Ode to E Pluribus Unum for Sunday December 29 2024



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M16: Pillars of Star Creation



These dark pillars may look destructive, but they are creating stars. This pillar-capturing picture of the Eagle Nebula combines visible light exposures taken with the Hubble Space Telescope with infrared images taken with the James Webb Space Telescope to highlight evaporating gaseous globules (EGGs) emerging from pillars of molecular hydrogen gas and dust.

The giant pillars are light years in length and are so dense that interior gas contracts gravitationally to form stars. At each pillar's end, the intense radiation of bright young stars causes low density material to boil away, leaving stellar nurseries of dense EGGs exposed.

The Eagle Nebula, associated with the open star cluster M16, lies about 7000 light years away.

We've seen the Pillars before, but never so detailed with inputs from Hubble and JWST.

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The Miracle of the Light

In darker times we look for light



(Rachel Posner via Getty Images)

Among Jewish images of illumination there are few more inspiring than one taken in the German city of Kiel in 1931. Akiva Posner, rabbi of the Jewish community in Kiel, had set up his menorah on the windowsill on the eighth night of Hanukkah. Before the sun set, before the ceremony began, his wife, Rachel, saw that the menorah was facing, across the street, a symbol of a very different kind: an enormous swastika hung by local Nazis.

Rachel's picture is a reminder of a speech ever given by Supreme Court Justice Antonin Scalia delivered in the Capitol Rotunda in 1997, in a ceremony remembering the Holocaust. Scalia spoke of visiting Auschwitz, and then emphasized, "The one message I want to convey today is that you will have missed the most frightening aspect of it all, if you do not appreciate that it happened in one of the most educated, most progressive, most cultured countries in the world." The Germany of the early twentieth century, he noted, "was a world leader in most fields of art, science, and intellect." Its universities were some of the most celebrated on earth, yet this did not prevent Nazism from suffusing society; in fact, German education and Nazism went hand in hand. This, Scalia then added, was not only a fact of history but for our own lives. American parents, Scalia reflected, place so much value today on the opportunities offered in elite educational institutions, yet he added that "is only of only secondary importance—to our children, and to the society that their generation will create."

Near-Unlimited EV Range Through Solar Paint?

Mercedes-Benz is developing a new type of solar paint that could free EV owners from the perennial problem of range anxiety.

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(Image credit: Marin Tomas via Getty Images)

Photovoltaic paint converts light energy into an electrical charge via a process known as the <u>photovoltaic effect</u> where semiconductor nanoparticles known as quantum dots absorb the light energy and transfer it to electrons within the material.

The movement of electrons creates an electric current, which is collected through tiny conductive layers embedded in the paint. This current can then be directed to the EV's electrical system to either power its components immediately or charge its battery for later use.

Despite being extremely lightweight, the paint packs an energy efficiency of 20%, meaning one-fifth of sunlight energy that hits its surface is converted into usable power. This is comparable to the efficiency of common solar panels.

https://bit.ly/4iUJzSo

How about as a house paint?



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Chords & Riffs

John Dowland (1563-1623)



thefamouspeople.com

An internationally known English musician of the late 16th and early 17th centuries. He was one of the most renowned lutenists of his time, and his compositions were disseminated widely. In modern scholarship, he is often listed second in importance

only to William Byrd. Dowland spent most of his career coveting a musical position in the English court, but was passed over by Elizabeth I. In his early years, he served English Ambassador Sir Henry Cobham in France.

His most noteworthy and well-paid position was as court lutenist for Christian IV of Denmark (1598–1606). In his declining years, he finally obtained a post of limited importance in the employ of James I. His access to diverse courts has led to speculation as to his participation in intelligence activities.

In spite of Dowland's ongoing popularity with performers and scholars, only one comprehensive monograph on his life and works in English is currently available in print. Foundational modern research on the composer, however, stretches back to the 19th century and a steady stream of journal articles and dissertations related to Dowland and his works have appeared since the mid-20th century.

Recent scholarship tends toward more narrow focuses, such as textual and musical analyses of individual works and close examinations of the political and cultural contexts in which Dowland's music was produced.

