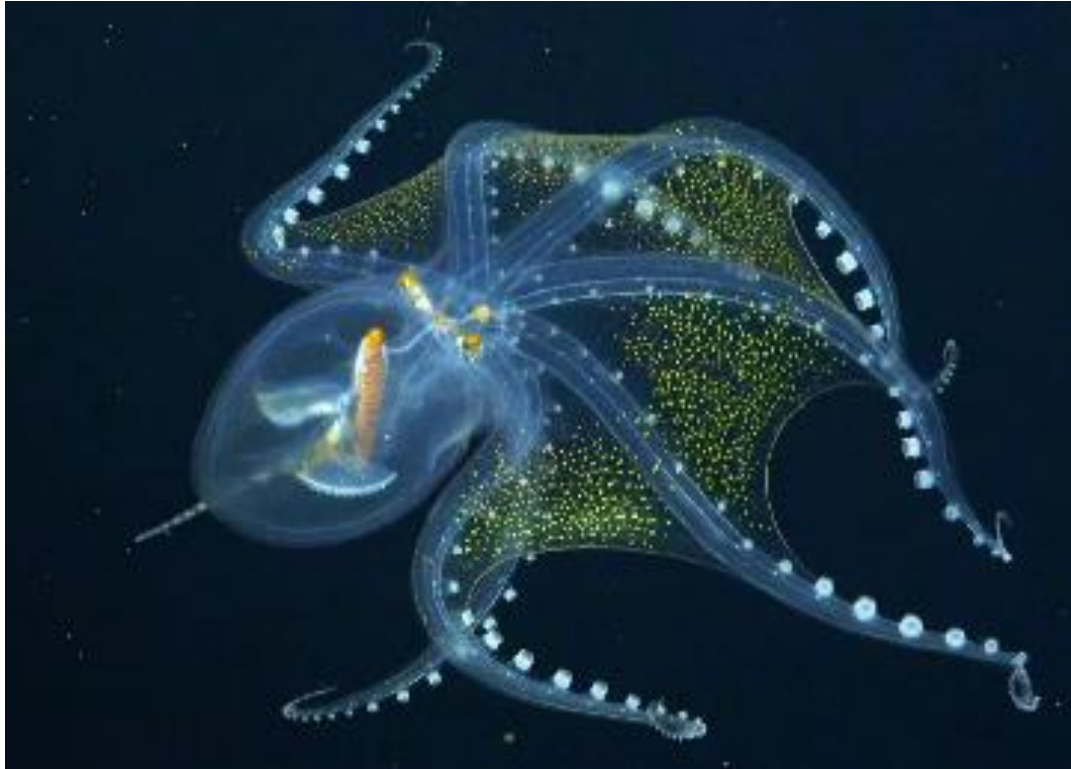


Ode to Happiness for Sunday July 18 2021

## **Elusive Glass Octopus Spotted in the Remote Pacific Ocean**

Only its eyes, optic nerve and digestive tract are opaque.



*Footage of glass octopuses is extremely rare.  
(Image credit: Schmidt Ocean Institute)*

This rarely seen glass octopus bared all recently — even a view of its innards — when an underwater robot filmed it gracefully soaring through the deep waters of the Central Pacific Ocean.

Marine biologists spotted the elusive glass octopus (*Vitreledonella richardi*) during a 34-day expedition off the remote Phoenix Islands, an archipelago located more than 3,200 miles (5,100 kilometers) northeast of Sydney, Australia.

Like other "glass" creatures, such as glass frogs and certain comb jellies, glass octopuses are almost completely transparent, with only their cylindrical eyes, optic nerve and digestive tract appearing opaque. The expedition crew reported two encounters with the glass octopus — an impressive count given that previously there was such limited footage of these clear cephalopods, scientists had to learn about them by studying chunks of them in the gut contents of their predators.

Glass octopuses weren't discovered until 1918. Little is known about these cephalopods, except that they live in tropical and subtropical areas in the deep ocean in the mesopelagic, or twilight zone, 656 to 3,280 feet (200 to 1,000 meters) below the surface, and the bathypelagic, or midnight zone, 3,280 to 9,800 feet (1,000 to 3,000 m) below the surface, according to the International Union for Conservation of Nature.

Glass octopuses' cylindrical eye shape may have evolved to minimize the silhouette of the creatures' eyes when seen from below, "and is part of the animal's camouflage strategy," according to a 1992 report in the Journal of the Marine Biological Association of the United Kingdom.

[https://www.youtube.com/watch?v=FIe2zG\\_I4ro](https://www.youtube.com/watch?v=FIe2zG_I4ro)



*Footage of glass octopuses is extremely rare.  
(Image credit: Schmidt Ocean Institute)*

The glass octopus was spotted by an expedition aboard the research vessel Falkor, run by the Schmidt Ocean Institute, a nonprofit operating foundation co-founded by Wendy and Eric Schmidt, the former CEO of Google. Scientists from Boston University and the Woods Hole Oceanographic Institution also participated in the expedition.

During the expedition, which ended July 8, a crew of marine scientists discovered a handful of what are likely newfound marine animals on nine previously unexplored submarine mountains known as seamounts. The team also completed high-resolution seafloor mapping of more than 11,500 square miles (30,000 square km) around the archipelago and video recordings of five additional seamounts filmed by the underwater robot SuBastian, according to a statement.

SuBastian also snagged footage of a whale shark (the largest living fish in the world) and a long-legged crab stealing a fish from another crab.

The expedition sent SuBastian on 21 dives, enabling the robot to record more than 182 hours on the seafloor. Seven of those dives took place in the U.S. Pacific Remote Islands Marine National Monument (PRIMNM), which was established in 2009 and expanded in 2014. The expedition allowed scientists to document the monument, where marine animals are protected. The Falkor also revisited parts of the Phoenix Islands that its scientists had studied in 2017, which allowed researchers to collect data that will help them learn how the entire ecosystem and seamounts' habitats are linked together.

"The Ocean holds wonders and promises we haven't even imagined, much less discovered," Wendy Schmidt said in the statement. "Expeditions like these teach us why we need to increase our efforts to restore and better understand marine ecosystems everywhere — because the great chain of life that begins in the ocean is critical for human health and wellbeing."

By Laura Geggel – Live Science Editor

*Originally published on Live Science.*

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## **How to Become a Big Man in a Small Town**



Joe grew up in a small town, then moved away to attend college and law school. When he graduated, he decided to come back to the small town because he could be a big man in this small town. He really wanted to impress everyone and opened an office.

The first day, he saw a man coming up the sidewalk. He decided to make a big impression on this new client when he arrived. As the man came to the door, Joe picked up the phone. He motioned the man in, all the while talking.

