Ode to E Pluribus Unum for Sunday August 20 2023

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Monster Solar Prominence

Image Credit & Copyright: Mike Wenz

The monsters that live on the Sun are not like us. They are larger than the Earth and made of gas hotter than in any teapot. They have no eyes, but at times, many tentacles. They float.

Usually, they slowly change shape and just fade back onto the Sun over about a month. Sometimes, though, they suddenly explode and unleash energetic particles into the Solar System that can attack the Earth.

Pictured is a huge solar prominence imaged almost two weeks ago in the light of hydrogen. Captured by a small telescope in Gilbert, Arizona, USA, the monsteresque plume of gas was held aloft by the ever-present but ever-changing magnetic field near the surface of the Sun. Our active Sun continues to show an unusually high number of prominences, filaments, sunspots, and large active regions as solar maximum approaches in 2025.

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"Precarious Pear #1" By Louisa Wallace Jacobs

Louisa is donating the painting (32x35, acrylic on paper) to the Brain Injury Center of Ventura County for their annual fundraiser auction in October 2023.

If you go to her website you'll see this is not the only pear in her larder…in fact not the only one in a precarious position.

Louisa is my absolute longest acquaintance, which says something about stick-to-it-ness.

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Ana Vidovic

Ana Vidović is a Croatian classical guitarist, winner of prizes and international competitions worldwide.

Her international career includes frequent recitals, concerto engagements, festival appearances, and tours all over the world. Vidović has performed with numerous orchestras. She often plays works by Johann Sebastian Bach, who is her favorite composer, and other composers such as Federico Moreno Torroba, Manuel Ponce, Francisco Tárrega, and Joaquín Rodrigo (including Concierto de Aranjuez).

Bach Cello Suite No. 1 Prelude in G Major https://youtu.be/zBdK-ailioA?t=2
Bach Fugue BWV 100 https://youtu.be/Id0IbHNvknw?t=1
Bach Partita in A Minor https://youtu.be/-IVziY-k-to?t=1
Concierto de Aranjuez, Capriccio Diabolico https://youtu.be/hob430HF4UY
Isaac Albéniz Asturias https://youtu.be/inBKFMB-yPg?t=4
Sor Variations on a Theme by Mozart Op 9 https://youtu.be/iaEcDgxm8es?t=3

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The Origins of 15 Classic Carnival Rides

Theme parks keep getting more innovative, but some classic rides are here to stay.

They're not just for cowboys.
Pixel_Pig, E+ Collection, Getty Images

https://bit.ly/3OxMn9L

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Behind the Rise of Catalytic Converter Theft in the US

In the dark and mysterious labyrinth of pipes and steel lurking beneath your car, there's something called a catalytic converter.

Inside most converters, to help break up noxious gasses into less harmful compounds, there's a ceramic "honeycomb" containing trace amounts of precious metals.

In recent years, platinum, palladium, and rhodium have rocketed in value, making your car's underbelly thieves' favorite place to target. What happens to the catalytic converters from there? Well…here's a peak into the theft business.

https://youtu.be/fF0tr6uqCYI

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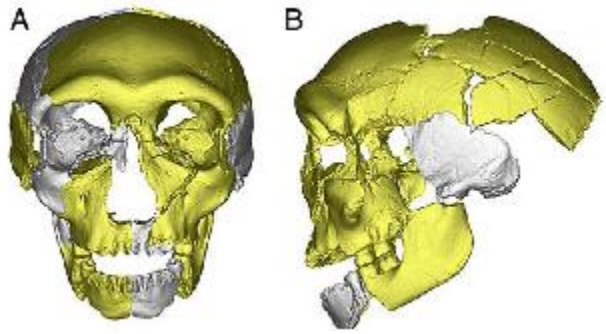
Remains Found in China May Belong to Third Human Lineage



The virtually reconstructed HLD 6 skull.
Credit: Wu Liu et al. Proceedings of the National Academy of Sciences (2019). DOI: 10.1073/pnas.1902396116

A team of paleontologists at the Chinese Academy of Sciences, working with colleagues from Xi'an Jiaotong University, the University of York, the University of Chinese Academy of Sciences and the National Research Center on Human Evolution, has found evidence of a previously unknown human lineage. In their study, reported in Journal of

Human Evolution, the group analyzed the fossilized jawbone, partial skull and some leg bones of a hominin dated to 300,000 years ago.

