Ode to E Pluribus Unum for Sunday September 8 2024

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Arp 142: Interacting Galaxies from Webb

Image Credit: NASA, ESA, CSA, STScI; Copyright: Raul Villaverde

To some, it looks like a penguin. But to people who study the universe, it is an interesting example of two big galaxies interacting.

Just a few hundred million years ago, the upper NGC 2936 was likely a normal spiral galaxy: spinning, creating stars, and minding its own business. Then it got too close to the massive elliptical galaxy NGC 2937, below, and took a dive.

Together known as Arp 142, they are featured in this new Webb infrared image, while a visible light Hubble image appears in comparison. NGC 2936 is not only being deflected, but distorted, by this close gravitational interaction. When massive galaxies pass near each other, gas is typically condensed from which new stars form. A young group of stars appears as the nose of the penguin toward the right of the upper galaxy, while in the center of the spiral, bright stars together appear as an eye. Before a billion years, the two galaxies will likely merge into one larger galaxy.

Hubble Image

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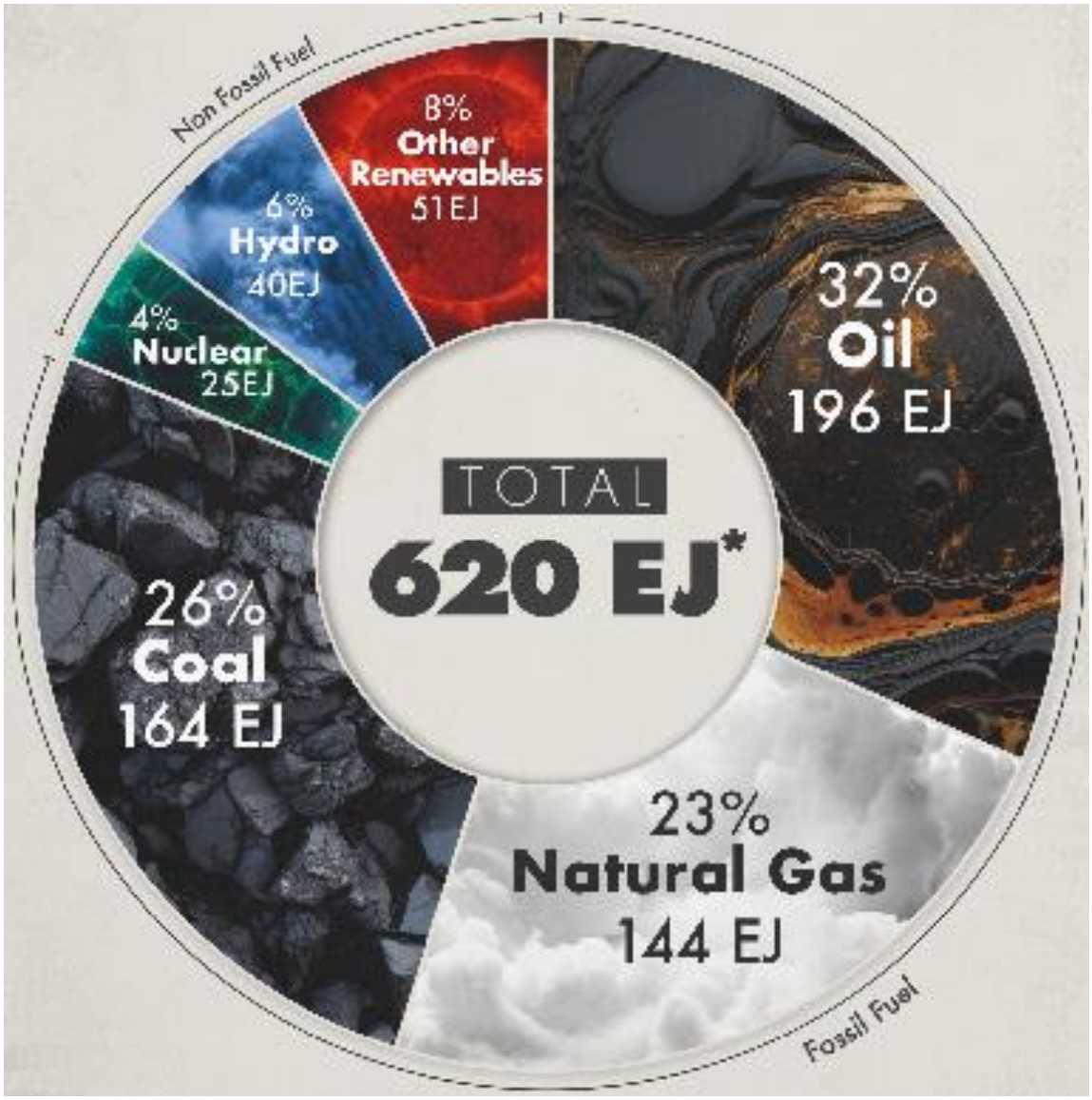
A Statistical Review of What Powered the World in 2023



Energy Institute 2024

Despite efforts to decarbonize the economy, fossil fuels still accounted for over 80% of the global energy mix in 2023.

Oil was responsible for 32% of the energy consumed around the world, followed by coal (26%) and then natural gas (23%).

Renewables' share of total primary energy consumption reached 14.6%, an increase of 0.4% over the previous year. Together with nuclear, they represented roughly 19% of total primary energy consumption.