"No. Absolutely not. You tell those clowns in New York that I won't settle this case for less than one million. Yes. The Appeals Court has agreed to hear that case next week. I'll be handling the primary argument and the other members of my team will provide support. Okay. Tell the DA that I'll meet with him next week to discuss the details."

This sort of thing went on for almost five minutes. All the while the man sat patiently as Joe rattled instructions. Finally, Joe put down the phone and turned to the man. "I'm sorry for the delay, but as you can see, I'm very busy. What can I do for you?"

The man replied, "I came to hook up your phone."

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## **Tour of Beautiful Churches from Around the World**



[https://www.cntraveler.com/gallery/the-most-beautiful-churches-in-the-world?utm\\_source=join1440&utm\\_medium=email&utm\\_placement=newsletter](https://www.cntraveler.com/gallery/the-most-beautiful-churches-in-the-world?utm_source=join1440&utm_medium=email&utm_placement=newsletter)

From Conde Nast Traveler

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### **Piano for Mother and Baby Elephant**



<https://youtu.be/ftZO-RWVH4Y>

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### **Groaners**

I said to the gym instructor 'Can you teach me to do the splits?'  
He said 'How flexible are you?'  
I said 'I can't make Tuesdays'

A semicolon got arrested.  
It got 2 back to back sentences.

I've decided to quit my job as a personal trainer because the weights are too heavy.  
I just handed in my too weak notice.

A lot of people can't tell the difference between entomology and etymology.  
I can't find the words for how much this bugs me.

I woke up this morning to find two birds sitting in the sun in our backyard eating ice cream.  
They were Basking Robins.

I was walking past a farm and a sign said: "Duck, eggs!"  
I thought: "That's an unnecessary comma - then it hit me."

Doctor: Relax, David. It's just a small surgery, don't panic.  
Me: But my name isn't David.  
Doctor: I know. I'm David.

Delighted to say I've finally got a new job installing mirrors!  
Nothing fancy, but was something I could always see myself doing.

You do know that modern appliances are really spying on us, and sending back data on our habits. In fact..

Vacuum cleaners have been gathering dirt on us for years.

What do you call two young married spiders?  
Newly webs.

Why do cows have hooves instead of feet.  
Cause they lactose.

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**There are selfies and then there are selfies**

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**We all can use a helping hand.**

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### **DexterDog Overcomes a Serious Injury**



<https://www.youtube.com/watch?v=9ZeWljLGF0Y&t=3s>

The next time you think you've reached the end, think about Dexter,

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## Russia's New Nauka Module Readied for Launch to ISS

By Leonard David for Space.com



*Russia's new Nauka module undergoes testing at the Baikonur Cosmodrome in Kazakhstan  
(Image credit: Roscosmos)*

Russia's Nauka laboratory module is now slated to launch to the International Space Station (ISS) on July 21.

In a statement, the Russian space agency Roscosmos said the new module for the International Space Station will launch from Site 200 of the Baikonur Cosmodrome in Kazakhstan, atop a Proton-M carrier rocket. Backup launch dates are available on July 22 and July 23.

The module's flight to the ISS will take eight days, after which it will dock at the nadir port of Russia's Zvezda service module. Docking is currently scheduled for 9:25 a.m. EDT (1325 GMT) on July 29.

Undocking of the Russian Progress MS-16 cargo vehicle (also called Progress 77) with the Pirs docking module is scheduled for July 23 (subject to the Nauka launch on July 21). Cosmonauts at the space station have been working to decommission the decade-old Pirs module in a recent series of spacewalks to remove it from the station and clear a parking space for Nauka.

### **Prelaunch prep stage**

At the Baikonur Cosmodrome, Roscosmos states, routine preparations of the Nauka module are underway for the upcoming launch. Currently, the ascent unit is at the fueling and neutralization station, the most important operation of the final prelaunch preparations.

Nauka, formally known as the Russian Multipurpose Laboratory Module, is a new research module for the Russian segment of the ISS, developed by the Russian aerospace manufacturer RSC Energia together with Khrunichev State Research and Production Space Center (part of Roscosmos), both in Moscow. This module is designed to expand the functionality of the Russian segment of the International Space Station.



*Roscosmos engineers work on assembling and testing the new Nauka module at the Baikonur Cosmodrome in Kazakhstan.*

*(Image credit: Roscosmos)*

### **Added safety of ISS crew**

"The Nauka module was created on the constructive and technological basis of the Zarya Functional Cargo Block employing the experience of designing a transport supply vehicle for the Salyut crewed scientific stations and modules for retrofitting the Mir orbital complex," Roscosmos said in the statement.

"After the commissioning of the new module, the Russian segment will receive additional volumes for the workplaces and storage of cargo, places for water and oxygen regeneration equipment, improve the conditions of cosmonauts' stay, as well as increase the safety of the entire ISS crew," the statement adds.

### **Cherry-picker crane**

The European Robotic Arm (ERA) will launch to the ISS together with Nauka. ERA will work with the new Russian airlock to transfer small payloads directly from inside to outside the ISS. This will reduce the setup time for astronauts on a spacewalk and allow ERA to work alongside astronauts.

Another task for ERA is to transport astronauts like a cherry-picker crane to a position where they can work on the exterior of the ISS, or from one external location to another. This again saves time and effort during spacewalks.





Released in June 1981, the song appeared on the rock band's seventh album, "Escape." Although it never made it to No. 1 on the charts, "Don't Stop Believin'" has seeped into our culture in countless ways. The "Sopranos" series finale. That memorable "Glee" pilot episode. Broadway's "Rock of Ages" musical.

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## Phoebes and the 'Lamb of Life'

By Joe Horton



*He was actually far handsomer than the drawing, and his coat was as dense as winter sable. It was a real pleasure to pet him. He plainly felt the same, and purred to let me know when I got it right, which quickly became always. I don't know how many photos I took of him, but at the moment, I can't lay my hands on even one of them. When I do, I'll send it, but given how firmly the 2nd law of thermodynamics rules my house, don't hold your breath.*

*He was clearly an Edwardian gentleman who happened to live inside a feline body. I'm not sure whether that was a blessing or a curse for him. Phoebes was my best friend. I will surely be toasting his memory tonight....*

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My own favorite cat of all time was Phoebes. He was the single handsomest cat I ever saw, and also the smartest. He came into my life as a kitten when I was in medical school. Rather than imprinting on other cats, he tried imitating humans. He tried walking on his hind legs, which didn't work very well, and for his entire life, he ate with his paws rather than putting his face in the food bowl.

He never--never--meowed like a cat; it was clear that he wanted to talk, but couldn't quite make words come out. It was bittersweet to listen to him try, though. One night, I had a dream that I was listening to him trying to talk and felt the usual pleasant ache of the heart when I had an epiphany: I was an idiot--he was speaking perfectly clear French which, in the dream, I understood completely. I woke up with all my cats sleeping soundly on my bed and I grabbed Phoebes and hugged him which, of course, woke him up. He looked at me as if to ask, "You OK, Dad?" I assured him I was and we both went back to sleep.