The fossils were excavated at a site in Hualongdong, in what is now a part of East China. They were subsequently subjected to both a morphological and a geometric assessment, with the initial focus on the jawbone, which exhibited unique features—a triangular lower edge and a unique bend.

The research team suggests that the unique features of the jawbone resemble those of both modern humans and Late Pleistocene hominids. But they also found that it did not have a chin, which suggests that it was more closely related to older species. They found other features that resemble hominins of the Middle Pleistocene, which, when taken together, suggested the individual most resembled a Homo erectus species. And that, they conclude, suggests a hybrid of modern human and ancient hominid.

The researchers note that the combination of features has never before been observed in hominids in East Asia, suggesting that traits found in modern humans began to appear as far back as 300,000 years ago.

In turning their attention to the skull, which a prior team had found to be the first-ever Middle Pleistocene human skull found in southeastern China, the new team found that the bones in its face were more similar to those in modern humans than was the case for the jawbone.

In an effort to determine a species for the remains, the team ruled out Denisovan. That left them with the likelihood that the fossils represent a third lineage—one that is not Denisovan or Homo erectus, and is closer to Homo sapiens. And if this is the case, the species would very likely have shared some evolutionary relationships with hominins of the Middle or Late Pleistocene, resulting in shared characteristics.

By Bob Yirka for Phys.org

Check last week's Walking Thoughts to see more on the subject.

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Flashmob at Festival La Perla - Aida

Set in the Old Kingdom of Egypt, Aida was commissioned by Cairo's Khedivial Opera House and had its première there on 24 December 1871. Today the work receives performances every year around the world.

https://youtu.be/dir5hjg3fmU

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Sargassum Whale

Words & Photographs by Luca Malaguti

Seven miles off the shore of Dominica, in the Martinique Straight, I lay below a thick layer of sargassum seaweed that stretched as far as I could see. Almost two feet thick, the sargassum cloud blocked out almost all the sunlight of the Caribbean midday sun. Only a few rays could penetrate through, guiding a path of light into the depths of the sea.

https://bit.ly/3OCoZIe

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Surf's Up!

Wave heights increase on California's coast as climate warms.

https://bit.ly/3OS1Kec

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What Is Dopamine and How Does It Work?

Known as the "feel good" hormone, dopamine is one of the brain's most important molecules. As a chemical messenger—communicating information between nerve cells in the brain, and the brain and the rest of the body—it's involved in movement, memory, reward behavior, diseases, and more. Learn about the basic neurochemistry of dopamine in this two-minute video overview, along with a high-level view on how it affects the body and mind.

https://youtu.be/Wa8_nLwQIpg

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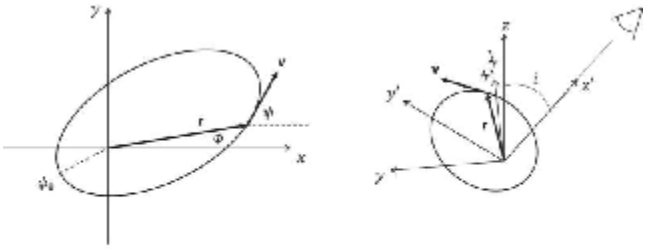
Evidence for Modified Gravity at Low Acceleration



orbital plane
(face-on view)

observer's view
(3D geometry)

A new study reports conclusive evidence for the breakdown of standard gravity in the low acceleration limit from a verifiable analysis of the orbital motions of long-period, widely separated, binary stars, usually referred to as wide binaries in astronomy and astrophysics.

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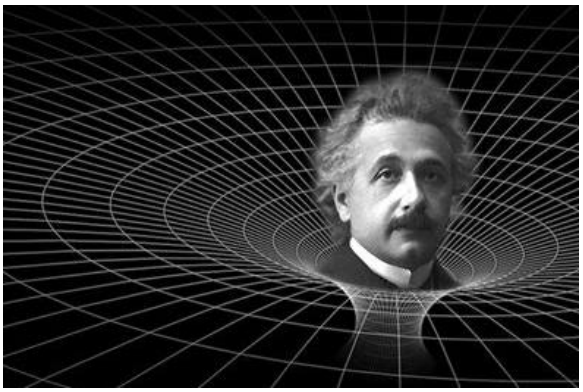
From Newton To Einstein: The Origins of General Relativity



