sauroktonos was roughly 2.5 meters long and lived between 104 million and 92.5 million years ago in what is now Queensland, Australia. Similarities between the creature's skull features and those of other extinct and living crocodyliforms suggest that it didn't just eat dinos. *C. sauroktonos* probably cast a wide net when it came to seeking out prey.

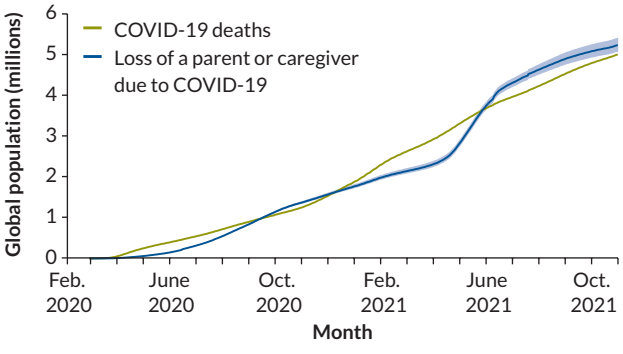
The grisly contents of the animal's gut — including bits of spine and leg bone — may represent a new species of herbivorous dinosaur, though it's difficult to tell from these few pieces, the team says. *— Carolyn Gramling*

SCIENCE STATS

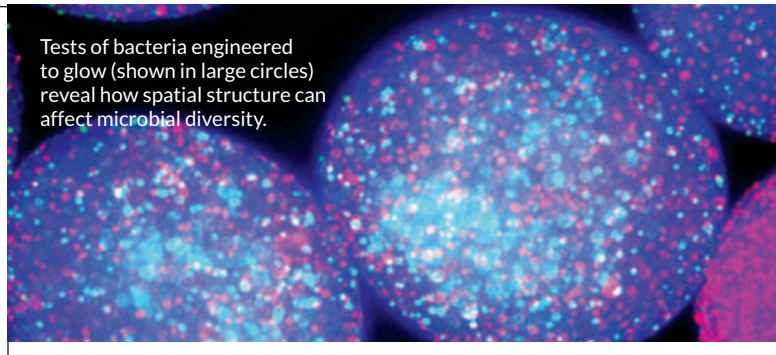
COVID-19 has orphaned millions

An estimated 5 million people worldwide have died from COVID-19 as of October 2021. On average with each death, a child became orphaned — losing one or both parents — or lost a caregiver, scientists report February 24 in the *Lancet Child & Adolescent Health*. The international research team's calculations are based on an analysis of reported COVID-19 deaths, excess deaths (those beyond what would be expected without a pandemic) and other data from 21 countries. Previously, the team estimated that from March 2020 through April 2021, 1.5 million children lost a parent or caregiver to COVID-19. The scientists adjusted that total to 2.7 million based on updated mortality data. Over the next six months from May through October 2021, the number of children who lost a parent or caregiver to COVID-19 almost doubled, reaching 5.2 million (see graph below). *— Aimee Cunningham*

COVID-19 deaths and children who have lost a parent or caregiver to COVID-19, March 2020–October 2021



SOURCE: H.J.T. UNWIN *ET AL/LANCET CHILD & ADOLESCENT HEALTH* 2022



Tests of bacteria engineered to glow (shown in large circles) reveal how spatial structure can affect microbial diversity.

THE EVERYDAY EXPLAINED

Why bacteria love kitchen sponges

Kitchen sponges are microbial paradises, capable of housing 54 billion bacteria per cubic centimeter. In addition to damp interiors loaded with food scraps, sponges provide suites of rooms ideal for bacteria with disparate social lives, synthetic biologist Lingchong You of Duke University and colleagues report February 10 in *Nature Chemical Biology*. In experiments with *E. coli* strains on welled plates, the team found that the level of spatial separation common in sponges maximizes microbial diversity. Strains with varying social preferences mingled for 30 hours on plates with six to 1,536 wells. On plates with six wells, mostly social strains survived. On plates with 1,536 wells, strains that were more social died while less-social ones survived. But on plates with an intermediate number of wells, spatially similar to a sponge, strains from across the social spectrum thrived. A follow-up test with a kitchen sponge found it fostered a more diverse group of bacteria than liquid cultures. Sponges' architecture helps meet the needs of party-loving microbes and loners alike, the team says. *— Anna Gibbs*

FROM TOP: JULIUS CSOTONYI; ANDREA WEISS, ZACH HOLMES, YUANCHI HA; C. CHANG

SCIENCE & SOCIETY

How Russia's war in Ukraine hinders work in space

Mars rover, satellite launches and other projects are on hold

BY LIZ KRUESI

Space exploration may be a faraway endeavor, but events on the ground ripple into space. The Russian war on Ukraine is no exception.

From satellites to a rover set to explore Mars, a wide range of space missions face postponements or cancellations due to escalating international tensions in the wake of Russia's invasion of Ukraine in February. The European Union, the United States and others have imposed sanctions on Russia. In response, Russia is changing or canceling its space-related plans. Here's a closer look at some of the affected projects.

ExoMars rover

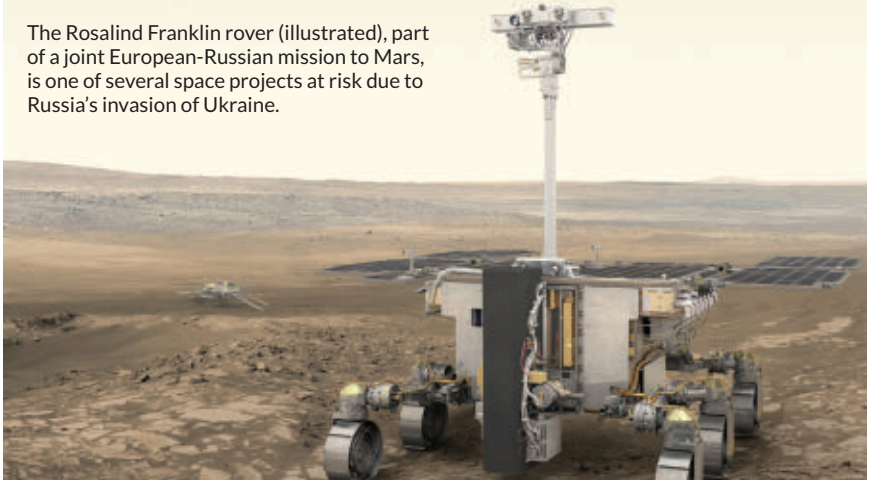
The ExoMars program, a partnership between the European Space Agency and the Russian space agency, Roscosmos, consists of an orbiter and a rover named after British chemist Rosalind Franklin. The orbiter has been at the Red Planet since 2016, but the Rosalind Franklin rover was slated to launch from Earth in September. "The sanctions and the wider context make a launch in 2022 very unlikely," ESA said in a February 28 statement.

Due to Earth's and Mars' orbital geometry, the most direct trajectory for a Mars-bound spacecraft repeats every two years, and that launch window remains open for less than two weeks. The ExoMars rover, which will look for signs of past life, was originally scheduled to launch in 2018, but due to technical issues and then the pandemic slipped many times. Now it's at risk of slipping to 2024.

eROSITA telescope

Run jointly by Germany and Russia, Spectrum-Roentgen-Gamma is a space-based X-ray observatory that's mapping the large-scale structure of the universe (*SN: 8/15/20, p. 30*). The probe's main telescope, eROSITA, has discovered hundreds of celestial objects, including a bizarre stellar explosion known as a "cow" (*SN: 2/12/22, p. 8*). Germany placed eROSITA into safe mode on February 26 to "freeze co-operation with Russia," according to a statement from SRG leadership at the Max Planck Institute for Extraterrestrial Physics in Garching, Germany.

"This is a standard, reversible operation mode of the telescope, in which we do not take data but keep the vital subsystems on," says eROSITA project scientist Andrea Merloni of Max Planck. He declined to comment on other aspects of the mission or collaboration with Russia.



The Rosalind Franklin rover (illustrated), part of a joint European-Russian mission to Mars, is one of several space projects at risk due to Russia's invasion of Ukraine.

ESA, ATG MEDIALAB

Navigation and internet satellites

Launches dependent on Russian Soyuz rockets are also in jeopardy. In response to sanctions against Russia, Roscosmos announced February 26 that it was suspending cooperation with the European spaceport in French Guiana and withdrawing its employees from the site. Several missions were set to launch there via a Soyuz rocket in the next year, including satellites that would have expanded the Galileo navigational system, Europe's answer to the United States' GPS.

OneWeb, a U.K. company building a space-based internet network with hundreds of satellites in low-Earth orbit, has already experienced delays. A Soyuz rocket was going to send up a few dozen OneWeb satellites from a Kazakhstan spaceport on March 4, one of a series of launches aimed at completing the network in 2022. But on March 2, Roscosmos tweeted that the space agency wouldn't launch the satellites without a guarantee that they wouldn't be used for military purposes and demanded that the U.K. government sell its shares in the company. The next day, OneWeb announced that it was suspending all upcoming Soyuz launches.

International Space Station

While other areas of cooperation with Russia are fraying, the International Space Station collaboration is still functioning for now. "NASA continues working with all our international partners, including the State Space Corporation Roscosmos, for the ongoing safe operations of the International Space Station," NASA public affairs officer Joshua Finch told *Science News* by e-mail.

Two Russian cosmonauts, four NASA astronauts and one ESA astronaut are aboard the station. As of early March, when the magazine went to press, a Russian Soyuz capsule was still set to return the cosmonauts and one NASA astronaut to Earth on March 30, Finch said. ■

EARTH & ENVIRONMENT

Climate change's toll is escalating fast

United Nations report urges swift action to avoid worst effects

BY NIKK OGASA

Neither adaptation by humankind nor mitigation alone is enough to reduce the risk from climate impacts, hundreds of the world's scientists say. Nothing less than a concerted global effort to both drastically curb carbon emissions and proactively adapt to climate change can stave off the most disastrous consequences, according to a report released February 28 by the United Nations' Intergovernmental Panel on Climate Change, or IPCC.

That dire warning comes as the effects of climate change on people and nature are playing out across the world in a more widespread and severe manner than previously anticipated. And the most vulnerable communities — often low-income or Indigenous — are being hit the hardest, the report says.

"It's the strongest rebuttal that we've seen yet of this idea that we can just adapt our way out of climate change and we don't have to mitigate emissions," says Anne Christianson, director of international climate policy at the Center for American Progress, a think tank in Washington, D.C., dedicated to public policy research. Christianson was not involved in the report.

A consortium of 270 scientists from 67 countries compiled the report after reviewing over 34,000 studies. Part of the IPCC's sixth assessment of climate science, the report details how the impacts of climate change are playing out in various regions and assesses the capacities of communities within those areas to adapt.

Many countries understand the need for climate adaptation. Modern solutions, such as building urban gardens or adopting agroforestry, where implemented, appear to show promise. But the majority of such efforts are reactionary, small and drastically underfunded, the report finds. As a result, about 3.3 billion to 3.6 billion people remain highly vulnerable to climate risks, including extreme weather events, sea level rise, and food and water shortages. The need for adaptation is greatest — and growing larger — in low-income regions, most notably in parts of Africa, South Asia, Central and South America, and small island states.

The report also underscores the importance of involving those who are impacted the most in climate response plans. "We can no longer just make these decisions at the highest level; we need to include local stakeholders, Indigenous groups, local communities and those who are most at risk for climate change, such as women, racial minorities, the elderly and children," Christianson says.

A previous report, released last August as part of the IPCC's sixth assessment, covered the physical science underpinning climate change (*SN: 9/11/21, p. 8*). By 2030, carbon emissions need to be cut in half to prevent global temperatures from climbing 1.5 degrees Celsius above the preindustrial baseline, that report found. Beyond that threshold, nature and humankind's capacity to adapt will severely deteriorate. But the report also found that we can still make a timely impact. If all carbon emissions ceased today, global temperatures would stop rising in about three years, not the 30 to 40 years once thought.

Still, climate change is already affecting many parts of Earth. And some of the consequences aren't going away anytime soon. Sea level will continue to rise for decades. Extreme weather events and climate-fueled wildfires have pushed entire species toward extinction. Mosquito-borne diseases such as dengue are spreading to new regions as warming helps the insects expand their reach.

As a result, people are being forced to relocate, and many are moving to cities. Urban centers are expected to contain two-thirds of the world's population by 2050, including climate refugees, the new report finds. Adaptation will be key for these communities, as cities are becoming increasingly vulnerable to extreme heat waves, floods and storm surges.

Climate change is hitting those who are most vulnerable to its effects the hardest, a United Nations report finds. In the Maldives (shown), rising seas are eroding coastlines.

CARL COURT/GETTY IMAGES

Outside of cities, the breakdown of natural systems severely impacts the people whose livelihoods rely on them. For farmers in the Global South, droughts, heat waves and floods make growing crops increasingly challenging. People who make their living fishing have to travel greater distances to pursue species whose ranges are shifting due to warming.

Restoring and preserving ecosystems are key to adapting to climate impacts, the report states. Conserving 30 to 50 percent of Earth's land, ocean and freshwater ecosystems will help support biodiversity and enhance resilience. Preserving mangrove forests along less developed coastlines, for example, sequesters large amounts of carbon and protects against storm surges (*SN: 7/4/20 & 7/18/20, p. 7*).

But many services that nature provides, such as carbon storage and flood control, will begin to rapidly break down at about 1.5 degrees C above preindustrial temperatures, the report notes. And the window to prevent that from happening is closing.

"We simultaneously need to reduce our greenhouse gas emissions, adapt to reduce the risks of climate change and also address losses and damages that are already being experienced," said Adelle Thomas, a climate scientist at the University of the Bahamas in Nassau and a coauthor of the report, at a February 27 news briefing. "And we have a very limited amount of time left to do this." ■

LIFE & EVOLUTION

Dinosaur killer may have hit in spring

Scientists estimate timing of asteroid impact from fish fossils

BY SID PERKINS

About 66 million years ago, an asteroid 10 kilometers wide slammed into Earth. Not long afterward, all nonbird dinosaurs, as well as many other species, perished. Although the exact year of the strike is unknown, researchers now say they have determined the impact's season: springtime in the Northern Hemisphere.

