



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

News from the Den

What a show! The total solar eclipse on 8 April provide an amazing view for the public and scientists alike. If you were fortunate enough to live within or travel to the path of totality - good on you! I had several friends who did travel to Arkansas and they had a once-in-a-lifetime experience. They reported back with their observations: 1) the temperature fell more than 12degF, 2) birds stopped singing, and 3) the darkness was profound and startling. Scientists have collected an immense amount of data, made even better due to the sun being at solar maximum. Here in the central Rockies we experienced 65% totality. And although I did not notice any changes in animal behavior, I did experience a 6degF drop in temperature and the quality of the light changed: colors faded a bit and the change in the wavelength of light seemed to smear images making objects less sharp. One can easily see how ancient people would be so impacted by this solar event. The next total solar eclipse in the United States will be on 23 August 2044. In the next decade, there will be seven total solar eclipses. Head to Iceland on 12 August 2026 for the two minute and 18 seconds of totality.

Our subscribers, who have traveled along on this science journey, know a bit about me: coffee, cats and all things science are pleasures. So let's learn a bit about one of my pleasures (?vices): arabica beans. Whether it's an espresso, a cappuccino, or just a cup of joe, the coffee in your drink of choice is over 600,000 years old. That's correct, 600,000 years. Through a process of natural cross-breeding (two coffee plants interbred without the intervention of humans) to create the genius and species: *Coffea arabica*. Originating in Ethiopia, arabica was first roasted and brewed in the 1400's. Known for its smooth, rich flavor, arabica makes up 70% of the world's coffee. The other 30% is made up of one of the parent species *Coffea canephora*, a bitter robusta. Published in *Nature Genetics*, the researchers studied 30 different arabica plants and samples from the 1700's courtesy of the Natural History Museum, London. Results show, *Coffea arabica* is a highly specialized species and thus, susceptible to disease due to the genetic variation limitations. Coffee is a multi-billion dollar crop and understanding its origin and evolution will allow growers to selectively breed more disease-resistant plants. So, when you raise your cup remember where the bean came from and how amazing this organic suspension we enjoy is. [Drink Up Some More Here](#)

Latest and Greatest Science News

Are you right- or left-handed? Being the right-handed outlier in my family (you know the one, who had to sit on the corner during family dinners to not bump elbows with your neighbor) I found an article in *Nature Communications* fascinating. Over 90% of the human population is right-handed (I guess this proves my family is weird, if I'm the only righty). So most times, its the lefty who sits at the corner as odd person out or has to have special left-handed golf clubs or is prized by baseball teams for batting from the other side of the plate. Researchers at the Max Planck Institute studied 350,000 individual genetic records in search of clues to 'handedness'. It appears differences in parts of our DNA, those which control proteins, impacted embryonic development of the brain and resulted in hemisphere differentiation and determines our right-brain, left-brain behaviors. Behaviors like: which side of the mouth do you chew your food, which way do you lean when hugging someone, or which way do you tilt

your head to kiss another, and most important which of your hands is dominate. The genetic variants in the protein coding gene *TUBB4B* is 2.7 times more common in left-handed individuals. Go lefties! [Right or Left? Learn more here](#)

Thinking about left- and right-handedness leads to our Word of the Month — **Enantiomers**. Look at your hands, they're alike but not. They can't be superimposed, but they are mirror images of one another. Many biological molecules — sugars, amino acids and even DNA — occur in mirror image pairs. This mirror image concept is known as chirality in chemistry. But chemists are hampered in studies because it is not easy to determine which of the pair one is working with, regardless of left or right pair, the molecules are chemically identical. But drug companies wrestle with this problem daily, as one of the pair will impart medical benefits and the other will not. Humans may be able to synthesize (digest and utilize) one of the pair but not the other. Even though chemically each of the pair is identical. So how do chemists tell them apart, it's complicated and takes a bunch of weird chemistry to separate the two. Let's look at an example: Stevia, a common non-caloric sweetener, is a one of a pair of sugars. Humans cannot digest this half of the pair of sugars, thus Stevia is considered a non-nutritive sugar. You can taste the sweetness of Stevia but cannot utilize any nutritive benefits from ingestion. [Read More Here](#)