A very good friend of mine, Henry Kelner, was a veterinarian and for a while, he was seeing another (very good looking) vet named Liz. One time they were over to my place and Liz, never shy, asked me to give Phoebes to her. I told her that both Phoebes and I were immensely flattered by the request, but that only death would part us. She kept trying to convince me that she could take better care of Phoebes than I could; I explained to her that that would be impossible. I then said that she probably couldn't afford to keep him in Oreos. "Cats don't eat Oreos!" Just then Phoebes showed up at the door, so I let him in and gave him an Oreo. I had never done that before, but he figured out what was going on and rose to the occasion: he broke it open, licked the filling off, then ate the cookies. Liz's jaw was mostly on the floor.

When Phoebes came into my life, so did his brother, Napoleon--another extraordinarily fine cat. One evening I was serving breaded veal cutlets for dinner and a bunch of friends were over. I saw a blur of motion which was Napoleon staging a smash-and-grab: he had jumped onto the table, grabbed a cutlet, ran off the table with it and located himself in pretty much the geometric dead center of the floor under my bed. He started chomping away furiously. I didn't think it was a good idea to allow that sort of behavior, so I got a broom and shooed him out, took the meat, and gave him a couple half-hearted perfunctory smacks on his kitty behind, but he and I both knew it was more for show than anything else.

I always admired that kind of initiative and thought long and hard about it. Eventually I figured out the solution. If it should ever happen again, I'd go out of my way not to have noticed it.

Fast forward maybe a half dozen years. Napoleon didn't survive the big street we lived on in New Orleans, but Phoebes did. By then I'm in Philadelphia and I've made lamb for dinner. While waiting for my company to come to the table, I saw/didn't see a gray blur and noticed that the serving bowl had one fewer lamb chop in it than I thought I had placed there. But I'm absent minded. These mistakes can happen.

Fast forward another 7 or 8 years and Phoebes is now sick, as in sick unto death. I take him to the vet and they give him fluids by clysis, which means sub-Q, and they tell me that sometimes that's enough to pull them through and get their appetites going again. On the way home, I told Phoebes that if he lived, I'd give him lamb every week for the rest of his life. And for the next year, every Sunday I went to the supermarket and bought a pound of stewing lamb, which I sauteed in olive oil with some garlic. He literally did figure-8's around my feet while I cooked for him. He had lost 3 of his 4 fangs, so I had to put the lamb into a Cuisinart to make it Phoebes-friendly. And he always tried to eat it while it was still a little too hot for him. But I made enough that he could Have it for half a week.

One friend described him as having "massive dignity," and he really did. Meowed only in the King's cat's English (which, alas, I never quite understood). He died in 1986. I still miss him today.

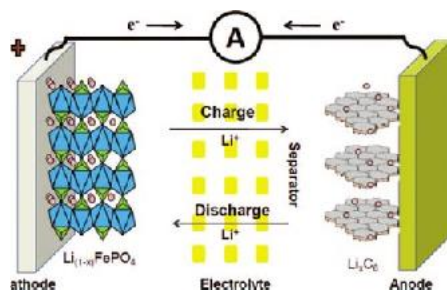
*[This is from Joe Horton, MD, who continues to amaze me with the variety of his interests and incredible ability to bring them to life. As a physician he knows that the body has its limitations, but the soul can in special circumstance live forever.]*

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## **Ion Dynamics in Battery Materials Imaged Rapidly**

An imaging method has been developed that tracks ion transport in functioning battery materials in real time, at submicrometre scales — offering insights into how to design batteries that charge in minutes.

Aashutosh Mistry



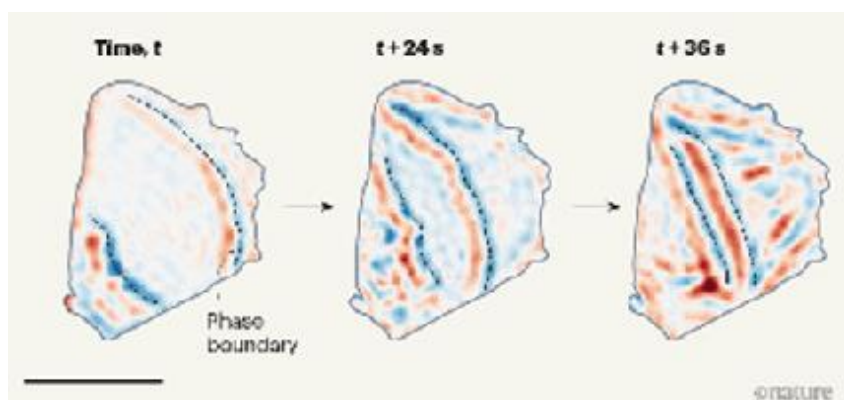
The most important materials in lithium-ion batteries are the 'active' particles that store and release lithium ions during charging and discharging, because they store the energy in these devices. To design batteries for any potential application, scientists need to understand the ion dynamics in the active particles. However, conventional methods for studying lithium-ion dynamics cannot track, at submicrometre resolution, the rapid changes occurring in batteries that charge in minutes. These are being developed for emerging applications such as fast-charging vehicles and flying taxis. In a paper in *Nature*, Merryweather et al.<sup>1</sup> report a technique that can visualize such fast dynamics.

Lithium-ion batteries consist of two porous electrodes (positive and negative), which are made up of active particles, carbon and a binder material. The carbon provides necessary electron conduction, and the binder holds the other materials together like a glue. The batteries also contain an electrolyte, which provides a conduit through which ions can move from one electrode to another.

Battery applications can be categorized in terms of their operation time — for example, portable electronics require batteries that last for 10 hours or more, and electric vehicles should be able to drive for 6–8 hours. To track the internal ion dynamics of batteries for each of these operations, researchers need to image the associated physical and chemical interactions at least ten times as fast as the operation time. This is analogous to selecting a camera shutter speed that is suitable for filming sport — if the shutter speed is too slow, the camera produces blurry pictures. In the context of batteries, the physical aspects of interest are the geometry of the active particles and the structure of the porous electrodes, whereas the key chemical process is the evolution of ion concentrations in the active particles and the electrolyte.

Every battery-imaging technique has its own characteristic image-acquisition time — this determines which battery operations can be tracked accurately. Previously available techniques<sup>2–8</sup> take a few minutes to acquire an image, and can therefore capture only processes that occur over several hours.