The finding comes from an analysis of ancient fish bones entombed at an extraordinary site dubbed Tanis in North Dakota, the researchers report in the March 3 *Nature*.

Pinning down the season of the impact, which occurred off the coast of what's now the Yucatán Peninsula in Mexico, may help researchers explain the global pattern of survival of birds, mammals and other animals following the strike. For example, creatures that spend the winters in burrows underground would have emerged and been active during a Northern Hemisphere spring, rendering them especially vulnerable. By contrast, in a Southern Hemisphere autumn, these creatures probably would have been settling in for a season-long nap and perhaps were more protected.

The dinosaur-killing asteroid impact triggered devastating flooding at a site in North Dakota (illustrated). That strike took place during the Northern Hemisphere's spring, a study finds.

Discovered in 2008, sediments at Tanis purportedly capture the flooding of a riverbed and other destruction that immediately followed the Chicxulub impact, which took place 3,000 kilometers away (*SN: 4/27/19, p. 10*). Previous work suggested that some of Tanis' fossilized fish have tiny spherules — solidified globs of molten and vaporized rock that had been flung skyward from the asteroid impact — stuck in their gills, a sign that the fish were still living and breathing as hell rained down on them.

To determine the season of the impact, vertebrate paleontologist Melanie During of Uppsala University in Sweden and colleagues examined features in fish bones that record seasonal and annual growth cycles, akin to tree rings. These features typically include a thick band signifying vigorous bone growth, a thinner band characterizing slow growth and a line of arrested growth denoting wintertime or sometimes periods of drought or famine.

The team analyzed jawbones of three paddlefish and bony spines from the pectoral fins of three sturgeons. The bones' outermost layers indicate rapid growth that hadn't yet reached peak rates seen during previous years' growth cycles, During says. That means that the last growth season recorded in the bones hadn't yet reached its summertime peak.

The regularity of the lines of arrested growth strongly suggests that the fish weren't suffering from drought or famine when they died, During says. "By all indications, these fish were doing fine." Taken together, the results point to spring as when the asteroid hit.

"This is a solid story backed by strong evidence," says vertebrate paleontologist Stephen Brusatte of the University of Edinburgh. The impact "would have turned a season that is normally about growth and flowering and rebirth into a time of unbelievable fire and fury." ■

HUMANS & SOCIETY

Ancient mate shift recorded in DNA

People's interactions in Africa changed 20,000 years ago

BY BRUCE BOWER

Ancient Africans in search of mates traded long-distance travels for regional connections starting about 20,000 years ago, an analysis of ancient and modern DNA suggests.

That shift occurred after treks across much of Africa to find partners had been the norm starting at least 50,000 years ago, the analysis shows. The findings — thanks to some of the oldest human DNA yet isolated from Africa — offer the first genetic support for a previously suspected change in mating patterns around that time.

The long-distance movements of ancient human groups help explain archaeological discoveries of common types of toolmaking and other cultural behaviors that increasingly appeared across Africa starting about 50,000 years ago, evolutionary geneticist Mark Lipson of Harvard Medical School and colleagues report February 23 in *Nature*.

Starting around that time, inherited sets of gene variants became increasingly similar in ancient individuals found in central, eastern and southern regions of sub-Saharan Africa, the team reports. This suggests that southern Africa was a genetic melting pot, in which hunter-gatherers migrated between the three regions, mating with each other along the way.

Comparisons of ancient human DNA with that of present-day hunter-gatherers and herders in the same three parts of Africa indicate that people generally stopped traveling outside their home regions to find mates about 20,000 years ago. People may have stayed closer to home at least partly because the last ice age peaked around that time, reducing the number of areas with enough edible plants, animals and other resources, says study coauthor Jessica Thompson, a

JOSCHUA KNÜPPE

bioarchaeologist at Yale University.

"As the African tropics came out of the last ice age, the landscape became full of many small groups of people with diverse local cultural traditions," Thompson says. Culturally distinct groups sought mates from neighboring groups with whom they had more in common than people from more distant regions, she suspects.

African hunter-gatherers today follow local cultural practices, speak in regionally distinct tongues and draw mates from nearby groups. Migrations of West African farmers to eastern and southern Africa starting about 2,000 years ago have largely erased ancient ancestry patterns in the DNA of present-day Africans. That makes ancient DNA crucial for unveiling those lost patterns.

The scientists extracted ancient DNA from six individuals excavated in eastern and south-central Africa. Estimates of when these people lived range from about 18,000 to 5,000 years ago. These genetic data were studied along with already published ancient DNA evidence from 28 African hunter-gatherers dating to as early as about 8,000 years ago.

Calculations of the genetic variation in three present-day groups — San hunter-gatherers from southern Africa, Mbuti hunter-gatherers from central Africa and Dinka herders and farmers from northeastern Africa — were used to estimate ancestry patterns reflected in ancient DNA samples.

The analysis fits with previous African DNA studies suggesting that mating among widespread human groups began 200,000 years ago or more, says evolutionary geneticist Carina Schlebusch of the University of Uppsala in Sweden. ■

BODY & BRAIN

'Poop pills' take on peanut allergies

Fecal microbiota transplants show promise in small clinical trial

BY ESTHER LANDHUIS

PHOENIX — Pills loaded with bacteria from other people's poop might help peanut-allergic adults build protection against accidental exposures.

In a small clinical trial, a course of pills helped some people with the allergy consume one or more peanuts. The results, presented February 26 at the American Academy of Allergy, Asthma & Immunology annual meeting, are a first step toward seeing whether the approach, called fecal microbiota transplant, could extend to people allergic to other foods. In the United States alone, about 32 million people have food allergies.

The trial evolved out of research suggesting that gut microbes help shape the immune system to protect against food allergies. In a 2019 study, Rima Rachid, an allergist-immunologist at Boston Children's Hospital, and colleagues found that the stool of babies without food allergies is enriched with certain bacteria compared with the stool of babies who have food allergies. When transferred into allergy-prone mice, these bacteria — either *Subdoligranulum variabile* or a set of *Clostridia* species — prevented anaphylaxis. The treatment increased the response of a subset of immune cells called regulatory T cells, which protect against severe allergic reactions.

Rachid's team partnered with a nonprofit stool bank called OpenBiome to collect stool samples from healthy donors without allergic diseases and encapsulate the fecal matter into odorless, tasteless pills. The donors had avoided peanuts and tree nuts for a week, and their stool was analyzed to ensure it contained no traces of nut proteins, Rachid said.

The study enrolled 15 adults with severe peanut allergies. At the start of the trial, each had an allergic reaction to 100 milligrams or less of peanut protein (less than half a peanut). Ten participants took 36 "poop pills" in a day. After one month, 30 percent (three of 10 participants) could safely consume a 100-milligram dose of peanuts. By four months, two of these individuals had increased their tolerance to at least 300 milligrams (about one peanut), enough to guard against most accidental exposures.

The remaining five participants had the same poop pill regimen but first took a four-day course of antibiotics with the aim of killing bacteria to clear space for the transferred gut microbes.

The results hint that this strategy may work better: Three of five participants were able to eat up to 600 milligrams by month four. (The COVID-19 pandemic prevented data collection from several participants at the one-month mark.)

Some allergy sufferers tolerated small amounts of peanut protein after a course of pills (shown) containing bacteria from others' fecal matter.

ERIK JACOBS/OPENBIOME

Throughout the study, no one suffered serious adverse events or had allergic reactions related to the fecal transplant, Rachid reported.

An analysis of participants' blood samples found increased levels of regulatory T cells only in the six people whose peanut threshold rose with the therapy.

The results are exciting, says immunologist Cecilia Berin, deputy director of the Jaffe Food Allergy Institute at the Icahn School of Medicine at Mount Sinai in New York City. The fact that fecal transplant pills helped a subset of individuals without needing exposure to a specific allergen suggests the approach could potentially be useful for multiple types of food allergies, she says.

Rachid said her team plans to launch a larger trial later this year using capsules with higher concentrations of bacteria and less fecal matter, which could prove more effective and eliminate the need for ultracold storage, making the pills easier to administer. A future trial will test a product that ditches the poop altogether. ■

LIFE & EVOLUTION

African shrubs weaponize skinny roots

Fynbos plants commandeer nutrients to keep infiltrators out

BY JAKE BUEHLER

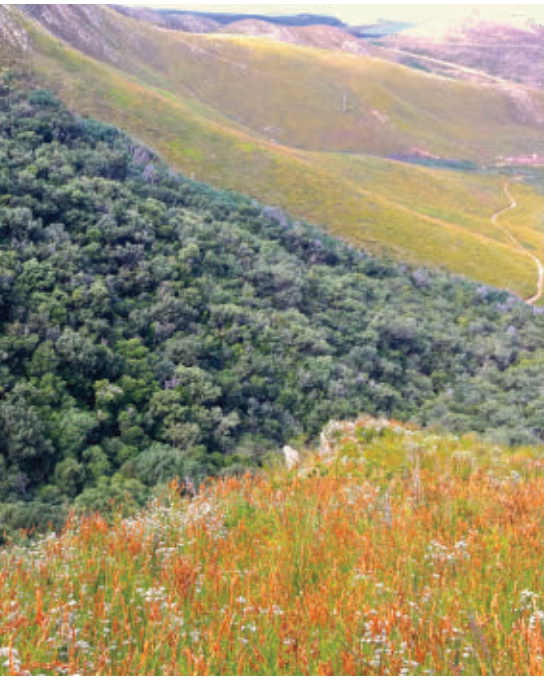
Some plant roots draw a line in the sand — literally.

In South Africa, you can move between cool, green forest and sunbaked shrubland in a single stride. The narrow border between dramatically different ecosystems is maintained by intense competition between plants' roots, new research suggests.

The fynbos — a species-rich shrubland found only on the far southern tip of Africa — has the thinnest known roots by far of any plant community in the world, researchers report in the March 1 *Proceedings of the National Academy of Sciences*. These nutrient-gobbling roots, plus some fire-encouraging adaptations, help turn the fynbos into an austere realm where only fynbos plants can survive.

The fynbos is home to more than 7,000 species of plants, most of which are found nowhere else. "It's one of the most floristically biodiverse systems in the world," says ecologist Lars Hedin of Princeton University. "It's essentially as diverse as a tropical forest."

South Africa's fynbos shrubland (foreground and background) abruptly transitions to forest, a standoff maintained by thin plant roots.



L. HEDIN

But right next to this sun-exposed, flower-filled wonderland — with the same climate and underlying geologic composition — is the lush Afro-temperate forest, with tall trees and moss but fewer plant species overall.

"The boundary is as sharp as one meter. It's like a binary, zero-to-one transition," says ecologist Mingzhen Lu of the Santa Fe Institute in New Mexico. This is far narrower than the transition zone between savanna and tropical rainforest, he says, which can occur over many kilometers.

To investigate what underlies the sharp border, Hedin, Lu and colleagues compared roots from both fynbos and forest systems. The team also conducted transplant experiments, moving Afro-temperate forest plants to the fynbos and tracking growth over four years. The researchers kept fynbos plant roots away from the transplants and manipulated nutrient levels in some plots to unveil limiting factors for the forest plants.

When kept away from fynbos roots or offered more nitrogen, forest trees grew five times as fast as those that experienced competition or nutritional disadvantage, the team found. That suggests the fynbos plants keep invading plants away by monopolizing nutrient access.

Looking below the surface, the story becomes even clearer. Fynbos plants have long, thin roots that act like nutrient-seeking missiles, snaking through the soil where other roots can't reach. "That's a competitive advantage," Hedin says. "That's an underground weapon."

The median root tip thickness in the fynbos plant community is about 0.1 millimeters, or about a quarter to half the thickness of any other known root system. "The thickest fynbos roots are still thinner than the thinnest [Afro-temperate] forest roots," Lu says.

Compared with forest roots, fynbos roots are also 10 times as long. A gram of one fynbos species's root tissue — about the mass of a thumbtack — can stretch over 15 American football field lengths of territory.

The fynbos creates "nutritional misery" for any nonfynbos plant, the researchers suggest, with the hyperefficient roots making the soil throughout the fynbos nutrient poor. Also, a large proportion of fynbos shrubs and grasses are highly flammable, making the ecosystem prone to intense fires. The fires burn so hot that they volatilize soil nitrogen into the air, removing that nutrient from the area. Rather than engineering their surroundings to enhance nutrient levels, the plants may be doing the opposite — sabotaging the nutrient supply — to give themselves the upper hand against would-be encroachers.

"You can try to invade; you're not going to stand a chance," Hedin says.

The fynbos-forest border wavers over the years between fire cycles, with the wet forest mostly rebuffing the flames and the fynbos eventually casting out trespassers.

A prevailing idea about large ecological communities, Hedin says, is that they are largely driven by nonliving factors, such as climate, topography and geology, and organisms adapt to localized conditions. But in this case, and maybe others, "alternative stable states" arise from a war between organisms.

The findings demonstrate how pieces of this puzzle — fire, plant traits above and below ground, and feedbacks between soil and plant, to start — illuminate the processes behind the creation and maintenance of the two coexisting vegetation zones, says Gerlinde de Deyn, a soil ecologist at Wageningen University & Research in the Netherlands.

The thinness of the fynbos plant roots is "striking," de Deyn says, but the role of root-associated fungi in the ecosystem needs to be addressed. Fungi are usually heavily involved in soil nutrient cycling and could be contributing to the fybnos roots' efficient nutrient uptake, rather than the roots doing it all by themselves. ■

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ATOM & COSMOS

Impact caused a cascade of craters

For the first time, scientists find 'secondary craters' on Earth

BY SID PERKINS

Craters formed by material blasted from the carving of a larger crater have finally been spotted on Earth. Several groupings of craters in Wyoming have the hallmarks of such "secondary cratering," scientists report February 11 in *GSA Bulletin*.