A few weeks ago, Taiwan experienced the largest earthquake on the island in 25 years. The 7.4 magnitude quake was not uncommon in this complex geologic setting, one of the most seismically-active locales in the world. This large quake occurred at a depth of 35 kilometers, 18 kilometers offshore and produced a fault rupture 50 kilometers long on the seafloor. Even though this was a major quake, only 2 individuals were killed, though buildings were collapsed and landslides occurred across the island. Taiwan's preparedness is what saved lives. They have an extensive early-warning system, buildings have been reinforced and new construction is completed with strict building codes. Remote sensing stations have been installed across the area and even within buildings to measure shaking intensity and determine seismic risks. Knowing the possible risks should help people be prepared when the next large event occurs. These preparedness systems would be of great benefit in other seismically-active areas of the world. Two more earthquakes, 6.1 and 6.0 magnitude rocked the same fault system this week, a testament to the active fault zone the island rests upon. [Rock and Roll](#)

If you think about earthquakes, its always the big ones which headline the news, but earthquakes occur every day, multiple times a day, all over the globe. In fact, a rare 4.8 magnitude quake occurred in New Jersey this month. But what causes earthquakes? Its the interactions of the immense tectonic plates, which make up the Earth's crust. As they move and grind against each other at their boundaries all things remain quiet, but if the plates lock, strain accumulates and when the plate breaks this sudden release of energy produce earthquakes.

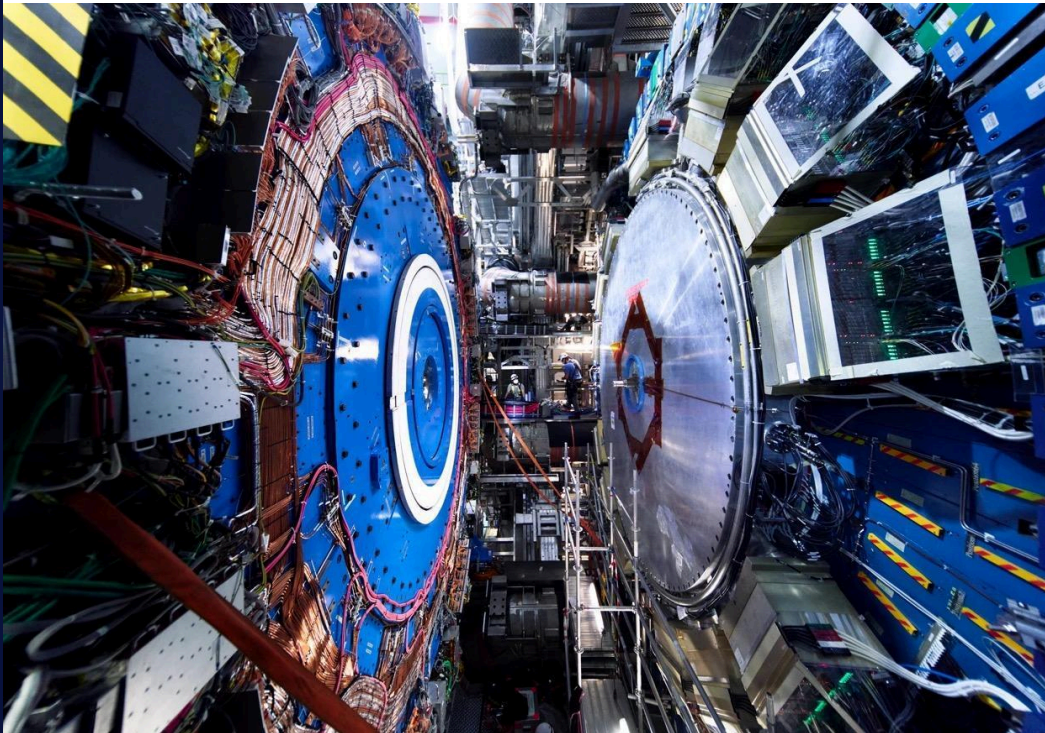
I've studied plate-boundaries around the world and often wonder how long has the earth experienced earthquakes? When did earthquakes start? When will earthquakes end? If plate movement and interaction are required, then they started when the plates first formed and movement began. The current theory hypothesizes plates began interacting about 2.8 billion years ago. But now geologists in South Africa have found evidence of a giant mega-thrust event occurring between 3.2 and 3.6 billion years ago. Over 800 million years earlier then plate interactions were believed to start. Studying an area in the Barberton Greenstone Belt in northeastern South Africa (home to some of the oldest rocks on Earth), they found evidence of massive landslides preserved in a rock layer and an area where an older rock unit sits atop a younger rock unit. Both of these findings could be evidence of a plate tectonic process called subduction — where one plate slides under another (modern examples are offshore Japan and the Oregon-Washington coast of the US). Determining when a global process initiated is the topic of great debate but of huge scientific significance - knowing when can give geologists examples to compare to new areas of study. But the Earth is a complex place and we only have bits and pieces of observational data, not the entire picture. We exist in the middle of an ongoing experiment which began 4.55 billion years ago and will continue for another 6 billion or so. Geologists don't have all the facts. Therefore, all geologic interpretation is more an art-form than a scientific study.