Reading further you'll see that global efforts to phase out coal and shut down coal plants were entirely offset by China's new coal mine additions. While China is leading

the world in wind and solar installations, its coal, oil, and natural gas consumption have all increased since 2022 too.

https://bit.ly/4bQRzz6

You'll want to view and think about each of the several presentations.

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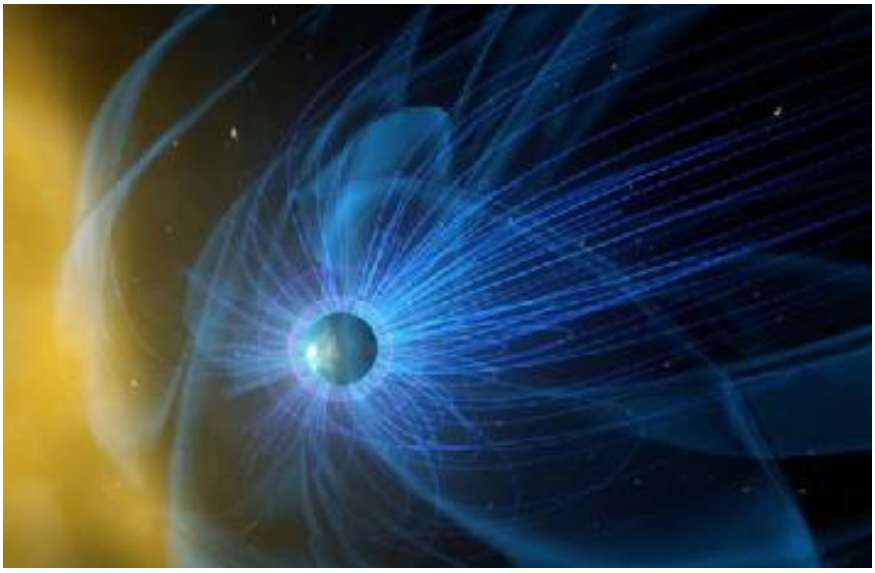
Magnetospheres: What Are They and Why Should You Care



Earth is surrounded by a giant magnetic bubble called the magnetosphere, which is is part of a dynamic, interconnected system that responds to solar, planetary, and interstellar conditions.
Credit: NASA

A magnetosphere is the region around a planet dominated by the planet's magnetic field. Other planets in our solar system have magnetospheres, but Earth has the strongest one of all the rocky planets: Earth's magnetosphere is a vast, comet-shaped bubble, which has played a crucial role in our planet's habitability. Life on Earth initially developed and continues to be sustained under the protection of this magnetic environment. The magnetosphere shields our home planet from solar and cosmic particle radiation, as well as erosion of the atmosphere by the solar wind - the constant flow of charged particles streaming off the sun.

Earth's magnetosphere is part of a dynamic, interconnected system that responds to solar, planetary, and interstellar conditions. It is generated by the convective motion of charged, molten iron, far below the surface in Earth's outer core. Constant bombardment by the solar wind compresses the sun-facing side of our magnetic field. The sun-facing side, or dayside, extends a distance of about six to 10 times the radius of the Earth. The side of the magnetosphere facing away from the sun - the nightside -

stretches out into an immense magnetotail, which fluctuates in length and can measure hundreds of Earth radii, far past the moon's orbit at 60 Earth radii.

NASA heliophysics studies the magnetosphere to better understand its role in our space environment. Such research helps unravel the fundamental physics of space, which is dominated by complex electromagnetic interactions unlike what we experience day-to-day on Earth. By studying this space environment close to home, we can better understand the nature of space throughout the universe. Additionally, space weather within the magnetosphere - where many of our spacecraft reside - can sometimes have adverse effects on space technology as well as communications systems. Better understanding of the science of the magnetosphere helps improve our space weather models.

NASA's studies of the magnetosphere include research into: understanding the nature of the electromagnetic phenomena in near-Earth space; how near-Earth space responds to external and internal stimuli; how the coupled middle and upper atmosphere respond to external factors; and how the various regions of the magnetosphere and upper atmosphere interact with each other.

NASA heliophysics missions contributing to magnetospheric research are: Balloon Array for Radiation-belt Relativistic Electron Losses; Geotail; the Magnetospheric Multiscale mission, Time History of Events and Macroscale Interactions during Substorms; Two Wide-Angle Imaging Neutral-Atom Spectrometers; and the Van Allen Probes. Additionally, instruments on other NASA missions -- for example, Juno, which observes Jupiter -- observe the magnetosphere of other planets.

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Are Dinosaur Skeletons in Museums the Real Thing?

Fern is truly special, but it wouldn't exist without the replicas that came before it.
Image Credit: © The Trustees of the Natural History Museum

What about the wonder of long-dead species that roamed planet Earth millions of years ago? IFLScience took a trip down to the Natural History Museum, London to learn all

about their shiny, new bronze Diplodocus, Fern, and just what goes into making dinosaur specimens for display.

Museums around the world make replicas to showcase the skeletons to the public. Legally some bones must also remain in the country they were found in, so creating replicas is a great way to showcase species to a wider audience.

https://bit.ly/4doLifg

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Where Is the "Cradle of Humankind"?

The answer may change depending on who - and what - you ask.