Christopher Morrongiello performs "Lachrimae" <u>https://youtu.be/fZYzuIGDYGs?t=1</u> Andres Segovia If My Complaints Could Passions Move <u>https://youtu.be/mNRmFc_kqm8</u> Christoph Denoth - Frog Galliard <u>https://youtu.be/h8LEvYca7Rw?t=3</u> Can she excuse my wrongs Sting <u>https://youtu.be/nntri9OfaRY</u>

The Future of Commercial Travel?

NASA's testing a futuristic plane. You might fly on it.



An artist's rendering of the X-66 aircraft soaring above the clouds. Credit: NASA

The space agency's Sustainable Flight Demonstrator project — intended to slash the fuel commercial airliners burn — is developing the novel X-66 plane. Working with Boeing, the project aims to reengineer the single-aisle aircraft that you typically fly on. As NASA noted, these planes (like the Airbus A320 and Boeing 737) are the "workhorse of passenger airlines around the world."

At its facility in Palmdale, California, Boeing will convert an MD-90 aircraft — a singleaisle plane that's no longer in service — into the X-66. The novel design could offer significant benefits. "When combined with other advancements in propulsion systems, materials, and systems architecture, this configuration could result in up to 30 percent less fuel consumption and reduced emissions when compared with today's best-in-class aircraft," NASA explained.

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Brain-Controlled Bionic Limbs Are Inching Closer to Reality

An "anatomics" approach to bionic prostheses reworks the body for smoother integration



A technique called osseointegration anchors a prosthesis in place using a titanium bolt inserted into the skeleton. Implanted electrodes allow for fine motor control, such as picking up eggs. Integrum AB

The word "bionic" conjures sci-fi visions of humans enhanced to superhuman levels, but the field has struggled to integrate these powerful machines with the human body.

That's starting to change. A recent trial tested one new integration technique, which involves surgically reconstructing muscle pairs that give recipients a sense of the position and movement of a bionic limb. Signals from those muscles control robotic

joints, so the prosthesis is fully under control of the user's brain. The <u>system enabled</u> <u>people with below-knee amputations to walk more naturally</u> and better navigate slopes, stairs and obstacles, researchers reported in the July *Nature Medicine*.



https://bit.ly/49oeV MB

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How Humans Evolved from Great Apes...Today's Story

The picture of human evolution has changed repeatedly and dramatically over the past half century, shaped by waves of new fossil discovery, technology, and scientific techniques.



Washington Post/Getty Images

The divergence from the apes of a lineage—the hominins—that eventually led to us had probably already begun 8 million years ago. But our knowledge of this date depends on molecular comparisons with other animals, rather than fossils.

Even the term "human" is arguable. Many scholars reserve it for modern humans like us, even though we have Neanderthal genes, and they shared at least 90 percent of our hominin history from its beginnings around 8 million years ago. The essence of hominin evolution ever since has been gradual change, with occasional rapid phases. The record of evolution in our own genus, Homo, is already full enough to show we cannot separate ourselves with hard lines.

https://bit.ly/3CWJrRL

My guess is that there will be far more twists to the tale than straight lines.

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Will GenCast Outdo Punxsutawney Phil?

lonaqyalonda.pages.dev

Google's DeepMind yesterday unveiled an <u>AI model</u> capable of predicting the weather more accurately than existing forecasting systems. The breakthrough marks an advancement in the field, promising quicker and cheaper results.

As published in <u>Nature</u>, DeepMind researchers trained their model, <u>GenCast</u>, on data from 1979 to 2018 to predict the weather for 2019. In a study published in Nature, they found GenCast outperformed the world's leading atmospheric predictor—the ensemble system from the European Centre for Medium-Range Weather Forecasts—over 97% of the time on factors like wind speeds, temperatures, and precipitation. GenCast was also fast, producing 15-day predictions in eight minutes rather than the hours conventional systems can take. GenCast also outperformed in predicting fast-changing hurricane paths but underperformed in predictions of hurricane intensity.

At least 35 countries rely on Europe's ensemble system, which forecasts weather using room-sized supercomputers that calculate global observations from satellites and

weather stations. In contrast, GenCast runs on smaller machines and uses historical data to spot patterns and present scenarios.

