

Ode to E Pluribus Unum for Sunday April 23 2023

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M2-9: Wings of a Butterfly Nebula

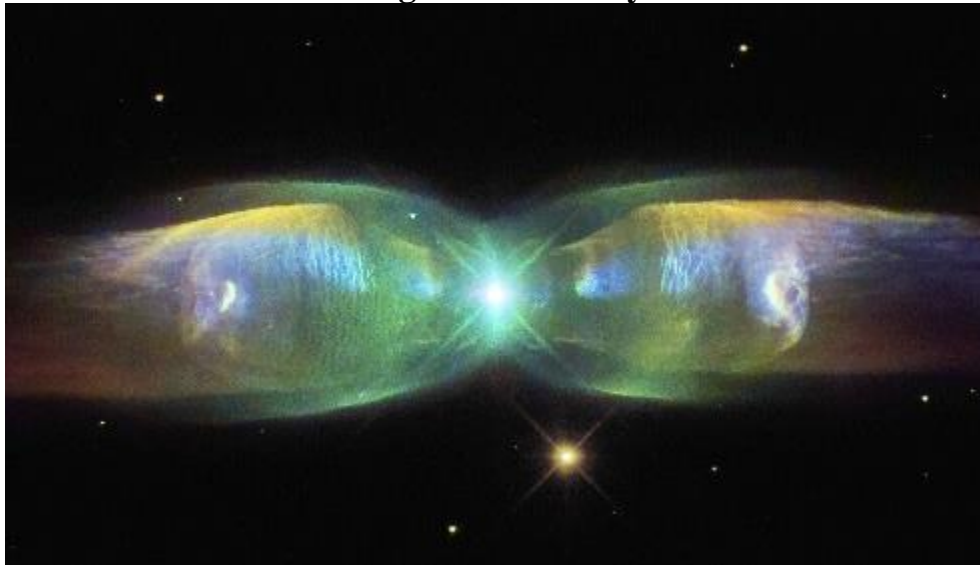


Image Credit: Hubble Legacy Archive, NASA, ESA; Processing: Judy Schmidt

Are stars better appreciated for their art after they die? Actually, stars usually create their most artistic displays as they die.

In the case of low-mass stars like our Sun and M2-9 pictured here, the stars transform themselves from normal stars to white dwarfs by casting off their outer gaseous envelopes. The expended gas frequently forms an impressive display called a planetary nebula that fades gradually over thousands of years.

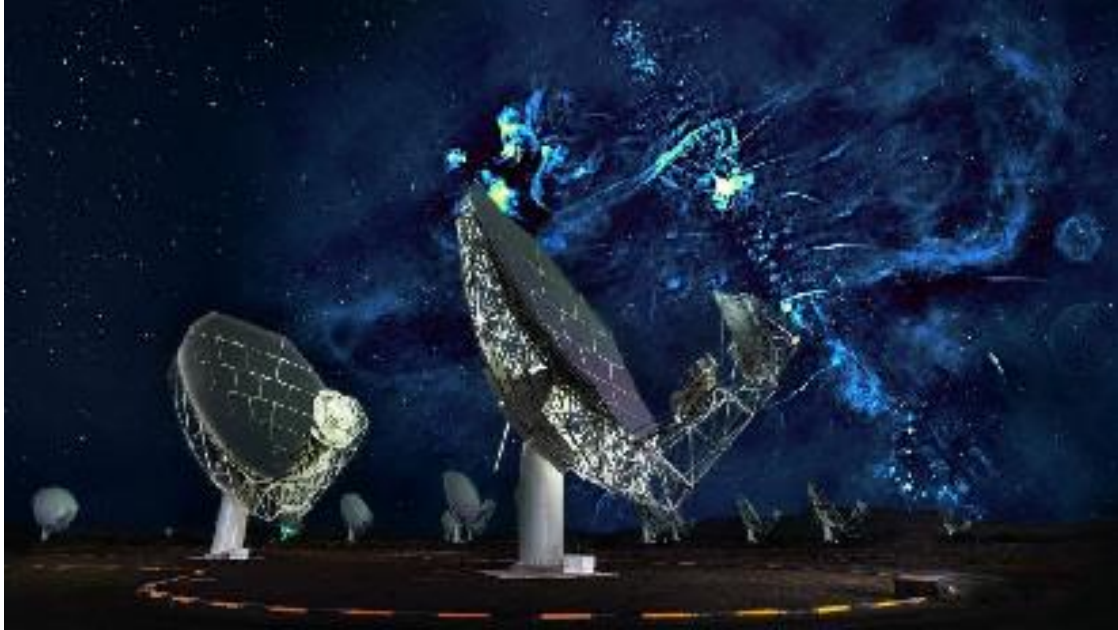
M2-9, a butterfly planetary nebula 2100 light-years away shown in representative colors, has wings that tell a strange but incomplete tale. In the center, two stars orbit inside a gaseous disk 10 times the orbit of Pluto. The expelled envelope of the dying star breaks out from the disk creating the bipolar appearance.

