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This opah was caught during an NOAA Fisheries survey off the California coast. (Credit: NOAA Fisheries/Southwest Fisheries Science Center)

Scientists Identify the World's First Warm-Blooded Fish

Carl Engelking

All fish are cold-blooded.

Just a week ago, that statement would have been true. But on Thursday, scientists announced they discovered the world's first warm-blooded fish, the opah, forcing us to rethink some of the most basic biological concepts we learned back in elementary school.

Opah!

Opah, also known as moonfish, are rotund — almost comically so — predatory fish that hunt for prey in cold, dark waters up to 1,000 feet below the ocean's surface. Although they aren't fished commercially, opah are often accidentally caught in fishing nets. Hawaiians consider opah a sign of good luck, and the fish are often given away as a gesture of goodwill.

But opah have long intrigued scientists because they are such nimble hunters in deep water; most predatory fish move slowly at these depths and wait for meals to come to them rather than chase them down. Things got even stranger when Nicholas Wegner, a researcher at the National Oceanic and Atmospheric Administration, examined an opah gill sample.

All fish gills have two types of vessels: One set transports stale blood from the body to be oxygenated, and another set transports oxygenated blood back into the body. But in opah, blood traveling into the gills is warm. Opah generate heat by rigorously flapping their fins to swim, which blood into the body. The unique setup raises the temperature of inbound blood before it travels to organs and muscles. It's a process called counter-current heat exchange. Automobile radiators regulate engine temperatures the same way, but in reverse. In this way, opah can maintain a body temperature that is roughly 41 degrees Fahrenheit warmer than the water they swim in.

Wegner published his observations Thursday in the journal Science.

Big Advantage

Other top sea predators, such as tuna and sharks, have similar vascular systems to warm specific parts of their body, such as their eyes or swimming muscles, but they lose that heat when they dive deeper into cold water. As a result, they need to repeatedly reheat their bodies in warmer waters closer to the ocean surface.

also speeds up their metabolism.

NOAA Fisheries biologist Nick Wegner holds an opah caught during a research survey off the California coast. (NOAA Fisheries/Southwest Fisheries Science Center)

Wegner noticed that vessels carrying warm blood away from the body wrapped around vessels carrying cold, oxygenated

Since opah have a heating system built into their gills, they don't need to waste time seeking warmer waters. Instead, they can spend their time hunting in cold water and rely on their keen vision and speed, which is made possible by their warm blood.

Indeed, there may be millions of fish in the sea, but none — that we know of — like the opah.

Mosquitoes

How do they find you?

M.V.N. Murthy,

The Institute of Mathematical Sciences, Chennai

It is the season of mosquitoes now. With clockwork precision they arrive at home at sunset and leave home after sunrise. You cannot escape them as they hover around you in the evening and at night when you are studying for your exams. You try to move around but they will find you any way. You try many ways of getting rid of them but there is no getting away from them. How do they find you no matter where you go? Interestingly, mosquitoes have some of the most advanced technology built into their anatomy.

Few animals on our Earth evoke such an aversion as mosquitoes. With their ubiquitous presence they catch you, bite you, causing itch, disturb your sleep with a whiny hum from their buzzing wings. You try to swat them, but they most often escape. Worse still, by carrying infection, they cause numerous diseases like malaria, filaria, yellow fever, etc. Every year this leads to millions of cases mostly among children and old people, especially in developing countries. According to the latest estimates there were about 198 million cases of malaria alone in 2013 and an estimated 584,000 deaths. These numbers were much higher few decades ago.

The deaths caused by mosquitoes every year is much more than those caused by other natural calamities like earth quakes, tsunamis, or for that matter any major war! They are public enemy number one! How do they do they conceal so much harm in their tiny bodies?

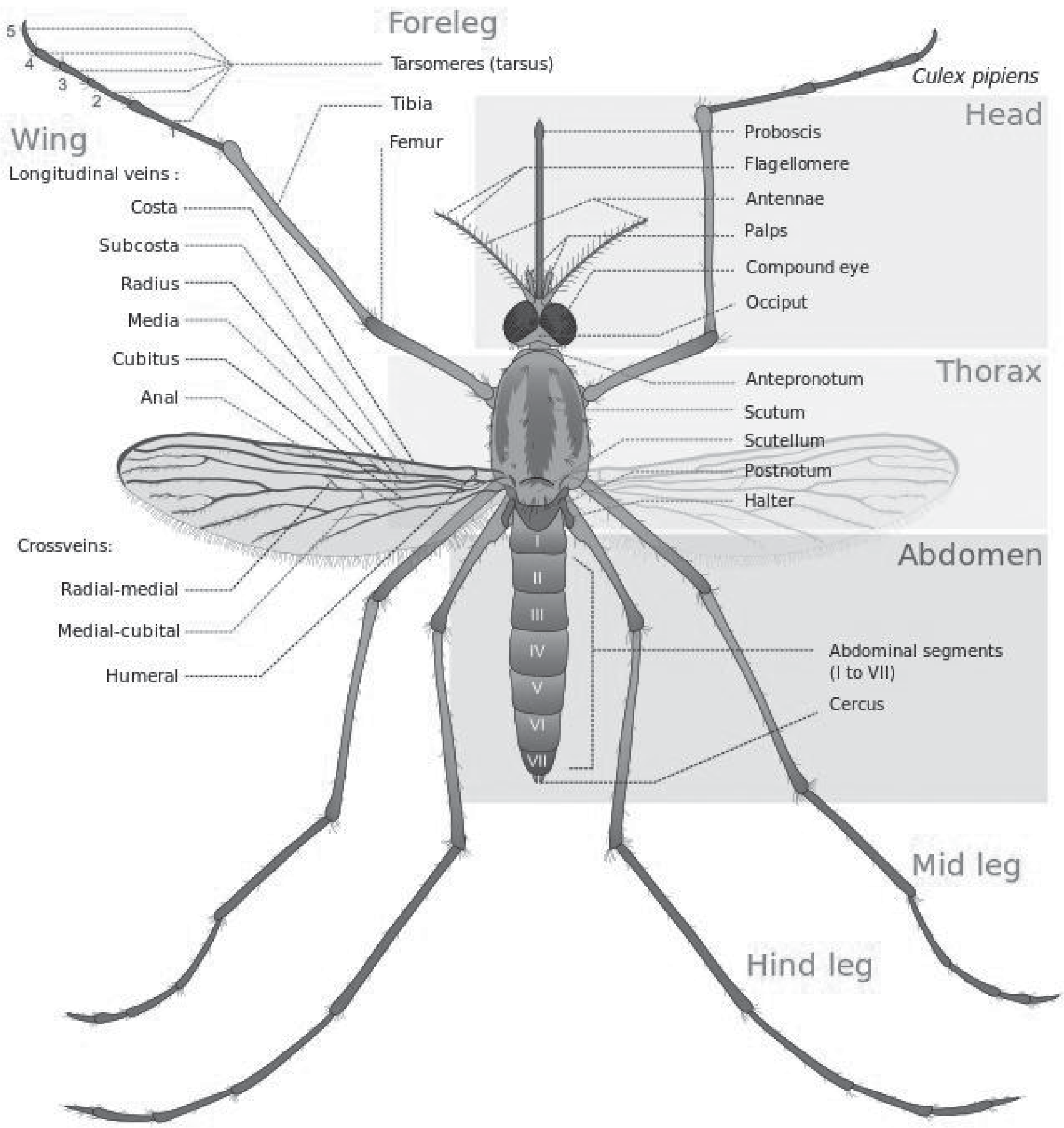
Mosquito Lifecycle

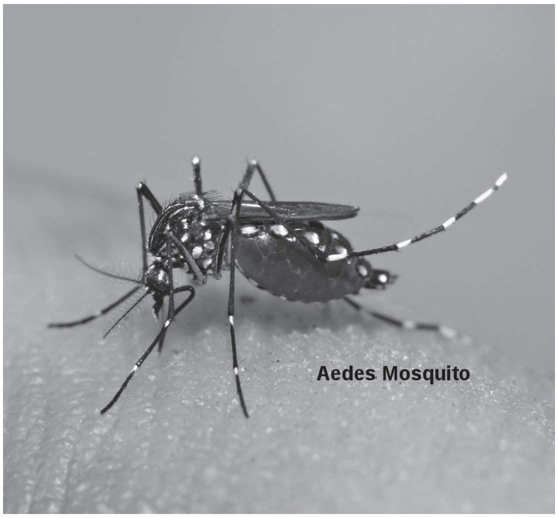
The name mosquito in English has its origins in the Spanish or Portuguese language, meaning a little fly. Indeed they belong to the family of flies called ***Culicidae***. There are nearly 3,500 species in various parts of the world. Like all insects, mosquitoes go through four stages, egg, larva, pupa and adult. The first three stages of are spent entirely in water and only the adults break free as flying mosquitoes. The eggs are laid on stagnant water, like lakes, puddles and marshes. Typically the life cycle varies from one to several weeks depending on the species. They can fly great distances, up to 120 kms from their breeding sites.

