



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

News from the Den

It's September already! In Colorado, after the hottest June on record, we have endured the second hottest summer. We had no minimum night time temperatures below 50degF the entire season and over 45-90degF days. This led to a dangerous wildfire season. The Quarry Fire burned almost 600 acres (one square mile). It was located approximately 5 miles from our home. We had air tankers flying over the house, dropping fire retardant on the site and then returning every 25 minutes to Colorado Springs to refill their tanks. DC-10s flying low and slow will rattle your windows. And some think climate change isn't real? But in this case, the fire is being investigated for arson.

We traveled to Santa Fe New Mexico to enjoy the Opera - offered each summer in an open-air theater. This year we saw Don Giovanni - a 4 hour extravaganza. Climate change impacted this performance as the air temperature at the opening curtain was over 94degF and 4.5 hours later a not-much cooler 85degF at final bow. The performance was amazing, the heat not so much. My thanks go to the performers (in full costume) and the stage hands (moving huge sets back and forth) in the unrelenting heat. Not to mention the perseverance of the audience.

Last month we touched on the application of science and sport. We'll wrap up this discussion in this newsletter and share some interesting thoughts on food, beer, fraud, and cats. Of course we have to include cats. After all, this newsletter is dedicated to Peet.

Latest and greatest science news

America's fastest swimmers now use a mathematical formula developed by number theorist Ken Ono from the University of Virginia, to improve their performances. Dr. Ono utilized digital data recorded from thousands of races of over 100 of the top swimmers in the world to generate a database of all the metrics associated with a race. A swimmer can plot his performance against this database, having his digital twin then swim a digital race. From this simulation, they can determine specific metrics for each race: how many kicks to use off the entry, how to place their hands on the turn, how many breaths to take each lap, in essence its an analysis of every inch of the race. The mathematics used in the model must consider a body in motion in three-dimensions and translating this orientation into when the force the swimmer creates against the water is going in the direction of the swim. Although, the math and physics used are not new - we're still dealing with Newtonian laws after all - the application of the analytics are key. It's all about math. ([Enter the Pool Here](#))

But if we can figure out the optimal swim model for each Olympic athlete in each race, why were the times in Paris so slow? The average number of swimming world records set at an Olympic Game is between 13 and 28. This year only 2 were set in Paris - one in a 100 meter sprint and another in a 1500 meter marathon. What happened? It's all about the pool - not the athletes. In the 'Water Cube' built in Beijing for the 2008 Olympics, the pool was 10 feet deep - there were 25 world records and 65 Olympic records set. An average Olympic swimming pool is 3 meters deep and more than 50 meters long. The temporary, removable pool in Paris was 2.2 meters deep and barely 50 meters long. What

did this shallow pool cause? A swimmer cutting through the water pushes a wave in front of them and another down. If the pool is too shallow the downward wave hits the bottom of the pool and reflects back up into the swimmer - this creates destructive interference turbulence in the water column and slows the swimmer down. This is unfortunate for the talented athletes who competed in Paris and hoped to win with a record. ([It's All About Depth](#))

The 2024 Tour de France completed 21 stages over three weeks, covering 3498 kilometers across Italy and France. The sports commentators spend time highlighting the historical and cultural sites the riders cycle past. But, avid cyclist and geologist Douwe Va Hinsbergen of Utrecht University often found himself watching the outcrops wiz by, wondering about the rocks and geologic history of the region. France is geologically very diverse and he felt the viewers were missing out and saw this as an opportunity to provide the public with some science education. He with some geology colleagues formed a Geo-Sports team and prepared 2-minute video clips and a blog about each stage of the tour. Their presentations were broadcast in Europe and met with great feedback from the public. ([Cycle along here](#))

How long does it take a barkeep to pull a pint of Guinness? 119.5 seconds exactly, which produces the perfect layer of velvety froth on the top of their rich stout. It's heaven in a glass. This layer and process of pouring is the result of nitrogen added to the beer in the keg and the little balls placed in their cans. The Guinness brewery was established in 1759 when Alex Guinness signed a 9000 year lease for land in Dublin for £45/year. But the most amazing innovation isn't their beer - it's the invention of the most important statistical technique in all of science. The Guinness brewery invented the *t-test*. Think about the 'bell-curve' grading practices we all lived with in school. A bell-shaped curve defined the distribution of grades from A to F within a group of students. 10% at the lowest end and at the highest - with the bulk of the population - 80% - in the middle. The brewmasters at Guinness needed to optimize the quality of ingredients - hops, malt, barley, etc. To do this they measured the parameters of each ingredient - plotting them on a graph and found a way to determine the optimal parameters to produce the stout we enjoy. Hence, the t-test. But their t-test is applicable for more than beer, its used in everything where you need to determine the statistical significance of a group of data, from medical trials to which years produce the best wines. ([Enjoy More Here](#))

How do organisms evolve new and innovative features? They use polyploidy or hybridization. This is the ability to create massive amounts of additional genetic material setting the genetic stage for future adaptations forced by unusual or harsh changes in an organisms environment. Enter the strawberry. Here in the northern hemisphere its prime strawberry season. Genetic researchers are using the lowly little berry because its quirky and unique genomes lend themselves to polyploidy. Kevin Bird, University of California, Davis.

