Saturday Citations: Volcano vs. asteroid; NASA's supernova time lapse; immortal chemicals

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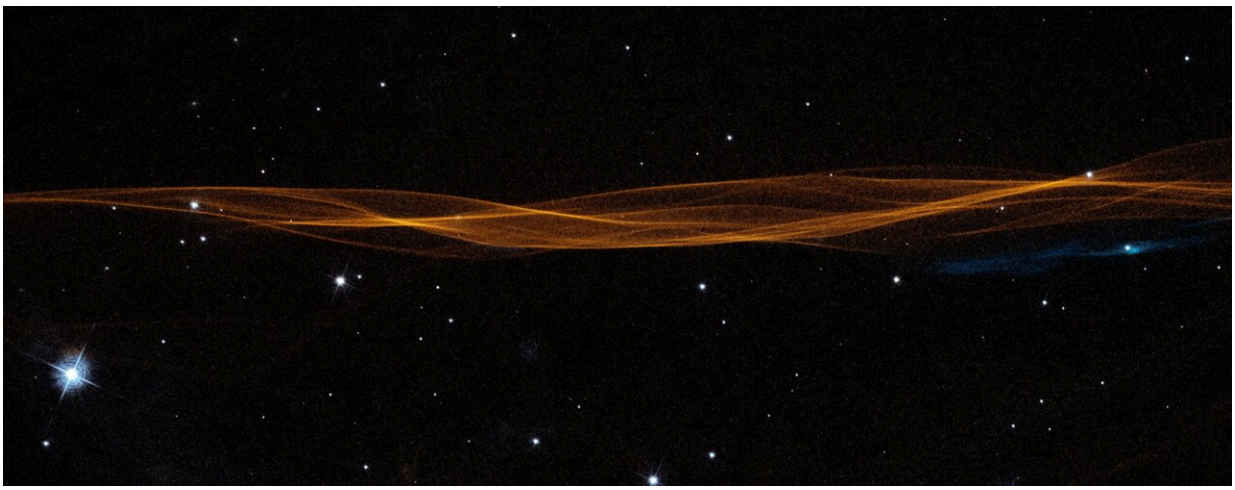

Matter from a 20,000-year-old supernova continues hurtling into space at a half-million miles per hour. Credit: NASA, ESA, Ravi Sankrit (STScI)

This week, we're highlighting a study involving toxic chemical contaminants, and just for fun, a second study involving other toxic chemical contaminants. But NASA made a cool time-lapse video using the good old Hubble space telescope, and a group of Italian demographers have a lot to say about the population-level consequences of lying.

Conclusion unbiased

Were dinosaurs wiped out by massive volcanic eruptions? Or the impact of a giant asteroid? Scientists have debated this issue for decades, and now, a group of Dartmouth researchers fed up with all the bickering decided to let an unbiased panel of computers take an unemotional, Spock-like approach to determining which of these apocalyptic scenarios was more likely.

The researchers developed a Bayesian inversion modeling method that analyzed a gigantic corpus of geological and climate data in reverse chronological order to pinpoint the likeliest cause of the Cretaceous-Paleogene extinction event. The system's processors used Markov Chain Monte Carlo machine learning to independently compare and recalculate conclusions to create a scenario matching the fossil record.

The result? Without the distorting influence of human bias, the model determined that an outpouring of gases from the enormous Deccan Traps shield volcano over a period of 300,000 years was enough to trigger the extinction event.

Consequences unforeseen

Bisphenol A, the chemical compound associated with absolutely crystalline plastic water bottles and also a range of endocrine-disruption impacts, is used in polycarbonates, the manufacture of epoxy resins, in thermal paper and PVC manufacturing. The first time I ever read about BPA was in 2007—my only other memory from that period is being surrounded by a lot of people wearing boot-cut jeans *without boots*.

Since then, there's been a lot of BPA-contaminated water under the bridge, and now, a new study reports that children with autism spectrum

disorder and attention deficit hyperactivity disorder tend to have a reduced ability to clear BPA from their systems; there has been a rise in diagnoses for both conditions over the decades, though it is unlikely to be attributable to a single cause.

Decontamination noisy

Speaking of toxic "forever chemicals," researchers at The Ohio State University report a new technique with potential to treat PFAS toxins in contaminated groundwater. In the 20th century, these robust, durable compounds gave us nonstick cookware, industrial foams, stain-resistant carpet, and also higher rates of testicular, bladder and kidney cancer, weakened response to vaccines, and birth defects.

And they hang around the environment without degrading, essentially forever, the Paul Rudds of chemical contamination. The researchers used ultrasound degradation over a three-hour period to weaken the chemical bonds in compounds called fluortelomer sulfonates, which are commonly used in firefighting foams. They note that the same technique could also degrade pharmaceuticals in municipal tap and wastewater.

Explosion ongoing

This week, NASA released time-lapse footage of stellar remnants hurtling into space after a star exploded 20,000 years ago. Astronomers used the Hubble Space Telescope to zoom in on a tiny area of the Cygnus Loop nebula to observe a portion of the leading edge of the supernova bubble's expansion.

By capturing successive images of this tiny region over 19 years, from 2001 to 2020, they assembled a time lapse of the continuing explosion, revealing that the shreds of the star are hurtling into space at a half-

million miles per hour.

Liartown corrupt

Social science researchers have reported a newly discovered phenomenon called "honesty drain," in which honest people tend to migrate away from areas where cheating is widespread. This creates a kind of duplicity doom loop in which areas experiencing severe honesty drain also experience a lower-quality political class, lower scores of earning growth, and reduced labor productivity.

Demographers use false birth registrations as a measure of regional honesty; In Italy, many parents of children born in December falsify birth certificates, creating an increase in January birth registrations. Citizens who migrate from a high-cheating area to a low-cheating area are far less likely to have a false birth certificate.

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