To grasp the meaning and significance of general relativity, it is worth reflecting on the state of physics in the 19th century to see how Einstein came to realize that space, time, and geometry are not absolute but depend on the physical environment.

https://bit.ly/3DWTkvP

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R2Bier2

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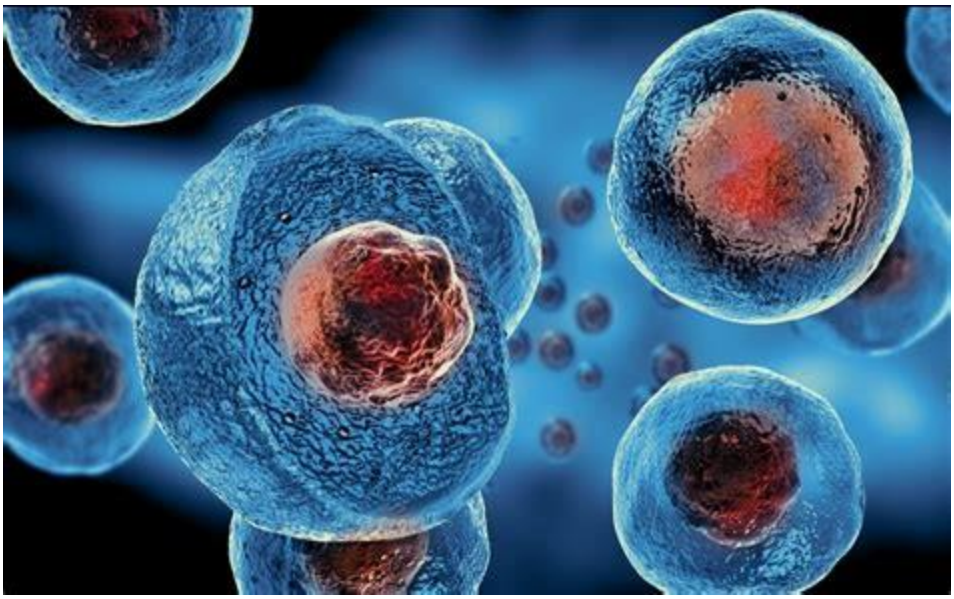
What Are Stem Cells and How Do They Work?

There are three types of stem cells. Each has potential for medical research and clinical applications based on its unique properties.



Embryonic Stem Cell
biologydictionary.net

Video

Stem cells are the building blocks of the human body. At the start of life, they divide over and over again to create a full person from an embryo. As we age, they replenish cells in our blood, bone, skin and organs. Stem cells could be powerful tools in treating injury and illness.

https://bit.ly/444MgYE

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How the Inca Built Machu Picchu

The city's longevity attests to the craftsmanship and practical prowess of its builders.

https://bit.ly/47pzOpu

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iPhone Photography Awards.

2023 Winning Photographers

1st Place – Abstract, The Long Wait
iPhone 7 Plus. Tim Wheeler, Stockholm, Sweden

https://bit.ly/3DOnku7

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Gray's Elegy in a Country Churchyard

Elegy Written in a Country Churchyard

BY THOMAS GRAY

The curfew tolls the knell of parting day,
The lowing herd wind slowly o'er the lea,
The plowman homeward plods his weary way,
And leaves the world to darkness and to me.

Now fades the glimm'ring landscape on the sight,
And all the air a solemn stillness holds,
Save where the beetle wheels his droning flight,
And drowsy tinklings lull the distant folds;

Save that from yonder ivy-mantled tow'r
The moping owl does to the moon complain
Of such, as wand'ring near her secret bow'r,
Molest her ancient solitary reign.

Beneath those rugged elms, that yew-tree's shade,
Where heaves the turf in many a mould'ring heap,
Each in his narrow cell for ever laid,

The rude forefathers of the hamlet sleep.

The breezy call of incense-breathing Morn,
The swallow twitt'ring from the straw-built shed,
The cock's shrill clarion, or the echoing horn,
No more shall rouse them from their lowly bed.

For them no more the blazing hearth shall burn,
Or busy housewife ply her evening care:
No children run to lisp their sire's return,
Or climb his knees the envied kiss to share.