Merryweather et al. have customized an optical microscopy technique, previously used in biology<sup>9</sup>, to track the movement of lithium ions in the active materials of batteries. In this approach, a laser beam is shone at electrochemically operating battery particles as they store or release lithium ions, and the scattered light is analyzed. The local concentration of electrons in these particles changes as more lithium is stored, which in turn alters the scattering pattern. Therefore, the time evolution of the scattering signals at each position on a particle correlates with the local change in lithium concentration (Fig. 1).



*Figure 1 | Images of a functioning battery particle. 'Active' materials in battery electrodes store and release ions during charge–discharge cycles. Merryweather et al.<sup>1</sup> report an imaging technique that uses light scattered from functioning active particles to track changes in ion concentration in real time. In their approach, the scattering intensity changes with local ion concentration, and so the evolution of scattering patterns over time represents the ion dynamics of the system. Here, the colours of the contours represent the change of scattering intensity over the previous 5-second period as more ions are stored in the particle: red indicates an increase in intensity; blue indicates a decrease. The changing patterns correlate with the transition of one phase of the material to another. Broken black lines indicate the boundaries between phases when a central domain consisting of one phase shrinks, and surrounding domains of another phase expand. Scale bar, 5 micrometres. Images from Fig. 5e of ref. 1.*

Notably, the image-acquisition time for Merryweather and colleagues' technique is less than 1 second, which allows examination of much faster processes than was previously possible. However, having a short acquisition time is not the only requirement when studying battery function. Imaging techniques must also be able to study batteries during operation and have a reasonable spatial resolution — submicrometre resolution is needed to track what happens in an active particle. The authors' technique meets this requirement, too. Moreover, the technique can map ion dynamics at the electrode scale, by comparing the evolution of ion concentration in active particles that are spatially separated in the electrode.

Almost all active materials that store lithium or other ions undergo electronic changes as the ion concentration varies, and are therefore amenable to study by this technique. The time variation of ion concentration in active particles is poorly understood, because conventional techniques can not directly track changes in local concentration throughout a particle during fast operation. By solving this problem, Merryweather and co-workers' method will help researchers to validate the hypothesized mechanisms of ion transport in these materials (see ref. 10, for example).

### **Long-lived electrodes for plastic batteries**

It should be noted that the spatial resolution of the authors' imaging technique is constrained by a fundamental limit defined by the wavelength of the light used, which means that shorter wavelengths are needed to resolve smaller details. The resolution is about 300 nanometres in the current study. Another caveat is that scattering is the cumulative effect of light interacting with just the first couple of atomic layers of the particle. This approach therefore captures only the ion dynamics in the 2D plane associated with these atomic layers. By contrast, 3D information can be obtained using slower methods, such as X-ray tomography.

It will be exciting to take the authors' findings for individual particles further and study porous electrodes at the far-from-equilibrium conditions associated with rapid charging. For example, it was hypothesized<sup>11</sup> last year that inhomogeneous porous-electrode structures result in non-uniform distribution of lithium in electrodes when batteries are charged in minutes. Merryweather and colleagues' technique could act as a test for such predictions.

This method could also be used to examine solid electrolytes — battery materials that are interesting, but poorly understood. If light scattering from solid electrolytes changes with local ion concentration as it does in active materials, then the technique could be used to map how the ion distribution in such electrolytes changes when an electric current passes through them. Optical scattering might be equally useful for studying other systems that involve coupled ion and electron transport, such as catalyst layers in fuel cells and electrochemical gas sensors.

### **Machine-learning techniques used to accurately predict battery life**

In the future, it should be possible to quantify the relationship between the scattering response and lithium-ion concentration by conducting meticulous scattering experiments using active particles that are compositionally uniform. This correlation could then be used to convert scattering signals to local concentrations. However, the relationship will not necessarily be the same for different materials, and might be difficult to identify in each case. Machine-learning techniques could be used to streamline the determination of these relationships and to automate analysis of scattering responses.

The authors' imaging technique also opens up the prospect of simultaneously tracking the chemical and physical (geometric) changes that occur in active particles during battery operation. The time course of scattering in a particle would reveal local changes

in lithium concentration, and the difference between the scattering from a particle and that from other materials in a battery (such as the binder or electrolyte) could be used to determine the particle shape and how it evolves with time. Such experiments would revolutionize the study of active materials (such as silicon) that appreciably expand and contract as the lithium concentration changes within them. Materials of this type store much more energy than currently used active materials do, and their use might reduce battery weight. This would be particularly useful in electric vehicles, because it would enable longer driving ranges.

Merryweather and colleagues' research offers previously inaccessible insights into battery materials operating at far-from-equilibrium conditions. Their method for directly observing changes in active particles during operation will complement existing approaches, in which internal changes are inferred from destructive testing of batteries. It could therefore revolutionize the battery-design cycle.

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## **'Dragon Man' Skull May Be New Species, Shaking Up Human Family Tree**



*cnn*

Hidden down a well for decades, the stunningly complete cranium is stirring debate about the increasing number of fossils that don't neatly fit in the classic human origin story.

By Aya Wei-Haas

The strange skull appeared soon after the Japanese invaded northeast China in the early 1930s. A team of locals was raising a bridge near Harbin, a city in China's northernmost province, when one of the workers stumbled on a surprise in the river

mud. The nearly complete human skull had an elongated cranium from which a heavy brow bone protruded, shading the gaping squares that once housed eyes.

And then there was the skull's unusual size: "It's enormous," says paleoanthropologist Chris Stringer of London's Natural History Museum.

Perhaps aware of the magnitude of the find, the man secreted the skull away in an abandoned well. Now, nearly 90 years later, a study published in the journal *The Innovation* makes the case that this skull represents a new human species: *Homo longi*, or the Dragon Man.

Two additional studies reveal that the stunningly preserved cranium likely came from a male that died at least 146,000 years ago. Its mashup of both ancient and more modern anatomical features hints at a unique placement on the human family tree.

"I've held a lot of other human skulls and fossils, but never like this," says paleoanthropologist Xijun Ni of the Chinese Academy of Sciences, who is an author of all three studies.

Based on the shape and size of the Harbin skull, as it's often called, and comparison to other known fossils, the researchers posit that it's closely related to several other perplexing human fossils, from this same time period, that have been found across Asia. The researchers' analysis suggests all these fossils belong to a group that is closely related to our own species—perhaps even more so than the Neanderthals.

### **A crowded landscape**

Until relatively recently, many different species of hominins co-existed.

Originally discovered during construction of a bridge in Harbin, China in 1933, the skull of *H. longi* has a mixture of archaic and modern features.

"It's a spectacular fossil," says María Martín-Torres, the director of Spain's National Research Center on Human Evolution, who was not involved in the suite of papers.

Yet the proposed grouping and species designation is stirring debate among scientists. Some experts see tantalizing hints that the Dragon Man may have ties to the mysterious Denisovans, a sister group of the Neanderthals for which scant fossil remains have been found—a few teeth, a fractured piece of skull, a pinky bone, and perhaps a broken jaw.