When a space rock smacks into a planet or moon, it blasts material from the surface and creates a crater. Large blocks of that material can form their own holes upon landing, says planetary scientist Thomas Kenkmann of the University of Freiburg in Germany. Astronomers have long observed secondary cratering on the moon, Mars and other orbs in the solar system but never before on Earth.

When Kenkmann and colleagues investigated a series of craters near Douglas, Wyo., in 2018, the team thought the pockmarks were formed by fragments of a single space rock that had broken up in the atmosphere. But the team later discovered similar groups of craters of the same age, roughly 280 million years old, throughout the region.

In all, the team found over 30 impact craters between 10 and 70 meters in diameter at six locales. Based on subtle differences in the alignment of elliptical craters in the groups, the researchers suggest that the impactors that blasted each set of craters struck the ground from slightly different directions.

The impactors that made the secondary craters were probably between 4 and 8 meters wide and hit the ground at speeds between 2,520 and 3,600 kilometers per hour, Kenkmann says. Extrapolating the paths of the impactors back to their presumed sources suggests that the original crater straddled the Wyoming-Nebraska border northeast of Cheyenne.

That crater was probably 50 to 65 kilometers across, created by an impactor 4 to 5.4 kilometers wide, the team estimates.

Impact debris blasted from a larger crater may have formed this smaller crater in Wyoming, about 60 meters across at its widest point.

The crater is probably buried under more than two kilometers of sediment that accumulated since impact. An equivalent amount of sediment eroded away to expose the secondary craters when the Rocky Mountains later rose.

The team's evidence "comes together very well to make a compelling story," says Gareth Collins, a planetary scientist at Imperial College London.

Scouring measurements of gravitational and magnetic fields in the region for anomalies could help reveal the buried crater, the researchers note. ■

ATOM & COSMOS

Fast radio burst's home is a surprise

Source stars were considered too old to create these flashes

BY MARA JOHNSON-GROH

In a galaxy not so far away, astronomers have located a surprising source of a mysterious, rapid radio signal.

The signal, a repeating fast radio burst, or FRB, was observed over several months in 2021. That allowed astronomers to pinpoint the FRB's location to a globular cluster — a tight, spherical cluster of stars — in a galaxy 12 million light-years from Earth. The finding, published in the Feb. 24 *Nature*, challenges assumptions about what objects create FRBs.

"It is exciting to see an FRB from a globular cluster," says Bing Zhang, an astronomer at the University of Nevada, Las Vegas. "That is not the [favorite] place people imagined."

Astronomers have puzzled over FRBs, which typically last just milliseconds or less, since their discovery in 2007. But in 2020, an FRB was seen in our own galaxy, helping scientists determine that one source must be magnetars — young, highly magnetized neutron stars.

The new discovery comes as a surprise because globular clusters harbor old stars. Magnetars, however, are young, leftover dense cores typically created from the death of short-lived massive stars. The magnetized cores are thought to lose the energy needed to produce FRBs after about 10,000 years. Globular clusters, whose stars average many billions of years old, are too elderly to have had a sufficiently recent young stellar death to create this type of magnetar.

Astronomer Franz Kirsten and colleagues used radio telescopes in Europe and Asia to catch five FRBs from the same source, finding that the signal was almost certainly from within a globular cluster.

The researchers suggest a few possible sources for the repeating FRB. It could come from a magnetar that actually formed from old stars, perhaps from a remnant stellar core known as a white dwarf that had gathered too much material from a companion star and collapsed. This type of magnetar formation has been predicted but never observed, says Kirsten, of ASTRON, the Netherlands Institute for Radio Astronomy, who is based at the Onsala Space Observatory in Sweden. Alternatively, the magnetar could have formed from the merger of two stars closely orbiting each other, but this scenario is less likely, Kirsten says.

It's also possible, the team says, that the FRB source isn't a magnetar at all but a very energetic millisecond pulsar in orbit with another star. Like a magnetar, a millisecond pulsar is a type of neutron star but with a weaker magnetic field. ■

KENT SUNDELL/CASPER COLLEGE

MATTER & ENERGY

Free-falling atoms 'see' underground

Quantum sensors could be a better way to map gravity

BY MARIA TEMMING

The best way to find buried treasure in the future may be with a quantum gravity sensor.

In these devices, free-falling atoms reveal subtle variations in Earth's gravitational pull at different places. Those variations reflect differences in the density of material beneath the sensor — effectively letting the instrument peer underground. In a new experiment, one of these machines teased out the tiny gravitational signature of an underground tunnel, researchers report in the Feb. 24 *Nature*.

"Instruments like this would find many, many applications," says Nicola Poli, an experimental physicist at the University of Florence who coauthored a commentary on the study in the same issue of *Nature*.

Quantum gravity sensors could monitor groundwater or magma beneath volcanoes, or help archaeologists uncover hidden tombs or other artifacts without having to dig them up, Poli says. These devices could also help farmers check soil quality or help engineers inspect potential construction sites for unstable ground.

"There are many tools to measure gravity," says Xuejian Wu, an atomic physicist at Rutgers University in Newark, N.J., who wasn't involved in the study. Some devices measure how far gravity pulls down a mass hanging from a spring. Other tools use lasers to clock how fast an object tumbles down a vacuum chamber. But free-falling atoms, like those in quantum gravity sensors, are the most pristine, reliable test masses out there, Wu says. As a result, quantum sensors promise to be more accurate and stable in the long run than other gravity probes.

Inside a quantum gravity sensor, a cloud of supercooled atoms is dropped down a chute. A pulse of light splits each of the falling atoms into a superposition of states — a quantum limbo where each atom can exist in two places at once (*SN: 12/7/19, p. 9*). Due to their slightly different positions in Earth's gravitational field, the two different possible states of the atom feel a different downward tug as they fall. Another light pulse then recombines the split atoms.

Thanks to the atoms' wave-particle duality — a strange rule of quantum physics that says atoms can act like waves — the reunited atoms interfere with each other. That is, as the atom waves overlap, their crests and troughs can reinforce or cancel each other out. That interference reflects the slightly different downward pulls that the split versions of each atom felt as they fell — revealing the gravity field at the atom cloud's location.

Extremely precise measurements made by such atom-based devices have helped test Einstein's theory of gravity (*SN: 11/21/20, p. 12*) and measure fundamental constants, such as Newton's gravitational constant (*SN: 4/28/18 & 5/12/18, p. 24*). But atom-based gravity sensors are highly sensitive to vibrations from seismic activity, traffic and other sources.

Quantum gravity sensors could monitor groundwater or magma beneath volcanoes, or help archaeologists uncover artifacts without having to dig them up.

"Even very, very small vibrations create enough noise that you have to measure for a long time" at any location to weed out background tremors, says Michael Holynski, a physicist at the University of Birmingham in England. That has made quantum gravity sensing impractical for many uses outside the lab.

Holynski's team solved that problem by building a gravity sensor with not one but two falling clouds of rubidium atoms. With one cloud suspended a meter above the other, the instrument could gauge the strength of gravity at two different heights in a single location. Comparing those measurements allowed the researchers to cancel out the effects of background noise.

Holynski and colleagues tested whether their sensor — a roughly 2-meter-tall chute on wheels tethered to a rolling cart of equipment — could detect an underground passageway on the University of Birmingham campus. The 2-by-2-meter concrete tunnel lay beneath a road between two multistory buildings. The quantum sensor measured the local gravitational field every 0.5 meters along an 8.5-meter-long line that crossed over the tunnel. Those readouts matched the predictions of a computer simulation, which had estimated the gravitational signal of the tunnel based on its structure and other factors that could influence the local gravitational field, such as nearby buildings.

Based on the machine's sensitivity in this experiment, it could probably provide a reliable gravity measurement wherever the sensor is parked in less than two minutes, the research team estimates. That's about one-tenth the time needed for other types of gravity sensors.

The team has since built a downsized version of the gravity sensor used in the tunnel-detecting experiment. The new machine weighs about 15 kilograms, compared with the roughly 300-kilogram beast used for the tunnel test. Other upgrades could also boost the gravity sensor's speed.

Engineer Nicole Metje envisions building a quantum gravity sensor in the future that could be pushed from place to place like a lawn mower. But portability and speed aren't the only challenges for making these tools more user-friendly, says Metje, a coauthor on the study who is also at the University of Birmingham. "At the moment, we still need someone with a physics degree to operate the sensor."

So hopeful beachcombers may be waiting a long time to trade in their metal detectors for quantum gravity sensors. ■

HUMANS & SOCIETY

Literary losses gauged via ecology

Only about 9 percent of medieval European texts may survive

BY BRUCE BOWER

King Arthur's lasting renown is one for the books. But a statistical spotlight now shines on medieval European literature's round table of lost and forgotten stories.

An international team used a mathematical formula borrowed from ecology to estimate the extent to which medieval adventure and romance tales, and materials on which they were written, have been lost over the years. Only about 9 percent of these documents may have survived till modern times, the researchers found.

The research suggests that simple statistical principles can be used to gauge losses of a range of past cultural items, such as specific types of stone tools or ancient coins, literature professor Mike Kestemont of the University of Antwerp in Belgium and colleagues report in the Feb. 18 *Science*.

Their approach represents a simple but powerful tool for studying culture, says anthropologist Alex Bentley of the University of Tennessee, Knoxville. "It's like walking into an abandoned Amazon book warehouse decades later and estimating the total number of book titles based on the numbers of surviving single and double copies that you find."

Much medieval European literature, which dates to between roughly the years 600 and 1450, has been lost, and many surviving manuscripts are fragmentary. Durable parchment documents were often recycled as small boxes or for other practical uses. That has left researchers unsure about whether surviving tales and documents are representative of what once existed.

Kestemont's team turned to a formula developed by environmental statistician and study coauthor Anne Chao of National Tsing Hua University in Taiwan. Chao's statistical technique, designed to assess biological diversity, accounts for species that go undetected by researchers in field surveys. More generally, her approach can be used to estimate the number of unobserved events of any type that accompany relatively frequent observed events of the same type.

For example, this formula might be used to estimate the number of undiscovered archaeological sites in an early state society where the biggest settlements have been easier to find than smaller ones.

In the new study, medieval literary stories from Europe were treated as species, and surviving manuscript copies of those tales were treated as sightings of a species. Counts of literary works with either one copy or two copies — the equivalent of toting up species sighted either once or twice in a survey — enabled the researchers to estimate how many literary stories have been lost because none of the documents preserving them has survived. This method also estimated how many documents originally existed for stories that have surviving manuscripts.

Kestemont's group estimates that about 799 literary tales survive today out of what would have been an original total of around 1,170 stories, at least for the six languages that were studied. The 3,648 surviving written accounts of those tales come from an estimated original total of around 40,614 documents, the researchers say.

More than three-quarters of medieval literary stories in German, Irish and Icelandic have survived in at least one written document, the team suggests. That figure falls to about half for Dutch and French tales, and around 38 percent for English works.

Handwritten versions of those medieval adventure and romance stories — often created by individuals in the general population who avidly consumed fictional literature — have fared poorly across the board. Survival rates of those documents range from an estimated 4.9 percent for English yarns to 19.2 percent for Irish tales, the researchers report.

Recycling of documents, such as using fragments of a manuscript to stiffen a bishop's headgear (shown), contributed to losses of medieval European literature.

Literary documents on the islands of Ireland and Iceland survived relatively well at least partly because there were enough written copies of different stories, the team says. That made it harder for disasters, such as library fires, to wipe out all copies of specific stories. In contrast, copies of many medieval French stories were rare and thus more susceptible to disappearing over time.

French-speaking Normans conquered England in 1066, which may have led to greater neglect and recycling of manuscripts written in English, the researchers suggest.

Chao's method may help unveil cultural diversity in past societies, Bentley says. For instance, roughly 7,000-year-old villages in part of Germany have yielded about 40 different pottery styles. An analysis of the number of styles found on one and two pots, respectively, could be used to estimate the total number of pottery styles that once circulated in that region. ■

100 years of *Science News*

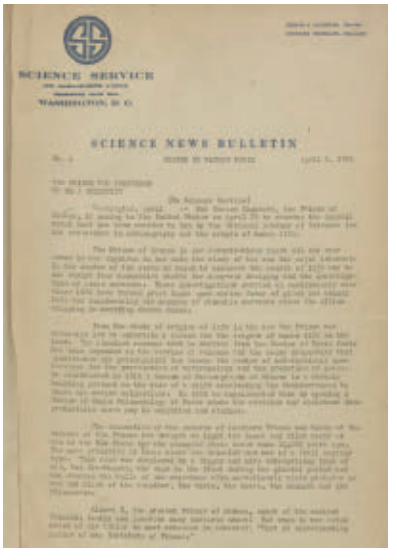
From general relativity to gene editing, we've shined a light on all corners of science

By Maria Temming

The first three months of covering the COVID-19 pandemic felt, by Tina Hesman Saey's estimation, "closer to 300 years." From February to April 2020, the *Science News* senior molecular biology writer had produced a flurry of stories on the new coronavirus that wove together findings from dozens of scientific papers and reports. Her hours were long and stress levels high. But the science wasn't slowing down, so neither could she.

"We're in a hyperdrive situation," Saey said in May 2020, reflecting on her pandemic reporting. "It's amazing how fast the science is moving." In mere months, researchers had completely overhauled their understanding of how the SARS-CoV-2 virus infiltrates the body, and vaccines were already in the works. Readers were counting on Saey and her *Science News* colleagues to sift through the deluge of information pouring out of labs across the world. "The information that they get from us can really help them make life-or-death decisions," Saey said.