Oft did the harvest to their sickle yield,
Their furrow oft the stubborn glebe has broke;
How jocund did they drive their team afield!
How bow'd the woods beneath their sturdy stroke!

Let not Ambition mock their useful toil,
Their homely joys, and destiny obscure;
Nor Grandeur hear with a disdainful smile
The short and simple annals of the poor.

The boast of heraldry, the pomp of pow'r,
And all that beauty, all that wealth e'er gave,
Awaits alike th' inevitable hour.
The paths of glory lead but to the grave.

Nor you, ye proud, impute to these the fault,
If Mem'ry o'er their tomb no trophies raise,
Where thro' the long-drawn aisle and fretted vault
The pealing anthem swells the note of praise.

Can storied urn or animated bust
Back to its mansion call the fleeting breath?
Can Honour's voice provoke the silent dust,
Or Flatt'ry soothe the dull cold ear of Death?

Perhaps in this neglected spot is laid
Some heart once pregnant with celestial fire;
Hands, that the rod of empire might have sway'd,
Or wak'd to ecstasy the living lyre.

But Knowledge to their eyes her ample page
Rich with the spoils of time did ne'er unroll;
Chill Penury repress'd their noble rage,
And froze the genial current of the soul.

Full many a gem of purest ray serene,
The dark unfathom'd caves of ocean bear:
Full many a flow'r is born to blush unseen,
And waste its sweetness on the desert air.

Some village-Hampden, that with dauntless breast
The little tyrant of his fields withstood;
Some mute inglorious Milton here may rest,
Some Cromwell guiltless of his country's blood.

Th' applause of list'ning senates to command,
The threats of pain and ruin to despise,
To scatter plenty o'er a smiling land,
And read their hist'ry in a nation's eyes,

Their lot forbade: nor circumscrib'd alone
Their growing virtues, but their crimes confin'd;
Forbade to wade through slaughter to a throne,
And shut the gates of mercy on mankind,

The struggling pangs of conscious truth to hide,
To quench the blushes of ingenuous shame,
Or heap the shrine of Luxury and Pride
With incense kindled at the Muse's flame.

Far from the madding crowd's ignoble strife,
Their sober wishes never learn'd to stray;
Along the cool sequester'd vale of life
They kept the noiseless tenor of their way.

Yet ev'n these bones from insult to protect,
Some frail memorial still erected nigh,
With uncouth rhymes and shapeless sculpture deck'd,
Implores the passing tribute of a sigh.

Their name, their years, spelt by th' unletter'd muse,
The place of fame and elegy supply:
And many a holy text around she strews,
That teach the rustic moralist to die.

For who to dumb Forgetfulness a prey,
This pleasing anxious being e'er resign'd,
Left the warm precincts of the cheerful day,
Nor cast one longing, ling'ring look behind?

On some fond breast the parting soul relies,
Some pious drops the closing eye requires;
Ev'n from the tomb the voice of Nature cries,
Ev'n in our ashes live their wonted fires.

For thee, who mindful of th' unhonour'd Dead
Dost in these lines their artless tale relate;
If chance, by lonely contemplation led,
Some kindred spirit shall inquire thy fate,

Haply some hoary-headed swain may say,
"Oft have we seen him at the peep of dawn
Brushing with hasty steps the dews away
To meet the sun upon the upland lawn.

"There at the foot of yonder nodding beech

That wreathes its old fantastic roots so high,
His listless length at noontide would he stretch,
And pore upon the brook that babbles by.

"Hard by yon wood, now smiling as in scorn,
Mutt'ring his wayward fancies he would rove,
Now drooping, woeful wan, like one forlorn,
Or craz'd with care, or cross'd in hopeless love.

"One morn I miss'd him on the custom'd hill,
Along the heath and near his fav'rite tree;
Another came; nor yet beside the rill,
Nor up the lawn, nor at the wood was he;

"The next with dirges due in sad array
Slow thro' the church-way path we saw him borne.
Approach and read (for thou canst read) the lay,
Grav'd on the stone beneath yon aged thorn."

THE EPITAPH
Here rests his head upon the lap of Earth
A youth to Fortune and to Fame unknown.
Fair Science frown'd not on his humble birth,
And Melancholy mark'd him for her own.