Much remains unknown about the physical processes that cause and shape planetary nebulae.

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100 Times Bigger, a New Telescope Joins the Hunt for Alien Life

One of the world's largest telescopes has just joined the hunt for signs of alien life elsewhere in the cosmos.



A pair of dishes from the MeerKAT telescope in South Africa. The night sky has been overlaid with radio bubbles observed by the telescope.

(Image credit: South Africa Radio Astronomy Observatory (SARAO))

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If the Brain Doesn't Feel Pain, Why Do Headaches Hurt?

By Donavyn Coffey for Live Science

The brain doesn't have its own pain receptors, so why do headaches hurt so much?



*Pain-sensing nerves send messages to the brain.
MR.Cole_Photographer via Getty Images Getty Images)*

Headaches are extremely common and they can take many forms, ranging from mild to debilitating and lasting minutes to days. When your cranium is in pain, it's easy to think your brain tissue itself must be hurting. But that's not likely.

Ironically, the brain senses pain throughout the body, but doesn't actually have its own pain receptors. So why, then, do headaches hurt?

Headaches can stem from an underlying medical condition, for instance, swollen sinuses, low blood sugar or a head injury. But broadly speaking, most headaches arise due to "referred pain," meaning you feel the pain in a different place than where it's actually occurring, Dr. Charles Clarke([opens in new tab](#)), a neurologist and headache specialist at Vanderbilt Health in Tennessee, told Live Science. It's similar to how a herniated disk in your back can cause sciatica, a pain down your leg. For most headaches, an issue somewhere else in the body — like the jaw, shoulders and neck — causes pain in the muscle and nerves around the brain, he said.

Related: [Why do so many people have back pain?](#)

Take tension headaches, which according to the World Health Organization([opens in new tab](#)), are the most common type of recurring headaches. Tension headaches often occur as pain in the muscles across the top of your head or forehead, where a sweatband or a headband would sit, Clarke said. The pain is caused by tightened muscles in the face, neck and scalp and can be stress-related, according to the National Institute of Health([opens in new tab](#)) (NIH). But the head pain and the tightening of

cranial muscles can be secondary to another stress response, like tight shoulders or a clenched jaw, Clarke said.

According to the NIH, pain-sensing nerves in the muscles and blood vessels around the head, neck and face can be triggered by different processes, such as enlarged blood vessels, stress or muscle tension. Once activated, these nerves send messages to the brain, but it can feel as if the pain is coming from deep within the brain tissue.

Migraines are another type of headache, although technically, headache is just one symptom of the neurological disorder. Migraine headaches can be felt in a variety of ways and places: deep pain, surface pain; the back, left or right of the head; or behind the eyes. What sets migraines apart, Clarke said, is their severity.

Migraine pain is more intense than other headaches and can be longer lasting. The disorder is often genetic and can cause additional symptoms, such as nausea. The underlying causes of migraines is not completely understood, but one theory is that the pain is linked to the trigeminal nerve, the sensory nerve for the head and face; and the dura, the brain's protective layer where blood vessels expand and contract.

One possible explanation for migraine pain is that an electrical event in the brain stimulates the trigeminal nerve pathways and sets off an inflammatory reaction(opens in new tab). The inflammation spreads through the dural blood vessels and the trigeminal nerve fibers send signals back to the brain stem(opens in new tab). The inflammation then spreads to pain-sensitive meninges — protective tissue around the brain — triggering a headache.