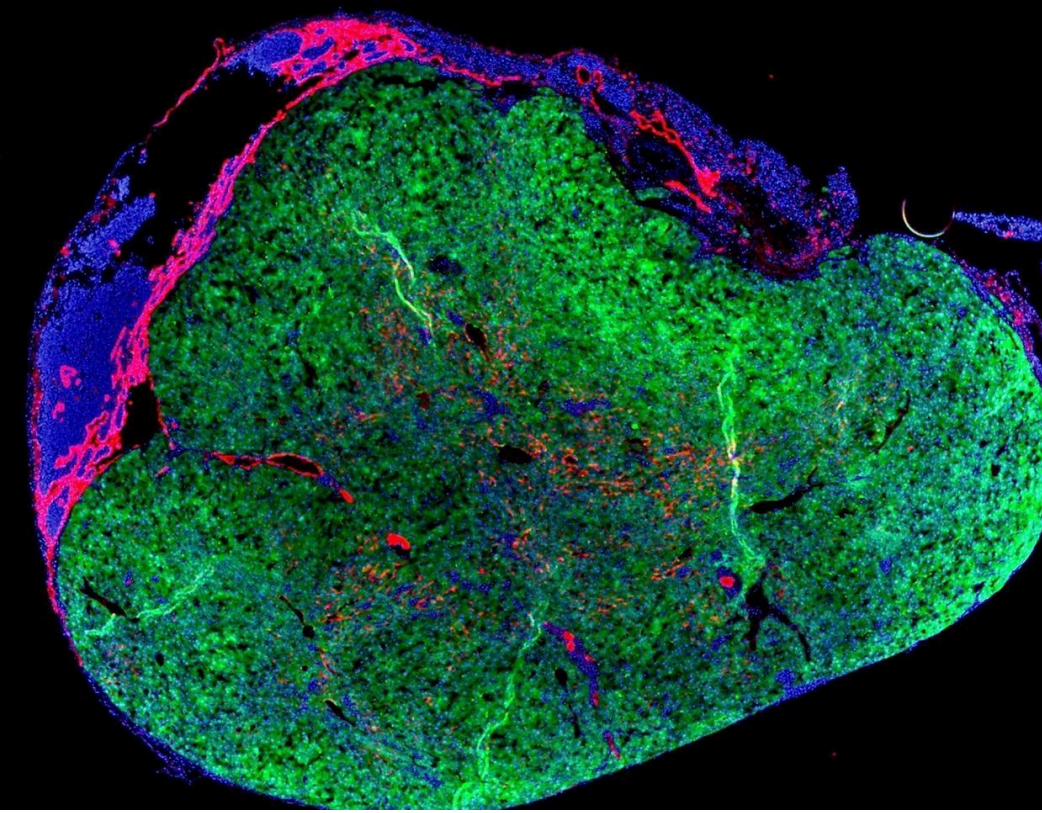
But the earth still rocks and rolls, volcanoes erupt, mountains form as the dynamic movement of the plates continues. [How Old?](#)