Since then, Saey and other *Science News* reporters have cranked out hundreds of stories on SARS-CoV-2's basic virology, new variants, vaccine rollouts and more. To boost public understanding of the new coronavirus, *Science News* has freely offered its COVID-19 stories to local and nonprofit news organizations since April 2020.


SCIENCE SERVICE

SCIENCE NEWS BULLETIN

The first *Science News Bulletin*, released April 2, 1921, carried 12 stories for publishing in subscribing newspapers.

"What *Science News* provided was authoritative reporting and in-depth articles on what we're all talking about and what we're all worried about," *Cleveland Scene* editor in chief Vince Grzegorek said after his publication started reprinting *Science News* coverage. Whether a story was about the importance of masking up or the risks of in-person shopping, Grzegorek said, "what people can read from *Science News* on our site is going to go a lot further than a 45-second spot on the local [news] station."

Science News' push to get reliable reporting in front of as many eyes as possible harks back to before the publication was even a magazine. A little over a century ago, *Science News* got its start as *Science News Bulletin* — the first syndicated news specializing in science.

"There certainly had been media coverage of science before," says Bruce Lewenstein of Cornell University, who studies science communication. But that coverage was more sporadic and often plagued with sensationalism and superstition.

Newspaper magnate Edward W. Scripps, who believed that a functioning democracy requires a science-savvy public, wanted to get more accurate, reliable science news in the public eye. To do that, Scripps teamed up with his zoologist friend William E. Ritter to form a new organization for science communication in 1921. Based in Washington, D.C., Science Service — now known as the Society for Science — was funded by Scripps and overseen by a board of 15 scientists and journalists. That board of trustees included famed astronomer George Ellery Hale and Edwin Gay, president of the *New York Evening Post*.

"Science Service was formed at a critical time for science and public understanding of science," says Susan Swanberg, who studies the history of science journalism at the University of Arizona in Tucson. In the early 20th century, the pace of scientific discovery was making it harder for nonexperts to keep up. At the same time, World War I, nicknamed "the chemists' war" for the use of chemical weapons on the battlefield, had heightened many people's uncertainty about, and interest in, science.

Scripps and Ritter hoped their new organization would help bridge the gap between scientists and the public. When Science Service announced its debut in the journal *Science* in April 1921, the organization branded itself as "a sort of liaison officer between scientific circles and the outside world." In this go-between role, Science Service hoped

SOCIETY FOR SCIENCE



Newspaper publisher Edward W. Scripps (left) launched Science Service in 1921 with William E. Ritter. Chemist Edwin Slosson (middle) was the first editor. Watson Davis (right) joined in 1921 at age 25, and eventually became director from 1933–1966.

to foster popular support for science while helping people become more well-informed citizens. That same month, Science Service launched *Science News Bulletin*, a weekly — then daily — dispatch of stories to subscribing newspapers across the country. This marked the first sustained effort to provide engaging, accurate news about scientific research to a national U.S. audience.

By October 1921, the bulletin fed more than 30 subscribing newspapers with a combined circulation of more than 1.5 million readers. Libraries, schools and science enthusiasts started requesting copies of the bulletin to keep for themselves. In response, Science Service began bundling its dispatches into a stand-alone publication, dubbed *Science News-Letter*. Readers got the first issue 100 years ago this month, in March 1922. The publication became *Science News* in 1966.

Slosson, Scopes and syndication

Science Service's first editor, Edwin Slosson, fancied himself a "renegade from natural science." A chemist-turned-writer who had worked as a magazine editor and authored science books, he shared Scripps and Ritter's belief that democracy hinged on scientific literacy — and that science didn't need to be overhyped to capture readers' imaginations.

"It is not necessary," Slosson wrote in *Science News-Letter*, "to pervert scientific truths in the process of translation into the vernacular. The facts are sensational enough without any picturesque exaggeration" (*SN: 3/3/28, p. 136*).

When Slosson took charge of Science Service in 1921, his challenge was not finding interesting science to write about. It was finding journalists to do the writing. Science journalism was a new field. And without an established pool of reporters to call on, Slosson reportedly spent his first month at Science Service begging friends to write articles for him, only to spend the next month, as he put it, "sending the articles back and telling them how rotten they were in such polite language as to induce them to send soon some better ones."

But not all of Slosson's early searches for science writers turned up disappointments. He did find Watson Davis — or rather, Watson Davis found him. The 25-year-old journalist and engineer was allegedly waiting on Science Service's front steps to ask for a job when Slosson showed up for his first day at work.

"Davis had the instincts of a journalist and an engineer's ability to organize," historian Marcel Chotkowski LaFollette wrote in a 2006 article about Science Service. "He could ferret out news and glean the essence from dull research reports, and proved to be a skilled manager." Those traits served Davis well as Slosson's right-hand man, and later as the director of Science Service from 1933 to 1966.

Science News-Letter's earliest stories set the stage for the magazine's coverage over the next century. Readers learned about news on the biggest scientific happenings, such as the discovery that insulin could treat diabetes (*SN: 10/28/22, p. 1*), as well as curious everyday insights, such as what foods help houseflies live longer — detailed in a story charmingly titled "How to feed flies in case you love them" (*SN: 8/30/24, p. 9*).

For Science Service writers, the name of the game was transforming the dry language typical of scientific papers into compelling narratives. But having staked its reputation on scientific accuracy, Science Service was careful to avoid sensationalism. Writers couldn't risk alienating their scientist sources. Biology editor Frank Thone, for instance, once wrote a story describing insects that were "just as fond of the bright lights, a hot time and fast living" as their human counterparts — after which Thone sent a rather sheepish note to the researcher asking for forgiveness for the jazzy language (*SN: 12/15/28, p. 377*).

Sometimes, Science Service's deference to the scientific community went so far that, by today's standards, it broke the code of journalistic objectivity. Perhaps the most striking example was Science Service's involvement in the Scopes

Watson Davis shot this picture at the 1925 trial of high school teacher John Scopes, who was tried for teaching evolution in Tennessee. Part of the event moved outdoors because of July's extreme heat.

CLOCKWISE FROM TOP LEFT: SMITHSONIAN INSTITUTION ARCHIVES, IMAGE #SIA2007-0010; SMITHSONIAN INSTITUTION ARCHIVES, IMAGE #SIA2009-3471; SMITHSONIAN INSTITUTION ARCHIVES, IMAGE #SIA2017-003785; SMITHSONIAN INSTITUTION ARCHIVES, IMAGE #SIA2007-0123

"Monkey Trial" of 1925, when high school science teacher John Scopes was put on trial for breaking a Tennessee law that forbade teaching evolution. Leading up to the trial, *Science News-Letter* printed a pledge of support for Scopes by the president of the American Association for the Advancement of Science (*SN: 6/6/25, p. 1*). In another article, Davis proclaimed that anyone could see Scopes was in the right "if men will but use their eyes and their brains" (*SN: 6/27/25, p. 2*).

Science Service went far beyond editorializing in its coverage of the trial. The organization helped Scopes' lawyers find expert witnesses to testify on his behalf. And when Davis and Thone traveled to Tennessee to cover the trial, they moved into the Victorian mansion that Scopes' legal team was using as headquarters.

"All day long and far into the night, the rumble of scientific discussion and laughter issues forth from Defense Mansion," Thone wrote, calling the place "the headquarters for the defenders of science, religion and freedom."

From today's perspective, the whole affair was completely inappropriate. But LaFollette doesn't judge Science Service too harshly. "We must be careful in applying retrospectively contemporary standards," says LaFollette, whose 2008 book *Reframing Scopes* explores Science Service's role in the trial. The modern code of journalistic ethics was not as formal in the early 20th century as it is now, she says, and back then many journalists were more comfortable cozying up to their sources.

"Davis and Thone believed they were doing the right thing by assisting the Scopes defense," LaFollette says. After all, in its 1921 debut announcement in the journal *Science*, Science Service had sworn it would "not indulge in propaganda, unless it be propaganda to urge the value of research and the usefulness of science."

A decade after its birth, *Science News Letter* — which abandoned its hyphen in 1930 — had earned a reputation for top-quality, accurate coverage. Thomas Edison gave the magazine permission to print excerpts from conversations Edison had with Slosson in the twilight years of Edison's life (*SN: 10/24/31, p. 264*). In 1933, Eleanor Roosevelt reportedly commissioned Science Service to collect statistics on women working in government science jobs. And in 1936, the *Science News Letter* staff arranged a meeting between Albert Einstein and engineer Rudi Mandl, who had immigrated from Germany and was working as a dishwasher. Mandl convinced Einstein to publish a paper on a then-theoretical curiosity known as gravitational lensing (*SN Online: 10/1/15*). It turned out to be a very real phenomenon that today's astronomers use like a cosmic magnifying glass to peer at the distant universe.

Throughout the 1920s, Science Service sold articles to over 100 newspapers, potentially reaching more than 7 million people. During the Great Depression, newspaper subscriptions to Science Service's syndicated material took a hit, but individual subscriptions to *Science News Letter* rose steadily. The magazine kept its readers in the know about a range of fields, announcing the discovery of penicillin — which one reporter mused "may turn out to be a useful antiseptic" (*SN: 5/17/30, p. 314*) — and tracking the emerging field of quantum mechanics. The magazine deemed this new realm of physics both revolutionary and "disturbing" (*SN: 4/27/29, p. 257*).

Science Service's reporting was seminal in the emerging field of science writing, according to science and society researcher Dorothy Nelkin's 1995 book *Selling Science*. "It laid the foundation for contemporary science journalism," Nelkin wrote, "giving the profession both a purpose and a style."

Throughout the 1920s, Science Service sold articles to over **100 newspapers**, potentially reaching more than **7 million people**.

The war years

In 1936, Science Service helped throw one of the nerdiest dinner parties of all time.

By then, Science Service had grown to include several pioneers of science journalism, including acclaimed medical reporter Jane Stafford and psychology writer Marjorie Van de Water. "They were an extremely intelligent group of people," LaFollette says. "If you couldn't write quickly, think quickly, you didn't last long in that newsroom." But the staff wasn't all serious all the time.

One particularly extravagant display of the team's playful spirit was a celebration that Science Service helped organize in November 1936 honoring the centennial of the U.S. patent system. Politicians and scientists gathered in Washington, D.C., for an afternoon "research parade" hosted by Davis, where inventors showed off their various gadgets (*SN: 12/5/36, p. 356*). At the banquet that followed, tables were decked out with patented hybrid flowers, and guests dined from a menu that listed the patent number for each food and drink. The entertainment featured a phonograph recording of the late Thomas Edison and a radio show broadcast from a plane flying overhead.

Science Service's unbridled enthusiasm for the scientific enterprise was often its greatest asset. But staff members' devotion to particular topics sometimes led to uncritical coverage. One prominent example was eugenics, a scientific and social movement in the United States and Europe in the 20th century that aimed to "improve" humankind by selectively breeding for desirable traits or breeding out undesirable ones. Such "undesirable" traits could be anything from mental and physical disabilities to supposed moral failings, such as promiscuity. Eugenics influenced U.S. immigration policies as well as laws that led to the forced sterilization of over 60,000 people in the United States.

"By the time Science Service was created ... eugenics had become well-established, both in the sciences and as a sort of popular political, culture and social movement," says Emily Rader, an independent historian based in Long Beach, Calif., who was commissioned last year by *Science News* to provide

an outside analysis of the publication's eugenics coverage. "*Science News* published a lot of articles about eugenics in the 1920s and 1930s," Rader says. That was perhaps not surprising, given that Davis was a board member of the American Eugenics Society. "There were almost no articles that brought up criticism of eugenics," Rader says, even though some biologists and social scientists at the time had pointed out its problems.

In November 1933, for instance, the magazine published a story about American eugenicists praising Hitler's new Law for the Prevention of Offspring with Hereditary Diseases. That law allowed the forced sterilization of several groups of people, including those who were born blind or deaf, and those who suffered from epilepsy or alcoholism. The *Science News Letter* article quoted an editorial from *Eugenical News* that said: "It is difficult to see how the new German Sterilization Law could, as some have suggested ... be made an 'instrument of tyranny' " (*SN: 11/4/33, p. 295*).

Science Service's "frequent failure to report alternative viewpoints, its gushing coverage of sterilization statutes and approving report about Germany's new eugenics law all suggest that the science news agency had wandered into the realm of propaganda," Swanberg, of the University of Arizona, wrote in a 2021 article in *American Journalism* about *Science News Letter*'s eugenics coverage. If not propaganda, Swanberg wrote, this reporting was at least "not very enterprising journalism."

Science News Letter's eugenics reporting tapered off in the 1940s. This was around the time eugenics largely fell out of favor in the United States due to eugenics-inspired atrocities committed in Nazi Germany during World War II. There was, however, a slight uptick in coverage in *Science News Letter* in the 1960s, alongside a resurgence in eugenic ideas (see Page 26 for a statement from *Science News* on its past coverage).

World War II brought other changes to Science Service. *Science News Letter* articles touted the ways that science and engineering could aid the U.S. military (*SN: 5/24/41, p. 327*). "Overshadowing almost everything else these critical days is the application of almost all our energies and our science to rescuing the world from forces of darkness," Davis said in a speech quoted in the magazine in 1941 (*SN: 9/6/41, p. 154*). In a show of support for U.S. troops, Science Service began offering a pocket-sized, monthly edition of *Science News Letter* to service members. "This international edition," boasted one 1943 advertisement, "will contain only the scientific news of interest to the men and women overseas."