This cascade of inflamed blood vessels and irritated nerves is "a fire that's burning out of control," Clarke said. It's like a feedback loop that becomes more and more irritated, causing the experience of a migraine to build, he said. This is why many migraine treatments work better if deployed earlier.

While the relationships between pain around the body and head pain are well established, the mechanisms that cause headaches still aren't fully understood, Clarke said. But the good news is that "we are very good at treating these," he said. For instance, lifestyle changes, such as practicing yoga; over the counter medications, such as ibuprofen and aspirin; and prescription medication for more severe headache disorders can go a long way to reduce headache severity and frequency.

"If people need help [with headaches] we can often make them a lot better," Clarke said.

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Maternal Deaths in the U.S. Keep Climbing

The COVID-19 pandemic contributed to the higher rate in 2020 and 2021



The maternal mortality rate for Black women was 2.6 times the rate for white women in the United States in 2021, according to the National Center for Health Statistics.

Jgi/Tom Grill/Tetra Images/Getty Images Plus

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Dinosaur Bone Study Reveals That Not All Giants Grew Alike



A survey of prehistoric bones reveals that T. rex and some of its cousins had more than one way to reach enormous sizes. Evolution may have preserved that variation in modern animals too.

By Anna Gibbs for Quanta Magazine

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The Shocking True Story of Bambi



The iconic fawn is this year celebrating a very significant birthday, it being a century since the German imprint Ullstein Verlag first published *Bambi: A Life in the Woods*. Written by Felix Salten, an Austro-Hungarian, the coming-of-age novel would go on to be banned by the Nazis before eventually winding up in the hands of Walt Disney and becoming the animated children's film many know and love.

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Underwater Reflections



Why is diving so alluring? Why are coral reefs so colorful? What is a pristine reef? And what exactly does a coral symbiosis with algae entail? Coral expert Oded Degany has spent the last two decades trying to find answers, while exploring the secrets of tropical

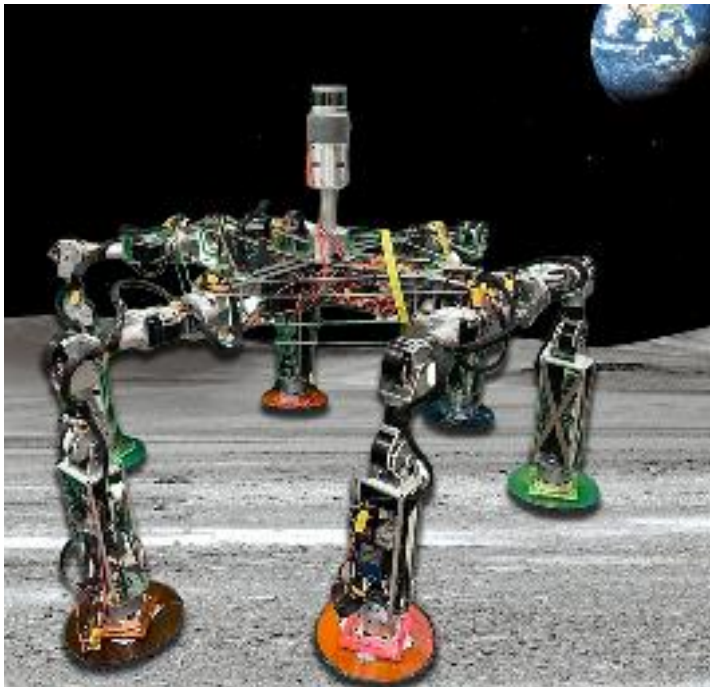
coral reefs. In this interview, he discusses his most important findings and might just change your perception of coral reefs.

<https://oceanographicmagazine.com/features/oded-degany-explores-coral-reefs-around-the-globe/>

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WORMS to Build A Menagerie of Lunar Exploration Bots

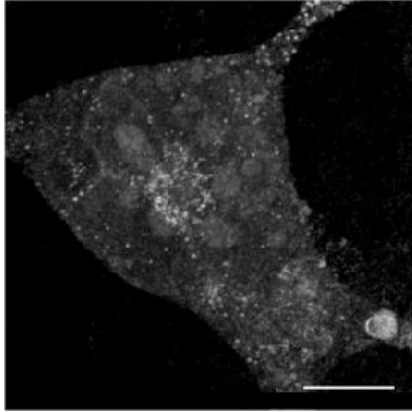
Robotic parts could be assembled into nimble spider bots for exploring lava tubes or heavy-duty elephant bots for transporting solar panels.