How amazing and resilient is the human body? Pretty amazing! As the occurrence of cancer increases in an increasingly younger population, medical researchers are pushing the boundaries of medical possibilities and hope for a longer life. LyGenesis, a biotechnical company located in Pittsburgh, PA, is working on cellular therapies which hope to transform lymph nodes into functionally-active ectopic organs. They have injected donor liver cells into the lymph node of a patient nearing end-stage liver disease. Their hope is the donor cells will grow into a miniature, blood-filtering liver. Although this mini-organ is not a substitute for a whole liver, it may provide enough organ function to extend life until a donor liver becomes available. [Read More](#)

20 billion miles away and still phoning home. That's the Voyager 2 spacecraft. NASA is receiving its heart-beat signal and is now preparing to realign the craft so its antenna points toward Earth and the 'little craft that could' can send data back from interstellar space.

Photos of the Month - A Massive Machine and A Mini-Liver



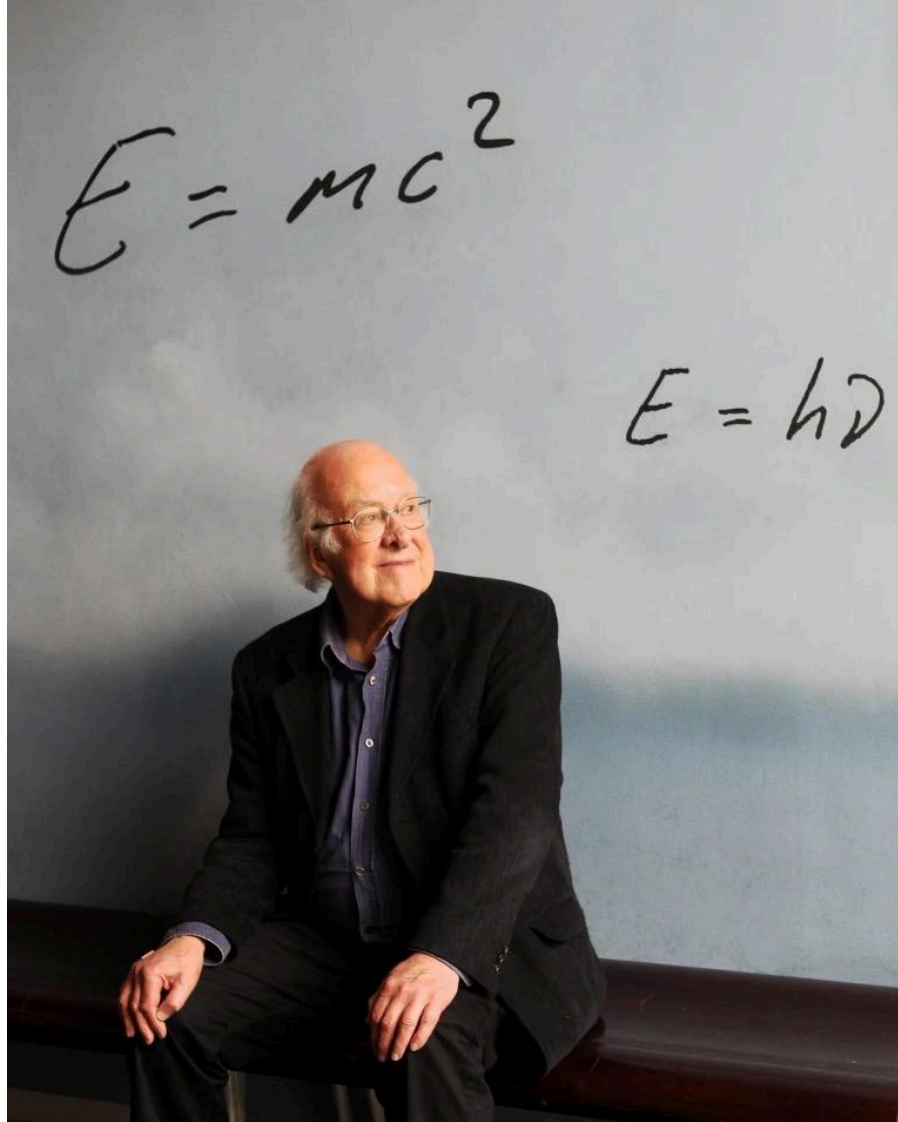


Part of the Large Hadron Collider's ATLAS detector which discovered the Higgs Boson on 4 July 2012, Credit: CERN For scale - an operator is standing in the background between the detectors disks.

Mouse lymph node with implanted liver cells (green), converting the node into a mini-liver. Credit: Lagasse Lab

In Memoriam - Peter Higgs

Theoretical physicist Peter Higgs died on 8 April 2024 at the age of 94. Theoretical physicists sit in isolation for most of their lives and think great thoughts about impossible problems and rarely see their theories proven and changed into scientific facts. Albert Einstein's Theory of General Relativity is now proven, Stephen Hawkins' Theory of Black Holes and Information is now proven. Peter Higgs' theory of the existence of a huge elementary particle which give other elementary particles their mass is proven. In 1964, Peter Higgs postulated the existence of this massive particle and its place within the standard model of the universe. Come to be known as the Higgs boson, it wasn't until 4 July 2012 the experimental machinery existed to prove the particle was real. On this monumental day the Large Hadron Collider in CERN, Geneva, Switzerland, propelled two streams of protons in opposing directions around a 27 kilometer diameter circular racetrack to collide together and blow apart. This particle collision broke the protons into their