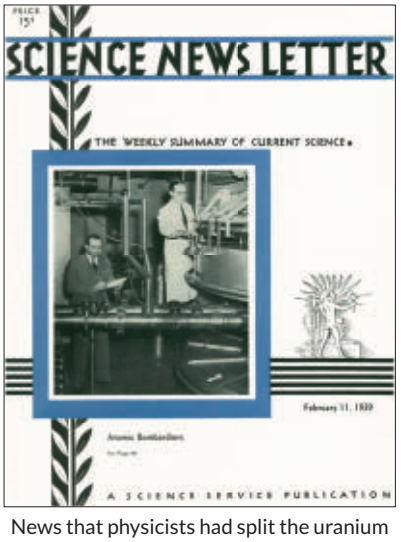
In the lead-up to WWII, Science Service had plenty of atomic physics coverage. For instance, when physicists split the uranium atom in 1939, it made the cover of *Science News Letter* (*SN: 2/11/39, p. 86*). In the aftermath, the magazine published a slew of stories on what elements tumbled out when uranium cracked like a particulate piñata (*SN: 4/8/39, p. 218*), on the prospects for using atomic energy as a fuel source or a weapon (*SN: 6/24/39, p. 392*), and so on.

Jane Stafford joined Science Service to cover medicine in the 1920s and was a founding member of the National Association of Science Writers.

But soon, government censorship and scientific self-censorship loomed over atomic physics. "It is very improbable that if significant advances are made in the release of atomic energy from uranium, details will be made public," *Science News Letter* predicted in 1940. "It will become a military secret" (*SN: 7/20/40, p. 37*). Lo and behold, by late 1942 the word *uranium* had all but vanished from the pages of *Science News Letter*. When one reader sent a letter to complain about the magazine's recent dearth of physics coverage, Davis replied that although the magazine would "like to write more about uranium isotopes and atomic power ... it is not possible to do this, because of the secrecy connected with our war effort."

That all changed in August 1945, when the United States dropped atomic bombs on Hiroshima and Nagasaki, Japan, and a government report on the Manhattan Project — the Smyth Report — came out.

"It is one of the amazing documents of all time," Helen Davis, editor of *Chemistry* magazine wrote in a letter; she was filling in for her husband Watson Davis at Science Service while he traveled. "We got two copies. One we kept intact, the other we pulled the staples out of, so we could work on parts of it all at once." Helen Davis, along with Science Service reporters Marjorie Van de Water and Jane Stafford,



News that physicists had split the uranium atom, releasing extraordinary amounts of atomic energy, made the cover of *Science News Letter* on February 11, 1939.

FROM TOP: SMITHSONIAN INSTITUTION ARCHIVES, IMAGE #SIA2009-3715; SOCIETY FOR SCIENCE

spent days cranking out stories on various aspects of the report. In a letter to her husband, Helen Davis wrote, "It is beyond all imagining. It is THE document of the age, and makes all physics and chemistry B.A.B. (Before Atom Bomb, of course) completely obsolete."

The Second World War may have ushered in a new era of science journalism as well. "Contemporary popular science is conventionally described as having been spurred on by World War II," Cornell's Lewenstein wrote in a 1994 article on the history of popular science in America. "Recognizing the role in winning the war of the atomic bomb, jet engines, radar, penicillin and a host of other scientific and technological achievements, the public 'demanded' more information about science and technology."

The July 26, 1969 issue of *Science News* led with the big news that astronauts had walked on the moon.

Of course, many organizations were communicating to the public about science and technology, Lewenstein adds, including science museums and journalism organizations like Science Service. "Still, it is true that the United States had people and institutions ready to participate in new opportunities for public communication of science and technology after the war." For starters, many newspapers at the time started doing more of their own science coverage.

In 1949, Ferry Colton, president of the National Association of Science Writers — founded in 1934 by a dozen reporters, including Science Service's own Jane Stafford — hailed Science Service as a pioneer of science journalism. The scads of science writers now working for newspapers and magazines across the country were, Colton said, "the best possible testimony to the soundness of Mr. Scripps' judgment in encouraging popular science writing."

But that vindication was a double-edged sword. With more science writers on staff at other publications, there was less of a need for Science Service's syndicated material. As a result, the organization ultimately phased out its syndication business and instead focused on producing *Science News Letter*, which started going by *Science News* in 1966. "It is like being on a first name basis," Davis wrote in the editor's note that explained the title change, "which we like" (*SN: 3/12/66, p. 164*).

In shedding its original role as a nationally syndicated news source, Science Service "doesn't lose its legitimacy," LaFollette says. "It retains its authority as an accurate, reliable source of news about the scientific community." But the organization now had other priorities besides getting science into the headlines — it was getting science on the airwaves and into the hands of kids across the country.

Off the page

Come one, come all, and join "expeditions to the frontiers of research!" Lend an ear as "eminent men of science tell of their own achievements!"

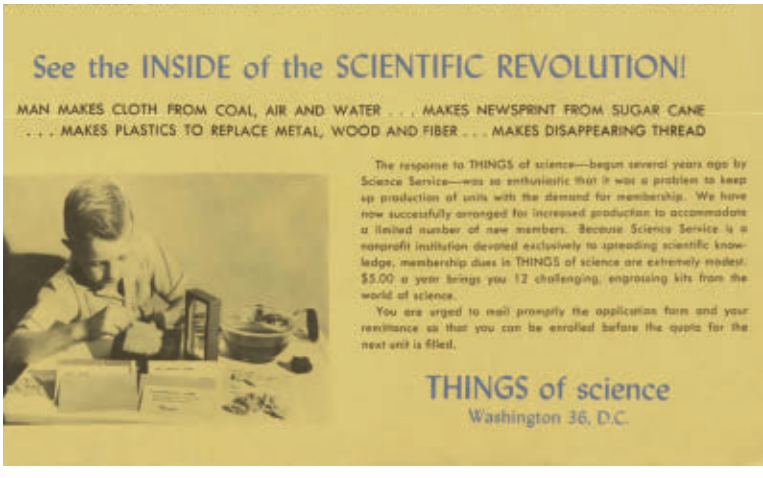
So opened one episode of *Adventures in Science*, a CBS radio program that Davis hosted for two decades.

Science Service got in on the ground floor of commercial broadcasting and was involved in radio for nearly 40 years. In the 1920s, the organization started producing weekly radio science news scripts, which were mailed to dozens of stations across the country and read on the air by local announcers. By the early 1930s, Science Service was producing the weekly news program that would soon add interviews and would come to be known in 1938 as *Adventures in Science*.

"They were attempting to use radio to do something similar

ALL: SOCIETY FOR SCIENCE

Two outreach efforts of Science Service included the CBS radio program *Adventures in Science*, hosted by Watson Davis (second from left), which aired from 1938 to 1958, and Things of Science boxes, mailed to subscribers monthly with a science experiment for children to try.



to what they were doing in print," LaFollette says. That is, get the public excited about science. But promoting science on the radio came with new challenges. Science Service often had to fight to protect its trademark scientific rigor from network executives who put more stock in making science shows entertaining than accurate. For a few months in 1938, CBS seized full control over *Adventures in Science*, replacing Davis with CBS announcers as hosts. That setup led to "watered-down dramatizations" of scientific discoveries and short, "almost flippant" interviews with scientists, LaFollette wrote in her 2008 book *Science on the Air*. The new version of the show was so unpopular it lasted only a single summer — after which CBS handed the reins back to Davis, who kept *Adventures in Science* on the air until 1958.

Print and radio were far from Davis' only tools for promoting science. "He was a tremendously creative guy," Lewenstein says. And one of Davis' most successful out-of-the-box ideas was Things of Science.

The Things of Science program mailed experiment kits in small boxes to children, schools and science clubs around the world. Every kit contained some scientific goody, such as a fingerprinting kit, flexible magnet or silkworm cocoon — including some Things of Science products that definitely wouldn't fly today, like asbestos-containing fabrics. Each bit of paraphernalia came with a little placard to display the item. "In a short time," promised one 1957 flyer, "you will build up an extensive and unique little science museum of your own."

> "I suspect that many of us who chose careers in the sciences found at least part of our inspiration in those blue [Things of Science] boxes."
>
> GEORGE MOODY

MIT signal processing researcher George Moody recalled saving a quarter each week for four months to buy his subscription as a child in the 1960s. "I suspect that many of us who chose careers in the sciences found at least part of our inspiration in those blue boxes," Moody wrote in a blog post about an online Things of Science catalog he created.

The Things of Science program launched in 1940 and ran for decades. Around the same time, Science Service undertook another major effort to encourage the next generation of scientists: The organization started hosting science competitions for science-minded kids around the country — and later the world. It all started in 1942 with the first annual Westinghouse Science Talent Search, now called the Regeneron Science Talent Search, for high schoolers. In 1950, Science Service kicked off a second annual competition that has grown into the Regeneron International Science and Engineering Fair, which draws high school competitors from across the globe. And since 2010, middle schoolers have competed in the annual Broadcom MASTERS contest.

Amid all these other ventures, Science Service continued mailing out copies of *Science News* — which also played a role in inspiring young minds. The magazine was a natural fit for student readers, says Barbara Culliton, who covered life sciences for *Science News* from 1966 to 1971. "There's a lot of explanation of the mechanisms of how things work," she says. "That is a formula that speaks particularly to people who want to learn something."

Joseph Bates of Newton, Mass., remembers reading issues of *Science News* when he was growing up in the 1960s. "They gave me the sense of science as a search for truth," he says. "You really had a feeling of the liveliness of scientific inquiry." Watching the drama of science unfold in real time helped Bates envision himself as a scientist. Bates became a computer scientist, and in 1992, *Science News* covered his research on how to build lifelike characters in virtual reality (*SN: 12/19/92, p. 440*).

To help younger readers connect with our coverage, Science Service launched a second publication in 2003. The online magazine Science News for Kids — now Science News for Students — covers a similar range of topics as *Science News*, but is written at a middle school reading level.

"Kids shouldn't have to work to understand our stories. They should read them because they love them, and because it explains their universe," says Janet Raloff, who started writing for *Science News* in 1977 and has helmed Science News for Students since 2007. "They're just sponges trying to understand all this cool stuff."

Andrea Distelhurst, a high school biology teacher in Bradenton, Fla., has used both Science News for Students and *Science News* with her students. "We try to impress upon them that science keeps changing over time," Distelhurst says. *Science News* gives the teenagers a front-row seat to those changes.

On the beat

In 2011, *Science News* editor in chief Tom Siegfried assigned Raloff a herculean task. Over the next year, he wanted her to scour every past issue of *Science News* and compile a list of the most important stories from each decade to commemorate the magazine's 90th birthday (*SN: 3/24/12, p. 20*).

Undaunted, Raloff started carrying bound volumes of old print magazines home from the office on weekends and vacations. "In a beach house, I was going through all these volumes, taking notes," Raloff says. "My family thought I was crazy." But Raloff rose to the challenge, reading more than 70,000 pages of *Science News* in a single year.

Her assessment? "We did very catholic coverage across all of the disciplines," she says. But over time, different scientific fields took the spotlight.

In the 1960s, all eyes were on the space race. But earthly issues came to the fore in the following decades, as public concerns over the environment mounted. *Science News* covered the U.S. Environmental Protection Agency's announcement that it was outlawing use of the harmful pesticide DDT (*SN: 1/23/71, p. 63*) and the signing of the global Montreal

Protocol to phase out ozone-destroying chemicals (*SN: 9/26/87, p. 196*). In the 1990s, growing agreement among scientists about human-caused climate change shifted environmentalists' focus toward cutting carbon emissions (*SN: 6/23/90, p. 391*). In the world of biology, amid a surge in molecular biology research, *Science News* explained how scientists became masters of manipulating DNA — creating synthetic genes and accomplishing other feats of genetic engineering in the 1970s (*SN: 9/1/73, p. 132*), and then deciphering the human genetic instruction manual, or genome, at the turn of the century (*SN: 2/17/01, p. 100*).

Whatever the hot topic at any given time, *Science News* didn't let other fields slip through the cracks, says Julie Miller, who covered life sciences for the magazine from 1976 to 1986 and returned as editor in chief from 1995 to 2007. "You have so many people enthusiastic about their own fields that there's always some coverage across the board," she says. Miller recalls an old journalism professor visiting her at *Science News* headquarters and noting, "It's like you've got a little university here with just one person in each department."

Joel Greenberg, editor in chief from 1981 to 1988, had a similar feeling about *Science News* staff. "The writers and editors were just so invested," he says. "They just lived their beats."

Perhaps no one embodied his beat more fully than Jonathan Eberhart, who covered space science and exploration for *Science News* from 1960 to 1991, including the Apollo 11 moon landing (*SN: 7/26/69, p. 72*). Eberhart was such a dedicated reporter that he moved to Pasadena, Calif., for several months during the Viking mission to Mars so he could report new findings directly out of NASA's Jet Propulsion Laboratory.

"He was so curious and so smart and had such great questions that they loved him and almost accepted him as a member of their team," says Kendrick Frazier, who was the *Science News* editor in chief at the time. "That contributed to the quality of his articles." Those articles won Eberhart the American Association for the Advancement of Science and Westinghouse Corporation's joint science writing award in 1976.

Science News staff did on-the-ground reporting for other major scientific events, too. Thone, for instance, witnessed the nuclear tests at Bikini Atoll in July 1946. And Raloff visited the Three Mile Island nuclear power plant after its historic meltdown in 1979 (*SN: 4/7/79, p. 227*).

Science News reporters also got many of their story ideas from scientific meetings. "The meetings we went to were where cutting-edge papers were presented," Greenberg says, "so we'd get in on the ground floor on all of these new developments."

Miller still vividly remembers one such meeting. It was a gathering of medical researchers in 1981 — just after the first cases of acquired immunodeficiency syndrome, or AIDS, had appeared in the United Sates. "The scientists there were running around, all upset about this cluster of diseases that were occurring in gay men, and they put together a symposium on the spot," Miller says. "I came back and said we had to write about this" (*SN: 11/14/81, p. 309*). As the AIDS outbreak became an epidemic, *Science News* followed the quest to develop tests and treatments.

There were "so many parallels to what's going on now with the coronavirus," Greenberg recalls, "including a guy we quoted a lot back then in the search for a cure for AIDS. A guy named Anthony Fauci."