Maropeng
africantravelcanvas.com

When we hear the phrase "cradle of humanity" – the point in the world from which all human life sprang – there's one place that usually springs to mind: Africa.

But the story of human evolution certainly doesn't end there – and, perhaps surprisingly, it doesn't begin there either. As more and better research and analysis continue to come to light about our ancient origins, the question has to be asked… have we got the "cradle of humankind" all wrong?

But that really does seem to be where the evidence points. "Our findings […] suggest that hominines not only evolved in western and central Europe but spent over five million years evolving there," reported David Begun, professor in the Department of Anthropology in the Faculty of Arts & Science at the University of Toronto, in 2023.

https://bit.ly/4dqqLa5

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Celebs Are Doing Hyperbaric Oxygen Therapy. What Is It?

navacenter.com

Mayim Bialik, the "Call Me Kat" and "The Big Bang Theory" star revealed on Instagram last week she'll be trying the pricey wellness treatment – which involves going into a pressurized chamber to breathe 100% pure oxygen – for the next six months. Her goal, she says, is to see if the therapy can help alleviate her inflammation and autoimmune issues.

Hyperbaric oxygen therapy has been around for decades and involves going into a pressurized chamber to breathe pure oxygen – something that isn't naturally available in Earth's atmosphere, which is made up of about 21% oxygen.

https://bit.ly/4cJK8dy

I guess if you've got money to burn it will do so more spectacularly in hyperbaric oxygen. But best of all, the treatment keeps them off the street.

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Why Do We See Colors That Aren't There?

Human eyes can see only a small portion of the whole electromagnetic wavelength called the visible light spectrum.
(Image credit: Zhengshun Tang via Getty Images)

Here's how our brains construct color in our environment.

In 2015, a photo of a dress sparked a heated debate with a simple question: What color is it? "The dress was so unusual; we really don't have very many controversies about colors," Bevil Conway, a neuroscientist and visual scientist at the National Institutes of Health in Maryland, told Live Science. "We don't disagree about white and gold or blue and black. The disagreement is about whether or not those colors applied to this image."

Conway and his team analyzed the dilemma by asking 1,400 participants what they thought the color of the dress was if the illumination was changed. They found that people's expectations of what kind of lighting the dress was in affected what color they thought the dress was. People who assumed that the dress was shot under a warm or incandescent light thought that the dress was blue and black (its actual color), whereas people who assumed cool or daylight saw white and gold.

https://bit.ly/4c2ml85

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Solar Atmospheric Water Extractor Provides Continuous Freshwater

Water out of air A solar-powered water harvester developed by KAUST researchers can extract freshwater at a rate of 2–3 L/m2 per day during the summer months.
(Courtesy: © 2024 KAUST; Heno Hw

Harvesting moisture from the air is one approach that has been trialled over the years with varying degrees of success.

Qiaoqiang Gan, from King Abdullah University of Science and Technology (KAUST) and his team have recently developed a solar-driven atmospheric water extraction (SAWE) device that can continuously harvest moisture from the air to supply clean water to people in humid climates.

https://bit.ly/4dA3Zgb

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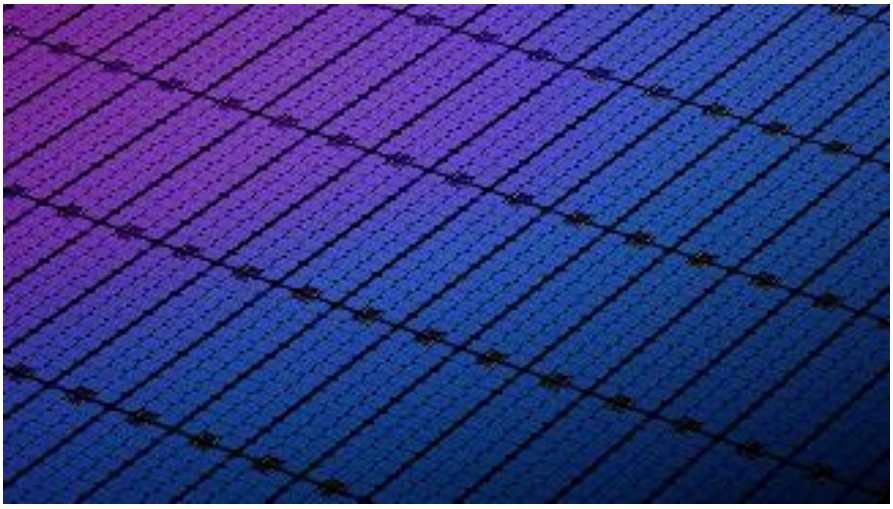
Ultra-Thin Solar Coatings Generate Power for Phone Cases and Evs

Cheap and flexible perovskite solar cells could revolutionize solar power, making it easier than ever to power the world with sunlight.



The new thin layer of solar film is 27% efficient when converting sunlight into energy —

compared with the approximate 22% efficiency of silicon panels on the market today.
(Image credit: Andriy Onufriyenko/Getty Images)

A breakthrough approach allowed scientists to create solar cells 150 times thinner than existing silicon-based panels, without sacrificing any of their energy-generating capabilities. These panels could eventually be applied to almost any object as an easily-printed layer, such as cars or smartphone cases, enabling anyone to charge on the go and negating the need for large solar farms, the scientists said.