Large was his bounty, and his soul sincere,
Heav'n did a recompense as largely send:
He gave to Mis'ry all he had, a tear,
He gain'd from Heav'n ('twas all he wish'd) a friend.

No farther seek his merits to disclose,
Or draw his frailties from their dread abode,
(There they alike in trembling hope repose)
The bosom of his Father and his God

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Gray's Elegy read by Iain Gilchrist https://youtu.be/Urb-CpuRWoQ?t=48

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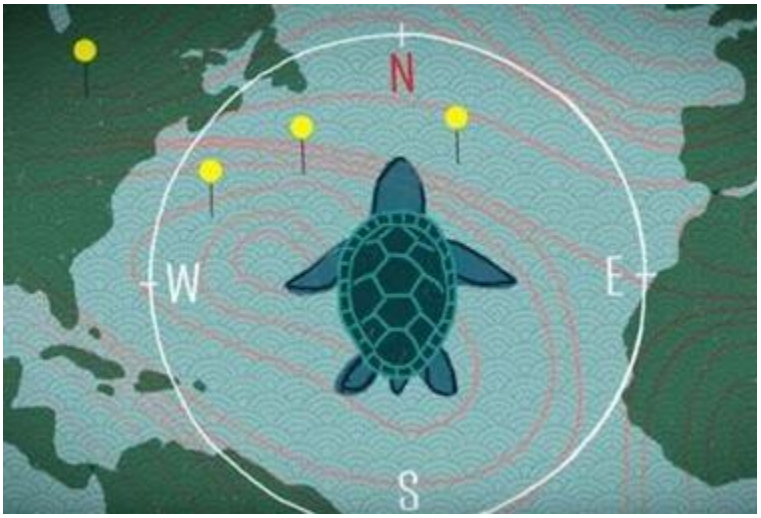
How Animal Use Earth's Magnetic Field to Navigate



Many animals use magnetoreception—the ability to sense the Earth's magnetic field—for navigation, including birds, sea turtles, and sharks. But how this "sixth sense" works at the biological level is not fully understood.

Two competing theories suggest the mechanism is either due to tiny magnetic materials inside animals' bodies, or a molecule in their eyes that effectively allows them to "see" magnetic fields.

This overview from Science, the leading US scientific publication, breaks down what we don't know about the phenomenon.

https://youtu.be/tdXb_4EkYtU

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Cowabunga Woof-Woof

Josh Edelson/Getty Images

This is the intense focus required to become an elite athlete. You are looking at competitors at the World Dog Surfing Championships in California, an event that helps raise money for dog, environmental, and surfing nonprofits.

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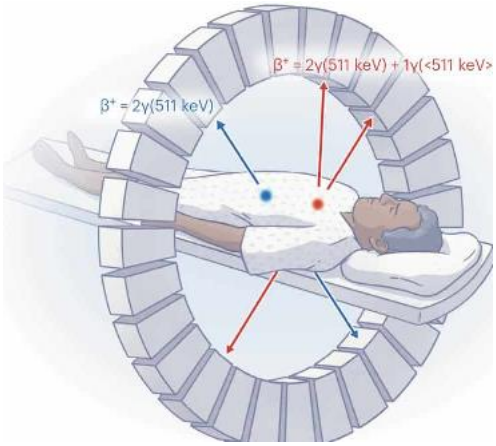
Multiplexed PET Can Image Two Radiotracers in a Single Scan



Dual isotope imaging Overview of multiplexed PET using a pure positron emitter and a positron–gamma emitting radionuclide.
(Courtesy: E C Pratt et al Nat. Biomed. Eng 10.1038/s41551-023-01060-y)

A research team headed up by Jan Grimm at Memorial Sloan Kettering Cancer Center and Joaquin Herraiz at Complutense University of Madrid has developed a new image reconstruction method that enables in vivo imaging of two different PET tracers simultaneously.

This advance could help increase the depth of molecular information attainable during a single scan, giving scientists and radiologists alike more timely information for a diagnosis and staging that could not be done with a biopsy.”=

https://bit.ly/3rLuHzv

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Seaside Quantum Mechanics: Sunscreen on the Atomic Level

Illustration by Sandbox Studio, Chicago

Summer 2023 in the Northern Hemisphere is on track to be the hottest on record, and the sun is blazing in the sky. One way to deal with it is to slap on the sunscreen. But have you ever thought about how sunscreen actually works? It all comes down to how photons from the sun interact with our skin.