While she is excited about the Harbin skull's preservation and mosaic of features, "at this point, I am not that clear how different it is from other groups that are already known," Martín-Torres says.

Still, the skull underscores how tangled the branches are in the human family tree, and how studying the full array of enigmatic human ancestors and their shifting distribution through time could help us decipher our own origins.

"We forget, even as anthropologists, that it's really weird for us to be the only hominins left alive," says Laura Buck, biological anthropologist at Liverpool John Moores University, who was not part of the study team.



## Story from the skull

Before his death, the worker who found the skull disclosed his long-held secret to his grandchildren, who ventured to the well to retrieve the prize in 2018. Qiang Ji, a paleontologist at Hebei GEO University of China who led the new research, caught wind of the find and went to take a look. Unsure of its significance, he took a picture to show Ni.

"I was shocked," Ni recalls. Not only was the fossil remarkably well preserved, it sported that odd mishmash of features. The Harbin skull is squat and wide, with a prominent brow common among ancient hominins. Only one tooth remains in the jawless cranium, but that tooth has three roots, which is a rare trait among modern humans. Other features—such as its delicate cheekbones, which sit flat and low on the face—are more reminiscent of our own species.

"You have a very strange feeling when you look into the eye sockets," Ni says. "You're always thinking, he's trying to tell you something."

Ji persuaded the family to donate the specimen to the Geoscience Museum of Hebei GEO University, and the team got to work. They accrued information from 95 fossil crania, jawbones, and teeth representing a range of hominin groups, characterizing more than 600 features. They then used a supercomputer to construct billions of phylogenetic trees, tools used to illuminate the evolutionary relationships between hominins, with the fewest evolutionary steps, which most scientists agree is the most likely possibility. The tree that sprouted placed the Harbin skull on a new branch that is closely related to our own species.

"I was surprised to see this," says Stringer, who is an author on two of the studies defining the grouping and age of the fossil. He had expected the Harbin skull to be an offshoot of the Neanderthals.



*The Harbin cranium, with its combination of both ancient and modern features, joins a growing number of fossil finds across Asia that don't neatly fit on the branches of the human family tree.  
image by xijun ni*

Part of the team thought that the Harbin skull was so different from other hominin fossils that it should be named a separate species. Ni, an author on the third study defining the new species, ticks off the list of features that together define the Dragon Man: remarkably square eye holes, a long and low braincase, lack of a ridge along the skull's midline, and more.

"It's not just one feature that distinguishes this from all the others," he says. "It's kind of a combination."

### **Debating the Dragon Man**

Yet not all the scientists and outside experts agree that Dragon Man is a separate species—nor do they agree about its relative position on the hominin family tree.

Many of the skull's defining characteristics seem to be matters of scale rather than distinct features, says Buck, of Liverpool John Moores University. Even within a species, she says, some variation is expected. Differences in sex, age of the individual, regional adaptations, age of the fossil, and more can all drive slight individual changes.

If not its own species, what was the Dragon Man? Stringer points to a similar mix of modern and more ancient traits in a fossil called the Dali cranium, which the new study categorized in the same group as the Harbin skull. Found in Shaanxi Province in Northwest China, this skull is considered its own species, *Homo daliensis*.

"There is already a bit of an inflation of species names in anthropology," adds Bence Viola, a paleoanthropologist at the University of Toronto, who was not part of the study team. He thinks it's preferable to group the skull with *H. daliensis*, or leave the species unnamed, rather than coining a new species moniker.

Then there are the mysterious Denisovans. Though not formally recognized as its own species, this group likely inhabited Asia for tens of thousands of years, and many Asian fossils have been suggested as members. But because scientists have found only meager fossil traces of their existence, genetic confirmation is necessary—and DNA preservation becomes increasingly unlikely with older fossils.

In 2019, scientists announced the discovery of a fractured jaw on the Tibetan Plateau that likely came from a Denisovan, which would make the bone the first fossil of these ancient humans found outside the cave that gives the group its name.

The newly proposed phylogenetic tree suggests the Dragon Man is most closely related to this jaw, called the Xiahe mandible.

"They probably belong to the same species," Ni says. But he's hesitant to call the jaw (and thus the Dragon Man) Denisovan, since the fractured mandible's identity came by way of proteins extracted from the jaw and DNA extracted from sediments, not directly from the mandible's DNA. The Harbin skull also lacks a jaw for physical comparison.

Viola, who was on the team that first described the Denisovans, disagrees, noting that Denisovan identity is most logical for the Xiahe mandible. But he points out that even if the Dragon Man was Denisovan, the new analysis places the branch of the tree that includes both the Harbin skull and the Xiahe mandible apart from the Neanderthals.

That would be odd, since such a grouping conflicts with the story of the Denisovans laid out in past studies of their genetics. Those analyses suggest that the common ancestor of Neanderthals and Denisovans split from the predecessors of *Homo sapiens* some 600,000 years ago. That ancestor then split into two groups, with Neanderthals fanning out through Europe and the Middle East and Denisovans moving into Asia.

The relationships between all these groups are "bound to be close and difficult to resolve," paleoanthropologist Katerina Harvati, who was not part of the research, says via email. "I think probably this is something that will need to be worked out more closely once there is more evidence," says Harvati, of Eberhard Karls University of Tübingen.

## **Frozen dragons**

More evidence may be on the horizon. The team involved in the new papers is exploring the possibility of genetic analyses for the Dragon Man, Ni says. But they are proceeding with caution because such work requires destroying small samples of the fossil.

Regardless of whether Dragon Man is a new species, its stunningly preserved features are a reminder that nature rarely paints inside the lines, and that categorization will only get more complex as new discoveries emerge.

"What you consider a species is really this philosophical question rather than this biological truth," Buck says. Species definitions can be useful, she says, but "for me, the more interesting questions are ... how did they adapt? And how did they exist in the world?"

Here, too, the Dragon Man offers enticing possibilities. The exact location where the worker pulled it from the mud remains unknown, but the proposed region is extremely far north, says Michael Petraglia, a paleoanthropologist at the Max Planck Institute for the Science of Human History, who was not part of the research. Even in today's relatively balmy conditions, the wintertime temperatures in this area can plummet into the single digits in degrees Fahrenheit; about 146,000 years ago, it probably wasn't much warmer.

The team speculates that some of the skull's robust traits reflect adaptations to a much colder climate. The environment may have also isolated the Dragon Man and its kin from other hominins, Petraglia says, which could have driven some of the distinctiveness seen in the fossil today.

The team's full database and detailed images of the Dragon Man are now publicly available, Stringer says, so other researchers can plumb the hominin's depths themselves. Many seem eager to do so.