The material the researchers made is just over one micron thick (0.001 mm). Japan's National Institute of Advanced Industrial Science and Technology (AIST) has certified this invention ahead of the publication of a scientific study later this year.

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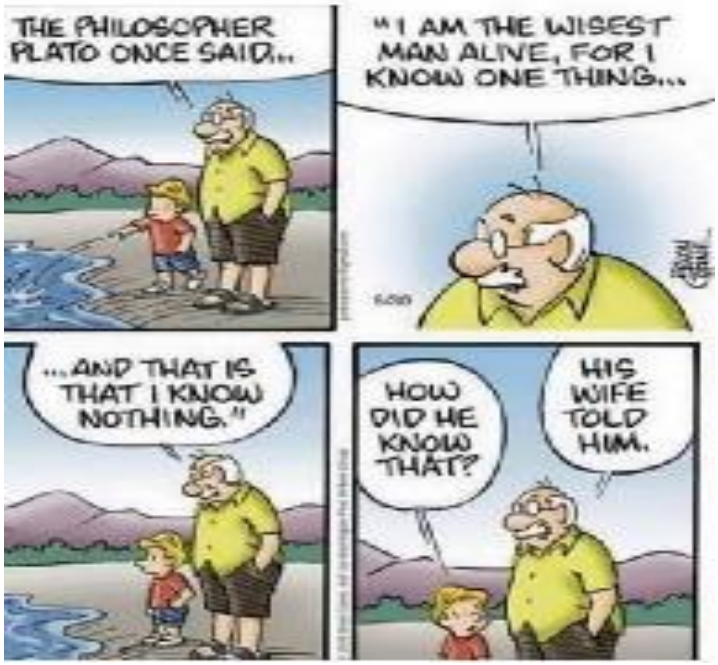

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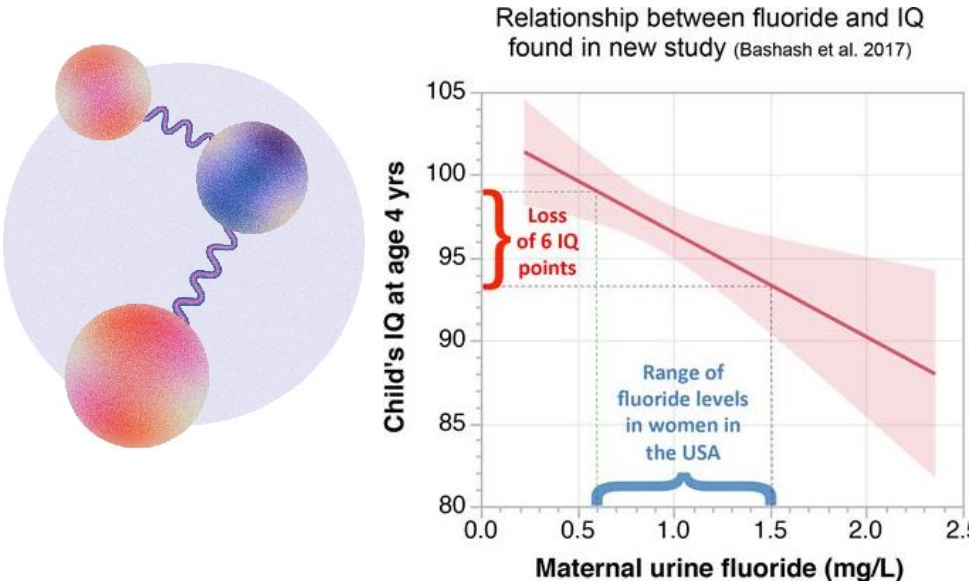
Fluoride Concern Sixty Years Later



thewaterfilterloady

US government report says fluoride at twice the recommended limit is linked to lower IQ in kids

The report, based on an analysis of previously published research, marks the first time a federal agency has determined — "with moderate confidence" — that there is a link between higher levels of fluoride exposure and lower IQ in kids. While the report was not designed to evaluate the health effects of fluoride in drinking water alone, it is a striking acknowledgment of a potential neurological risk from high levels of fluoride.

https://bit.ly/4dBzMgL

Damn the brain cells, government's here to protect us from tooth decay.

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The Quantum Mechanics of the Greenhouse Effect

Carbon dioxide's powerful heat-trapping effect has been traced to a quirk of its quantum structure. The finding may explain climate change better than any computer model.

In 1896, the Swedish physicist Svante Arrhenius realized that carbon dioxide (CO2) traps heat in Earth's atmosphere—the phenomenon now called the greenhouse effect. Since then, increasingly sophisticated modern climate models have verified Arrhenius' central conclusion: that every time the CO_2 concentration in the atmosphere doubles, Earth's temperature will rise between 2 and 5 degrees Celsius.

This spring, a team led by Robin Wordsworth of Harvard University figured out why the CO_2 molecule is so good at trapping heat in the first place. The researchers identified a strange quirk of the molecule's quantum structure that explains why it's such a powerful

greenhouse gas—and why pumping more carbon into the sky drives climate change. The findings appeared in The Planetary Science Journal.

https://bit.ly/3T2oVUW

Illustration: Kristina Armitage And Matt Twombly For Quanta Magazine

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Atlantic Ocean Patch Near Equator Cooled at Record Speeds

The Atlantic Ocean, near the Bahamas, as seen from the International Space Station in July 2024.
(Image credit: NASA / JSC)

Scientists are trying to decipher what drove the recent dramatic cooling of the tropical Atlantic, but so far few clues have emerged. "We are still scratching our heads as to what's actually happening," the researchers said.