Most common among them is the ***Anopheles*** which tend to breed in permanent fresh water bodies, small or big. These are the common malaria-causing mosquitoes. The ***Aedes*** mosquitoes are easy to spot because of their striped black and white legs and body. Unlike most other mosquitoes, they are active and bite during the daytime. The ***Aedes Aegypti*** is responsible for transmitting the viruses that cause dengue fever and chikungunya.

The first thing that an adult mosquito does is to seek a mate. The males usually live only a few days after mating. Most mosquitoes feed on nectar and juices from plants. Blood is not their regular food. The male mosquitoes have a small mouth whereas the female mosquito has long, sharp and thin tube-like structure called proboscis. This is very similar to the trunk of an elephant except that it is much smaller. She sticks this in to the skin. The saliva contains anti-coagulants so that the blood does not clot. She then sucks the blood into her abdomen (about 5 micro-litres per serving). Unless disturbed, she will keep sucking until the abdomen is full. Usually the bite creates a small bump and starts itching provoking the response from the person bitten. This can be treated by simply washing with mild soap and water.

A meal of blood, however, is only required to produce eggs. As a result it is only females of the species that risk blood sucking adventure. Blood pro-





vides them with proteins which is used for producing eggs. (They seem to prefer ***Type O blood*** to other types.) So how do they find you?

Mosquito Sensors

Mosquitoes have been around more than 30 million years. During this long time they have been honing their skills at finding people to suck blood. They have an array of sophisticated sensors to track their prey from a distance of 30-40 metres.

Chemical Sensors: Mosquitoes are equipped with chemical sensors that can sense carbon dioxide, lactic acid and certain chemicals from a distance. All mammals and birds emit carbon dioxide as part of normal breathing. The chemicals contained in human sweat also attracts mosquitoes. In fact you are better off from bites if you do not sweat.

Visual sensors: Mosquitoes can sense motion, especially if you are wearing clothes which are very distinctive from the background. As a strategy this works well for mosquitoes since any thing alive and full of blood moves!

Heat Sensors: Mosquitoes can sense heat. Thus any warm-blooded mammal is a very easy prey for mosquitoes. They can sense heat gradient and move from cooler regions to warmer regions. This is why they enter a home after dusk since it is warmer inside the house than outside once the Sun sets. Conversely, they move out of the homes once the Sun rises in the morning just as we go to school or college during the day and return in the evening.

These sensors form an intricate combination of sophisticated gadgets which help mosquitoes efficiently locate the victim for sucking blood as well as for regular meals of nectar and other juices from plants and flowers. While the bite itself is not harmful but a nuisance, the problem with mosquitoes is that carry infectious bacteria and viruses that can take on epidemic proportions. Malaria is the most common such disease caused by the Anopheles Mosquito and can be fatal unless treated immediately. Malaria is still prevalent in tropical and sub-tropical climates like India and several other countries.

Mosquito Population Control

The best way to control mosquitoes is to prevent them from breeding by eliminating standing water puddles. Breeding fish in such ponds also prevents mosquitoes from multiplying since fish feed on mosquitoes.

Having as little as possible exposed area of skin on persons is a basic precaution. Another method is to confuse the mosquito sensor with creams that can be applied on the skin. Such creams also called repellents confuse the mosquito sensors by emitting strong odour that masks the natural body odour to which they are attracted. Many people use liquids which slowly evaporate, or solids that burn, emitting a smell that confuses the sensors in mosquitoes and drives them away.

While we may not want mosquitoes near us, they are nevertheless wonderful creatures of nature with sophisticated technology built into their tiny bodies. They definitely pinch much above their weight!

To Zoom In, Bats Say "Ahh!"

Elizabeth Preston

In the future when touch screens are obsolete and we control our devices by facial gesture, maybe we'll zoom in and out the same way a bat does it. We'll open our mouths wide to narrow our field of focus. To see the bigger picture, we'll purse our lips tightly. But while we'll only be reading the news or shopping online, bats are operating one of the coolest sensory systems owned by a mammal.

An Italian priest, Lazzaro Spallanzani, sent blindfolded bats through obstacle courses in the late 18th century and concluded that they seemed to use sound to navigate. But no one figured out how it worked for another century and a half. The

1835 British Cyclopaedia of Natural History attributed bats' navigational skills, a bit vaguely, to "delicacy of sensation."

Now we know bats make sounds that are too high for us to hear. They navigate and search for food by listening to how those sound waves bounce back. They can adjust the length and rate of their sound pulses to gather exactly the information they need about their environments. And, researchers in Israel say, bats can widen or narrow their field of view by simply stretching out their mouths.

Yossi Yovel and his colleagues at Tel Aviv University studied a bat called Bodenheimer's pipistrelle, or Hypsugo bodenheimeri. In the wild, the researchers observed bats coming to a small desert pond for a drink of water. On their approach to the pond, bats had to fly through a confined space before entering a more open one.

The researchers set up an array of cameras and ultrasonic microphones facing the pond. The microphones let them measure the width of the sound beams that bats emitted during 312 flights. Then they used the camera images to estimate how wide each bat's mouth had been open at different moments. (This calculation wasn't easy, so the researchers assigned the task to an artificial neural network, which they trained using stuffed bats from a museum collection.)

Yovel saw that as bats flew through a confined space, they used a focused, narrow beam of sound. When they entered a big, open space, they used a wide beam to zoom back out. The bats made the adjustment by changing the width of their mouths. Counterintuitively, a wider mouth creates a narrower sound beam for these bats. To zoom in from the broadest to the narrowest view, bats stretched their mouths more than four times as wide.

The researchers also sent bats through a tunnel—like Spallanzani minus the tiny blindfolds—to make sure their results weren't specific to bats getting a drink of water. They saw the same thing as before: in a small space, bats gaped their mouths wide to zoom in. They did the opposite in a large space.

Plenty of animals can change their gaze to direct their attention where it needs to be, or adjust the focus of their eyes from nearer to farther away. But no other animal is known to adjust its whole field of view like the bat does, Yovel writes.

That might make bats a worthy animal to emulate for our future computer interfaces. We'll just have to make sure to stay engaged, because yawning at our desks would make things difficult.

Image: by Michael Sale (via Flickr)

Animal Tracking Could Help Predict Earthquakes

Yijun Yu and Clara Mancini

The recent earthquake in Nepal demonstrated yet again how difficult it is to reliably predict natural disasters. While we have a good knowledge of the various earthquakes zones on the planet, we have no way of knowing exactly when a big quake like the 7.8-magnitude event in Nepal will happen.

But we know that many animals seem able to sense the onset of such events. We could use powerful computers to monitor herds of animals and make use of their natural instincts to provide forewarning of natural disasters.

Immediately before an earthquake, herds of animals often start to behave strangely – for example suddenly leaving their homes to seek shelter. This could be because they detect small, fast-traveling

waves or because they sense chemical changes in ground water from an impending earthquake.

Although there are possibilities here, we certainly need more studies – because it's difficult to find statistically significant links between unusual animal behavior and impending disasters. This is because natural disasters occur relatively rarely and it's hard to reliably interpret animal behavior after the fact. In fact, this uncertainty was quoted by the Chinese government after reports that zoo animals behaved strangely before the Wenchuan earthquake a few years ago.

Analyzing Animals

There are areas where we know beyond doubt that animals have accurate detection ability, for example the way dogs can spot signs of cancer that we otherwise have difficulty recognizing. We also know that by giving them animal-centered interfaces we can provide them the means to express what they detect, for example by hitting the right buttons according to their judgement.

This is an example of providing animals with accessible technology that supports their natural behavior, while also translating their behavior into something we can understand.

Of course, a key difference between a dog who is detecting cancer and a swarm of birds that is responding to the early signs of an imminent quake is in the numbers involved. We would expect an upcoming earthquake to affect many individuals at the same time, which would amplify the effect.

Collecting data in large quantities – while at the same time being able to recognize and filter background noise – requires efficient and elastic cloud computation. However, we already have technology that can do this, something we've previously suggested could be used to track the course of large numbers of aircraft.

Deploying Sensors

So the bigger question is how to record data from large groups of animals, capitalizing on advances in the Internet of Things, without affecting the welfare of the animals and without interfering with their natural behavior.

Research has shown that putting sensors such as biotelemetric devices on animals can have seriously detrimental effects on their welfare, change their behavior and, by doing so, invalidate whatever data is collected. Of course, trying to fit sensors to large numbers of animals for generation after generation would be highly impractical.

A better option would be to monitor changes in the animals' behavior around their habitats via ambient sensors such as motion detectors. The data could be used to automatically detect any deviation from normal behavioral patterns.

