



**A little science...A touch of fiction...
A lot of adventure...**

News from the Den

Before we embark on another summary of science news, head on over to npr's playlist and take a listen to the start of what will be the slowest piece of music ever played—John Cage's Organ2/ASLSP. [Listen here.](#)

ASLSP is a request by the composer to play the piece 'as slowly as possible'. After Cage's death in 1992, a collection of music scholars, professors and theologians came together to determine what this instruction meant for an organist. It was decided the piece would be played on an organ built in an abandoned 11th century chapel within Burchardi Church in Halsberstadt, Germany. The 'recital' began on 5 September 2001 and is scheduled to take 639 years to complete.

The 639 years commemorate the time between the construction of the first Gothic organ in 1361 and the beginning of the new millennium in the year 2000. A wood-framed organ was built for the performance and the project begun. As notes change (they have changed 16 times so far) pipes are added and deleted as needed. It was decided an organist couldn't sit at the organ for that length of time, so small sandbags are used to hold the keys down. For the first 17 months, all one heard was air moving through the bellows to the organ. This represented the opening pause in the piece.

This all may seem like a ridiculous venture for those of us caught up in the rush of 'instant gratification'. But, it's a reminder to take a moment to breathe, to relish in the world around us and the amazing discoveries and creations afforded us. And we have to admit when John Cage's most famous piece #4'33, where performers sit silently for four minutes and thirty-three seconds, the meditation 'om' comes to front of mind. So, lets all take a moment and breathe, leave this crazy world for a bit or the 335,858,400 minutes needed for this piece of organ music, to just—be.

Latest and Greatest Science News

Sunday, 11 February 2024, the National Football League hosted the 58th Super Bowl between the Kansas City Chiefs and the San Francisco 49's. Apologies to our non-American readers, I fully acknowledge and accept 'football' is another game all together and shouldn't be confused with American football. We know you are saying 'this doesn't sound very scientific' but, please be patient. Footie notwithstanding, American football and its use of an oblate spheroidal ball present some interesting quandaries to physicists.

A perfectly thrown spiral pass from the quarterback to the receiver is a thing of beauty and not an easy physical accomplishment. To a physicist it appears to break Newtonian laws of physics. A ball thrown with its nose initially pointing upward, should not change orientation mid-flight into a nose down orientation. It should remain in the nose-up orientation throughout its flight. (Sometimes this happens with a pass, you get a wobbler or 'duck' where the nose doesn't turn over). Not so with the perfect spiral pass—why? Two physical properties: gravity and angular momentum.

We all understand gravity—throw a round ball in a straight line, it starts out straight and then it arcs downward to the ground. Gravity pushes the ball down, toward the center of mass of the Earth. But momentum, what's that? Imagine a passenger in a car. What happens when the driver slams on the brakes? The passenger is thrown forward against the seatbelt. The car is slowing but the passenger is still moving forward at the car's original rate of speed—that's linear momentum and the reason seatbelts are important.

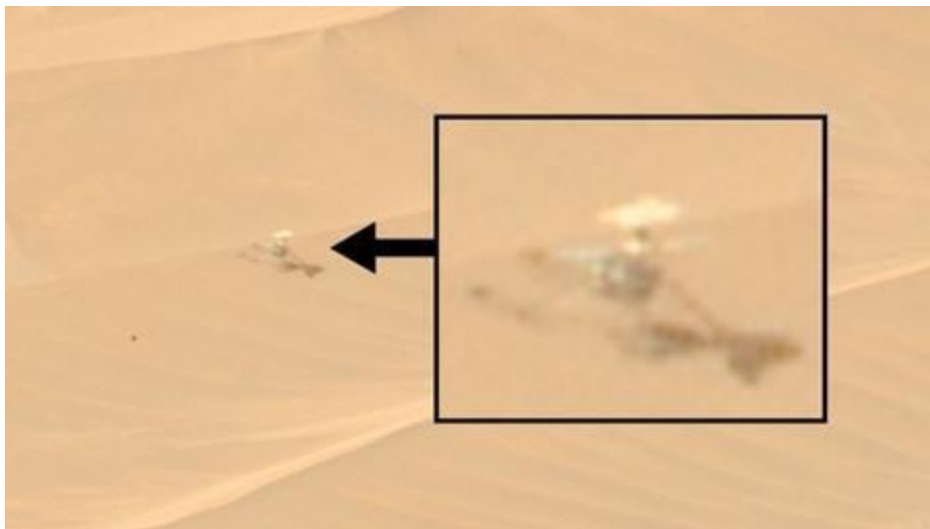
Angular momentum is generated when a massive object is spinning, for example: in an ice skater's spin or a spinning top or the rotating Earth. When the quarterback throws the football, he aligns his fingers on the ball's laces and snaps his wrist as his arm comes forward. His forward moving arm generates velocity and accelerates the ball forward. The wrist snap imparts rotation on the ball as his fingers release the ball off the laces, creating a spin about the ball's longitudinal axis as it travels through the air. Think of a top spinning on its side.