Photons are the messenger particles of the electromagnetic force—one of the four fundamental forces of nature—and are responsible for an array of phenomena including the X-rays we use to examine broken bones, the microwaves we use to reheat food, and, probably most importantly for many people, the visible light we use to see.

During summer, we receive the maximum flux of photons from the sun due to the Earth’s slight tilt in its direction. At roughly the latitude of Chicago, the flux of photons is three times greater at midday in the peak of summer than during midwinter.

The sun emits photons in all parts of the electromagnetic spectrum, but the majority are from the visible, infrared and ultraviolet segments. Ultraviolet radiation plays an essential role in maintaining plant and animal life, but it has also consistently been identified as a cause of skin cancer. Understanding why is the first step to understanding how sunscreen protects us from it.

UV radiation has a higher frequency than visible or infrared light, which means that, of the three types, UV photons have the most energy. When UV photons hit your skin, their energy has to go somewhere. (Even in the summertime, no one gets a holiday from conserving energy.) In the absence of protection, this energy is transferred to the fats and proteins in your skin. The excess energy is capable of triggering mutations in our DNA, which are a cause of skin cancer.

While our bodies do possess some natural protective mechanisms against UV radiation, the prevalence of skin cancer (along with painful sunburns) clearly demonstrates that it is necessary to enhance these mechanisms artificially.

Enter sunscreen.

The active ingredients of sunscreen fall into two main categories: organic molecules and inorganic crystals. Both of these components act by absorbing UV radiation like a sponge and then dissipating it safely into the environment. How does this work? It all has to do with electrons and quantum mechanics.

As you may remember from chemistry classes, electrons in atoms and molecules occupy orbitals i.e., discrete energy levels. An electron stays put in its home orbital unless it absorbs the right amount of energy to jump up to the next one. Because of this, an electron can't contain any old amount of energy—only specific, quantized amounts. This is where the "quantum" comes from in "quantum mechanics," which includes the study of quantized energy in subatomic particles.

The inorganic compounds in sunscreen have a crystalline structure and contain (mostly) free electrons. These electrons are constantly buzzing around and interacting, which creates a flexible orbital structure called a band gap.

The band presents a loophole to the quantized energy problem in quantum mechanics because it allows electrons to absorb a wide spectrum of energies. (After all, there's not just a single dangerous wavelength of light from the sun.)

"In isolated atoms, you have pretty sharp, quantized transitions between atomic orbitals," says Thomas Wolf, a physical chemist at the US Department of Energy's SLAC National Accelerator Laboratory. "If you now have many atoms in a lattice like in an inorganic sunscreen, their atomic orbitals can overlap. This leads to many quantized transitions, which are fairly similar in energy and form bands. If light gets absorbed, electrons get promoted from an occupied to an unoccupied band across a band gap."

When UV photons from the sun hit inorganic sunscreen, the electrons dash from the lower orbitals into the excited orbitals, each jumping a distance equivalent to the energy of the photon that excited it. After a while, the excited electrons drop back down to their original orbitals, releasing the energy they absorbed as heat.

Organic sunscreens work in a similar way, but their active ingredients have no band gaps. Instead, they use the beauty of covalent bonds and hybridized orbitals.

Covalent bonds form when an electron is shared almost evenly between two atoms, and this creates orbital hybridization (the mixing and merging of two independent atomic orbitals into a new super orbital, so to speak). Organic sunscreens use rings and chains of covalently bonded carbon atoms to play with the distance between these new ground and excited states. Combining many different molecules with many different orbital configurations allows organic sunscreens to protect the skin against many different wavelengths of light.

There is ongoing research to find the most efficient mechanism for the excited electrons in sunscreen to release their energy, with researchers taking inspiration from the mechanisms that plants use to protect themselves from the sun. Scientists are also researching how to make organic sunscreens hardier, since over time and after atoms have absorbed a certain amount of energy, the bonds between them can snap.

So there you have it, the science behind sunscreen. To all you physics students out there: Even on the beach, you are still applying quantum mechanics, literally to your skin!