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Human Cells Help Researchers Understand Squid Camouflage



By incorporating squid proteins in mammalian cells, researchers could tune the cells' transparency from clear to cloudy (scale bar is 10 μ m).

Adapted from ACS Biomaterials Science & Engineering, 2023, DOI: 10.1021/acsbmaterials.2c00088

Researchers report that they have replicated the tunable transparency of some squid skin cells in mammalian cells, which can be cultured. The work could not only shed light on basic squid biology, but also lead to better ways to image many cell types.

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Smithsonian Magazine's 20th Annual Photo Contest

From Norway to Nepal, this year's winning images span the globe to capture the extraordinary



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The von Trapps of Harlem

Can "The Happy Caravan" playing Bach become the next Kardashians?



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Amelia Earhart Hangar Museum



Image: Atchison Amelia Earhart Foundation

The Atchison Amelia Earhart Foundation held the grand opening ceremony for the new Amelia Earhart Hangar Museum on Friday, April 14. Located at the Amelia Earhart Memorial Airport (K59) in Atchison, Kansas, the museum features the world's last remaining Lockheed Electra 10-E, called *Muriel*, as its centerpiece. It will also offer 14 interactive "STEM and history storytelling" exhibit areas.

"We're thrilled to celebrate our grand opening and welcome visitors of all ages to journey through Amelia Earhart's trailblazing life as a world-renowned aviator, innovator, educator and activist," said Karen Seaberg, Atchison Amelia Earhart Foundation founder and president. "It is an honor to bring Amelia's courageous and persevering legacy to life in her Atchison, Kansas, hometown where the Amelia Earhart Hangar Museum is dedicated to inspiring all generations in the pursuit of flight."

The ceremony, which was open to the public, began with "remarks from elected officials, Museum leaders, and special guests including members of the Earhart family." Museum hours will run Wednesdays through Saturdays from 10 a.m. to 5 p.m. and Sundays from noon to 5 p.m. Organizers noted that pilots flying in to visit the museum will be able to tie down their aircraft free of charge. Construction began on the Amelia

Earhart Hangar Museum last year aided by contributions from companies including FedEx, Garmin International and Lockheed Martin.

Further information is available on the museum's website at ameliaearhartangarmuseum.org.

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Baseball home runs could increase by 10% in the next 80 years.

Warmer temperatures due to climate change is resulting in more home runs in Major League Baseball.



*Climate change is resulting in more home runs during Major League Baseball games.
(Image credit: Randy Faris via Getty)*

"There's a very clear physical mechanism at play in which warmer temperatures reduce the density of air," study co-author Justin Mankin (opens in new tab), an assistant professor of geography at Dartmouth University in New Hampshire, said in the statement. "Baseball is a game of ballistics, and a batted ball is going to fly farther on a warm day."

The team examined data from more than 100,000 MLB games played between 1962 and 2019, and 220,000 individual hits between 2015 and 2019.

Their findings, published April 7 in the journal *Bulletin of the American Meteorological Society* (opens in new tab), showed that between 2010 and 2019, more than 500 homers could be attributed to higher-than-average temperatures as a result of global warming, with an average of 58 additional home runs per season, according to the study.

They discovered that a reduction in air density results from higher temperatures and "was the driving force" in why homers increased on hotter days. Additionally, climate change may have contributed to approximately 1% of home runs in that time frame. However, by 2100, that number could jump to 10% compared with averages between 2010 and 2019 if greenhouse gas emissions and climate change continue at their current pace. This could result in what researchers have dubbed the "climate-ball era," according to the statement.

Under an emissions worst-case-scenario, the team estimated there would be an additional 192 home runs per year by 2050, climbing to 467 by 2100.

To counter the impact of climate change, the researchers suggest playing more games at night, when temperatures are milder, or building domes over stadiums.