Herdsourcing

The "wisdom of crowds" has been put to use through the practice of crowdsourcing, where the internet is used to bring together a large, diverse range of users in order to undertake a certain task. For example, analyzing Wikipedia documents, conducting citizen science projects, or generating cash

through crowd-sourcing.

This is exactly that kind of concept we need to extend to animals in order to watch for collective changes in their behavior. The technology of cloud computing, which can elastically scale to the amount of computation needed for such a project, is already commercially available.

The groundwork for the kind of system we need has been carried out as part of an ongoing security research program. This project designs cloud-based software systems to recognize and adapt to changes that may have safety and security consequences.

Applied to the task of monitoring collective animal behavior, the system could use sensors to detect big groups of animals in specific areas, monitor the speed and shape of their movement, or detect variations in their calls or cries. Of course, a major consideration would have to be to ensure the data is secure, so that for example it couldn't be used to cause the animals harm (for example, through poaching).

We could apply approaches typically used for human-computer interfaces to animals; designing the means to do so for animals might shed light on how to predict earthquakes – not only that but it could show that there are plenty of other things we can find out from animals too, if only we can learn how to do it.

This article was originally published on The Conversation.

Tiny Dinosaur with Bat-Like Wings Discovered in China

Kiona Smith-Strickland

Scientists have long known that modern birds are the descendants of dinosaurs. Many small dinosaurs in the late Jurassic period even had feathers.

Now, paleontologists in China say that they've identified the fossils of one of the earliest flying dinosaurs, but its wings are nothing like those of modern birds. They're so different, in fact, that paleontologists Xu Xing and Zheng Xiaoting named the little dinosaur Yi qi (pronounced "ee chee"), which means "strange wing" in Mandarin. Despite being a close relative of feathered birds, Yi qi had wings that looked more like those of modern bats or flying squirrels. The discovery raises more questions about the origins of flight.

Strange Wings

Bird wings are muscular, supported by the bones of the forelimb, and most of their aerodynamic shape comes from long feathers. Yi qi's wings were membranes of skin, supported by a curved, rod-like bone extending outward from each wrist. "We believe that Yi qi is probably not a great flyer," Xing said. "I guess it might move in the air by a combination of flapping flight and gliding flight, but rely more on the latter."

Xing and his colleagues aren't sure exactly how the rod-like bone, which they call a "styliform element" would have connected to the wrist, but they think it would probably have gotten in the way of much flapping. Yi qi's skeleton also showed no signs of the kinds of muscle attachments points that scientists expect to see in animals that flap their wings to fly. It probably glided short distances, perhaps between trees or from high perches down to the ground, but it would probably have had to climb, rather than fly, up again.

Unearthing Yi qi

Paleontologists have reconstructed Yi qi based on a partial skeleton found in a rock slab in Hebei Province, China, which dated to the mid- to late Jurassic Period, from 175 million years ago to 145 million years ago. Flight is the only plausible explanation for the rod-like bone attached to the dinosaur's wrists, said Xing and his colleagues in a study published in today's issue of Nature.

The surrounding rock even preserved some patches of Yi qi's wing membranes between the styliform element and its fingers, though not enough for paleontologists to be completely sure of the wings' size and shape. Xing said that researchers believe Yi qi had a wingspan of about two feet. That's an impressive spread for an animal that weighed about as much as an average pigeon.

Many feathers also survived in the rock, and it appears that Yi qi had short feathers covering most of its body. By examining preserved melanosomes, the pigment-making structures within cells, scientists determined that Yi qi was either black or grey, with reddish-brown wings, and it boasted a black or reddish-brown crest atop its skull, according to Xing.

Dinosaur Family Tree

Yi qi belonged to a family of small, feathered dinosaurs called scansoriopterygids, which were very closely related to early birds like the well-known Archaeopteryx. But instead of feathery wings like its close relatives, Yi qi flew on bat-like membranous wings.

"This is the most unexpected discovery I have ever made, even though I have found a few really bizarre dinosaurs in my career," Xing told Discover.

Yi qi wasn't the only glider in its time. Pterosaurs, which soared on leathery, featherless wings, had diverged from dinosaurs during the middle Triassic period. The pterosaurs' branch of the family tree produced no modern ancestors, but the dinosaurs' branch eventually led to modern birds.

Yi qi seems to have also been an evolutionary dead-end in the long run.

"What we know is it is a failed experiment in flight along the line to birds, but we don't know why," said Xing. He added, "One reason might be that feathery wings in other bird-like dinosaurs and birds are more efficient and more competitive."

Record-Breaking Energy Unleashed in Largest Atom Smasher

Jeanna Bryner

The world's largest atom smasher is really cranking now: Protons zipped around the giant underground ring at near light-speed and collided head on, releasing recordbreaking energies.

The beauty of the fallout from these powerful particle smash-ups can be seen in images released on May 21 by the European Organization for Nuclear Research (CERN), which oversees the 17- mile-long (27 kilometers) Large Hadron Collider (LHC). The underground particle collider in Switzerland awoke in April after a two-year snooze for repairs and upgrades.

Now, during a test run, the protons sped into each other with energies of 13 tera-electronvolts (TeV), or double the collider's previous power. "It doesn't sound like very much, but if you have a mosquito buzzing around, the amount of energy it takes to keep that mosquito floating is about the energy of one of these collisions — except that you have this energy compressed down into the size that's a million times smaller than the width of a human hair," Greg Rakness, run coordinator for one of the experiments called CMS at the collider, told Live Science.

Physicists used these test collisions to set up systems called collimators that would protect the LHC's magnets and detectors from stray particles.

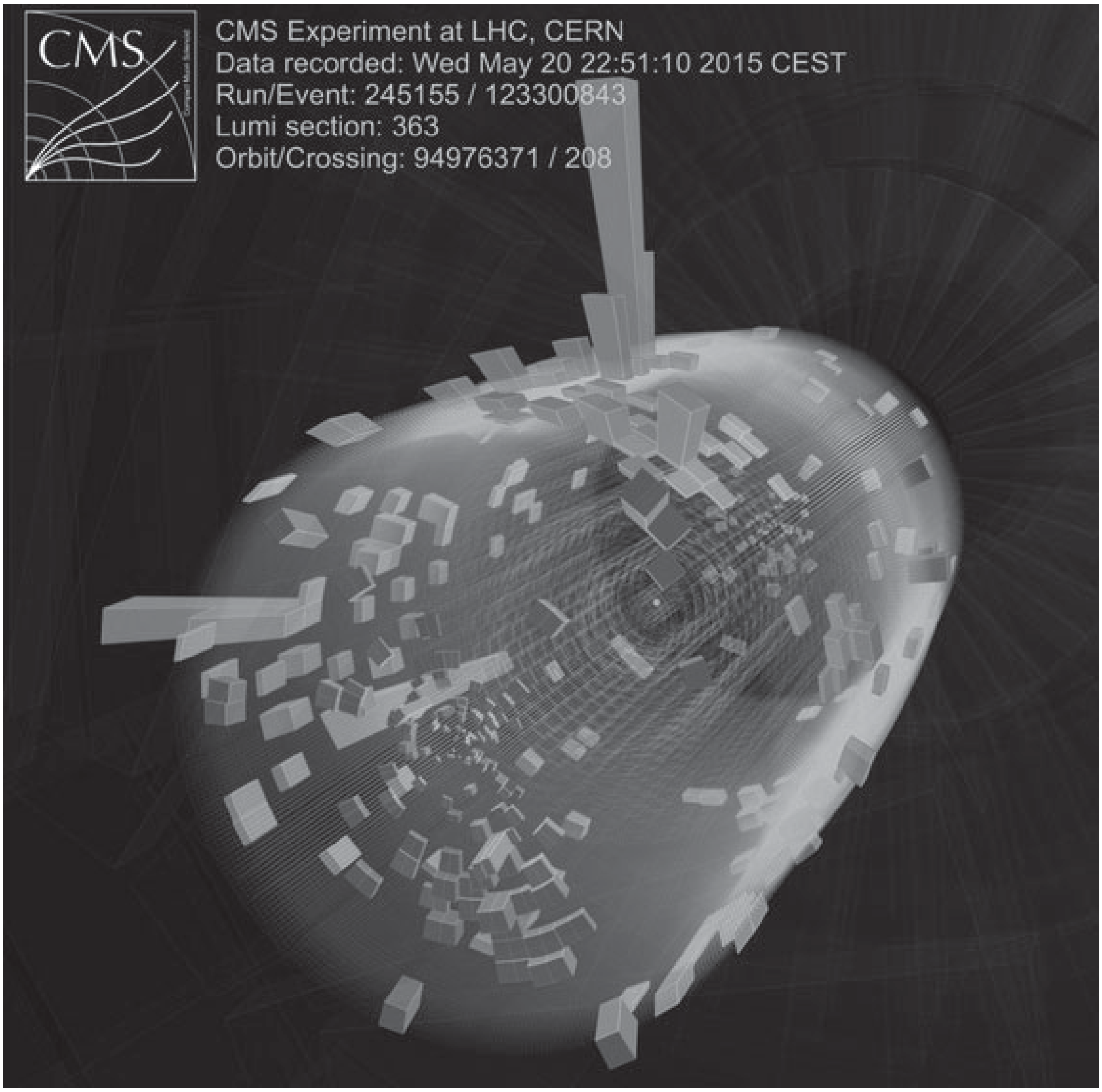
When 100 billion to 1,000 billion protons are sped up in a ring, some of them are inevitably going to be "off spec," having slightly different energies than the other particles, Rakness said. "If they don't have the right energy, they float outside [the main beam, and] they go around in a little bit bigger circle. And when they do this, the problem is these protons can hit equipment" inside the LHC, Raknesssaid. To capture these "out of whack" protons, Rakness said, physicists rely on the collimators, which are essentially blocks of metal. During the test run, the teams figured out where to place the collimators to capture the stray protons and protect the machine's equipment. The test run was successful, he added.