By Claire Malone for Fermilab and Stanford Linear Accelerator Center

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Junkyard B-17 Taking Shape in Illinois Barn Restoration Shop

Wartime image of B-17 E Serial Number 41-2595 at McDill Field, Florida.
Colorized by David Van Coolwijk

Nearly four decades ago, a young Mike Kellner, inspired by the television series 12 O'clock High, ponied up a bit more than seven grand to a Maine junkyard for a B-17E. Or, more accurately, the sawed-off pieces of one. "It was a scrapped airplane," he told the local Chicago suburban Daily Herald newspaper. "So, it was all chopped into eight-

foot pieces. At the time, they thought we were nuts." It took Kellner the better part of six years to truck the bits and pieces home to Illinois, and in the almost 40 years since, he's been putting those puzzle pieces back together—a little at a time.

B-17E Serial Number 41-2595 was built by Boeing in Seattle in 1941, likely before the Japanese attack on Pearl Harbor. The early variant of the famous "Flying Fortress" was delivered to the U.S. Army Air Corps in 1942. Ultimately nicknamed the "Desert Rat," it was assigned for training with the 97th Bomb Group at MacDill Field near Tampa, Florida, and never flew a combat mission. The last operational flight of the Desert Rat (also known as "Tangerine") was in December 1945. It was then authorized for salvage, ultimately ending up in pieces at the Maine auto salvage yard.

A private pilot and former construction worker, Kellner has been working on the B-17 eight hours a day, six days a week for the past several years. He told the Daily Herald he has been saving up money and horse-trading parts and expects the four-engine bomber to be airworthy in about five years—though he admits he's been using the same five-year estimate for the past two decades. "We're still looking for some things," Kellner told the newspaper. "We're still missing a couple of seats and a few turret parts." He explained that most of the internal structure of the four-engine Flying Fortress is original, "though some big, load-bearing pieces are new." He has accumulated ten of the 1,200-horsepower Wright R-1820-97 radial engines used on the B-17. No word yet on whether or not the current Airworthiness Directive on B-17 wing-spar assemblies will affect the Desert Rat's restoration timeline.

Asked how much he's spent on the project to date, Kellner told the newspaper, "Too much paperwork, and I'm not sure I want to know." Though he plans to handle the bulk of financing the project on his own, he is willing to work with sponsors and does accept donations—either financial or in volunteer help, through his Facebook page.

In the above photo, care to guess who the ball turret gunner is?

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Footlight Parade (1933) – Human Waterfall

From the 1933 movie Footlight Parade directed By Busby Berkeley.

https://youtu.be/FRqcZcrgPaU

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Strong as Glass

By building a structure out of DNA and then coating it with glass, researchers have created a very strong material with very low density

getty images

https://bit.ly/3rMG4az

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What's Kratom, and Why Is it in Trouble?

Has someone at your yoga and meditation workshop offered you kratom tea, leaving you wondering what the heck it is?

Kratom is an herbal supplement made from the dried leaves of a tree in the coffee family and imported from Southeast Asia. When ingested or smoked, it can cause effects similar to opioids and stimulants.

Some people who enjoy it say they feel relaxed or more social. Others say it helps them manage chronic pain or recover from addiction.

It's become popular in recent years:

- Over 2m Americans use kratom annually, per Bloomberg.
- In 2021, it was a $1.3B industry
- It can be purchased at smoke shops, online, or at kratom bars, where customers ditch alcohol for kratom teas and cocktails.

But before you get any business ideas…… know that it can be dangerous in high doses or when mixed with other substances. Negative side effects can include seizures and, though rare, death.

In May, a kratom vendor who sold a 39-year-old woman concentrated kratom extract was ordered to pay $4.6m+ to her family after she died of acute kratom intoxication, per NPR.

Lawyers representing families in other wrongful death lawsuits say vendors don't warn customers of potential harm or instruct them on how to use kratom. Why not?

Though a handful of states have banned it and the FDA warns against taking it, it isn't regulated. And despite its potential benefits, there hasn't been enough research on kratom to understand how to harness those benefits without the harm.

The National Institute on Drug Abuse supports such research, while the American Kratom Association advocates for kratom to be regulated so that it can be consumed safely and legally.

But if it's anything like cannabis and mushrooms, kratom may have a long road — and a lot of red tape — ahead.

BTW: Kratom aside, there is a push for sober bars, offering socializing without the booze. Alternatives include mocktails; low- and no-ABV beer, wine, and spirits; and drinks made with adaptogenics and nootropics.