For a few months this summer, a large strip of Atlantic Ocean along the equator cooled at record speed. Though the cold patch is now warming its way back to normal, scientists are still baffled by what caused the dramatic cooling in the first place.

The anomalous cold patch, which is confined to a stretch of ocean spanning several degrees north and south of the equator, formed in early June following a monthslong streak of the warmest surface waters in more than 40 years.

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Meet the $16K Humanoid Robot Leaping into Production

Unitree unveiled a new video of its G1 robot performing acrobatic feats, as part of its lead up to production.

interestingengineering.com

https://www.youtube.com/watch?v=y2KF2DnvN9Y

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The Story of How a Skydiver Survived a 14,000-Foot Fall

This 2013 image shows Emma Carey jumping out of a skydiving helicopter in Switzerland.
Emma Carey

EACH STEP THAT EMMA CAREY takes is a size six miracle. She has no feeling in her legs, no sense of when her feet land or they're in the air. That means her legs give her brain zero feedback, so she has to think about where her legs are going but never feels where they are.

Most people would have no idea that she is paralyzed from the waist down, or that she survived the unthinkable: In June 2013, Carey went skydiving for the first time and fell 14,000 feet out of a helicopter into an empty cow pasture in Switzerland, with two tangled parachutes and her instructor passed out on her back.

https://bit.ly/3zF7zH6

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Why Computer Scientists Study Hard Problems

Quanta

Why are some problems harder than others? It sounds like the sort of question that might occur to a philosophy major stumped by the second half of a math test, but it's actually one of the most profound questions in computer science, powering a field called computational complexity theory. Over the past 50 years, complexity theory research has yielded insights into the fundamental nature of computation, as well as practical applications in cryptography, parallel computing and many other fields.

Complexity theorists study problems that can in principle be solved using step-by-step procedures, or algorithms. These are called computational problems, but they don't necessarily have anything to do with computers. Alphabetizing your bookshelf, for instance, is a computational problem, and there are many algorithms you can use to solve it. Here's one: Put all the books on the shelf in a random order, then sweep them off and try again until you happen to get it exactly right. It doesn't take a doctorate in computer science to know that practically any other strategy will get the job done faster.

When complexity theorists talk about the difference between easy and hard problems, they're really drawing a distinction between fast and slow algorithms. Like alphabetizing a shelf, most computational problems can be solved using many different algorithms. If at least one of those algorithms is fast, researchers call the problem easy. If nobody has discovered any fast algorithms for solving a problem, that suggests the problem is hard.

Many important computational problems fall into this latter category. For decades, researchers have sought fast algorithms for such problems and have come up empty-handed, but they haven't been able to categorically rule out the possibility of undiscovered fast algorithms. So are these problems really hard or not?

That's the essence of the P versus NP problem, a fascinating question cursed with an exceptionally dull name. It's really a question about two broad classes of computational problems: "P" refers to the class of all easy problems, while "NP" is the class of problems that may or may not be easy to solve, but do have fast algorithms for checking whether a candidate solution is correct. The million-dollar question is whether these two classes are actually equivalent — that is, whether there's an easy way to solve every problem whose solution is easily checkable.

https://youtu.be/pQsdygaYcE4

Put this way, the question sounds simple. But in fact, the landscape of computational hardness is far richer than complexity theorists imagined when they first posed the P versus NP problem.

What's New and Noteworthy

Complexity theorists have now struggled with the P versus NP question for half a century, and the answer remains elusive — it seems that this problem about the hardness of computational problems is itself hard to solve.

That self-referential character hasn't escaped researchers. Last summer I took a deep dive into the mind-bending world of meta-complexity: the study of the hardness of computational problems that are themselves about the hardness of computational problems. "If you're confused about it, don't worry — I'm also confused," the complexity theorist Igor Oliveira reassured me during an interview. In recent years, researchers have discovered that seemingly arcane meta-complexity problems are intimately tied to the question of whether any kind of encryption can be truly secure.

There's more to complexity theory than the distinction between easy and hard problems — researchers also explore many different flavors of computational hardness. Sometimes, that means studying subtler differences in difficulty between NP problems. For a handful of especially frustrating problems, researchers haven't discovered any algorithms better than simply checking every possible solution. Last month, I wrote

about how two teams of researchers discovered a slightly faster algorithm for a problem long thought to fall into this category. The new algorithm works by adapting techniques developed to attack encryption protocols — a nice illustration that ideas can flow in both directions between complexity theory and cryptography.

Other researchers explore problems that are much, much harder than those in NP — almost to the point of absurdity. In these cases, there's no obvious way to check whether a proposed solution is correct, or even to enumerate all the possibilities. Recently, researchers proved that an innocent-sounding problem is actually among the hardest (except for ones that are literally unsolvable). Such an outlandish problem might seem far removed from any practical applications, but it shows up in the study of concurrent computing, in which programs divide tasks into many small parts and work on them simultaneously.

These are just a few of the recent results in complexity theory — researchers in the field have also explored the uses of randomness, the nature of mathematical proof and more. "P versus NP is just like our cornerstone somewhere in the middle of a temple," the mathematician and complexity theorist Alexander Razborov told me last year. "The temple is huge, and it produces lots of cool stuff."