Also, the nearly 9,600 magnets that move the protons around in a circle are working properly, he said.

The LHC has begun runs colliding protons with 13 TeV energy in early June. At that time, the various experiments, such as ALICE, ATLAS and CMS, have again begun producing data. One of the events produced at the CMS experiment in the LHC is shown in the figure. It is believed to have occurred due to formation and decay of a Higgs boson produced when the two protons collided. From the collision at the centre, the particle decays into two photons indicated by the "towers" radiating out from the centre which is the collision point.

The LHC's claim to fame right now is the Higgs boson, a particle thought to explain how other particles get their mass and which was discovered in 2012 inside the underground ring.

With higher energies, the collisions could produce even heavier exotic particles that



have not yet been discovered. And physicists are excited about what's in store, hoping that the particle crashes will reveal unknowns about the universe, from extra dimensions (beyond the three dimensions of space and one of time that we live in) to twins of the Higgs boson.

The new run of the LHC could also give physicists evidence of supersymmetry, the idea that all the known subatomic particles have superpartners that are yet to be discovered.

The centrespread shows the ATLAS detector, with the man in the centre showing how massive the detector is. In fact, all the detectors are huge and although they use fantastic technology, are really works of art!

produce even heavier exotic particles that have not yet been discovered. And physicists are excited about what's in store, hoping that the particle crashes will reveal unknowns about the universe, from extra dimensions to twins of the Higgs boson, the scientists have told Live Science.

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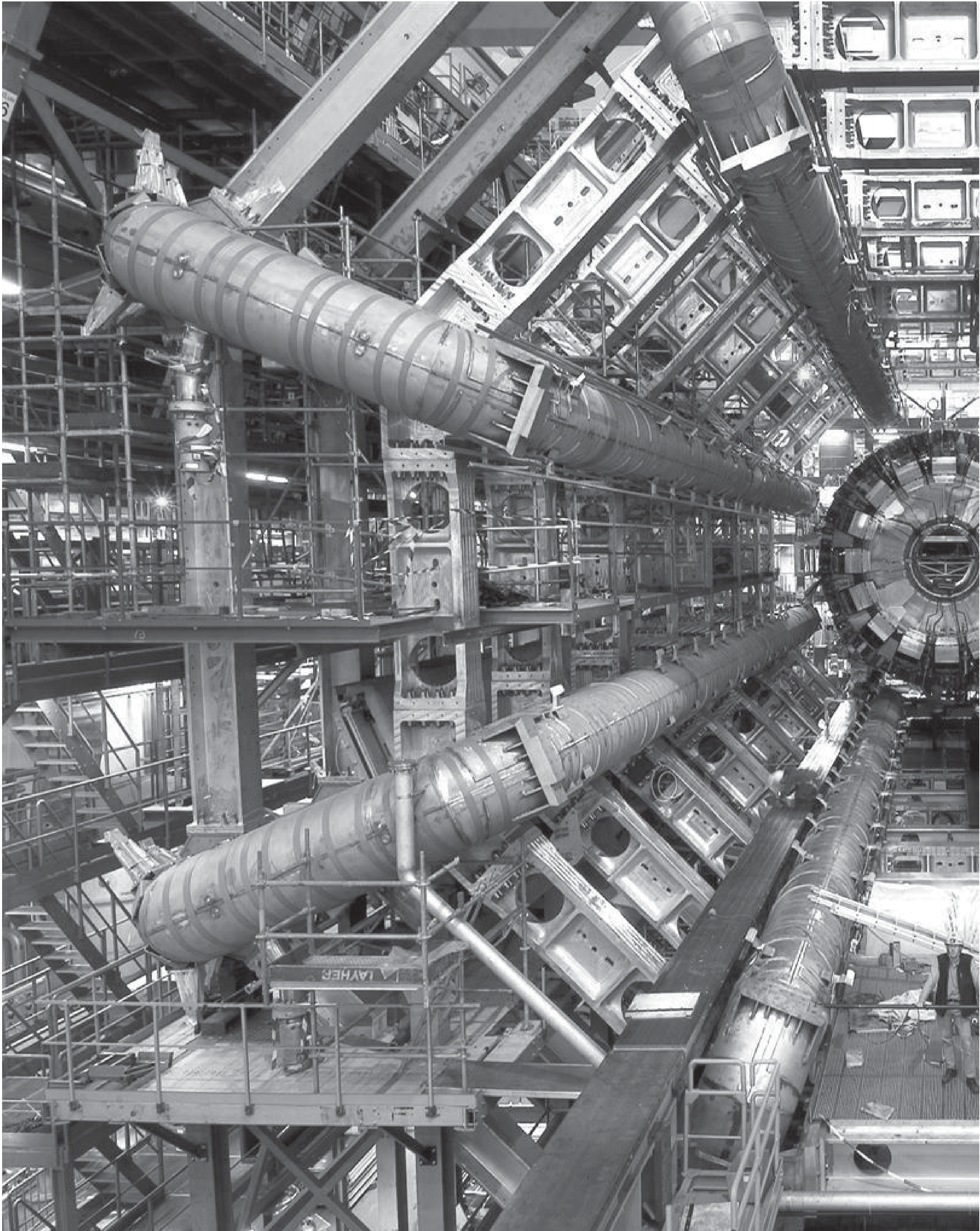
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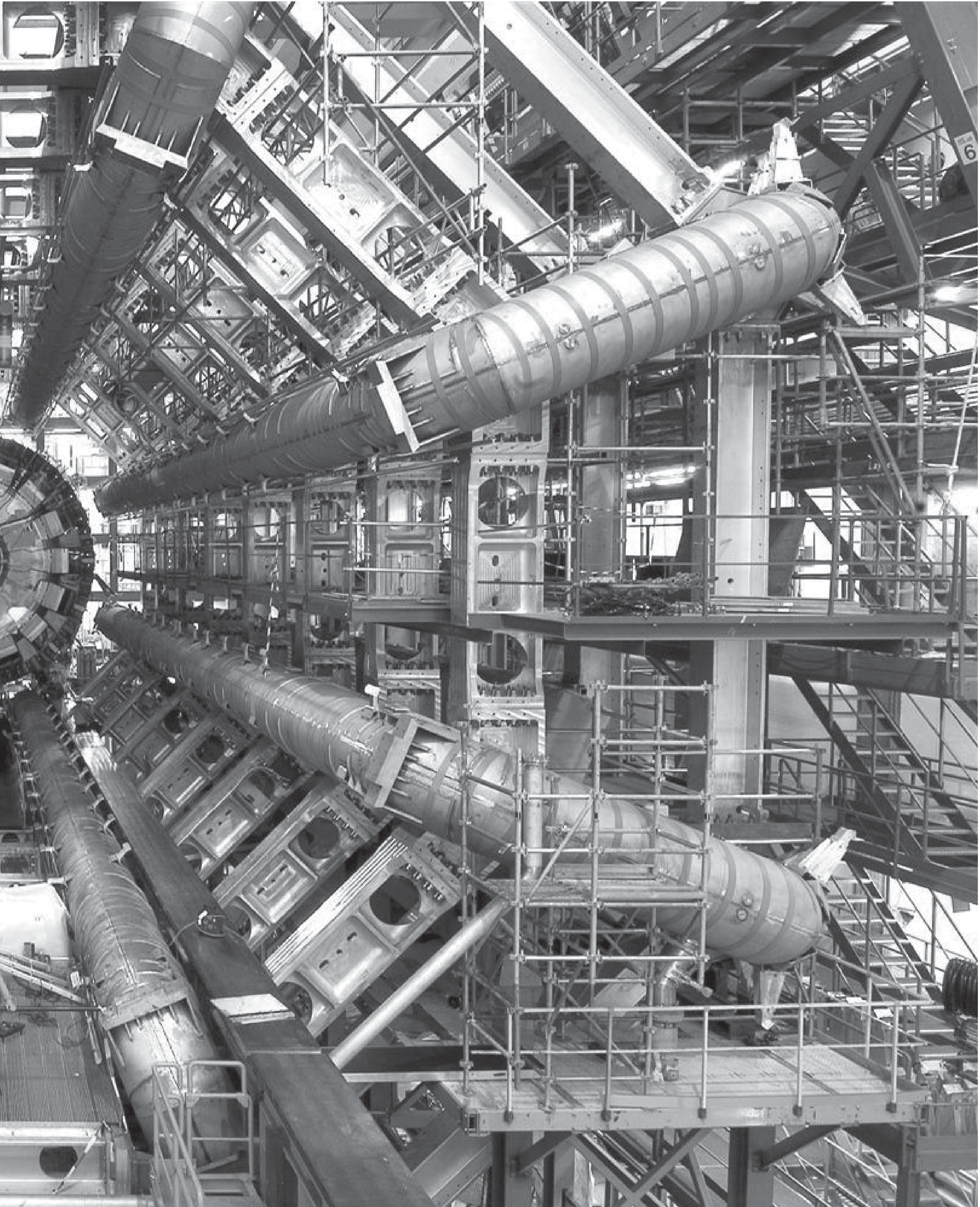