As Sarah Freidline of the University of Central Florida says via email: "The completeness of the Harbin skull is every paleoanthropologist's dream."

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## **Pilots**



Pilots are people who drive airplanes for other people who can't fly.  
Passengers are people who say they fly, but really just ride.

Fighter Pilots are steely-eyed weapons systems managers who kill bad people and break things. However, they can also be very charming and personable. The average fighter pilot, despite sometimes having a swaggering exterior, is very much capable of such feelings as love, affection, intimacy, and caring. (Occasionally these feelings involve someone else.)

Flying is a hard way to earn an easy living.

Both optimists and pessimists contribute to society. The optimist invents the airplane; the pessimist, the parachute.

Death is just nature's way of telling you to watch your airspeed.

As a pilot only two bad things can happen to you (and one of them will):

- a. One day you will walk out to the aircraft, knowing it is your last flight
- b. One day you will walk out to the aircraft, not knowing it is your last flight.

There are rules and there are laws: The rules are made by men who think that they know how to fly your airplane better than you. The laws (of physics) were ordained by God. You can and sometimes should suspend the rules, but you can never suspend the laws.

About Rules:

- a. The rules are a good place to hide if you don't have a better idea and the talent to execute it.
- b. If you deviate from a rule, it must be a flawless performance (e.g., if you fly under a bridge, don't hit the bridge.)

Before each flight, make sure that your bladder is empty and your fuel tanks are full.

He who demands everything that his aircraft can give him is a pilot; he who demands one iota more is a fool.

There are certain aircraft sounds that can only be heard at night and over the ocean. Most of them are scary. And the further you get from land, the louder they get.

The aircraft limits are only there in case there is another flight by that particular aircraft. If subsequent flights do not appear likely, there are no limits.

"If the Wright brothers were alive today, Wilbur would have to fire Orville to reduce costs." (President, DELTA Airlines.)

In the Alaskan bush, I'd rather have a two-hour bladder and three hours of gas than vice versa.

Airlines have really changed ... now a flight attendant can get a pilot pregnant.

I've flown in both pilot seats. Can someone tell me why the other one is always occupied by an idiot?

You have to make up your mind about growing up and becoming a pilot. You can't do both.

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**Want to Fly Without Wings?  
Gravity Industries Has an Answer**



<https://www.youtube.com/watch?v=suHOLFhbwsM>

No big deal except that one of these suits is a little out of my pay grade.

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## **The Advantages of Nuclear Energy in the Clean Energy Shift**

The world's population is projected to increase to 9.7 billion by 2050 and as the population grows, so will our energy needs.



*sustainability times*

According to the International Atomic Energy Agency (IAEA), global energy consumption will rise 40% by 2050, and electricity consumption will more than double. Meeting the rising demand for energy while protecting the environment will require clean energy sources that are powerful and reliable—and nuclear fits the bill.

The above infographic from Standard Uranium highlights the advantages of nuclear energy and its role in the clean energy transition.

### **The Advantages of Nuclear Energy**

From cleanliness and reliability to safety and efficiency, seven factors make nuclear power essential to a clean future.

#### **1. Carbon-free Energy**

Nuclear power plants generate energy through fission, without any fossil fuel combustion.

As a result, nuclear power has one of the lowest lifecycle carbon dioxide emissions among other energy technologies. In fact, the use of nuclear power has reduced over 60 billion tonnes of carbon dioxide emissions since 1970.

#### **2. Low Land Footprint**

Due to the high energy density of uranium, nuclear power plants can produce large amounts of electricity without taking up much space.

A 1,000 megawatt nuclear facility requires just 1.3 square miles of land. For context, solar and wind farms with equal generating capacity can occupy up to 75 times and 360 times more space, respectively.

### 3. Reliability

Of all the advantages of nuclear energy, reliability is one of the most important.

Nuclear facilities can generate electricity round the clock, contrary to solar and wind farms that depend on the weather. In 2020, U.S. nuclear power plants were running at maximum capacity 92.5% of the time, surpassing all other energy sources.

### 4. Resource Efficiency

All sources of energy use raw materials that help build them or support them, besides the fuels.

These can range from metals such as copper and rare earths to materials like concrete and glass. Nuclear power plants have the lowest structural material requirements of all low-carbon energy sources. They're not only powerful but also efficient in their material consumption.

### 5. Long-term Affordability

The high capital costs of nuclear facilities are often cited as a potential issue. However, this can change over time.

In fact, nuclear reactors with 20-year lifetime extensions are the cheapest sources of electricity in the United States. Furthermore, the average U.S. nuclear reactor is 39 years old, and 88 of the 96 reactors in the country are approved for 20-year extensions.

### 6. Safety

Although conventional beliefs might suggest otherwise, nuclear is actually one of the safest sources of energy.

| Energy source | Deaths per 10 TWh | Type          |
|---------------|-------------------|---------------|
| Coal          | 246               | Fossil fuel   |
| Oil           | 184               | Fossil fuel   |
| Biomass       | 46                | Renewable     |
| Natural Gas   | 28                | Fossil fuel   |
| Nuclear       | 0.7               | Non-renewable |
| Wind          | 0.4               | Renewable     |
| Hydro         | 0.2               | Renewable     |
| Solar         | 0.2               | Renewable     |

Even including disasters and accidents, nuclear energy accounts for one of the lowest number of deaths per terawatt-hour of electricity.

### 7. Economic Contribution

Apart from the above advantages of nuclear energy, the U.S. nuclear industry also plays a significant role in the economy.



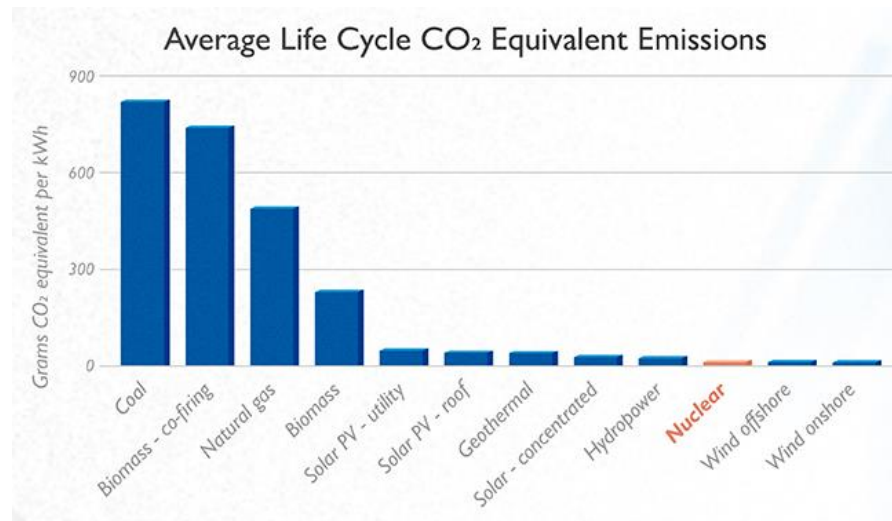
The nuclear industry directly employs 100,000 people, and creates thousands of indirect jobs.