By Ben Brubaker for Quanta Magazine

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The World-Famous Griffith Observatory as a Hollywood Star

The Griffith Observatory in Los Angeles.
(Image credit: Getty Images/Mitch Diamond)

Thanks to Griffith Jenkins Griffith, a Welsh immigrant who came to America as a teenager in the 1860 to claim his future in Mexican silver mines and California real estate, the City of Los Angeles was blessed by his generous donation of 3,015 acres in 1896 for the creation of a splendid park for his newly adopted hometown.

https://bit.ly/3VMa96o

The planetarium with its beetle-like projector was a magnet to LA kids back in the day.

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Here's How High-Speed Diving Kingfishers May Avoid Concussions

Specific genetic tweaks seem to protect brains from 40 km/h plunges into water

Flying at speeds up to 40 kilometers per hour as they hit the water, plunge diving kingfishers (one shown) are at risk of damaging their beaks, heads and brains.
Andy Morffew/Flickr (Cc By 2.0 Deed)

Analysis of the genetic instruction book of some diving kingfishers identified changes in genes related to brain function as well as retina and blood vessel development, which might protect against damage during dives, researchers report October 24 in *Communications Biology*. The results suggest the different species of diving kingfishers may have adapted to survive their dives unscathed in some of the same ways, but it's still unclear how the genetic changes protect the birds.

https://bit.ly/3xOOBwY

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The Most Common Wombat Is Also the Least Understood

thromyng.com

Wombats are closely related to koalas and nurture their young in pouches like other marsupials. Of the three species, one is threatened and another endangered, but the bare-nosed wombat (*Vombatus ursinus*), found in Southeast Australia and Tasmania and thought to number more than a million, is neither. So, it's been studied less than its hairy-nosed cousins.

"This is a species that everyone loves, but just doesn't know too much about," says Georgia Stannard, an archaeologist at La Trobe University in Bundoora/Melbourne.

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Some Social Rules from Yesteryear That May Help Us All.

1. Don’t call someone more than twice continuously. If they don’t pick up your call, presume they have something important to attend to.

2. Return money that you have borrowed even before the person who loaned it to you remembers or asks for it. It shows your integrity and character. The same goes for umbrellas, pens, and lunch boxes.

3. Never order the expensive dish on the menu when someone is treating you to lunch or dinner.

4. Don’t ask awkward questions like ‘Oh, so you aren’t married yet?’ Or ‘Don’t you have kids?’ Or ‘Why haven't you bought a house?’ Or ‘Why haven't you bought a car?’ For God’s sake, it isn’t your problem.

5. Always open the door for the person coming behind you. It doesn’t matter if it is a guy or a girl, senior or junior. You don’t grow small by treating someone well in public.

6. If you take a taxi with a friend and he/she pays now, try paying next time.

7. Respect different shades of opinions. Remember, what may seem like 6 to you might appear as 9 to someone else. Besides, a second opinion is good for an alternative.

8. Never interrupt people while they are talking. Allow them to pour it out. As they say, hear them all and filter them all.

9. If you tease someone, and they don’t seem to enjoy it, stop it and never do it again. It encourages one to do more and shows how appreciative you are.

10. Say “thank you” when someone is helping you.

11. Praise publicly. Criticize privately.

12. There’s almost never a reason to comment on someone’s weight. Just say, “You look fantastic.” If they want to talk about losing weight, they will.

13. When someone shows you a photo on their phone, don’t swipe left or right. You never know what’s next.

14. If a colleague tells you they have a doctor's appointment, don’t ask what it’s for, just say "I hope you’re okay." Don’t put them in the uncomfortable position of having to tell you their personal illness. If they want you to know, they'll do so without your inquisitiveness.

15. Treat the cleaner with the same respect as the CEO. Nobody is impressed by how rudely you treat someone below you, but people will notice if you treat them with respect.

16. If a person is speaking directly to you, staring at your phone is rude.

17. Never give advice until you're asked.

18. When meeting someone after a long time, unless they want to talk about it, don't ask them their age or salary.

19. Mind your business unless anything involves you directly - just stay out of it.

20. Remove your sunglasses if you are talking to anyone in the street. It is a sign of respect. Moreover, eye contact is as important as your speech.

21. Never talk about your riches in the midst of the poor. Similarly, don't talk about your children in the midst of the barren.

22. After reading a good message, consider saying "Thanks for the message."

Appreciation remains the easiest way of getting what you don't have.

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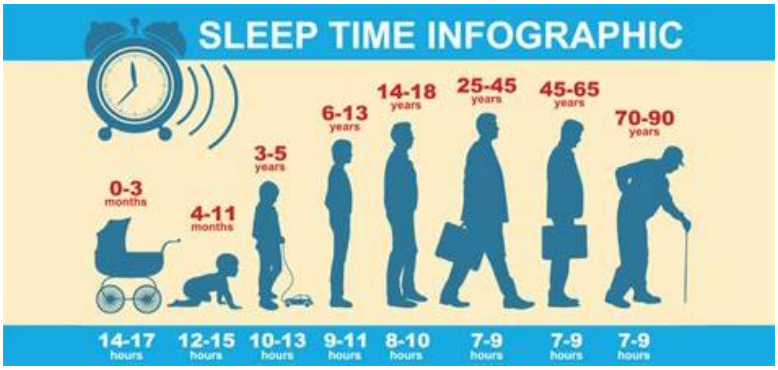
What We Know About Why We Need Sleep



weforum.com

We need sleep. This is a fundamental fact of life. Without it, we turn into grouchy, sluggish zombies. Yet although we do it every day, sleep largely remains a scientific mystery. What happens when we sleep — and what's the point?