IN IMAGES: THE MENAGERIE OF TINY ALIENLIKE CREATURES UNDER THE SEA

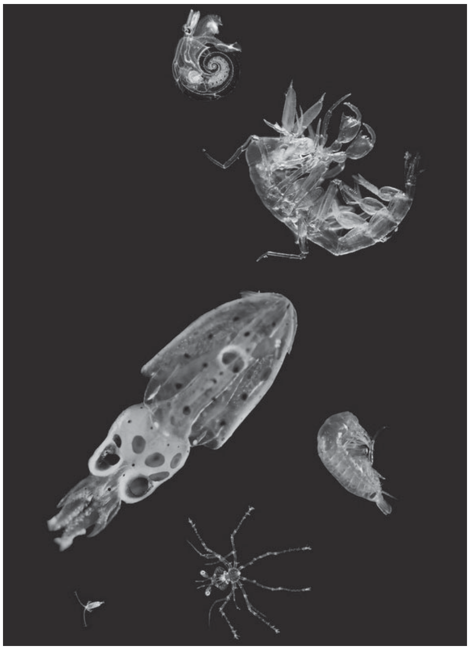
Tia Ghose

An epic, three-year voyage around the world's oceans has revealed an entire ecosystem of tiny organisms that lurk beneath the waves. Scientists set out on the schooner "Tara" to 210 stations in the seas, sampling the water for DNA. They found thousands of previouly unknown species that were larger than bacteria and viruses, but much smaller than the shrimplike creatures known as krill. [Read the full story on the hidden web of sea creatures]

Stunning sea creatures

zoo of glowing sea creatures

The scientists documented a menageries of stunning and bizarre sea creatures in the sunlight upper layers of the ocean,

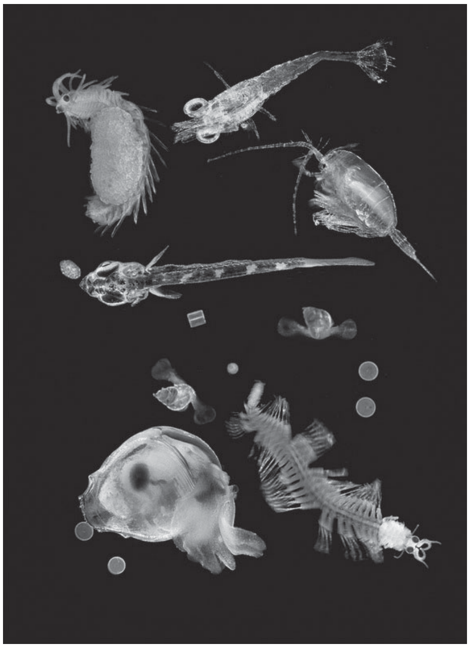


from glowing squid to tiny zooplankton. From left to right, the picture shows a crustacean copepod, a spider crab larva, an amphipod, a baby squid, a Phronima amphipod, and an Atlanta pteropod mollusc. (Photo credit: ©Christian Sardet/CNRS/Tara Expéditions)

Tiny world

array of deep-sea creatures

The team used tow nets with finer and finer mesh to capture some of the most miniscule creatures in the oceans. Here, some of the plankton pulled in from the Pacific Ocean with a 0.003

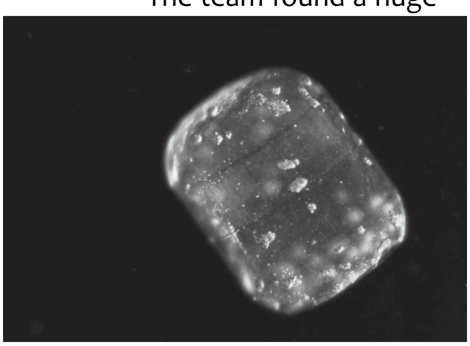


inch (0.1 millimeter) mesh net. The ultrafine mesh pulled up everything from zooplanktonic animals to larvae to single-celled creatures such as diatoms, dinoflagellates and radiolarians. (Photo credit: ©Christian Sardet/CNRS/Tara Expéditions)

Hidden ecosystem

lauderia annulata

The team found a huge

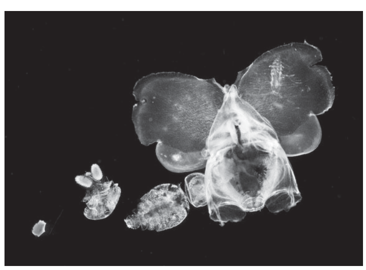


array of previously unknown single-celled eukaryotes and simple multicellular organisms that lived in the ocean. Among those was the Lauderia annulata, which lurks in the Indian Ocean. This massive diatoms, which is 0.007 inches (0.2 millimeters) across, is actually a single cell. Chloroplasts glow green and yellow inside its body. If it looks like a sparkling, colorful piece of glass, that's because it is: the outer casing of the cell is made of glass. (Photo credit: ©Christian Sardet/CNRS/Tara Expéditions)

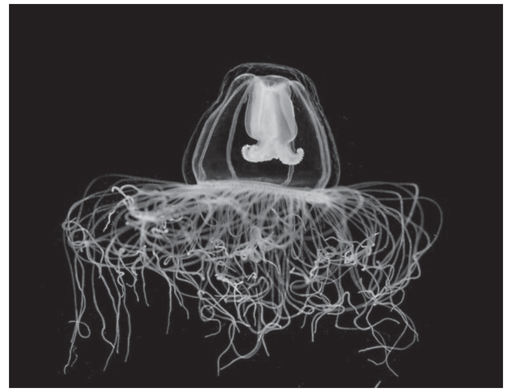
Zoo of plankton

zooplankton and diatoms

The team collected over



35,000 species of zooplankton. Here, this image shows a molluscan pteropod on the right, and two crustacean copepods. (Photo credit: ©Christian Sardet/CNRS/Tara Expéditions)



Immortal creature

immortal jellyfish relative

Not everything the team catalogued was teeny. Here, an immortal jellyfish viewed by the team. This translucent sea creature was spied in the Mediterranean sea and is likely a close cousin of the immortal jellyfish, known as Turritopsis. (Photo credit: ©Christian Sardet/CNRS/Tara Expéditions)

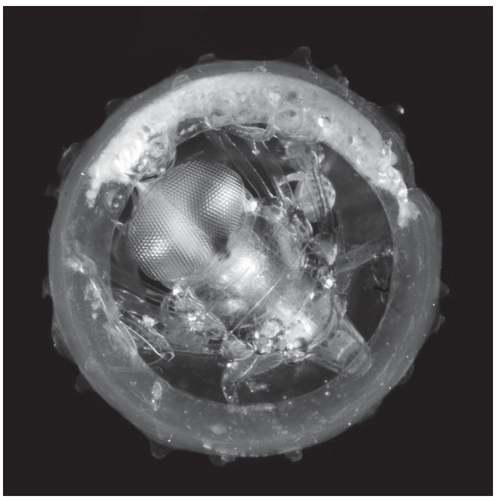
Glowing crustacean

sapphirina

The team snapped some photos of tiny, multicellular organisms called copepods in the Mediterranean sea. Here, the copepod Sapphirina sparkles as light diffuses through its outer layer of epidermis, which is made up of little plates. Sapphirina tend to congregate where their hosts, barrel-shaped tunicates called salps, are plentiful. (Photo credit: ©Christian Sardet/CNRS/ Sharif Mirshak/Parafilms/ Tara Expeditions)

