



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

News from the Den

As 2023 slides into the past, all of us in the Den wish you the best for the New Year. We were all set to release a newsletter all about cats and their amazing abilities. But then, the 'Best of Science of 2023' was release by the Association for the Advancement of Science and Nature. And given their choices we couldn't pass up a chance to disagree.

Latest and Greatest - The Best Science of 2023

These two venerable organizations chose the same 'Best' but overlooked a number of amazing discoveries and advancements—some of which we've covered in the last nine newsletters. So in deference to AAAS and *Nature*—here are our picks for the best of 2023.

1. **James Webb Space Telescope and the oldest Population III stars.** These denizens of the early universe (formed ~350,000 years after the Big Bang) were giants (100,000 times to size of our sun). A population III star would fill our solar system. They contained hydrogen and helium gravitationally-scooped up from the primordial gas clouds. They glowed a bright blue and burned at over 100,000 degK (90,000 degrees Kelvin higher than Sol). They contained no metals or heavier atoms and died a young and violent death. Until this year they were a hypothetical construct, now we have found them using a technique called gravitational lensing using the JWST. ([read more](#)) Gravitational lensing was quantified in 1936 by Einstein. He hypothesized the gravity well of a massive body would warp spacetime and cause light to 'bend around' the massive body. This bending allows us to 'see' the distorted light from distant objects like looking through a telescope the objects would appear closer. Some even too far away can be analyzed with the magnifying effect of the gravity lens.
2. **CRISPR-Cas9 Gene editing therapy approved for the treatment of Sickle Cell Disease.** A single mutation on one gene within the β -globin chain. Sickle cell disease cause the red blood cells to morph from round blob shapes to a sickle shape. This deformation causes severe pain, stroke, organ damage and early death. The CRISPR-Cas9 process will 'snip-out' the mutated gene and substitute the corrected genetic sequence. Because this is a single genomic mutation, then substitute the correct sequence. This will occur without or with limited side effects. Using gene editing for other genomic diseases which occur due to multiple gene mutations would be more difficult but are the target of current investigations.
3. **IBM's Condor 1000Qubit Quantum Chip.** The ability to perform computations beyond the reach of classical digital computers are the goal of quantum computers. ([read more](#)) These computers use quantum mechanical phenomena - superposition and entanglement. National governments and financial institutions are heavily invested in the development of error-free quantum computing as a way to break encryption codes as well as a way to develop unbreakable encryption. I never thought my iPad or MacBook Pro would be considered 'classical'.
4. **AI.** The free, unregulated availability of chatGPT and BARD have caused a tsunami throughout educational systems, political forums and elections, the media and scientific publications. The

number of papers submitted for publication under further review for use of AI has risen to 39%. More than 10,000 research papers were retracted in 2023. 3 of 4 companies (regardless of size) plan to use AI in the next 12 months. But without regulation or simple guidelines, where will AI take us?

5. **COP28 Climate Summit.** COP28 is the latest in a string of climate summits which have occurred over the last 30 years. Starting in Rio in 1992 through Berlin, Kyoto, Buenos Aires, Bali, Copenhagen, Cancun, Durban, Paris, Glasgow, and now Dubai. The world has met to discuss and mandate climate changes needed to slow global warming. ([read more](#)) COP28 is the most recent and the first to seriously address the role of fossil fuels. Is it enough? Is it soon enough? It is clear that fossil fuels must go, but is this enough after the warmest year on record? Read a summary of this historic summit [here](#). \$700 million was pledged to support countries most affected. A reduction of consumption and production of fossil fuels by 2025 was proposed and signed. Regardless, the world will overshoot the 1.5degC goal. [Read more](#).
6. **Energy conserving fusion reactions.** Not once, not twice, not three times but four! That's the number of successful ignitions Dr. Annie Kritcher and her team at the US National Ignition Facility achieved fusion reactions that produced more energy than they consumed. 192 laser beams were aimed at a pellet of deuterium and tritium, consuming 2.05 meg-joules of energy. They compressed the atoms and produced a fusion implosion which released 3.88 mega-joules of fusion energy. That's a net gain of 1.83 mega-joules. [Read more](#).

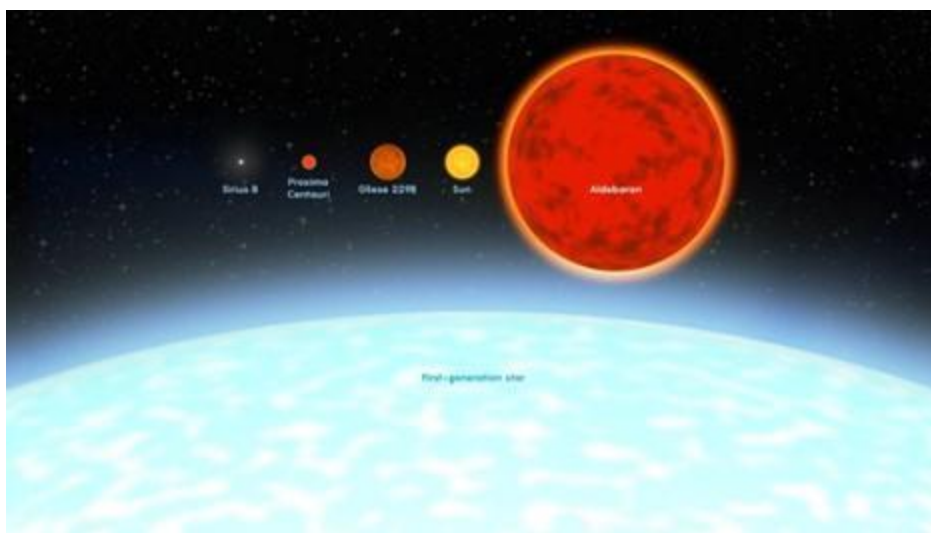
Okay, so that's my soap-box summary of 2023 in the world of science.