elemental particles. Of which the Higgs Boson was one. Known as the God Particle, this massive particle creates a field which imparts mass to other particles. It took 6000 physicists to run the experiment postulated by this one amazing theorist. A music lover, Higgs had little interest in modern technology. He had no television and did not use the internet. He was a member of the Campaign for Nuclear Disarmament and Greenpeace, exhibiting a strong social-conscience. A man who will be sorely missed in our turbulent world. [Higgs Boson](#)



Historical Foundations - Maria Mitchell, 19th Century Astronomer

In 1878, a team of six women astronomers traveled to Colorado to observe a total solar eclipse. Leading the group was Maria Mitchell, a faculty member from Vassar College. The observations made by the six women established the scientific observational guidelines for future eclipse events. Mitchell observed her first total eclipse at the age of 12 and her last at the age of 66. She established her scientific stature in October, 1847 when she spotted an unexpected object in her telescope from the backyard of her home in Nantucket, Massachusetts. The unexpected object was Comet 1847-VI, nicknamed 'Miss Mitchell's' Comet'. In acknowledgment of her contributions to astronomy, she was elected to the American Academy of Arts and Science. The first woman to be honored by this organization. At Vassar College, Mitchell set the standard for science education, especially astronomy. [Ms. Mitchell](#)

Book of the Month - *America's First Great Eclipse, Rocky Mountains, 1878*, Steve Ruskin

Near the end of the 19th century, American scientists were making strides, overtaking their domineering European counterparts and leading the country into the 20th century. In July, 1878, a group of women traveled to Colorado and overcame altitude sickness, huge thunderstorms and the potential for Indian attacks to observe a total solar eclipse. [Available Here](#)

Minutiae

I read journals, science articles and other news in a variety of formats: electronic, digital, hardcopy, newsprint. But, its books I like to hold in my hands, feel the weight of the tome, smell the parchment, and see the diagrams and photos as they were meant to be viewed. What format do you like best when immersing yourself in a new adventure through reading? Let me know by dropping a note to caauthor@earthlink.net.

Have a great month - until next time - Be well, be kind. CA



keep being curious

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