Undersea alien

amphipod hyperiid of the genus phronima



Some of the strange creatures look like would be more at home on another world. Here, an alienlike hyperiid amphipod of the Phronima genus. These little parasites gobble up salps, then use the salps now-empty, jellylike outer husks to protect themselves from predators. (Photo credit: ©M.Ormestad/Kahikai/Tara Oceans)

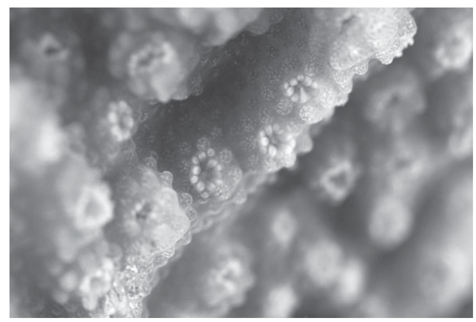
Three-year tour

tara schooner on the tara oceans expedition

More than 100 scientists set sail at different points in time on the Tara, shown here The scientists collected samples of sea life while braving icy Antarctic storms and navigating around pirates in the Gulf of Aden. (Photo credit: ©S.Bollet/Tara Expéditions)

Coral checkup

coral closeup



While traversing the world's oceans, the schooner also visited the sites of 102 coral reefs off the coasts of Djibouti, Saint Brandon, Mayotte and the Gambier Islands. Most seemed to be healthy and seemed to be weather the temperature changes they've experienced so far. But ocean acidifcation and deadly starfish invasions could still harm the coral. (Photo credit: ©A.Amiel/ Kahikai/Tara Oceans)

Which Baby Animals Look Cute?

It May Be No Accident

Elizabeth Preston

Dwarf croc

Do you want to cuddle me?

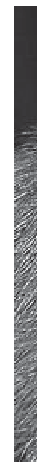
Sure, there are faces only a mother could love. And then there are faces no mother loves, because they belong to animals that fend for themselves from birth. The babies we find cutest—no matter what species they are—may have evolved to look that way because they need a parent's attention. That means even a crocodile can tug on our heartstrings.

Konrad Lorenz, an Austrian zoologist, proposed in the mid-20th century that human infants are cute for a reason. He said evolution has created adorable babies so that their parents will take care of them. When we see a face with big eyes, a big head, and a tiny nose and mouth, we can't help but feel affection, he argued. It's easy to look at a wide-eyed puppy or kitten and imagine that other animals have evolved in the same way.

(Lorenz was also known for studying "imprinting" in baby birds. He convinced small armies of newly hatched ducks and geese to follow him around like their mother, as in this video.)

"Lorenz's proposal seemed so obviously true that no one bothered to test it," says Daniel Kruger, a social psychologist at the University of Michigan's School of Public Health. Most research into what Lorenz called the Kindchenschema ("baby schema") has been done with pictures of humans or other mammals.

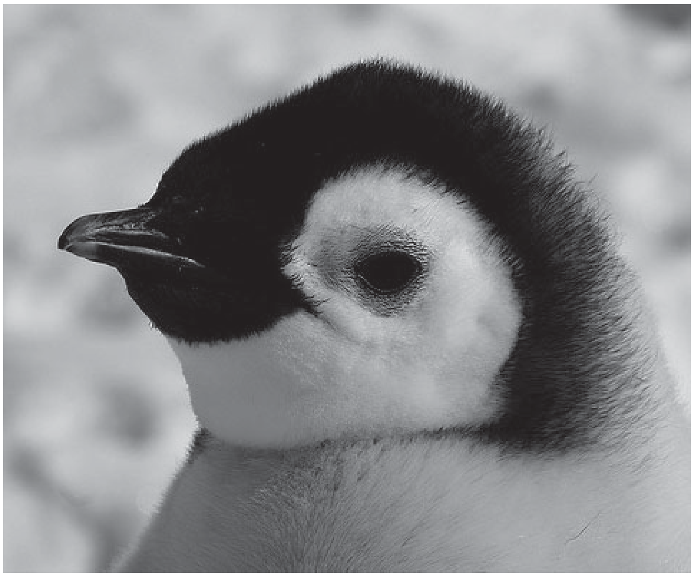
By definition, Kruger says, all mammals need some care from their parents. The animal's mother has to at least hold still long enough for her newborn to get some milk. Yet Kruger was curious about whether the Kindchenschema applies to other kinds of animals. Birds, for example, have a range of parenting styles. In some species, hatchlings wait in the nest while their parents bring back food and vomit it into their little beaks. Other birds tuck their eggs into a warm corner somewhere and never come back. Have birds that need their parents' attention evolved to look cuter?



Australian brush turkey

Kruger chose six bird species to study. Three of them have self-sufficient hatchlings that don't need any care from their parents. The other three have young that stay near their parents and need to be fed. He also threw two reptile species into the mix—one that cares for its young, and one that doesn't.

If you want to play along and guess which



species need parental care, five of them are pictured throughout this post.

Emperor penguin

Kruger used photos from a Google image search, picking out the first available high-quality shot that showed each animal alone in its environment. Then he showed these pictures to 172 college students.

The students looked at each hatchling and rated it on the adjectives attractive, cute, helpless, independent, mature, and young. Then they answered a series of questions,

including "To what extent would you like to hold or pet this animal?" "How likely would this animal be able to survive on its own?" and "If you were working out in the field and found this animal wandering around by itself, how likely would you be to adopt it at least temporarily to make sure that it survived?"

California alligator lizard

As Kruger had predicted, subjects rated animals that need parental care as cuter than the animals that don't. Even the care-requiring reptile baby scored higher than the self-sufficient one. Students also had a greater desire to hold or pet the animals needing parental care, thought these animals would appreciate being held or petted, and said they'd be more willing to adopt one of them. (Compared to men, women rated the baby animals slightly higher in cuteness, and were more excited about taking them home.)

This doesn't prove that Lorenz's Kindchenschema applies throughout the animal kingdom. The study only involved a handful of animal species and a casual Google search. Additionally, Kruger notes, he didn't look at bird species that require the most parental care. These birds hatch blind, naked, helpless, and not especially cute. He speculates that the "extreme" characteristics of these hatchlings might tap into a different evolutionary mechanism altogether.

Still, Kruger calls his experiment a "strong test" of Lorenz's idea. As far as he knows, it's the first time anyone has looked at cuteness in reptiles and birds. He's excited to learn more, and is talking to potential collaborators about ways to extend the research using other animal species as well as human infants.

"This might just be the beginning of an entire research program," Kruger says.

Do You Know?

1. We send up so many satellites into space. Can they collide ?

2. We usually feel the forehead or neck of a person to check for fever. Does fever raise temperature equally over the entire body?

3. Sometimes rain has a certain smell and sometimes it does not. What is it that is giving the rain its smell?

4. When we make ice cubes at home they are always white, but I have seen clear ice cubes in restaurants. How can we make clear ice cubes ?

5. Can one sneeze in sleep ?

6. Why does petrol create a rainbow on water?

Answers to last issue's DYK

1. If you fall asleep and start dreaming, and in the dream you are awake, do you still get a good night's sleep?

Ans: It is a common misconception that dreaming and waking are completely different states. They can occur at the same time. Examples of this happening are "sleep paralysis" and lucid dreaming. Sleep paralysis is where your body is overly fatigued and asleep but your mind is still actually awake. This usually indicates that you have been experiencing poor quality of sleep over a number of days, and so, may still wake up feeling tired. This is a common occurrence.

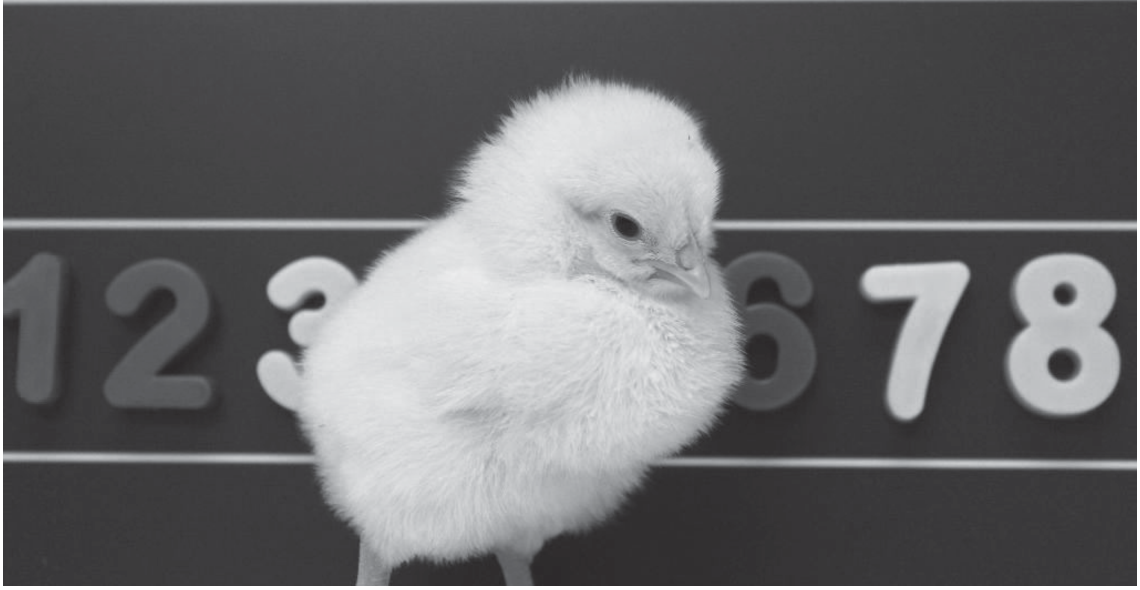
Dreaming that you are awake can also indicate that you have entered a lucid dream state. This is when you become aware that you are dreaming and are able to choose what happens next in the dream. Lucid dreaming is a very relaxing and refreshing dream state. This can give you a fantastic night's sleep, you wake up feeling re-energised.

