

Saturday Citations: Ancient corvids, tetraquarks, and researchers who aren't bored hearing about your dreams

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Opening of the LHCb detector in 2018. Credit: CERN, LHCb Collaboration.

This week, researchers reported on two-dimensional gold sheets, a tidy little meson made of four quarks (and its buddy!) and a big and almost

unimaginably dense exoplanet with an exciting backstory.

Gold malleable: Goldbeating, the ancient practice of pounding gold into delicate leaves, has applications in art, fancy, gilded desserts and disgusting cinnamon schnapps from Switzerland. None of these are "inexpensive" or "practical," but when you have a precious metal as malleable as gold, you look around for a hammer and make up reasons later. Scientists at the University of Southern Florida have now [pounded gold at the nanoscale](#)—so thin that it can no longer reasonably contain all three dimensions. Specifically, their process entails transforming 0D and 1D gold nanoparticles into anisotropic 2D leaves of [gold](#), and they say their achievement could advance the understanding of nanoscale metallic deformation and is applicable to other, perhaps less fancy, materials.

Tetraquark looked at: The Large Hadron Collider is a big hoop below the France-Switzerland border that smashes beams of protons or heavy ions together, scattering their subatomic constituents inside detectors, basically in order to reduce theoretical uncertainties related to understanding the strong force and develop new physics beyond the standard model. The good old LHCb experiment has produced the [first observations of a charged tetraquark and its straight-faced, neutral partner](#). Tetraquarks are particles made of four quarks. Like a lot of subatomic structures, tetraquarks were previously only theorized to exist based on quantum chromodynamics, which describes the strong interaction between quarks. The researchers focused their study on symmetries, specifically isospin, which relates the two observed particles by identical mass and width.

Bird notable: Ravens are big corvids, a family of birds notable for high intelligence, sociability, the use of tools and for inspiring the work of goths, gothic poets and heavy metal musicians. A team of researchers recently reviewed fossilized [Pleistocene-era raven bones](#) unearthed 30 years ago at a site in western Beijing with the extremely metal name

Dragon Bone Hill. The site has yielded thousands of [animal fossils](#), as well as the earliest human fossils in China, notably Homo erectus and Homo sapiens. These contemporaneous raven bones are an excellent indication that the association of corvids and humans is ancient. The researchers compared the fossilized bones to bones of living species of ravens and crows, as well as other extinct species; specific anatomical features suggest that the fossils are northern ravens.

Exoplanet substantial: Think of the most dense thing that comes to mind, like Thomas Pynchon's "Gravity's Rainbow." Now imagine a book with 10 times the density of 10 "Gravity's Rainbows." That's pretty much as dense as a Neptune-sized exoplanet reported by researchers at the University of Rome Tor Vergata and the University of Bristol.

[TOI-1853b](#), twice as dense as any similarly sized planet, contains a much larger fraction of rocky material than planetary models would predict; with the equivalent density of steel, it basically makes Earth look like a ball of foam. The researchers account for its unexpected composition with a theorized, extremely energetic collision between two planetary bodies—according to their modeling, it could only have formed if the original planetary body was water-rich and experienced an extreme giant impact at a speed greater than 75 kilometers per second.

Dreams utilitarian: The fact that dreams are sensory and immersive and also quickly forgotten is pretty hilarious. One moment you're in a tank full of sharks or running away from a clown with chicken feet, and two minutes later, you're brushing your teeth as though you hadn't just experienced what would otherwise be the most strange and terrifying trauma of your life. But researchers at the University of Notre Dame [report](#) that drawing connections between your dreams and your waking life can alter your approach and attitude at work. According to the study, making meaningful connections between dreams and life events can yield a sense of awe, an [emotional experience](#) often associated with nature, the cosmos and Terrence Malick films. Key to making these

connections is writing down dream experiences or their essential components before forgetting them. Study participants reported that carrying this sense of awe into the workplace framed everyday experiences within a greater perspective, which influenced their productivity.

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