Ps. Punxsutawney and his rodent wife Phyllis welcomed two beautiful babies who will surely continue the family business.

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A First-of-Its-Kind Explainable AI Model Detects Brain Cancer

A new AI model repurposes camouflage animal detection to find brain tumors.



Michigan head and spine institute

An area of great hope and promise for applied artificial intelligence (AI) deep learning is at the intersection of neuroscience and oncology, both challenging fields known for their inherent complexity. A new study published in Biology Methods & Protocols demonstrates how the unique combination of explainable AI (XAI) and repurposing camouflage animal detection algorithm can identify human brain cancer.

The researchers hypothesized that an AI network that was trained to spot animals in camouflage could be repurposed effectively to detect brain tumors from image data obtained noninvasively from magnetic resonance imaging (MRI) brain scans. In radiology, the two main types of MRI images are T1-weighted and T2-weighted. T1-weighted images highlight fat and are ideal for normal soft-tissue anatomy whereas T2-weighted images are ideal for spotting fluid and abnormalities such as tumors, trauma, and inflammation according to the 2023 Merck Manual.

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Architects Transform Riyadh Metro Station into a Work of Art

Zaha Hadid died in 2016, though the firm bearing her name continues on, and she would have fully approved of the new metro station in Riyadh.



mossandfog

It's not just a place to catch a train—it's a destination that inspires, blending practicality with beauty in a way that few transit hubs achieve

https://bit.ly/3Bb9ZhJ

NASA Flights Map Critical Minerals From Skies Above Western US

Technology used to chart other worlds is revealing minerals in the American West that are critical to the country's renewable energy future.



Various minerals are revealed in vibrant detail in this sample mineral map of Cuprite, Nevada, following processing of imaging spectrometer data. Credit: USGS

To jumpstart mineral exploration, USGS is leading a nationwide survey from the inside out, using tools like lidar and magnetic-radiometric sensors to probe ancient terrain in new detail.

The plane, a high-altitude ER-2 research aircraft, had taken off early that morning from NASA's Armstrong Flight Research Center in Edwards, California. Below pilot Dean Neeley, the landscape looked barren and brown. But to the optical sensors installed on the plane's belly and wing, it gleamed in hundreds of colors.

Neeley's flight that day was part of GEMx, the Geological Earth Mapping Experiment led by NASA and the U.S. Geological Survey to map critical minerals across more than 190,000 square miles (500,000 square kilometers) of North American soil. Using airborne instruments, scientists are collecting these measurements over parts of California, Nevada, Arizona, and Oregon. That's an area about the size of Spain.



https://bit.ly/3DdbFYr

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742 New Species Identified in the Congo Basin in the Last Decade



© Nik Borrow

It's always exciting when we get to share news about newly found species, rather than disappearing ones. And it's extra exciting when there are hundreds of said newly found species.

In a report released this week, the World Wildlife Fund announced that researchers identified 742 wildlife and plant species in the Congo Basin over the last 10 years, highlighting "the remarkable biodiversity and urgent conservation needs of one of the world's most vital ecosystems."

"I spent my early career carrying out wildlife surveys in many parts of the Congo Basin and was always astonished by its biodiversity. So this report does not come as a surprise to me but rather as a call to action," Allard Blom, the WWF's vice president for African forests, said in a press release. "We need to do more as the Congo Basin remains one of the least researched places on the planet and urgently needs additional protection."

The species include the Central African slender-snouted crocodile, pictured here; a dragonfly named after a Pink Floyd album; and a unique white orchid. Explore them all in the <u>80-page report</u>.



Study Explores the Value of "Incidental Exercise"



We're often hard on ourselves when it comes to what "counts" as a workout, but a new study found that even tiny bursts of movement can have positive health effects.

Everyday activities like walking the dog around the block, taking the stairs instead of the elevator, scrubbing the floors, and raking the leaves all fall into the bucket of "incidental exercise." Researchers from the University of Sydney analyzed the <u>value of these activities</u> when it comes to preventing major adverse cardiovascular events, like heart attacks.