But what about if you have been running around playing football in your dreams? According to experts, getting a good night's sleep does not depend on the content of your dream or how active you are in your dream. It is the quality of sleep you are having that determines how refreshed you will feel when you wake up.

2. Can little chicks (of birds) count?

Ans: The answer is yes! Humans do it. Primates do it. And now it has been found that birds can also do it: 3-day-old chickens have been shown to order numbers — low to high — from left to right — just like on a ruler scale! The findings, published in the journal Science, could indicate that this numerical ability is a feature of evolution, rather than training. It could also help explain why we pay more attention to things presented on our left.

How can one tell whether an animal or a bird can count? Consider peacocks. Peahens like to mate with peacocks that have about 150 eyes in their tail. If you take about 5 eyes out, the male peacock becomes far less attractive to the female. Does this mean that peahens can count to 150? No. actu-



ally the peahen can pay attention to the asymmetry of the tail, or the density of spots in their tail. So, while it might look like she is counting, she does not have to actually count at all. Birds can certainly tell the difference between patches that have a lot of items or fewer items, but that is not counting as such, more numerical discrimination.

So it took a lot of research to show that chicks can indeed count. The recent paper in Science in fact shows that they count from left to right. Imagine you are in a box. There is a card in the middle of the box with 5 dots on it. Behind it is a tasty treat. This happens again, and again, and again. A card with 5 dots is always in the middle. Then one day, there are two cards: one on your left, one on your right, both have two dots on them. Which one do you look behind for your tasty meal worm reward? Well, the chicks nearly always picked the one on the left. Perhaps chicks are all left-winged. So, in the next tests, they added two cards with 8 dots on them – one on the left, one on the right, same layout, different dots. Now they looked behind the right card for their reward. This shows that chicks like humans associate lower numbers on the left and higher numbers on the right.

In humans, we know that this is because the right hand side of our brain is very dominant. So, we pay attention to the left hand side of pictures. This seems to be the same in chickens as well. It may be that we have some very ancient shared ancestry where the wiring of our brain was very similar way back in evolutionary history. Researchers are searching for answers to this.

3. Is it true that stress experienced by a pregnant woman can affect the health of the foetus inside her?

Ans: When an animal is pregnant the developing baby exchanges nutrients and waste products through its umbilical cord and placenta, which attaches to the wall of the mother's uterus. But, if the mother is exposed to stress the placenta works less well, which can affect the growth of the baby.

There are some stress hormones called glucocorticoids that are secreted both in the mother and the foetus. When these glucocorticoid levels are raised in the pregnant mother, the ability of the placenta to transport glucose to the foetus is reduced. This can increase the risk of complications in child birth, but also the life-long risk of metabolic disease or diabetes.

Research has also shown that there is a relationship between glucocorticoid levels and food patterns of the mother. So we can limit the effects of stress on the foetus by manipulating the mother's diet. Both psychological stress and nutrient deprivation in the mother certainly seem to increase glucocorticoids. In this case, a particular gene called red1

in the placenta is increased.

In summary there seems to be plenty of evidence that stress on the pregnant woman does affect the health of the foetus inside her.

4. Do sporting performance of athletes vary at different times of day?

Ans: Athletes competing at the wrong time of day could be missing their best by as much as 26%, according to study. By comparing the sporting performances of “owl” athletes (the night performers) with more “lark”-like early risers, scientists have shown that correctly synchronizing your race time with your body clock can make the difference between a gold medal and not even qualifying.

Early risers, the ones that are called larks, who get up early in the morning and want to go to bed early, have their performance maximum around midday while those that wake up late and go to bed very late, so-called ‘owls’, have their performance maximum in the evening, at around 8 o’clock. The performance difference of athletes between their morning performance and their evening performance can be as pronounced as 26%, which is huge in the sports world.

The reason why we see these differences is because these individuals have different body clocks. The early types, the larks, have faster running body clocks. Note that the body clock controls more or less, all of our physiology. For an athlete, this is particularly important because things like how sugar is utilised by the muscles, how alert a person is, and of course, how physically active we can be depends very much on the state of wakefulness. So, if you are fully awake because your biological clock lets you then you can achieve your personal best performance.

Now, marathons take place in the morning, but football games usually take place in the afternoon and the evening. Then we have night matches such as in IPL cricket. So knowing about body clocks may be important for athletes and coaches.

5. Is the use of ‘smart’ phones changing the way our brains function? If yes, is it permanent?

Ans: It is known that concert violinists who grew up playing the instrument have higher activity in the part of the brain linked to the little finger of the non-bowing hand but not of the bowing hand. A study showed that the in the brain of a London taxi driver, regions associated with memory are (on average) bigger than that of the general population. So it is reasonable to wonder if phone use alters our brains as well.'

A recent study found that the part of the brain that receives information from the thumb generates more

electrical activity in people who use touchscreen phones compared to old fashioned phone users. This brain difference reflects the heavy reliance on the thumb in the more modern users. These changes seem to occur rather quickly, immediately falling a period of intense texting. The brain area that receives information from the thumb becomes more active. But these brain changes are not permanent. In fact, it is believed that the brain is continuously updated according to how we use our thumbs. This activity is likely to taper off after a period of non-use, possibly taking a few weeks to revert back to normal.

On the whole, these phenomena are not well understood as yet.

6. By testing a person's tears, can we find out if it was caused by pain or by emotion?

Ans: Crying predominantly expresses powerlessness or the strong desire to be reunited with a lost valued person, object or location. The advantage of crying aloud is that it is emitted in all directions. It is then very likely to be heard by parents, who can provide care, but this means it may also be heard by predators.

Most mammal offspring make distress calls if separated from their carers, however humans are the only species who shed emotional tears. The advantage of crying tears, a visual signal, is that it cannot be detected in the same way by predators but may easily be seen by the parents or caregivers.

Physical pain tears and emotional tears are both produced by the same glands in the eyes. Like other glands (such as salivary glands or sweat glands) they are connected to our blood stream. Some ingredients of tears originate from the blood, and the composition of blood can be effected by hormones, which in turn are affected by stresses and emotional state. This could lead us to think that tears produced in different emotional states could differ in their composition. However, a great deal of mystery still surrounds this idea.

Over 30 years ago, researchers compared the biochemical composition of emotional and irritant (onion) tears and found that the emotional tears contained more proteins. However, that has never been replicated and we do not know what this would mean.

Sources: Science, Nature, Cambridge University Science Forum.

Science News

Headlines

- Major earthquake rattles Nepal
- Collecting waste in space
- Asteroids boiled young Earth's oceans
- The world's biggest seed
- Chikungunya is on the move

Read more about them below.

• Major earthquake rattles Nepal

One of the worst disasters of recent times was an earthquake in Nepal, our neighbour in the Himalayas. A massive 7.8 magnitude quake devastated the region on April 25, 2015. This quake killed more than 8,000 people.