In the last few months it been all about the cats in science news. Whether it's the identification of their susceptibility to bird flu, the increase in feline COVID cases, receiving a Ph.D. or becoming the most cited author for a month. Not to diminish to terrible medical challenges our furry friends face, but all the above factoids are true. In May, Vermont State University, Castleton campus bestowed its first honorary doctorate in Litter-ature on Max, a 6 year old tabby for his efforts as the unofficial ambassador for the college. ([Dr. Max's Story](#)) And then there is Larry Richardson, also a 6 year old tabby from another college - Northwestern University. What is it about those tabby? How hard is it to garner tenure? New Ph.D.s struggle with this all the time. To answer, one must be highly published and those publications must be cited by others. Enter Google Scholar and a citation boasting service advertised on Facebook touting \$10/citation. Larry appeared to be a mathematician in the early years of his career trying to increase his citation rating or h-index. H-index is a measure of how many citations one has and how many times each is cited. An h-index of 10 - means you have 10 citations, each of which was cited 10 times. H-index and citation totals are used in hiring and tenure decisions. Through Google Scholar, Larry generated an h-index of 11 in two-weeks from 12 fake papers containing gibberish and works by ancient mathematicians like Pythagorus posted on ResearchGate. The investigators which placed these fake articles on the internet and placed Larry in this realm are scientific fraud investigators. They wanted to see how easy it was to jack the system and artificially

raise one's indices fraudulently. Though Larry is an overnight citation genius, the lesson is 'be careful what you read on the internet - not all is real information'. ([Larry works hard, all is not real](#))

Science Factoid of the Month

We come across so many interesting bits of data in our science reading that we decided to add a new section to our monthly newsletter. Here we'll present a single science fact, with the reference to it for your contemplation. We hope this spurs some interest, thought and a desire to counter disinformation.

Russia's war in Ukraine has produced \$32B USD in climate damage and a corresponding 175 million metric tons of carbon dioxide. This is equivalent to a single year's production of CO2 for Ukraine. ([More Here](#))

Photo of the Month

The ESA Euclid telescope, orbiting with the James Webb at the Second LaGrange point, captured this infrared and visible light image of the Messier 78 nebula. Messier 78 is a reflective nebular star-nursery 1300 light years away. It contains two massive young blue supergiant stars which illuminate the nebular cloud.

ESA/Euclid/Euclid Consortium/NASA



In Memoriam - Jim Simons

Jim Simons, a math prodigy, who gave up his early career to start a quantitative investing firm, died last week at the age of 86. Jim graduated from M.I.T. in 1958 and earned a Ph.D. from University of California, Berkeley at age 23. His first job was a codebreaker for the NSA, from which he was fired in 1968 for opposing the Vietnam war. He formed his investment firm and amassed a fortune of \$31B USD. He created the Simons Foundation which will continue to operate and fund major science efforts into the future. The Foundation gave \$90M USD of the \$110M needed to build the Simons microwave observatory in the Atacama Desert, Chile. It established the Math for America program to recruit and train math teachers in the US, including a \$500M USD grant to Stony Brook to educate new math teachers. And the creation of the Flatiron Institute in computational methods for advanced research in math, quantum physics, biology, astrophysics and neuroscience.

Minutiae

I came home the other day to find a U-Haul box on the porch - was my partner trying to tell me something? But when I opened the box I found an amazing gift - the LesFic Bard Award for *The Paris Contagion* (see photo below). We are eternally grateful and wish to thank the hard-working judges and staff of the LesFic Bard Award group. This group uses a triple-blind process in judging. The judges do not know the title, author or publisher of the book in their evaluations. This refines the process down to the words themselves. How fair is this - better than a bell-curve t-test.

As an aside, we saw an interesting note the other day on Instagram - the person said - "I just learned Albert Einstein is a real person, I thought he was a theoretical physicist." Is this a good or bad thing?

We'll be back next month with another installment. Be well, be kind. CA



Keep being curious,

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