

Saturday Citations: Bulking tips for black holes; microbes influence drinking; new dinosaur just dropped

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Reconstruction of Lokiceratops in the 78-million-year-old swamps of northern Montana, as two Probrachylophosaurus move past in the background. Credit: Fabrizio Lavezzi

What did scientists do this week? Exactly four things, all of which are summarized below.

'This sweet baby can hold 4.3 million suns'

Supermassive black holes: How do they get so huge? This simple question is way more complicated than it sounds. Science is exasperating. But an international team of astronomers may have found an answer. In the relatively nearby galaxy ESO320-G030, which surrounds a supermassive black hole, they discovered a [powerful, rotating magnetic wind](#).

They chose the galaxy for observation because it's highly active, forming [new stars](#) at a rate 10 times faster than our own galaxy, and it is therefore highly luminous in the infrared, making it possible to capture details in the center of the galaxy otherwise obscured by visible light and clouds of dust.

Using ALMA, they peered through the surrounding dust to zoom in on the dense gas around the black hole. They could discern patterns in the gas that strongly suggest the presence of a rotating, magnetized wind. By contrast with other kinds of winds and jets, which tend to blast matter away from supermassive [black holes](#), the magnetic wind can feed material into the black hole, enlarging it over time. The researchers say the process is analogous to the way baby stars accrete matter, though on a much larger scale.

Microbe temperance league

Binge drinking is generally defined as the consumption of a large quantity of alcohol in a short period of time, leading to a [blood alcohol concentration](#) of .08% or higher. Binge drinking behavior has short-term health risks, but also carries an increased risk of [alcohol use disorder](#) later in life. Although young people have reported decreased [illicit drug](#) and alcohol consumption in recent years, researchers find that many young people regularly [binge drink](#).

Current supports for alcohol use disorder are mainly through interventions like therapy and peer-led mutual aid groups like Alcoholics Anonymous, as there are few approved drugs available; researchers are interested in developing new and more effective pharmaceutical treatments.

A team at the University of Connecticut School of Medicine reports that [binge drinkers have different patterns of microbiota](#) in their guts than nondrinkers; their gut micro-organisms also produce a different mix of short-chain fatty acids, associated with the fermentation of undigested dietary fiber and protein. They theorized that the microbiome could influence drinking behaviors.

Using mice bred to express binge drinking behavior, the researchers explored whether changes in diet exerted influence in drinking patterns. Mice were allowed to drink alcohol at night over four nights, and over the course of the experiment, were fed different types of short-chain [fatty acids](#) with their feed for 10 days. The researchers found that increasing valeric acid in their feed corresponded to a 40% reduction in alcohol consumption in the engineered mice.

"Multiple mechanisms are likely at play in how valerate reduces drinking," says UConn School of Medicine microbiome scientist Yanjiao Zhou. "But the impact of this microbial metabolite on brain epigenetics can be quite powerful in regulating drinking behaviors."

When 3.14 isn't good enough

A team of researchers at the Indian Institute of Science modeling high-energy particle interactions accidentally discovered [a new series representation for pi](#). Because these interactions involve so

many parameters, one of the researchers was tasked with optimization. Using the Feynman diagram, a mathematical representation of energy exchange during particle interaction and scattering, and the Euler-Beta function, they succeeded in optimizing their model of particle interactions but also produced a new series representation of pi combining specific parameters such that researchers can quickly arrive at the value of pi, which can then be incorporated into calculations.

"Our efforts, initially, were never to find a way to look at pi. All we were doing was studying high-energy physics in quantum theory and trying to develop a model with fewer and more accurate parameters to understand how particles interact. We were excited when we got a new way to look at pi," says Aninda Sinha, professor at the Center for High Energy Physics.

New dinosaur just dropped

A multi-institutional team of paleontologists reports the [discovery](#) of a new plant-eating dinosaur in northern Montana with a spectacular, frilled array of horns resembling the headdress worn by Loki the trickster god in the Marvel Cinematic Universe. And since the specimen is now housed in Denmark, the researchers went ahead and called it *Lokiceratops rangiformis*. The fossilized bones were discovered in 2019, two miles south of the Canadian border.

After assembling the fragments of the skull, Colorado State University researcher Joseph Sertich and University of Utah Professor Mark Loewen realized they had discovered a new species. *Lokiceratops* lived about 78 million years ago; the same rock layer yielded remains of four other species, indicating that they had all lived at the same time. They estimate that *Lokiceratops* was 22 feet long and weighed in at 11,000 pounds, making it the largest of the

centrosaurine horned dinosaurs in North America.

"This new dinosaur pushes the envelope on bizarre ceratopsian headgear, sporting the largest frill horns ever seen in a ceratopsian," Sertich said.

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