Women who got 1.5-4 minutes of daily incidental exercise had a nearly 50% lower risk of cardiovascular issues compared to those who said they never engaged in such

activities. The results were slightly less dramatic for the men in the study: Those who got 5.6 minutes of incidental exercise per day saw a 16% reduction in their risk of major cardiovascular events.

"Doing something is likely better than nothing is the take-home message about incidental exercise," cardiologist Luke Laffin, who was not involved in the research, told Yahoo Life, noting that it's still ideal to have a more robust workout routine. Get <u>some</u> <u>ideas</u> on how to incorporate incidental exercise into your daily life.

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Has Modern Technology Changed How Our Ancient Minds Work?

'It explains why our ability to focus has gone to hell': Screens are assaulting our Stone Age brains with more information than we can handle." neurologist and author Richard E. Cytowic argues



(Image credit: Bevan Goldswain via Getty Images

We often joke that our attention spans have dropped significantly in recent years with the rise of digital technologies and screen-centric entertainment, but there is sound science to back up this observation.

From an engineering perspective, the brain has fixed energy limits that dictate how much work it can handle at a given time. Feeling overloaded leads to stress. Stress leads to distraction. Distraction then leads to error. The obvious solutions are either to staunch the incoming stream or alleviate the stress.

https://bit.ly/49te5OK

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Why Do Worms Come Out in the Rain?

Earthworms commonly come out when it's wet outside, but why?



There are a few ideas as to why earthworms come to the surface in rainy weather. (Image credit: Roman Romanov via Alamy Stock Photo)

Some people assume worms come to the surface so they do not drown in their burrows. However, "worms don't have lungs like we do," says Thea Whitman, a soil scientist at the University of Wisconsin-Madison. Instead, earthworms absorb oxygen through their skin, and they can do so from water as well as from air.

A likely explanation is that earthworms surface on rainy days to move more quickly on the wet ground, instead of slowly burrowing through soil as they usually do. "They require moist environments to survive, and so wet days could allow for them to travel above the soil," Whitman said. Earthworms might make such journeys to mate or migrate, she added.



How Fish Choose the Perfect Moment to Hatch



This growing zebrafish will eventually decide when it's the right time to hatch. Deodatta Gajbhiye

Let's face it: Some birthdays are just better than others. Back in school, mine always happened when all of my friends were away on vacation. So I was a little jealous when I learned that fish, which as far as I know don't even throw parties, actively decide when to hatch—essentially choosing their own birthdays. Now, scientists have finally figured out how they do it.

Zebrafish embryos initiate hatching, researchers report in a new Science study, <u>using a neurohormone known</u> <u>as thyrotropin-releasing hormone</u>

(Trh). After leaving the brain, this hormone travels through the bloodstream to a specialized hatching gland, triggering the release of enzymes that chew through the egg's protective envelope and allow the fish to swim out into the world. This fleeting neuroendocrine circuit, which dissipates shortly after hatching, ensures the embryo does not emerge from its egg too soon or too late—an error of timing with potentially fatal consequences. By contrast, embryos genetically engineered to lack Trh fail to hatch and eventually die inside their eggs.

"How the transient Trh circuit is precisely activated for hatching to occur at the perfect time and scenario is not yet known," biologists Francesco Argenton and Yoav Gothilf write in a related <u>Science Perspective</u>. In the future, the researchers plan to investigate the neurohormone's role in other species, granting further insight into the evolution of egg-laying fish.

Read the Science paper



The Aztec Empire's Rise and Fall

How did the Aztecs' great city Tenochtitlan rise and fall?



warhistoryonline.com

https://youtu.be/yNKOICsjahU

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Ocean Photographer of the Year, Jacob Guy: "Just get in the water"



Guy's winning image of the elusive algae octopus.

"I share a connection to this image as the octopus is one of my favorite animals. I also really love the story and process behind capturing this image. It embodies one of the only underwater images I've captured where I was happy not doing any editing to it. For me as well I find the practice of fluorescent photography a sight that is becoming rarer and I'd love to get people more involved in this type of photography and this type of diving."

https://bit.ly/49CkEP7

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People Who Read for Fun Have Different Brains.