- A typical nuclear power plant generates \$40 million in annual labor income.
- The nuclear industry adds \$60 billion to U.S. GDP annually.
- Nuclear is not only clean, safe, and reliable but it also has positive ramifications on the economy.

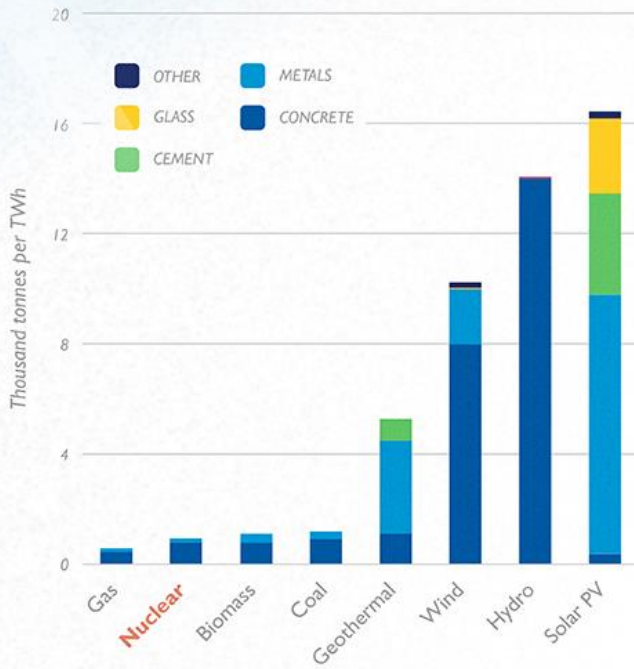
### Nuclear Power for the Future

Transitioning to a cleaner future while increasing energy production may be difficult without new nuclear sources—largely because other renewable energy sources aren't as powerful, reliable, or efficient.

As the energy shift ramps up, nuclear power will be an essential part of our clean energy mix.



## Structural Material Requirements of Energy Sources



## Levelized Cost of Electricity Generation in the U.S. (2020e)



In addition to being clean, reliable, and safe, nuclear also makes a significant contribution to the U.S. economy.



**100,000 people**

Directly employed by the U.S. nuclear industry



**\$40 million**

Annual labor income created by a typical nuclear power plant



**\$60 billion**

Nuclear industry's annual contribution to U.S. GDP

Source: Nuclear Energy Institute

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## All Your Pain in 59 Seconds



<https://www.youtube.com/watch?v=S-A4LzA08po>

See how many of these you've experienced in the last month

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**All Star Bond Rally 1945**



[https://www.youtube.com/watch?v=PDZUs\\_5L2lw](https://www.youtube.com/watch?v=PDZUs_5L2lw)

Bob Hope, Frank Sinatra, Betty Grable, Harpo Marx, Bing Crosby, Carmen Miranda, and a few others in an extravaganza.

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## **America Needs More Marine Corps Values**

by Mark Shields

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Mark Stephen Shields is an American political columnist and commentator who has worked in leadership positions for many Democratic candidates' election campaigns. Shields provided weekly political analysis and commentary for the PBS NewsHour from 1988 to 2020.

While I may not agree with many of the positions he has taken over the years, this is one to which I wholly subscribe, wishing he had managed to inculcate this vision—*officers eat last*-- in the value systems of many (maybe all) those whose in whose elections he has participated.

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A half a century ago, I spent the longest 13 weeks of my life at an out-of-the-way place called Parris Island, S.C., then and now the home of the Marine Corps Recruit Depot.

We were strangers who arrived there in the middle of the night and were immediately relieved of all our civilian clothing and possessions - including our hair. Standing there confused, apprehensive and bald, I remember asking myself over and over: What the hell am I doing here?

Then silently appeared in our midst a man in a starched uniform and polished boots brimming with self-confidence and a sense of command. This was the Marine drill instructor, the DI, who did not conceal his disgust with what he saw in us. I can still hear him that we were the sorriest collection of misfits and rejects he or anyone else had ever seen.

What followed was 90 days of splendid misery. Civilian habits, speech and attitude were marched and drilled and driven out of us. The DI was relentlessly democratic. He treated everyone on our platoon, 189, with equal contempt while double-timing us 12 hours a day from mess duty to the rifle range and back. He used his personal term of endearment to remind us, "Maggot, remember, you volunteered to be here."

Somehow after more than three months of no Cokes, no beer, no TV and not even a day off, the DI, by then our Ultimate Authority Figure, reluctantly conceded that just possibly, maybe someday, we might actually be Marines. The combination of joy, relief and pride was unmatched.

I was not a great Marine. I never saw combat. I got a lot more from the Marines than the Marines got from me. But I believe fervently that this nation today needs the values of the Marine Corps as much as the nation needs the Marine Corps.

Of course, honor, courage and commitment are always in short supply, But the Marines teach personal responsibility and accountability by example, that any chain is only as strong as the weakest individual link. As a unit we are stronger working together than the individual members can separately be. Marines take care of their own - and they take care of their fellow Marines before themselves. The well- being of the country and of the Corps is more important than our individual well-being.

This may best be stated in the hard-and-fast Marine rule: "Officers eat last." The Marine officer does not eat until after his subordinates for whom he is responsible - the corporals and privates - have been fed. Marines live by the rule that loyalty goes both up and down the chain of command. Would not our country be a more just and human place if the brass of Wall Street and Washington and executive suites believed that "officers eat last" The Marine ethic emphasizes responsibility to duty and responsibility to others before self. This is the very opposite of the unbridled individualism that elevates profit and personal comfort to high virtues. The selfish and self-centered CEO or senator who disregards and discards his loyal "troops" would be shunned in the Corps. Civilian Americans must understand that the greatest civil rights victories have been won by the Marines and the U.S. military, the most successfully integrated sector of our national life. Why? No racial reference and no racial discrimination. The first time I ever slept in the same quarters with African-Americans or Latinos - or took orders from them - was as a private in the Marines Corps. Yes, America really does need more Marine values and influence.

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### ***Personal Responsibility and Accountability***

What a concept--anachronistic in the eyes of too many of our nation's role models.

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## **Study: The Most Curious Babies Become the Most Curious Toddlers**

Infants' responses to surprising events like magic tricks are linked to later cognitive ability, researchers find



*credit:will kirk / johns hopkins university*

By Jill Rosen for Science+Technology

A first-of-its-kind longitudinal study of infant curiosity found that months-old babies most captivated by magic tricks became the most curious toddlers, suggesting a pre-verbal baby's level of interest in surprising aspects of the world remains constant over time and could predict their future cognitive ability.