The team also accounted for outside influences that could impact a dinger, such as athletes using performance drugs and ball and bat construction to determine what if any impact those factors could have on home runs.

"We asked whether there are more home runs on unseasonably warm days than on unseasonably cold days during the course of a season," lead author Christopher Callahan(opens in new tab), a doctoral candidate in geography at Dartmouth, said in the statement. "We're able to compare those days with the implicit assumption that the other factors affecting batter performance don't vary day to day or are affected if a day is unseasonably warm or cold."

He added, "Temperature matters and we've identified its effect. While climate change has been a minor influence so far, this influence will substantially increase by the end of the century if we continue to emit greenhouse gases and temperatures rise."

Unless, of course, it gets colder next spring.

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Random Thoughts and Insights from an Aging Gentleman...

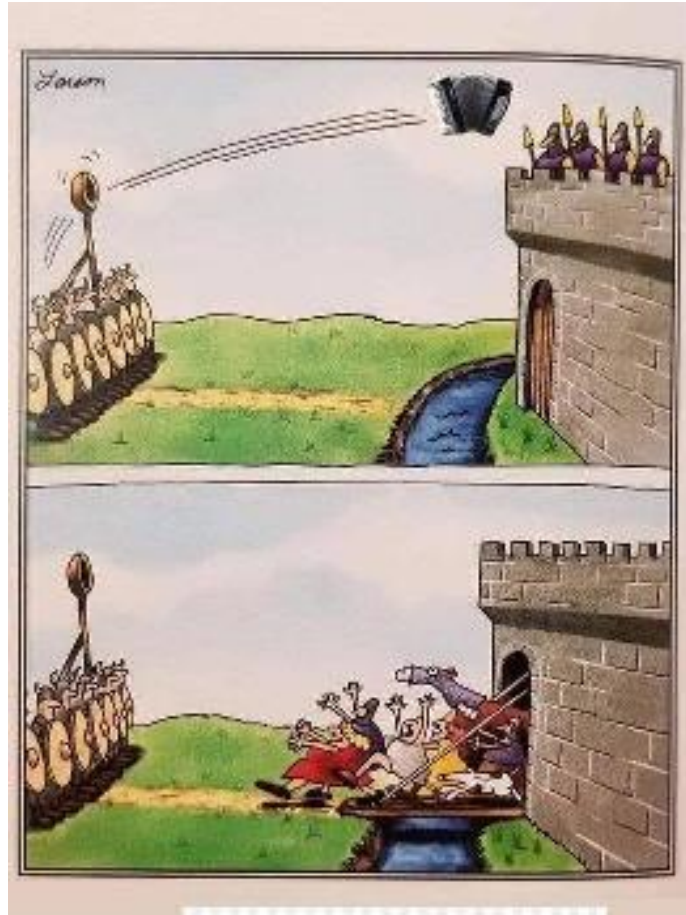


1. When one door closes and another door opens, you are probably in prison.

2. To me, "drink responsibly" means don't spill it.
3. Age 60 might be the new 40, but 9:00 pm is the new midnight.
4. It's the start of a brand new day, and I'm off like a herd of turtles.
5. The older I get, the earlier it gets late.
6. When I say, "The other day," I could be referring to any time between yesterday and 15 years ago.
7. I remember being able to get up without making sound effects.
8. I had my patience tested. I'm negative.
9. Remember, if you lose a sock in the dryer, it comes back as a Tupperware lid that doesn't fit any of your containers.
10. If you're sitting in public and a stranger takes the seat next to you, just stare straight ahead and say, "Did you bring the money?"
11. When you ask me what I am doing today, and I say "nothing," it does not mean I am free. It means I am doing nothing.
12. I finally got eight hours of sleep. It took me three days, but whatever.
13. I run like the winded.
14. I hate when a couple argues in public, and I missed the beginning and don't know whose side I'm on.
15. When someone asks what I did over the weekend, I squint and ask, "Why, what did you hear?"
16. When you do squats, are your knees supposed to sound like a goat chewing on an aluminum can stuffed with celery?
17. I don't mean to interrupt people. I just randomly remember things and get really excited.
18. When I ask for directions, please don't use words like "east."
19. Don't bother walking a mile in my shoes. That would be boring. Spend 30 seconds in my head. That'll freak you right out.
20. Sometimes, someone unexpected comes into your life out of nowhere, makes your heart race, and changes you forever. We call those people cops.
21. My luck is like a bald guy who just won a comb."