Some meetings offered *Science News* writers a brighter glimpse of the future. Ivars Peterson, who covered math,

Science News reporters go where the science is. Clockwise from left: Astronomy writer Lisa Grossman suited up to enter the clean lab at NASA's Johnson Space Center in Houston, members of our pandemic reporting team interviewed experts on COVID-19 science on Zoom in 2021, biomedical writer Aimee Cunningham and audience engagement editor Mike Denison interviewed environmental health scientist Donald Milton on influenza's spread on a college campus and Janet Raloff reported from Antarctica in 2012 on the southernmost active volcano, Mount Erebus.

CLOCKWISE FROM LEFT: FELIX SANCHEZ; SCIENCE NEWS NOW; UNIV. OF MARYLAND SCHOOL OF PUBLIC HEALTH; NSF

technology and other physical sciences from 1981 to 2007, recalls one particular gathering of physicists in the 1990s. "I saw this amazing thing called a Web browser," he says. "I was blown away." Other meetings granted Peterson access to more offbeat scientific curiosities — like a meeting of engineers who had given the Statue of Liberty a makeover in the 1980s, which ended with a private tour of the renovated statue (*SN: 12/20/86 & 12/27/86, p. 392*).

That mix of big, flashy findings and more obscure advances won *Science News* the 1987 George Polk Award for excellence in science reporting. In his nomination letter, *New York Times* science writer Malcolm Browne wrote, "I can't imagine any significant development in science, however arcane the discipline, escaping the speedy notice of *Science News*."

All about the science

Science News staffers — past or present — often describe their readers as science buffs.

"We reported on increments that were much smaller than any newspaper or other publications," Greenberg says. Naturally, that attracted readers who were "interested in every nook and cranny of science." Some were scientists keeping up with the latest in other fields. Others were plain-old science enthusiasts.

"There is an eclectic mix in there," says Raloff, who has received reader letters and phone calls from farmers, motorcycle mechanics and artists alike. But *Science News* readers have always been united by one common feature, she says: "People who just loved science and wanted to get their fix of what's new this week."

> "I can't imagine any significant development in science, however arcane the discipline, escaping the speedy notice of *Science News*."
>
> **MALCOLM BROWNE**

Science News staffers have typically been science buffs themselves. And that has influenced the kinds of stories that the magazine tells. Historically, *Science News* has focused more on regaling readers with new discoveries, Lewenstein says, than, say, investigating the motivations of those who fund certain research projects.

John Travis agrees. He covered biology for *Science News* from 1995 to 2004 and is now the managing news editor at *Science*, a trade journal that also covers news in science. "At *Science*, we cover policy, we cover the community, we cover the failures and weaknesses of scientists," he says. *Science News* has given those topics less attention.

Over the years, *Science News* has pondered some thorny ethical questions surrounding new science. When the first heart transplant was performed in 1967, for example, *Science News* covered surgeons' concerns about whether it was moral to save one person's life using a treatment that relied on someone else's death (*SN: 1/6/68, p. 8*). In 1975, the magazine covered a meeting about how genetic engineering could be regulated to prevent scientists from spawning unnaturally dangerous bacteria in the lab (*SN: 3/8/75, p. 148*).

But, historically, such stories have not been the main focus for *Science News*. "For better or for worse," Travis says, "they focus on the curiosity and wonder of science more than the downsides of it or of the scientific community."

There was good reason for *Science News*' "very pro-science" attitude, Peterson says. "Science is a very useful way of looking at the world." But that didn't necessarily mean the magazine hailed every reported result as a breakthrough, he adds. "We were always very careful to put in what the scientists like to put in," Peterson says, "which is the 'maybe's' and the 'with a high probability,' to avoid overstating things."

Travis remembers applying that skepticism when he covered the announcement that two research groups had completely mapped the human genome in 2000. "I was so annoyed at the press conference," Travis says now. That was because the epic mapping project actually wasn't finished. Neither group confirmed that its genetic sequence was free of gaps or errors — and in the opener for his story, Travis pulled no punches: "Biology's hottest race has been declared an amicable tie," he wrote, "even though one competitor has a clear lead and neither has actually reached the finish line or knows exactly what the prize contains" (*SN: 7/1/00, p. 4*).

That sober perspective would probably have made Davis proud. While director of Science Service, Davis drafted a list of "Stories That Should Be Handled with Care," from reports about the healing powers of hypnotism to long-range weather forecasts to "sweeping claims of any sort."

Science News hasn't always perfectly applied that critical eye, as Raloff discovered in her 90-year review of the magazine's coverage. "There's a series of those things," she says, "where you just look at them and you go, 'Oh my god. How could we ever have covered that, just straight-faced without challenging it?' " Raloff was particularly shocked by a Cold War–era article about a proposal to excavate a new Panama Canal with nuclear explosives (*SN: 9/5/64, p. 149*). "We covered it like ... 'Isn't that a clever idea?' " she says. "No! It's a horrible idea! You've just gone through World War II. How could you think that's a good idea?"

The problem with those kinds of stories, Raloff says, was often that writers reported on bold claims without including comments from other researchers in the field. Seeking comments from outside experts to provide perspective and criticism has now been standard practice at *Science News* for decades. "It's kept us from having egg on our face, I think, in some of our contemporary coverage," Raloff says.

Kevin Parker of Greenbelt, Md., who has been reading *Science News* since 1969, appreciates that approach. While other publications have "a tendency to do kind of the print version of clickbait," he says, *Science News* stories usually "manage to keep an even temper."

The magazine has always put a premium on factual correctness in stories. "There was a lot of care taken to make

sure things were accurate," Peterson says. "It would screw up once in a while, but that was rare." One 1985 article, for instance, reported the discovery of a lost city in Peru that was not, in fact, lost at all, but had previously appeared on maps and in guidebooks (*SN: 2/23/85, p. 117*). *Science News* published a follow-up story acknowledging and correcting the error, just as an editor's note appears on corrected stories today.

"Reporting without sensationalizing and getting things right," Frazier says. That has always been and continues to be the *Science News* brand. "It's a quality, reliable, respectable science news source."

Going digital and beyond

A popular science magazine may have been a niche product when *Science News-Letter* got its start, but half a century later, *Science News* was far from the only game in town. The 1970s and 1980s brought a flurry of new science magazines. Many of those publications ultimately folded because they couldn't sell enough ads, but *Science News* survived on the support of its subscribers.

"It seemed to have a really devoted following," says Richard Monastersky, who covered earth sciences for *Science News* from 1986 to 2000. "The people who got us really loved us." Hollywood icon and *Science News* subscriber Marlon Brando, for instance, sometimes called *Science News* reporters to discuss stories that piqued his interest.

Greenberg recalls meeting *Science News* readers from California after he had left the magazine in 1988 to become a science editor at the *Los Angeles Times*. "I'd get on a plane, and there'd be somebody from JPL or Caltech, and they'd say, 'What do you do?' and I'd say, 'I'm a science editor at the *LA Times*,' and they'd ... go back to reading or something. And then I'd say, 'But I used to be the editor at *Science News*,' and they would drop everything," Greenberg says. "It was like I was a matinee idol or something. They'd just want to talk and talk ... they couldn't care less about any newspaper stuff, but they really were devoted to *Science News*."

Such dedicated readers were the key to helping *Science News* thrive in the 1980s. But in the 1990s, *Science News* faced a whole new wave of competition online.

Science News launched its website in 1996, the same year that *Scientific American* and the *New York Times* went online. Each week, the *Science News* website posted short summaries of every story in the magazine and the full text of at least three articles. Raloff's food science column "Food for Thought" and Peterson's "MathLand" were among *Science News*' first online-only content. But *Science News*' print magazine was still the mainstay of the operation; the website was just a bonus.

Not every staff member was sold on the staying power of the internet. In her final editor's note of 1996, Miller expressed her skepticism. "Will the Web evolve into the New Media, as Wall Street analysts proclaim, replacing television, newspapers and other sources of information and entertainment?" she wrote. "Maybe, maybe not" (*SN: 12/21/96 & 12/28/96, p. 402*).

"How could we have been so naive!" Miller says now. "We were about to get run over by this train, and we were thinking, 'Maybe it will come, maybe it won't.'"

Of course, as it did for everyone, the internet changed everything for *Science News*. "For the kinds of people who read *Science News*," Lewenstein says, "suddenly, you don't really need *Science News*." Online readers had all kinds of publications to read for free, and scientists could speak directly to the public on their own websites.

When Siegfried became editor in chief of the magazine in 2007, his mission was to help *Science News* stay relevant in the digital age. "It was a recognition that online news was becoming a dominant force," Siegfried says. "The online publication was a way to increase the timeliness, to reach out to more people and to ... create general awareness of the magazine and try to boost circulation that way, too."

To that end, *Science News* started posting news online every day and collecting the most important stories into a biweekly magazine. Going to print every two weeks, rather than weekly, allowed the newsroom to focus on more rapid online coverage and to produce a heftier magazine for each print issue, Siegfried says. "That was a big change in how things were done."

By operating as a daily news outlet, *Science News* could jump on new discoveries faster. In 2012, *Science News* broke the discovery of the Higgs boson a day before scientists made their official announcement, thanks to then-editor Kate Travis, who uncovered an announcement video accidentally posted early on CERN's website (*SN Online: 7/3/12*).

In 2019, *Science News* published a story about the first image of a black hole mere minutes after it was unveiled (*SN: 4/27/19, p. 6*). That article drew over 1.5 million unique page views in a single day — a nice achievement for a publication believed to be the first to use the term "black hole" in print, in 1964.

Despite *Science News*' growing online audience, print

A. DISTELHURST

The *Science News* in High Schools program provides print magazines with online access plus classroom materials to more than 5,000 schools (students from Bayshore High School in Bradenton, Fla., are shown).

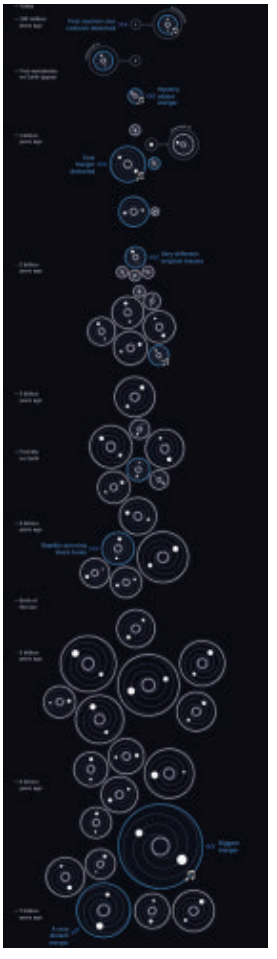
circulation was dwindling. "We were like all magazines or newspapers, in that we had survived on advertising and subscribers," says Maya Ajmera, who became president and chief executive officer of the Society for Science and publisher of *Science News* in 2014. "That model completely changed."

Ajmera sought new funding from private donors and foundations, and launched the *Science News* in High Schools program to boost print readership. (*Science News* in High Schools provides educators at more than 5,000 schools print copies and online access to the magazine, along with other classroom materials.) Those changes have helped make *Science News* more financially sustainable, Ajmera says, with more than 23 million visitors to its main website in 2021. "I'm excited by the next century of *Science News*."

The century ahead

Today, *Science News* is aggressively covering some of the biggest stories of our time, including rapid new developments in the COVID-19 pandemic and the global crisis of climate change. Reporters have their eyes on game-changing technologies across all fields, from gene-editing tools that could cure diseases to quantum computers that promise to perform feats of calculation impossible for normal computers (*SN: 12/21/19 & 1/4/20, p. 28*). But, true to form, the magazine also serves up the lighter side of science, explaining why wombats have cubed poop (*SN: 12/22/18 & 1/5/19, p. 4*) and what gravitational waves from a wormhole might look like (*SN: 8/29/20, p. 12*).

"I'd also love to see more stories that are dealing with the human condition," Ajmera says. She points to reporting by social sciences writer Sujata Gupta, who has covered research on police reform (*SN: 8/15/20, p. 10*) and how the pandemic has worsened some socioeconomic inequalities (*SN: 9/26/20, p. 5*). "How do we produce more stories that can really touch everyone's lives?" Ajmera asks. "I think we can do more."



This interactive online visualization lets people explore the first 50 cosmic smashups detected using gravitational waves.

Editor in chief Nancy Shute thinks so too. When Shute came to *Science News* in 2018, she says, "I thought it would be really important to expand our social sciences coverage to help people see how science could help them understand what's happening to them and what's happening to the world right now." Part of that was bringing on Gupta to cover social sciences.

But stories in other fields can elucidate people's personal connections to science, too. Shute is especially proud of a series that Tina Hesman Saey took on before the COVID-19 pandemic. "Genetic testing goes mainstream" explored the uses and limitations of direct-to-consumer DNA testing for medical information and tracing ancestry (*SN: 5/26/18, p. 20*).

"It was a great example of explanatory science journalism that people could really engage with, because it directly impacted their lives," Shute says. "That's a great example of the superb work that *Science News* can do." In fact, the series won a 2019 National Academies of Sciences, Engineering and Medicine Communications Award.

Shute also hopes to captivate more readers with new types of storytelling. For a century, the written word has been *Science News*' bread and butter. But that form has its limitations. "Online journalism is a visual medium," Shute says, "and it's really important that we invest more in that."

She would like to produce more data visualizations akin to one that *Science News* developed last year to illustrate every cosmic collision known to have kicked up gravitational waves (*SN: 1/30/21, p. 30*).

"It was so creative," Shute says. "Being able to do things like that, and give people another way to explore the science that's scientifically accurate but also incredibly fun and can deliver surprises, is just a joy."

That's really what science journalism is all about, says Laura Helmuth, who interned at *Science News* in 1999 and is now editor in chief of *Scientific American*. "The fundamental goal [is] making the most important research accessible and engaging and entertaining and fun to read," she says, which has been the purpose of *Science News* from the start. "I think that sticking with that principle has really been the reason it's survived and thrived."