But what causes the nose to drop down? The effect of air resistance on the spinning ball where laces are on one side only. Air resistance causes drag and the ball's velocity to slow along the side with the laces. This imparts a wobble on the ball as it spins about its axis. This wobble or precession combined with gravity will slow the spin and eventually push the nose of the ball down. Hopefully, into the arms of the intended receiver, and not the defensive back.

Whether you were a Niners or Chiefs fan, physics ultimately ruled the day and controlled each of the 58 total completions out of the 85 total attempts in the 5 quarters played.

[More Physics Here:](#)

Photo of the Month - A Broken Dream



Ingenuity - Somewhere in the Jezero Crater, Mars IMAGE Credits: NASA/JPL/CalTech



In Memoriam - Ingenuity

On 18 February 2021 the NASA Mars Rover Perseverance successfully landed on the Red Planet. On board, it carried a 19 inch tall, 4 pound passenger. The passenger—a solar powered helicopter—Ingenuity. This autonomous craft was designed with four rotors and carried flight computers, navigation sensors and two cameras; not to mention batteries and internal heaters. All of its components shrunk to a size and weight capable of being carried by this little vehicle, whose counter-rotating rotors would spin at more than 2400 rpm. If all went as NASA planned, and Ingenuity's rotors could create lift in the thin Martian atmosphere (less than 1% Earth's), the craft was to make five flights across the Jezero crater in 30 days. But this is the little 'copter that could. Ingenuity completed 72 flights and covered more than 17 kilometers, scouting routes for Perseverance in more than 2 hours of total flight time. All came to an end on 18 January 2024, when a crash landing broke one of its rotors. Though Ingenuity will fly no more across the red sands of Mars, its success has laid the groundwork for bigger helicopters. Perhaps, ones large enough to pick up the samples Perseverance is collecting.

Historical Foundations - The British Library Saga Continues

Last month I shared news of the heinous cyberattack on the British Library. Currently, the Library's confidential databases and files, with its staff and user private information is listed for sale on the dark web for US \$800,000. But, this is just the tip of the iceberg. More research and educational institutes, libraries, and museums are under attack. The Berlin Natural History Museum was also hit in October 2023. Since 1988, more than 58 such attacks on key research and educational institutions have occurred. Though the BL hosts some of the most advanced IT expertise in the UK (UK National Research Centre for AI and the Alan Turing Institute) it was not protected from attack. Currently, the cost to recover data, recreate databases and shore up its firewalls is in excess of £7mil (\$7.5million). Funds the BL does not have. Who should pay? The BL is the UK's national library and the repository to invaluable research data for ongoing and future projects worldwide. The UK government is not stepping up to protect this asset. The increasing threat and reality of cyberattacks should be a warning to governments worldwide, they must support their institutions in times of crises. [The Incident:](#) and [Read More:](#)

Book of the Month - *The Einsteinian Revolution* Jurgen Renn and Hancock Gutfreund

Last month and in other issues, we spoke about how science is built on the discoveries of those that came before. In this historical account of the iconic physicist's theories, the authors place Einstein's work within the context of scientific philosophy—his work representing a paradigm shift in thinking. The physicist recognized the problems within mechanics, thermodynamics and electromagnetism were not independent areas of research, but interrelated. Einstein applied a deductive approach to these problems in each field and crossed the boundaries between to meld them together. Einstein always argued science progressed cumulatively, through evolution. This book offers a unique view of Einstein's *annus mirabilis* in 1905 through his Nobel in 1922 for photoelectric effect. (NOTE: Einstein never won a Nobel for the Theories of Special or General Relativity) Though a bit of a slog at times, its is a unique review of this genius's thinking processes. [Available Here:](#)

Minutiae

In our next issue, we'll go on a journey around our space neighborhood and explore the happenings within our Solar System. Review the results of the OSIRIS-REx samples returned to Earth, now that the sample capsule has been successfully opened. And prepare for the next major solar system event—a total solar eclipse which will cross the US on 8 April 2024 and how citizen-scientists will help NASA study this rare event. The following total eclipse in the US will not occur until 23 August 2044. And discover when we stop having solar eclipses ever again and why.

Have a wonderful month. Be well, be kind. CA



keep being curious

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