-source unknown

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Maybe he should have played something other than 'Lady of Spain.'

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Europe Launches JUICE Mission To Study Jupiter's Icy Moons

But be patient: JUICE won't get to the Jovian system until 2031.



An artist's impression depicting Europe's JUICE spacecraft approaching Jupiter's moon Ganymede.

(Image credit: ESA/ATG MediaLab)

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50 Flights on Mars! Ingenuity Helicopter Is a Giant Leap



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NASA Sets Sights on a Next-Generation Mars Helicopter



*An illustration of one of the Sample Recovery Helicopters slated to fly to Mars as part of the Mars Sample Return Campaign.
(Image credit: NASA/JPL-Caltech)*

The basic design of a Mars helicopter is backed up by the dozens of flights NASA's Ingenuity has made.

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How Much Has 2 Years of Inflation Really Cost You?

These five graphs will tell you a lot.



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An AI Babysitter for Your Dog



*The Companion smart device is meant to entertain dogs while monitoring their health.
Photo courtesy of Companion*

A new smart device called Companion bills itself as an all-in-one nanny/tutor for your dog, stimulating and entertaining Fido while you work (or run out to buy grain-free artisanal dog food).

Why it matters: The humanization of dogs continues apace, as Americans treat the pooches they adopted during the pandemic like fur babies and happily spend crazy money on them.

Driving the news: Companion just started taking reservations for its \$49-a-month device, which is scheduled to start shipping in May 2024.

The stationary device — which dispenses treats — "provides all day scheduled and on-demand engagement for your dog with games, behavioral programs and training," the company says.

It simultaneously monitors your dog's health, looking for "sudden or subtle shifts in your dog's movement or posture that can indicate pain, anxiety or stress."

How it works: The device uses "AI hardware, machine learning and best-in-class positive reinforcement techniques," Companion says.

For instance, by playing commands like "sit" using an owner's voice, the Companion teaches the dog obedience — while noticing any physical changes that might signal disease. ([See a video here.](#))

What they're saying: "Every dog in the U.S. could benefit from more enrichment," says John Honchariw, the CEO and founder of Companion.

"There's this weird asymmetry between human children and pet children," he said. "We don't leave our human children alone, but we do leave our fur children alone, and people are anxious about that."

"We want to be able to give our kids, like whether it's a toddler, really good educational content. We also want to give our dog something really enriching — and even better if it helps us have better communication with it."

Honchariw, an engineer whose pedigree includes Google and Bain & Co., developed Companion for his rescue dog Boomer, a beagle-dachshund mix.

"He loves it, and it's his all-day play buddy," he said. "He eats 100% of his dog food through the device, so for him, it's like the world's most advanced food puzzle."

"And it really helped me because I know he's doing things and having fun at the same time and learning all the basic obedience commands."

"It's almost like starting a chatbot with your dog, or a device that can have a conversation with your dog."

The big picture: As society grows more anthropomorphic, companies are selling more products that cater to our interest in treating animals like children — witness the Joipaw video game system for dogs or the trend toward human-grade dog food.

Total spending in the pet care industry is expected to increase to \$277 billion by 2030, 134% higher than 2019 levels, per Morgan Stanley.

"We want to be with our dog 24 hours a day," Honchariw says.

Where it stands: Companion says it's raised \$14 million, with backers that include Lerer Hippeau and Digitalis Ventures, and its advisory board includes veterinarians who specialize in dog training and the human-animal bond.

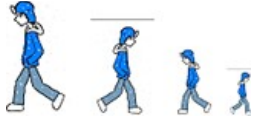
On Monday, Companion will have a "demo day" at the San Francisco SPCA to show how the device works.

What's next: Cats. "We've already had cats engaged with the device, and they love it," says Honchariw, who envisions one day creating a dedicated feline-oriented Companion.

I sincerely hope it comes with a baby buggy and Covid mask.