In May 1921, just one month after Science Service was born, Ritter wrote a letter to his old pal Scripps. In it, Ritter expressed his optimism that Science Service's journalism would meet an eager audience. "Unquestionably there are aspects of science that appeal strongly to popular interest," he wrote. "There is much that is curiosity-satisfying, much that is practically useful, much that is dramatic."

Indeed, the last 100 years have revolutionized scientists' understanding of everything from the architecture of the atom to the size of the universe. Through it all, *Science News* has tried to shine light on as many corners of science as possible. It is, as Shute says, "everything you need to know about science, including things you didn't know you wanted to know." ■

Explore more

- Century of Science: www.sciencenews.org/century
- *Science News* videos: www.youtube.com/ScienceNewsMag

NADIEH BREMER

The Darkness in Our Past

Science News reckons with its past prejudices

CONTENT WARNING: This essay about aspects of *Science News*' history cites specific examples of racism, sexism and prejudice against members of the LGBTQ community and others.

In late 2019, with the 100th birthday of *Science News* a few years off, our staff considered how we might celebrate. We realized that inviting the world to explore the more than 80,000 original reports of advances in science, medicine and technology in our archive was an obvious choice.

Newspaper magnate Edward W. Scripps and zoologist William E. Ritter founded Science Service, the original name of the news organization, to provide accurate, engaging news of science to the public. "The success of democratic government as well as the prosperity of the individual may be said to depend upon the ability of the people to distinguish between real science and fake," wrote our founding editor Edwin Slosson in 1921.

But Science Service didn't always live up to those ideals. As we planned for our centennial, we knew that alongside stories chronicling great feats of science there would be articles that we now find horrifying. Through much of its early history, this organization widely shared, and in some cases endorsed, ideas that were racist, sexist, xenophobic and otherwise prejudiced, as well as supposedly "scientific" justifications for immoral and unethical behavior.

We are deeply sorry.

Other publications, universities and nonprofit organizations have recently reckoned with their pasts. Our own efforts to grapple with previous coverage turned up specific examples of racism, sexism and prejudice against members of the LGBTQ community and others in reporting from the 1920s through the 1960s. Though the examples discussed below will be hurtful to some readers, we believe doing better in the future requires an honest and transparent examination of our past.

Our most egregious failing was our supportive coverage of eugenics, a field of study and associated practices born from the false belief that humankind could be improved if only the people judged to have the most desirable traits were allowed to reproduce. Francis Galton, a British polymath who coined the term in the late 1800s, wrote that eugenics would "give to the more suitable races or strains of blood a better chance of prevailing speedily over the less suitable than they otherwise would have had."

Slosson and several of our founding board members were proponents of eugenics, which gained popularity in scientific communities in the United States in the early 1900s. But research of the day did not support the assertion that one group of people was genetically superior to another, and today's science outright refutes that assertion.

Eugenics was used to justify racial, ethnic and other forms of discrimination. It led to the forced sterilization of over 60,000 people in the United States, including immigrants, Black people, Indigenous people, people with disabilities, people in prisons and people facing poverty. It shaped immigration policies that kept Southern and Eastern Europeans out of the country for decades.

In the 1930s, Nazi Germany enlisted scientists and physicians to argue that society needed to be "cleansed" of people who posed a threat to its "genetic health." Eugenic theories shaped Nazi policies of persecution and so contributed to the murders of millions of people in the Holocaust.

Science News, previously named *Science News Letter*, often covered eugenics approvingly, especially during the 1920s and 1930s. Watson Davis, who served at Slosson's right hand, was director of Science Service from 1933 to 1966 and probably did more than anyone to shape editorial direction in our early decades; he was also on the board of the American Eugenics Society, a clear conflict of interest for a journalist.

In a 1922 article, Slosson equated population growth in districts in Great Britain that had overcrowding, poor education, high rates of death from tuberculosis and infant diseases with "evolution working backward" (*SN: 8/26/22, p. 5*). An article from 1924 quoted eugenicists advocating for "numerical limitation and careful selection of immigrants" (*SN: 1/19/24, p. 7*). Another from 1935 was headlined "Sterilization is urged to prevent blindness" (*SN: 4/27/35, p. 275*).

In the late 1930s, *Science News Letter* reported on how proponents of eugenics sought to distance themselves from sterilization policies aimed at specific social, economic and racial groups (*SN: 10/15/38, p. 247*). Yet this reporting included the disturbing passage: "On the average, it is found that those parents who provide the best home training for their children are also those with the best genetic stock." And a headline from 1940 read, "Eugenics seen as vital to future of democracy" (*SN: 9/14/40, p. 168*).

It's not as if eugenics didn't have critics at the time. Renowned anthropologist Franz Boas denounced it as early as 1916 and continued to do so throughout his career; he saw race as a social construct rather than a biological one. Anthropologist Ashley Montagu challenged what he called "the fallacy of race." Other scientists pointed out that people's living conditions played a major role in their health

and behavior — it was not just nature, but also nurture. *Science News* in some cases covered these ideas, but for the most part failed to recognize them (or report on them) as counterpoints to eugenics.

Uncritical coverage of eugenics in *Science News* picked up again in the late 1950s and 1960s, during a resurgence in eugenic ideas. In 1964, the magazine published an article by Frederick Osborn, chairman of the board of editors of the American Eugenics Society, who was leading the rebranding of eugenics as an effort aimed at "saving genes for superior ability wherever they are found" (*SN: 7/25/64, p. 54*).

Our early coverage was often racist, assumed white superiority and debased Indigenous cultures. An article from 1954 summarized the thoughts of one anthropologist, saying, "a Negro may have been black before he was a man" (*SN: 6/5/54, p. 362*). Another from 1925 was headlined "American children claimed more intelligent than Chinese" (*SN: 8/1/25, p. 8*). An article in 1921 on the coming popularity of the avocado described the raising of the fruit as a "white man's job" because it required "a high order of intelligence" (*SN: 7/18/21, p. 2*).

Coverage of women was focused primarily on their role as family caretaker. Issues of women's rights, reproductive health, welfare and education received comparatively little attention. In a 1924 article titled, "How women control the future," Slosson wrote that women's right to vote was insignificant in relation to the role women have in their families (*SN: 1/12/24, p. 6*).

Women were disparaged in other ways in our reporting. Headlines in particular were often patronizing or fed into existing stereotypes: "Women fatigue easily during first work days," for example (*SN: 5/8/43, p. 302*). A story headlined "Women's personalities do not depend on age" led with, "A middle-aged woman may not have the figure of a young lady, but her emotional make-up is essentially the same" (*SN: 8/31/63, p. 139*). An article from the 1960s quoted a source who blamed the issue of "No women in space" at least in part on the challenges of designing spacesuits for women, without any question or criticism (*SN: 10/8/60, p. 230*).

Our coverage of the LGBTQ community through much of the 1950s and 1960s failed to question science that perpetuated bias, including characterizing gay men as having a "pathological personality" (*SN: 4/15/67, p. 352*). We reported on psychotherapy that "cured" one gay man (*SN: 10/11/58, p. 230*). One headline read: "Homosexuals need help" (*SN: 2/13/65, p. 102*).

We were wrong in other ways. The same spirit of science boosterism that championed eugenics seems to have been behind enthusiasm for less sinister but still dangerous notions, including a 1945 article touting the use of the pesticide DDT in wall paint (*SN: 9/8/45, p. 147*), and one from 1964 suggesting the use of nuclear explosives to dig a new Panama Canal (*SN: 9/5/64, p. 149*). And, yes, in the late 1940s, we touted the marvels of asbestos-laden dish towels, and actually distributed them to readers (*SN: 9/25/48, p. 204*).

Hindsight is of course easy, and some historians will warn us against applying today's knowledge and perspectives to different times. With the exception of our 1960s eugenics coverage, our reporting was for the most part consistent with prevailing views among the people in power at the time. Yet we wish *Science News* had followed a different course. As journalists, we need to be skeptical and ask tough questions. It's humbling to see that *Science News* journalists a century ago got so much wrong, and it pushes us to strive to do better.

So we ask ourselves, what are our current biases? Where are the gaps in our coverage? When are we narrow-minded? Whose voices are we amplifying and whose experiences are we omitting?

We are taking action to address our shortcomings. We have prioritized increasing the diversity of our staff through hiring. Because staff turnover can be slow, we are also seeking out freelance writers from countries and communities historically underrepresented in our coverage, as well as editors from those communities, who help us identify potential biases in story selection and language use. For several years, our writers have been growing an effort to track source diversity, which expanded after the Black Lives Matter movement gained national attention. They are holding themselves accountable for interviewing and quoting scientists with a wide range of backgrounds, perspectives and experiences. And we are participating in staff training in diversity, equity and inclusion through the Poynter Institute and other organizations.

We are also looking to what science can tell us about bias, race and diversity. We increased coverage of the social sciences, including the challenges scientists face in defining race in the U.S. Census (*SN: 3/14/20, p. 16*), the negative effects of racism on physical and mental health and how scientists are trying to study racial bias in policing (*SN: 12/18/21 & 1/1/22, p. 10*). And we are reporting on how misinformation and disinformation about science warps people's understanding of crucial issues such as climate change and COVID-19 vaccines (*SN: 5/8/21 & 5/22/21, p. 22*).

Science will be key to building a safe and sustainable future for humankind and our planet. Though Slosson, our founding editor, didn't always live up to his own ideals, we endorse his statement from a century ago that the ability of people to understand science, and distinguish between real science and fake, is essential to society's success.

We know our efforts moving forward will be imperfect. We suspect if *Science News* survives another century, our future colleagues will look back on some of what we did with dismay. Yet we hope reckoning with our past, being transparent about what was terrible alongside what was great, will help us hold ourselves accountable today. And we ask our readers to hold us accountable as well.

— *The* Science News *Reckoning Team and senior staff*

The Brain in Search of Itself
Benjamin Ehrlich
FARRAR, STRAUS AND GIROUX, $35

BOOKSHELF

How a scientist-artist transformed our view of the brain

Spanish anatomist Santiago Ramón y Cajal is known as the father of modern neuroscience. Cajal was the first to see that the brain is built of discrete cells, the "butterflies of the soul," as he put it, that hold our memories, thoughts and emotions.

With the same unflinching scrutiny that Cajal applied to cells, biographer Benjamin Ehrlich examines Cajal's life. In *The Brain in Search of Itself*, Ehrlich sketches Cajal as he moved through his life, capturing moments both mundane and extraordinary.

Some of the portraits show Cajal as a young boy in the mid-19th century. He was born in the mountains of Spain. As a child, he yearned to be an artist despite his disapproving and domineering father. Other portraits show him as a barber-surgeon's apprentice, a deeply insecure bodybuilder, a writer of romance stories, a photographer and a military physician suffering from malaria in Cuba.

The book is meticulously researched and utterly comprehensive, covering the time before Cajal's birth to after his death in 1934 at age 82. Ehrlich pulls out significant moments that bring readers inside Cajal's mind through his own writings in journals and books. These glimpses help situate Cajal's scientific discoveries within the broader context of his life.

Arriving in a new town as a child, for instance, the young Cajal wore the wrong clothes and spoke the wrong dialect. Embarrassed, the sensitive child began to act out, fighting and bragging and skipping school. Around this time, Cajal developed an insatiable impulse to draw. "He scribbled constantly on every surface he could find — on scraps of paper and school textbooks, on gates, walls and doors — scrounging money to spend on paper and pencils, pausing on his jaunts through the countryside to sit on a hillside and sketch the scenery," Ehrlich writes.

Anatomist Santiago Ramón y Cajal, shown circa 1870, studied brain tissue under the microscope and saw intricate details of the cells that form the nervous system, observations that earned him a Nobel Prize.

S. RAMÓN Y CAJAL/WIKIMEDIA COMMONS

Cajal was always a deep observer, whether the subject was the stone wall in front of a church, an ant trying to make its way home or dazzlingly complicated brain tissue. He saw details that other people missed. This talent is what ultimately propelled him in the 1880s to his big discovery.

At the time, a prevailing concept of the brain, called the reticular theory, held that the tangle of brain fibers was one unitary whole organ, indivisible. Peering into a microscope at all sorts of nerve cells from all sorts of creatures, Cajal saw over and over again that these cells in fact had space between them, "free endings," as he put it. "Independent nerve cells were everywhere," Ehrlich writes. The brain, therefore, was made of many discrete cells, all with their own different shapes and jobs (*SN: 11/25/17, p. 32*).

Cajal's observations ultimately gained traction with other scientists and earned him the 1906 Nobel Prize in physiology or medicine. He shared the prize with Camillo Golgi, the Italian physician who developed a stain that marked cells, called the black reaction. Golgi was a staunch proponent of the reticular theory, putting him at odds with Cajal, who used the black reaction to show discrete cells' endings. The two men had not met before their trip to Stockholm to attend the awards ceremony.

Cajal and Golgi's irreconcilable ideas — and their hostility toward each other — came through clearly from speeches they gave after their prizes were awarded. "Whoever believed in the 'so-called' independence of nerve cells, [Golgi] sneered, had not observed the evidence closely enough," Ehrlich writes. The next day, Cajal countered with a precise, forceful rebuttal, detailing his work on "nearly all the organs of the nervous system and on a large number of zoological species." He added, "I have never [encountered] a single observed fact contrary to these assertions."

Cajal's fiercely defended insights came from careful observations, and his intuitive drawings of nerve cells did much to convince others that he was right *(SN: 2/27/21, p. 32*). But as the book makes clear, Cajal was not a mere automaton who copied exactly the object in front of him. Like any artist, he saw through the extraneous details of his subjects and captured their essence. "He did not copy images — he *created* them," Ehrlich writes. Cajal's insights "bear the unique stamp of his mind and his experience of the world in which he lived."