Both *Science* and *Nature* chose to ignore these amazing developments/discoveries which may have significant impact on our futures for the development of glucagon like peptide-1 (GLP-1) as the breakthrough of the year. Recognizing obesity as a global health crises, the advent of Ozempic and Wegovy and their use for obesity was their number 1 science breakthrough of 2023. [Read more](#).

What do we have to look forward to in 2024:

1. The launch of NASA's Europa Clipper. The mission is to fly by Europa (one of Jupiter's moons) and study the availability of water and its possible habitability.
2. Several missions are scheduled to depart for the Moon. China's Chang'e 6 mission to the moon will land, retrieve samples and return to Earth.
3. Return of scientific data from the European Space Agency's Euclid space telescope. This observatory is orbiting at LaGrange point 2 along side the James Webb. It will investigate the heavens using different parts of the light spectrum from Webb.
4. Weaponized mosquitoes to combat malaria. And the release and distribution of the newest malaria vaccines.
5. Generative AI and the advance of increased computing power. And datafication or the transformation of data into our everyday lives to simplify human tasks

Photo of the Month - Population III Stars



Credit: Merrill Sherman/Quanta Magazine

In 1944, Walter Baade categorized the stars within the near-Milky Way galaxy based on metal content and color. Blue-white stars burn hotter and have low metal content. Yellow stars (like Sol) burn cooler and have high-metal content in their cores and are younger (NOTE: astrophysics classifies all elements heavier than helium as a metal). Blue stars were grouped in Population I, whereas yellow in Population II. Then in 1965, the make-up of the first stars were hypothesized and placed in Population III. These super massive hydrogen-based stars burned brightly and emitted a strong blue-white light with short lives.

In Memoriam - Dr. Sufyan Tayeh

Dr. Tayeh, physicist and mathematician, head of the Department of Physics, UNESCO Chair for Physical, Astrophysical and Space Science, died 2 December in an Israeli airstrike on the Gaza Strip. He was 52.

Historical Foundations - Stars in Her Eyes - Dr. Sthabile Kolwa

Dr. Kolwa earned her doctorate from Ludwig Maximilian University in Munich Germany. She became intrigued with black holes at the age of 12 and fulfilled her dream of 'seeing' a black hole in 2019 as part of the team of astronomers who took a photo of the black hole in the heart of the M87 galaxy. M87* is a black hole 27,000 light years from Sagittarius A*, the supermassive black hole in the center of our galaxy. M87* was imaged using the Event Horizon Telescope Collaboration. This collaboration synced a network of radio telescopes from around the world. Now Dr. Kolwa is using the MeerKAT array of 64-linked radio telescopes located in the South Africa's Karoo desert to categorize black holes across the galaxy. [Read more.](#)

Video of the Month - When Earth was a Snowball

This seasonally-appropriate video tells an amazing story of how geologists pieced together worldwide geologic observations and came up with a picture of Earth 700 million years ago. Enjoy the video with a cup of hot cocoa. It can be viewed on Amazon as PBS Ancient Earth, Season 1, episode 2.

Minutiae

This is the time of year of snowflakes, candy canes, fantasy fudge and frost bitten toes, if you live in the northern hemisphere. Its sunlit beaches, shrimp on the barbie, and cold Fosters for our southern hemisphere subscribers. One of the coolest animals (no pun intended) this time of year are reindeer. Whether you believe in Rudolph and the flying kind or simply the ones that inhabit the northern reaches of Lapland, these animals exhibit numerous wondrous traits (flying notwithstanding)—they sleep while they chew, a time saving strategy for survival in tough conditions. But have you ever wondered how an animal can find food in the dark of a polar winter above the Arctic Circle at -45degC temperatures? They change their eye color! Their eyes are brown in the spring and summer months and gradually change to blue in the fall. Blue eyes allow them to ‘see’ farther into the ultraviolet spectrum. Their primary food source—tundra reindeer moss—emit an ultraviolet aura in the dark. Blue eyes allow these amazing reindeer to more easily ‘see’ their food in the dark and below a layer of snow! Totally awesome!

Next month we will explore another amazing animal. Cats, our wonderful companions.

May the joy of the New Year be with you and the amazing discoveries of science thrill you in 2024. Be well, stay warm (or cool), be kind. CA



keep being curious

CA Farlow | ©Copyright 2023 | All Rights Reserved

Changed your mind? You can [unsubscribe](#) at any time.

[Manage](#) your preferences | [Opt Out](#) using TrueRemove™

Got this as a forward? [Sign up](#) to receive our future emails.

View this email [online](#).

10902 Snow Cloud Trail | Littleton, CO 80125 US

This email was sent to .

To continue receiving our emails, add us to your address book.

[Subscribe](#) to our email list.