Better reading ability was linked to a larger anterior part of the temporal lobe in the left hemisphere compared to the right.



msn.com

The number of people who read for fun appears to be steadily dropping. Fifty percent of U.K. adults say they don't read regularly (up from 42% in 2015) and almost one in four young people aged 16-24 say they've never been readers, according to research by The Reading Agency. But what are the implications?

Will people's preference for video over text affect our brains or our evolution as a species? What kind of brain structure do good readers actually have? The new <u>study</u>, published in *NeuroImage*, has found out.

The structure of two regions in the left hemisphere, which are crucial for language, is different in people who are good at reading.



Who Holds thre U.S. Debt

https://bit.ly/4izyON0

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visual capitalist

U.S. gross debt increased from \$34.4 trillion at the end of 2023 to \$36.1 trillion as of December 2024, with some experts calling it unsustainable.

In this graphic we bring a breakdown of U.S. debt composition, categorized by domestic and foreign investors as well as intragovernmental holdings. The data is sourced from the U.S. Department of the Treasury by the Peter G. Peterson Foundation, as of yearend for 2023.

Key Data on U.S. Debt

The U.S. national debt increases when the federal government spends more than it collects through taxes and other revenue streams.

When government spending exceeds tax revenue, a budget deficit occurs. To cover the shortfall, the U.S. Treasury issues Treasury bills, notes, and bonds. The national debt is the cumulative total of the federal government's budget deficits, adjusted for any surpluses.

Of the \$34.4 trillion in gross debt in 2023, \$27.3 trillion (79%) was public debt borrowed from domestic and foreign investors, while \$7.0 trillion (21%) was intragovernmental debt, reflecting internal government transactions.

The Federal Reserve System was the largest domestic holder of U.S. public debt, with holdings of \$5.24 trillion.

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How Do Solar Panels Work?

literoflightusa

The Earth intercepts a lot of solar power: 173,000 terawatts. That's 10,000 times more power than the planet's population uses. So is it possible that one day the world could be completely reliant on solar energy? Richard Komp examines how solar panels convert solar energy to electrical energy.

https://youtu.be/xKxrkht7CpY

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Drowning Prevention: A Startling Yet Hopeful Report

More than 300,000 people die from drowning every year – and nearly all of these cases are preventable, according to a new report from the World Health Organization (WHO).



Drowning is a leading causes of death globally for children, according to the first ever report on drowning as a public health issue issued by the World Health Organization. Md Rafayat Haque Khan/Eyepix Group/Future Publishing via Getty Images

Children are the highest-risk group, the report found. Nearly a quarter of all drowning deaths happen among children under age 4. Another 19% of drowning deaths are among kids between ages 5 and 14.

That means drowning is a leading cause of death for children across the globe.

"It is definitely underrecognized, and it is extremely devastating -- yet so preventable," said Caroline Lukaszyk, a technical officer for injury prevention at the WHO. "No matter where you live, what context you're in, it's still preventable."

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My Walking Thoughts



For Sunday December 29 2024

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Stalling for Fun

In the wake of the slightly supersonic plunge that converted 20 thousand feet of our potential energy budget into a solid line of compressed sound waves destined to bid 'good morning' to the fine folks of Falfurrias, Lieutenant Crayton suggested I turn to a heading of North and level off at 19 thousand feet.

"Then when you're ready," he continued, "go ahead and work through a series of stalls."

I could bore you with a lengthy explanation of what precipitates a stall along with its recovery and consequences. But why bother. Instead I'll post the lift equation and let you figure it out... or not as you desire.

Lift = (1/2) d v2 s CL.

First on the list of adventures was a straight-ahead non-accelerated stall that I initiated by retarding the throttle to idle while maintaining altitude with backstick until reaching the breakout point. While stalls in the T-34 and T-28 were not violent, they were at least quite noticeable. Not so the F-9, which sort of bumbled its way into a series of nose-flopping *galumphs*, first down then up (or maybe it was the other way around). Recovery was simply a matter of throwing the coals to the engine while neutralizing the the controls. In short order we were back in business with the heading indicator still pegged on north, airspeed on its way back to cruise speed, and the 300 feet lost prior to the galumph back in hand.