This biography draws a vivid picture of that world.
— *Laura Sanders*

A CELEBRATION OF 100 YEARS

SOCIETY FOR SCIENCE CENTENNIAL

Founded in April 1921 as Science Service by journalist Edward W. Scripps and zoologist William E. Ritter, our organization, today called Society for Science, is thrilled to be celebrating our centennial. In fact, the first issue of our magazine, known as *Science News-Letter* at the time, was published on March 13, 1922.

During our first century of service, the Society has published accurate, objective journalism in *Science News* magazine, advised government agencies, cultivated the nation's top science talent and ignited a passion for science in generations of students.

We invite you to learn more about the Society and our impact over the last century.

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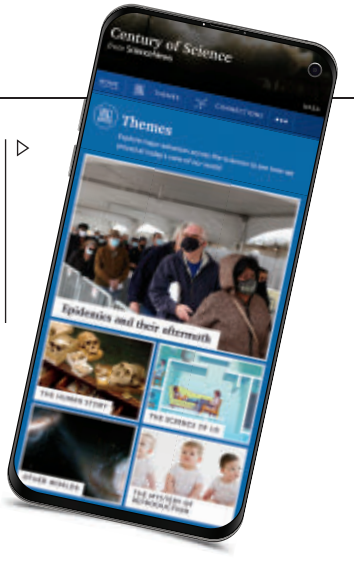

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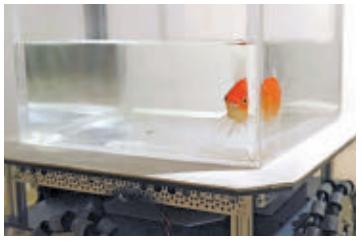
FEBRUARY 12, 2022

SOCIAL MEDIA

Lay of the land

Scientists taught goldfish to steer a motorized water tank (shown below), demonstrating that the creatures' sense of direction is not limited to their natural habitat, **Maria Temming** reported in "Goldfish drivers reveal navigation know-how" (*SN: 2/12/22, p. 4*). On Facebook, reader **Donna Meyer** quipped: "Two fish were in a tank, and the one turns to the other and says, 'Do you know how to drive this thing?' The answer is apparently, 'Yes. Yes, I do.' "



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Leaving microbes in the dust

Antimicrobial molecules in wood waste could be used to make more sustainable disinfectants, ***Carolyn Wilke*** *reported in "A disinfectant may get its oomph from sawdust"* (SN: 2/12/22, p. 5)*.*

Some readers wondered if the tree species or freshness of the wood waste affects the potency of the disinfectant.

In the study, the researchers used sawdust from birch wood. They did not look at the disinfecting effects of sawdust from different species of wood, **Wilke** says. But the team did examine disinfectants made from other forms of biomass, including bamboo powder, rice straw and corn straw.

Across the board, biomass with low levels of ash and high levels of lignocellulose, the matter that gives plants structure, may be preferable for killing microbes, says environmental engineer **Shicheng Zhang** of Fudan University in Shanghai. The freshness of the wood waste probably doesn't have a huge influence on the effectiveness of the resulting disinfectant, **Zhang** says. Sawdust from freshly cut trees and sawdust from wood processed later, such as wood used for construction, both have high lignocellulose content and similar other components.

Ancient kunga line

The earliest known hybrid animal bred by humans is the kunga, which existed around 4,500 years ago in Syro-Mesopotamia, ***Jake Buehler*** *reported in "Ancient equine was a human-made hybrid"* (SN: 2/12/22, p. 5)*.*

Reader **Anne Barschall** asked how researchers know that the kunga, a cross between a donkey and an Asiatic wild ass called a hemippe, was created by humans.

A couple of reasons point to the kunga being a human-made hybrid, says paleogeneticist **Eva-Maria Geigl** of Institut Jacques Monod in Paris. First, cuneiform tablets refer to a kunga production center in northern Syria. Second, if mating in the wild occurred between desert-dwelling male hemippes and domesticated female donkeys, then it would have been an exceedingly rare event. The donkey mothers would have stayed close to human civilization instead of roaming freely in the desert. There simply wouldn't have been enough wild mating happening to support the number of kungas in ancient records and that still exist as skeletal remains, **Geigl** says.

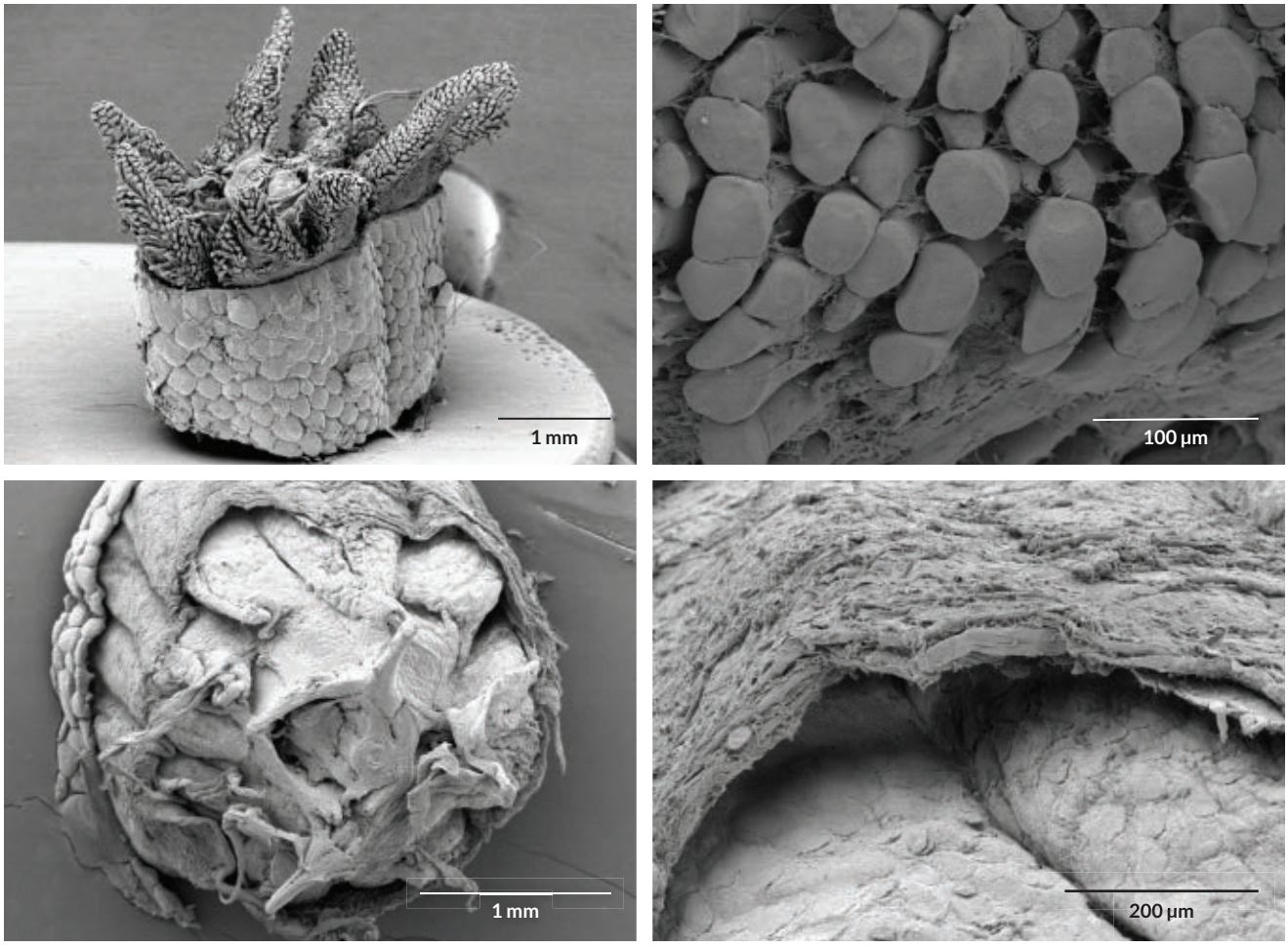
Frustrating physics

Quantum particles can feel the influence of gravitational fields they never touch, showing that a counterintuitive quantum phenomenon also applies to gravity, ***Emily Conover*** *reported in "Eerie quantum effect confirmed"* (SN: 2/12/22, p. 10)*.*

Quantum mechanics deals with the physics of the very small while general relativity, Einstein's theory of gravity, underpins physics on a macro scale. Reader **Stephen O'Rourke** could not conceive how these two disparate scientific fields can interact.

"There are plenty of cases in which these two fields interact," **Conover** says. "But the interactions are very difficult for researchers to measure with current technology."

For instance, everything with mass, no matter how small, has a gravitational field. That has led scientists to ask a seemingly simple question: What is the gravitational field of an atom that is in a quantum superposition, located in two places at once? "This is a question that scientists should be able to answer, but currently cannot," **Conover** says. "It is just one example of why physicists want to be able to combine the two fields."



How lizards keep detachable tails from falling off

A hierarchy of prongs, micropillars and nanopores may keep a lizard's detachable tail from separating accidentally.

A lizard's tail can break off between any of a series of segments, which fit together like plugs into sockets. A segment's prongs — eight wedge-shaped bundles of muscles arranged in a circle (above top left, as seen in a scanning electron microscope image) — fit neatly into matching sockets (bottom left) on the adjacent segment. Each prong is covered in a forest of protrusions, or micropillars, that resemble tiny mushrooms.

To uncover how this plug-and-socket system works, bioengineer Yong-Ak Song and colleagues analyzed broken lizard tails under the microscope. The tail "has to find just the right amount of attachment, so it doesn't come off easily. But it should also come off whenever it's needed," says Song, of New York University Abu Dhabi in the United Arab Emirates. The team expected to find that the micropillars (top right) hook into their corresponding socket, securing the segments like Velcro. Instead, the micropillars leave only slight imprints in the socket walls (bottom right), the team reports in the Feb. 18 *Science*. The micropillars — pockmarked with holes, or nanopores — didn't appear to provide any extra grip that would secure the tail to its owner.

Suspecting that the micropillars play another role, the team built a replica lizard tail from a rubbery silicone polymer. This model let the researchers examine the forces at work during a tail amputation. They found that the deep crevasses between micropillars, along with the nanopores on their surfaces, slow the spread of an initial fracture between two segments.

"If there's a crack coming in and it meets a pore, which is a void, then the crack is stopped," Song says. "It loses energy to propagate." Every indent and groove helps: Micropillars covered in nanopores enhanced adhesion up to nearly 15 times as much as smooth prongs without micropillars, and slightly more than prongs with micropillars but no nanopores. The hierarchical structure of prong, pillar and pore achieves a balance that Song describes as a beautiful example of the Goldilocks principle: not too tight, not too loose. — *Anna Gibbs*

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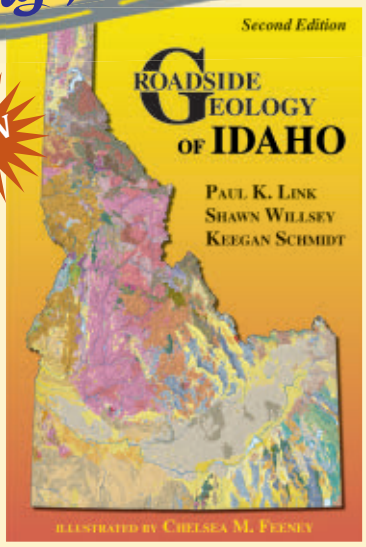

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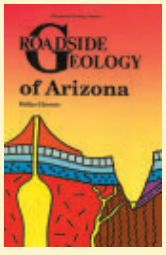

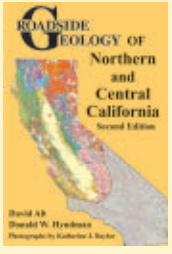

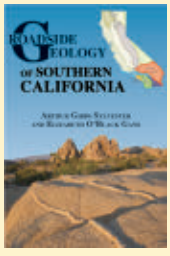

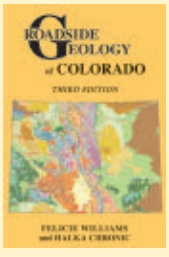

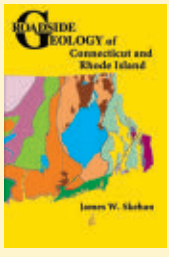

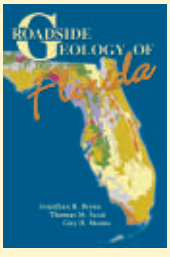

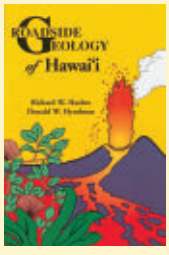

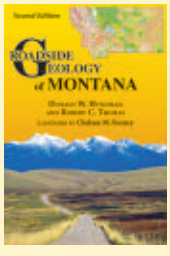

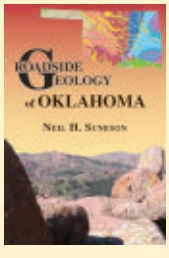

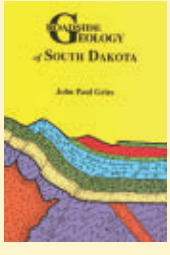

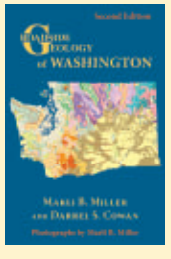

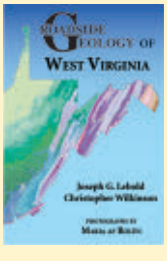

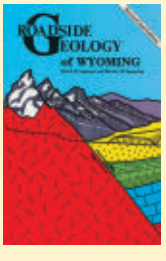

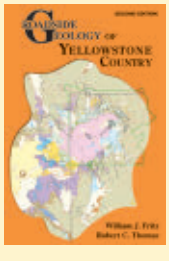

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