"Something about a baby's curiosity about magic tricks is predicting how curious they become as preschoolers," said Lisa Feigenson, co-director of the Johns Hopkins University Laboratory for Child Development. "What the data suggest is that some three-year-olds have a leg up or seem particularly well positioned to learn a lot about the world."

The findings appear today in Proceedings of the National Academy of Sciences.

Until this study, little was known about curiosity in the pre-verbal mind, as curiosity has mainly been studied in much older children and adults.

The key question behind this work was sparked by Feigenson's own curiosity, and that of lead author Johns Hopkins graduate student Jasmin Perez, about a constant frustration with the classic experimental method for studying infant cognition. In those experiments, babies are shown regular objects and objects behaving in surprising, unexpected ways. Many but not all babies tend to look longer at the unexpected events. Some will stare and stare at a car that seems to float in midair or a ball that seems to pass through a solid wall. Other babies will take a glimpse, yawn, and they're done.

Researchers assumed the variability was due to babies being babies—maybe they were fussy or hungry or distracted. But Feigenson and Perez suspected something important was happening.

"We started to wonder if maybe all of that individual variability is actually meaningful, and tells us that babies are responding to the world differently, from baby to baby," Perez said.

To find out, they launched an experiment where they studied 65 babies over time. At 11 months old, some babies were shown a toy that behaved normally, while others saw the toy seemingly pass straight through a wall. Six months later, the babies, now a year and a half old, now saw either a new toy that behaved normally, or seemed to float in mid-air.

"We found babies who looked really long at magical objects at 11 months were the same babies that looked really long at magical objects at 17 months," Perez said. "Babies are affected by these magical events in different ways, and these ways appear to be stable across a six-month period during infancy."

There was also little change in the least interested babies over the six-month period.

But was this difference among babies predictive of future thinking? To determine that, the team originally wanted to bring the participants back to the lab after they turned three, but because of the pandemic, they instead sent their parents standardized curiosity questionnaires.

They found that the babies who looked longest at events that defied their expectations were the ones whose parents rated them as most curious in an information-seeking, problem-solving way—the type of curiosity most likely to help children learn about the world.

Feigenson's lab previously found that these magical, expectation-defying events are learning opportunities for babies. The new findings, which show some kids are better at noticing these surprising events in the first place, raise the possibility that some kids are better positioned to learn, at least in this way that uses expectation violations as leverage to think more deeply about the world.

The team plans to follow-up with the cohort to see just how long lasting and broad the individual differences among the children become.

"One reason these results are exciting is they open the door to so many other important questions," Feigenson said. "What does it mean for the children in the future? Are these kids also rated as most curious in middle school? Are those kids going to score highest on school achievement tests or IQ tests? These results are screaming out for longitudinal follow-up."

*Posted in Science+Technology*

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**Change Makers**



## What is CRISPR?

CRISPR is a technology that can be used to edit genes and, as such, will likely change the world.



*genetic literacy project*

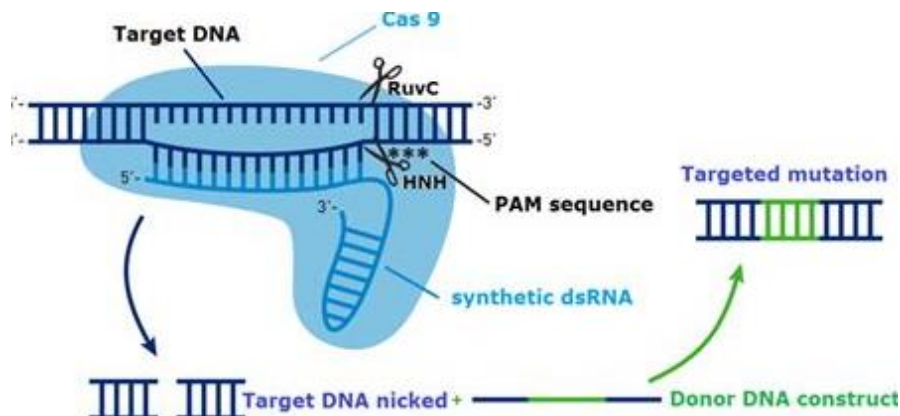
The essence of CRISPR is simple: it's a way of finding a specific bit of DNA inside a cell. After that, the next step in CRISPR gene editing is usually to alter that piece of DNA. However, CRISPR has also been adapted to do other things too, such as turning genes on or off without altering their sequence.

There were ways to edit the genomes of some plants and animals before the CRISPR method was unveiled in 2012 but it took years and cost hundreds of thousands of dollars. CRISPR has made it cheap and easy.

CRISPR is already widely used for scientific research, and in the not too distant future many of the plants and animals in our farms, gardens or homes may have been altered with CRISPR. In fact, some people already are eating CRISPRed food.

CRISPR technology also has the potential to transform medicine, enabling us to not only treat but also prevent many diseases. We may even decide to use it to change the genomes of our children. An attempt to do this in China has been condemned as premature and unethical, but some think it could benefit children in the future.

CRISPR is being used for all kinds of other purposes too, from fingerprinting cells and logging what happens inside them to directing evolution and creating gene drives.



*research gate*

The key to CRISPR is the many flavors of “Cas” proteins found in bacteria, where they help defend against viruses. The Cas9 protein is the most widely used by scientists. This protein can easily be programmed to find and bind to almost any desired target sequence, simply by giving it a piece of RNA to guide it in its search.

When the CRISPR Cas9 protein is added to a cell along with a piece of guide RNA, the Cas9 protein hooks up with the guide RNA and then moves along the strands of DNA until it finds and binds to a 20-DNA-letter long sequence that matches part of the guide RNA sequence. That’s impressive, given that the DNA packed into each of our cells has six billion letters and is two metres long.

What happens next can vary. The standard Cas9 protein cuts the DNA at the target. When the cut is repaired, mutations are introduced that usually disable a gene. This is by far the most common use of CRISPR. It’s called genome editing – or gene editing – but usually the results are not as precise as that term implies.

CRISPR can also be used to make precise changes such as replacing faulty genes – true genome editing – but this is far more difficult.

Customised Cas proteins have been created that do not cut DNA or alter it in any way, but merely turn genes on or off: CRISPRa and CRISPRi respectively. Yet others, called base editors, change one letter of the DNA code to another.

So why do we call it CRISPR? Cas proteins are used by bacteria to destroy viral DNA. They add bits of viral DNA to their own genome to guide the Cas proteins, and the odd patterns of these bits of DNA are what gave CRISPR its name: clustered regularly interspaced short palindromic repeats.

*By Michael Le Page for New Scientist*

<https://www.vox.com/2018/7/23/17594864/crispr-cas9-gene-editing>

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