You might want to read some of the highlighted elements underlying this article. Also:

How does sleep work.

https://youtu.be/0LNdsTrQJCs

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Chords & Riffs

Erroll Garner (1921-1977)

vintagemusic.fmT

An American pianist and composer, Erroll Garner was one of the most virtuosic and popular pianists in jazz.

Garner was influenced by Fats Waller and was entirely self-taught. Like Waller and Art Tatum, Garner was adept at performing both with a rhythm section and unaccompanied, often establishing great momentum with his sure sense of swing. His best-known composition is “Misty.”
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Misty https://youtu.be/P_tAU3GM9XI
Laura https://youtu.be/sRA-WV01Ogk
Shadow of Your Smile https://youtu.be/_X9t6esQjdk
Honeysuckle Rose https://youtu.be/VtQpFzu-unE

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America’s Bird from Francie Troy

Eagle

America's bird of liberty
Justice and homeland security.
The Bald Eagle's distinctive white feathered head,
Broad wings that protectively spread.
Strength in talons, and keen vision from up high.
A soaring symbol of freedom against the blue sky.
Congress today is a two-party conundrum.
Platitudes and speeches of confusing humdrum.
Our leaders ostentatiously posture grand
But
"*A House divided cannot stand.*"
Like the eagle we can fly above the fray.

Work together for a more perfect day.
Strength in resolve and dedication
Rather than personal immobilization.
One eagle is truly all we need
To stand together and succeed.
We can fly above the competitive brawl.
One nation with liberty and justice for all.
Francie Troy '24

In the past the Ode has featured Francies 'Thangs.' Here's another side of her talent.

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The Math That Keeps Messages Error-Free

Quanta Magazine

The digital signals that encode our words must compete with all sorts of noise enroute to their destination. But actual telephone conversations rarely devolve into games of telephone. Why is that?

The key to this puzzle is a mathematical technique called error correction, which was first proposed in the 1940s by the pioneering computer scientist Claude Shannon. Shannon's insight was simple: To guarantee that a message is faithfully transmitted, start by rewriting it in a form that makes subsequent corruption easy to spot and reverse.

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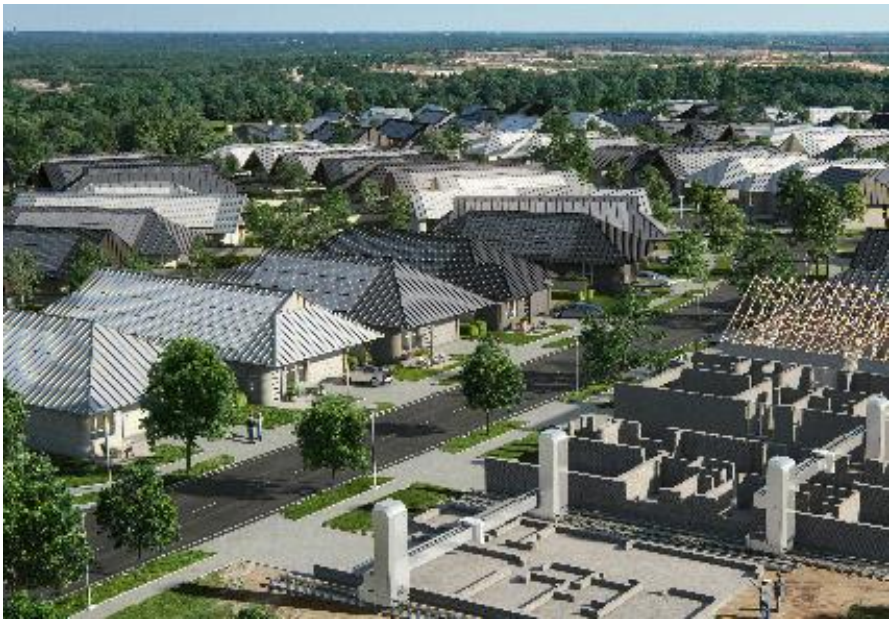
World’s Largest 3D-Printed Texas Neighborhood Is Nearly Complete



icon

They say everything’s bigger in Texas, and a development project nearing completion in Georgetown is no different. Construction tech company ICON is putting the finishing touches on the world’s largest 3D-printed neighborhood in the city just north of Austin.

“It brings a lot of efficiency to the trade market,” senior project manager Conner Jenkins told Reuters. “So, where there were maybe five different crews coming in to build a wall system, we now have one crew and one robot.”

The community, dubbed Wolf Ranch, comprises 100 homes ranging in price from around $450,000 to $600,000; roughly a quarter have already been sold. It takes about three weeks to print the single-story residences, with a nozzle squeezing out concrete walls designed to withstand extreme weather like tornadoes and maintain cool interior temperatures during hot Texas summers.