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My Walking Thoughts

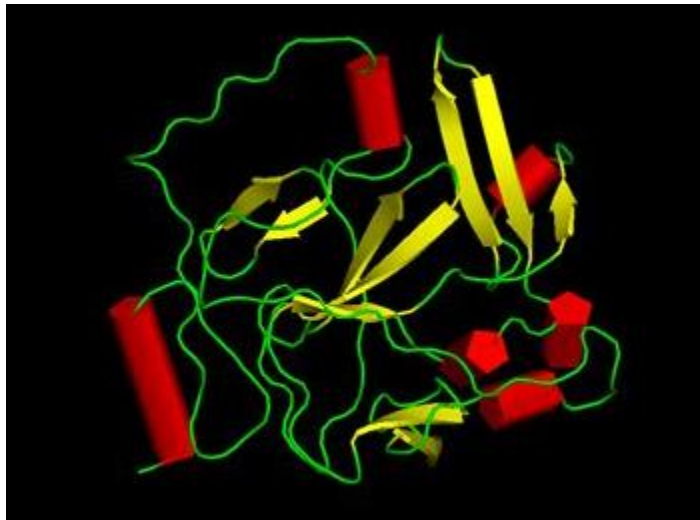


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When I posted the article on the breakthrough on Parkinson's Disease to last week's Ode, a friend provided some amplifying remarks on the achievement.

Protein Misfolding and Parkinson's Disease



That makes it similar to Jakob-Creutzfeld disease (CJD), which is also caused by protein misfolding. A problem is that PD can be hereditary (Woody Guthrie) but is more commonly not. Some are even post-traumatic, which means that the term may just represent a final common pathway for a variety of problems. The protein misfolding, though, is interesting. It's possible to imagine a number of things that might cause that, like problems with other molecules necessary to cause the protein to fold correctly. Collectively, they're called chaperone molecules and typically seem to hang around ribosomes, which are subcellular machines that make proteins.

The protein folding problem itself is pretty fascinating and complex. At least some simply fold correctly with no help at all. Given the number of possible ways a large protein can fold, it's sorta amazing it ever gets it right, let alone always. Many mechanisms have been proposed for this happening, but the funnel mechanism seems to have the most going for it: each successive step drops the molecule into

progressively lower energy configurations. And once in that energy "well," it stays there.

As for one misfolded protein leading others to misfold similarly, that's been the notion behind CJD, which led to the original incorrect thought that it's infectious: a person who received a corneal transplant from someone who died from CJD came down with the disease himself. It was never exactly clear how the CJD "prion" got into the brain from the cornea, but evidently it managed to do that.

The physico-chemical analog is Kurt Vonnegut's Ice-9 from Cat's Cradle. Once the scientist who figured it out made some, he used it as a seed crystal. And eventually it killed the world. I suspect Ice-9 was a metaphor for nuclear bombs. Which, given Putin's psychosis and our own rudderless foreign relations, is topical.

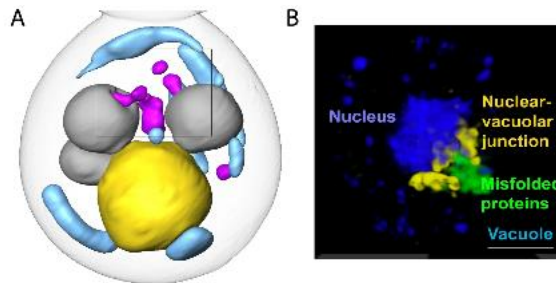
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So, look what scooted in the door this Thursday!

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Study Finds New Pathway for Clearing Misfolded Proteins

Stanford researchers defined a novel cellular pathway – including a “dump site” – for clearing misfolded proteins from cells. The pathway is a potential therapy target for age-related diseases like Alzheimer’s, Huntington’s, and Parkinson’s diseases.



A) A 3D reconstruction of a yeast cell engulfing cytoplasmic misfolded proteins (purple) inside of the degradation cellular machinery, or vacuole (gray).

B) Super-resolution reconstructions showing nuclear misfolded proteins (green) being targeted to the degradation cellular machinery through the nuclear-vacuolar junction (yellow).

(Image credit: Fabián Morales-Polanco)

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