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Recreational Bike Ride Golden Anniversary Trek Across Iowa

What bills itself as "the world's longest, largest and oldest recreational bicycle touring event" was more like the world's biggest traffic jam as riders, packed together in a

sinewy stream of brightly colored jerseys and shorts, churned across the Loess Hills on the western edge of Iowa.

https://bit.ly/3Y9YE8J

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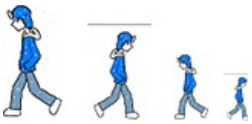
My Walking Thoughts



For Sunday August 20 2023

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I'm getting prepared for my role in this Weekend's 42nd Annual Wings Over Camarillo Air Show in which I will putter around the 'Veteran's Pavilion' and pretend I know something.

Anyway, here is something I wrote after my return from Vietnam in 1970, sniping at SecDef Robert MacNamara and his handling of the war. This is fiction, but I've come to realize how accurate an assessment of his beliefs and actions this really way.

The True Story of How McNamara's Whiz Kids Waged War in Vietnam

3,500 Marines of the 9th Marine Expeditionary Brigade arrived in Da Nang to protect the U.S. airbase there from Viet Cong attacks. UP News, March 9,1965

"I was at the O-club drinking a beer when Major Childs stuck his head in the door to announce an 'All-Officer's Meeting in 15 minutes," Captain James Wright recalls in 1980. "24 hours later we were headed for a place named Vietnam."

Four days after the landing the 9th suffered its first casualties and by June the Brigade was ass deep in mission grass conducting search and destroy operations against Viet Cong guerillas in the Da Nang area.

Not to be left in the dust by the speed with which both the ground and aviation units had gotten to work, Secretary of Defense, Robert McNamara tasked the Brigade to develop a Tactical Assessment and Operations Analysis Procedures Manual that would provide his Whiz Kids with the types and amounts of quantified data to permit long range strategic planning based on isolated tactical data. The study began with data from the aviation units at the Da Nang airfield.

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"First, let's decide what's important and what isn't," suggested the brigade's Intelligence Office, Colonel Brogan, during his staff's first meeting. "Who's got any ideas?"

"Sortie rate for one," offered Private Bung, two months out of boot camp.

"Ordnance load's important too," chimed in the commissary officer, Captain Wright.

"Don't forget target response," implored Lieutenant Dixon from the mosquito abatement officer, whose love for statistics invariably left him broke within an hour after pay call.

By the end of the meeting the participants had expanded the list to include such items as target size, attack frequency within a given area, time of day, weather, and finally first-hand damage assessment.

"Ok, gang, we've got a good start," approved the Colonel. "Now all we have to do is develop a matrix and weighting factors and we'll have it."

"It seems a little simplistic to me," countered Captain Norton after he reviewed the concept. "What you are saying is that in order to come up with an analysis of any given raid's effectiveness all you have to do is multiply the number of aircraft by how many bombs each carried, divided into the number of targets assigned, then multiplied by a factor of two." He paused, reviewing the formula for yet another few seconds to make certain he understood it. "Is that essentially what you have in mind?"

He was greeted by a general nod of assent.

"What happens if the pilot doesn't find the target, or he flat misses it because he puts in the wrong sight setting…or any of a thousand other things that can and do go wrong on every mission?"

"We took it into account by multiplying the equation by a factor of two, but if you think *three would be better* …" the chorus responded in unison.

"You don't understand," Captain Norton persisted in mounting desperation. "You can't go around making assumptions like these without some basis in observable fact."

"No, Captain Norton," Colonel Brogan corrected as if he were scolding a small child, " If we wait until there are enough data to create an exact formula, the war will be over, and it won't make any difference. Whether it's a factor of two or three is trivial in the long run. What's important is that we impress on the pilots how vital this is to the war effort, and they'll just have to stop missing targets, that's all." And that was that.

The next morning, a huge banner fluttered outside the Special Projects Staff Headquarters bearing the proscription:

Ae = 3T / SB

Back in Washington, SecDef was ecstatic. "By golly, with this we won't have to listen to all of those brass hat bastards bluster about how they need this weapon or that amount of manpower," he roared his approval. "All the grunts and zoomies have to do is supply us some simple information and we'll tell them what they need and how they're doing."

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