"Ok, this time hold the stick full back for three of those whatchamacallits before starting your recovery," the voice in my headset commanded.

I did so, and while nothing terrible seemed to be happening, the conclusion of each one of the galumphs left the nose pointed more steeply downward, so that by the time we had bottomed out and regained normal flight, the altimeter showed a loss of nearly two thousand feet. *Huh, how about that?*

Back at 19 thou, I began a series of turning (accelerated) stalls, adding to the recovery procedure the rolling to wings-level and neutralizing of the controls. The results were pretty much the same.

Next it was 'dirty-up' time with speedbrakes, landing gear, and flaps extended—again with straight ahead and turning entries—again with similar but slightly more abrupt departures from normal flight. *No big deal*, it seemed to me under such controlled conditions, but in subsequent hops my complacency required a significant recalibration.

"Time to head for the barn," the boss commanded. Do you know where we are?"

"Uhh... uh, yes sir," I..." well I lied, but miraculously in the next instant I spied the only north/south highway within 50 miles, that split a little town in two. "That's Driscoll at our two o'clock, "I said (somewhat prayerfully) banking on my belief we had been wandering mostly north in our stall exercises.

"Score one for you. What next?"

Since our takeoff had been to the southeast, it appeared we were in the perfect position to descend to pattern altitude in a sweeping righthand turn, but... *`had there been something of a snicker in that voice?*

As if by a bolt from heaven, my attention turned to my kneeboard checklist that reminded me to check Kingsville's ATIS (Automatic Terminal Information Service) to get airfield information. Doing so informed me that in the past hour the wind had changed, shifting the duty runway from southeast (Rwy. 13) to northwest (Rwy. 31). *Good catch*, I thanked whatever acolyte was in charge of divine providences that morning.

Lieutenant Crayton remained silent as I descended southeast toward runway 31's entry point. There, I switched to tower frequency requesting clearance to enter the pattern for a series of touch-and-go landings.

"Take it past midfield before you break," Crayton suggested... one I managed to ignore. In the T-28, the common practice was to go just a little past the point of intended touchdown before turning to the downwind. At the slower speed, aided by speedbrakes and the three big propellor paddles, there is plenty of time to lower the gear and flaps and slow to approach speed in time to double-check everything prior to beginning the turn from base and the descent to the runway.

Things were different in the F-9 where even with speedbrakes deployed, the bird showed no great desire to slow. Instead, what happened following the three g left break was that I hit the downwind at 260 knots—35 knots above gear down speed—with nothing to do but watch the airspeed slowly...slowly...bleed its way down to where I could begin to get into the landing configuration.

Thus I found myself well past the end of the runway when I finally got things squared enough away to call the tower for landing clearance and begin my approach. Yeah, the airfield was pretty far back over my left shoulder, but '*no worries,*' I thought as I approached the 90 degree position. But as I was about to find out, mine was one of those fool's journeys where rather than getting better, things turned to worms.

Because my pattern was so extended, by the time I rolled out on the runway's extended centerline I was seriously below glide path, so to correct this I added power, initiating in the process what is known as 'climbing in the groove.' This led to a 'fly through' where I found I was now both too high and fast to land anywhere near where I was supposed to.

"Why don't you take it around for another try," the voice suggested, this time with a twinkle of amusement. So I did, advising tower of my intention to remain in the pattern.

Next time was... well certainly different, but not significantly better. Instead of wandering deep into the wilds of the King Ranch as before, this time I cut the pattern too short, forcing me to suck power to get onto the glide slope and then having to twoblock the throttle to keep from crashing into the runway

The voice in my earphones sounded a little more concerned this time, so as a result my attempt number three was considerably better.

By the fourth try, I carried a centered ball all the way to touchdown. Whoopie.

What's a centered ball? I'll explain that next week, along Lieutenant Crayton's debrief of my first flight in the Cougar.

If leaving you in the dark with just the lift equation, here's a little fodder for your puzzlement. <u>https://web.mit.edu/16.00/www/aec/flight.html</u>