Another benefit of 3D-printed housing is sustainability — research has shown that the building method can reduce waste and carbon emissions. When the Wolf Ranch project was first announced, ICON CEO Jason Ballard called it a “watershed moment in the history of community-scale development.”

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Agency:Walker Werbeagentur

https://nobodyreadsads.com/

I did and he's right.

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Mongolia, Named 2024's Top Destination is Even Easier to Visit

Reindeer sledding, anyone?

Tourists climb onto the 40-meter- (130-foot-) tall stainless steel statue of Genghis Khan

Lonely Planet named Mongolia its top destination in its Best in Travel 2024 report.

With its stunning landscapes with room to roam, reindeer sleigh rides and camel racing, Mongolia is hoping to woo visitors looking to get away from it all.

Like most countries, its tourism industry was devastated by the Covid-19 pandemic, and it has launched a "Welcome to MonGOlia" campaign to win people back. The government has added flights and streamlined the visa process, offering visa-free visits for many countries.

Outside the lively capital, getting around can be difficult in summer as the steppes become waterlogged, and there is limited infrastructure, a shortage of accommodation and a deficit of skilled labor in tourism destinations, but the weather and scenery are great.

https://bit.ly/4fNVPlR

Have you ever dreamed of racing two-humped Bactrian camels? I haven't, but…

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Homefront Dad Shows Mom How He's Caring for the Little Darling

A graphic artist living in Germany works from home while his wife leaves their baby girl with him each day as she goes off to work.

A few months ago, he got tired of her texting to check on how he was doing with the baby, so he started photoshopping responses to text back to her. I'll try and include a different one in subsequent Odes.

Last week the kid was on a tightrope. Where will she be next week?

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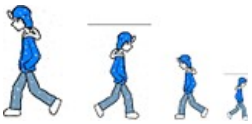
My Walking Thoughts



For Sunday September 1 2024

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Formation Flight

I'll go into the T-28 syllabus for formation flight training, next week, but first I'd like to present a broad background on the topic

Understanding number one: Formation flying is one of the most challenging and therefore most fun pursuits there is…*period*.

Also, breathes there a pilot who hasn't watched the Blue Angels or any of the dozen or so other flight demonstration teams in action and *not* dreamed of being a part of them. I hope not.

Understanding number two: Formation flying is the first skill that begins to set military flight students apart from their civilian counterparts. True, civilian pilots too can engage in it, but with different ends in mind.

Understanding number three: An obvious utility of formation flying is that it allows two or more aircraft to travel safely from one place to another at the same time and in roughly the same airspace, but if that were all, it probably wouldn't be worth the bother.

Understanding number four: Formation flying is the classroom for the study not just of relative motion but in a greater sense, aerial teamwork. Yes, killer instinct is a vital part of the fighter pilot equation, but not the only one…maybe not the most important. Mission is the bottom line of military flying, and this is where teamwork comes to the fore.

Understanding number five: Combat formations are about mutual support and if anything, more difficult to maintain properly than parade formations because of the distances involved. Distance between combat elements varies for a number of factors—altitude, airspeed, visibility, purpose—but for a quick and dirty marker think of a mile separation at 25,000 feet for a starting point.

It's easy enough to say that it is the wingmen's responsibility to maintain position on the leader but clearly it is not that simple. In a tactical maneuvering situation for instance, at any given time one person will be in a better position to clear the other's tail, maybe the flight leader maybe the wingman. In a prolonged turn this situation will swap back and forth. As a result, all participants will be making constant adjustments to maintain mutual support.

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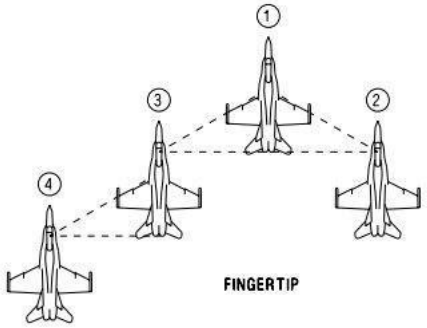
Not so, close company formations where leaders do the leading and wingmen do what it takes to stay in position.



Fingertip parade formation

Understanding number six: While the leader can do much to help the wingman by making maneuvers as smooth as possible and by communicating what's to follow by use of hand signals or head nods, neither is required—merely "good form."

Understanding number seven: From the wingman's standpoint, formation flight requires total, undivided concentration on a very particular spot on the leader's airplane and staying there...no exception permitted. Formation flying is an endless series of corrections in response to even the tiniest of mismatches the in the vectors of the participating aircraft. For instance, any change in the lead aircraft's flight path will necessitate a corresponding but somewhat greater response by the wingman. The longer the delay in responding to a mismatch, the greater the amount relative motion will develop, calling for an increased severity in the required response.

With all the electronic wizardry in present day aircraft, you might wonder whether there's a place for flight integrity (or even pilots) anymore, but if experience teaches anything, it's that even the simplest of plans and assumptions disappear into the ever-present fog of war when the furball begins.

Belief number one: The next war may begin in the hands of the technologists but shortly chaos will assert itself, resulting in aircraft and aircrew attrition, communications, navigation, and intelligence system shortfalls, changing strategic and tactical objective that toss all the plans and assumptions into a cocked hat, and all the other things whose impacts will be recognized after the initial dust settles.

When that happens maybe we'll remember why piloting skills and teamwork are important and that formation flying is important to their existence.

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