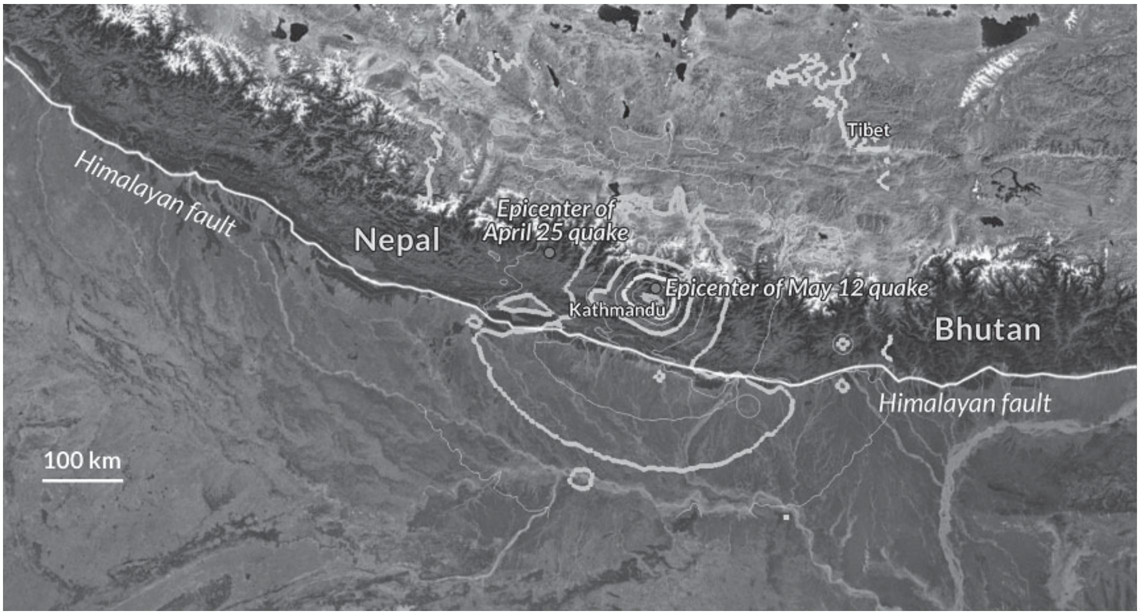
Only 17 days later, a magnitude 7.3 earthquake rattled eastern Nepal on May 12.

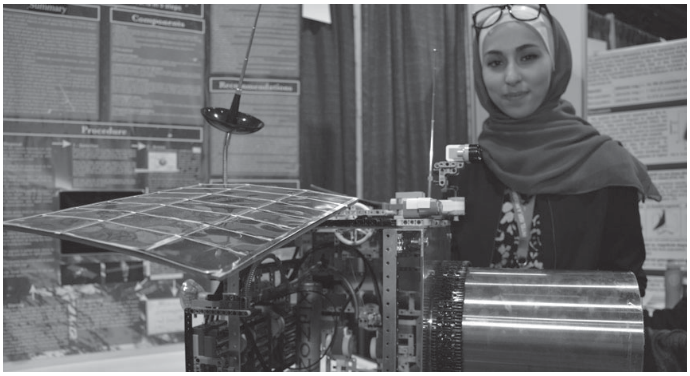
The new earthquake occurred roughly 80 kilometers to the east-northeast of Nepal's capital city, Kathmandu. It took place where the Indian tectonic plate is converging with the Eurasian plate at a rate of 45 millimeters per year. Part of the collision is helping to raise the Himalayan mountain range a bit each year.

Energy from the April 25 quake was directed from its centre eastwards and towards Kathmandu along a fault, which is a natural rupture in Earth's crust.

The magnitude 7.3 aftershock occurred just beyond the eastern end of that rupture. The new quake's epicentre was near Mount Everest. That is nearly 150 kilometers east of where the April 25 quake had been centred. The enormous, new aftershock released roughly one third as much pent-up energy as had powered the main earthquake.

Tremendous earth-shaking energy was released during this and the April 25 tremors. Still, researchers say, the affected region remains primed for even more powerful quakes.





The magnitude 7.3 quake was not the only large aftershock on May 12.

Thirty-one minutes after that first big quake hit, a still substantial magnitude 6.3 aftershock rattled the region.

• Collecting waste in space

Dana Arabiyat, 15 year old girl from Amman, Jordan, has designed a satellite to collect and dispose of the space garbage that threatens other satellites orbiting Earth.

Satellites play big roles in modern life. Some look downward to monitor environmental conditions on Earth. Others look outward in search of major solar flares that can disrupt the transmission of electrical power to homes and businesses. Some spy on countries. Others relay communications around the globe. But all of these marvels of technology can be knocked out by a collision with space junk – debris from satellites and other Earthly technology orbiting high above the planet. Now, a teen from Jordan has designed a satellite to chase down space garbage, collect it and then dispose of it.

Space organizations are now tracking about 500,000 pieces of space garbage that are currently orbiting Earth. Many come from satellites or rockets that have blown up and shattered. The objects being tracked are the size of a marble or larger. About 20,000 are at least the size of a football.

(Some are as large as a refrigerator). Most are too small to detect from Earth's surface. In all, some 100 million pieces of debris may be orbiting Earth today, says 15-year-old Dana Arabiyat. She attends Alridwan Schools in Amman, Jordan.

But this debris orbit our planet at speeds up to some 28,200 kilometers per hour, which is about 7.8 kilometers per second! Such blistering speed explains why tiny paint flecks have chipped the windshields of space shuttles so badly that they needed to be replaced.

Here's how Dana's system would work. A radar system aboard the satellite would scan for and find a piece of space junk. Then, thrusters would change the satellite's orbit so that it could chase down the errant object. As the satellite closed in on its prey, cameras would keep it on target.

At the last minute, a door that leads to a bulletproof container would open. This container needs to be strong so that it does not break apart when the satellite swallows the space junk. In some cases, the difference in speed between the satellite and the debris could still be pretty big.

Finally, when the garbage container is full, it would be lowered toward Earth on a kilometers-long cable and its contents released into the upper atmosphere. There, the space junk would harmlessly burn up

Magnitude (for earthquakes)

A measurement of the intensity of the ground-shaking associated with an earthquake. The scale is logarithmic. So for every 1 point increase in magnitude (such as from 3 to 4), there is a 10 fold increase in ground motion (how far the land shakes back and forth) and a roughly 33-fold increase in the amount of energy released.

just like a meteor does. Meanwhile, her satellite would reel the container back up so that it could collect more trash.

Dana's satellite will be able to collect bits of debris up to 50 centimeters across. If engineers wanted to catch larger bits of space garbage, they could build a version of her design with a larger door. But that might also require a far stronger bin.

Dana's project was presented at the Intel International Science and Engineering fair in Pittsburgh, USA, in May 2015.

• *The world's biggest seed*

How much does a seed typically weigh ? A few grams ? Here is a palm seed which is believed to the world's biggest seed, it can weigh as much as 18 kilograms !

Coco-de-mer palms (Lodoicea maldivica) produce these monster nuts, which are a type of seed. These seeds are heavy, but yet the palm outperforms all other plants – at least in seed weight – with a below-poverty diet.

These plants grow wild on nutrient-starved, rocky

soil on just two islands in the Seychelles. (They are part of an arc of some 115 islands in the Indian Ocean, off of the East Coast of Africa.)

Nitrogen and phosphorus are two natural fertilizers (nutrients) that these (and other plants) need. There isn't much of either on the islands where these palms grow. So the plants are frugal. They sprout fronds using only about one-third the nutrients needed by leaves of 56 neighbouring species of trees and shrubs. What is more, coco-de-mer palms scavenge a lot of the nutrients shed in their own dying leaves. This tree can reuse 90 percent of that prized phosphorus from the fronds it is about to drop.

That is a record for the plant world, report scientists in the May issue of the journal New Phytologist.

Each giant seed takes a long time to grow, about six years. But that cannot happen until the palm first 'comes of age'. On the nutrient-poor ground, this reproductive coming-of-age may take nearly 80 to 100 years.

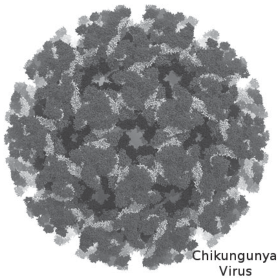
Only then can one of these palms yield its first seed. Throughout a female coco-de-mer palm's life of several hundred years, it may bear only about 100 seeds.

But the coco-de-mer forests are dwindling. Scientists calculate that 20 to 30 percent of the endangered species' seeds must sprout to keep the forests growing and healthy. But that has not been happening. Nut poachers have been illegally kidnapping the seeds. Then they grind them into a powder that they sell.

We do need to save these biggest seeds from the danger of extinction.

• *Chikungunya is on the move*

In one decade, the chikungunya fever has gone from an obscure tropical ailment to an international threat, causing more than 3 million infections worldwide. The virus has established itself in Latin



America and may now have the wherewithal to inflict its particular brand of misery in cooler climates as well.

Chikungunya rarely kills its victims, but it can bring a world of hurt.

It comes on like the flu: fever, cold, headache, aching joints and typically lingers for a week. Many patients later develop severe joint pain that can recur for months or years. In the Makonde language of East Africa, where the virus was first identified in 1952, chikungunya means 'to walk bent over' or 'to become contorted', a reference to the stooped posture of many sufferers.

In 2005, chikungunya departed Kenya, hit several islands in the Indian Ocean and spread like a brush fire through India and Southeast Asia, where it lingers today. In 2013, the strain of chikungunya that had been ensconced in Asia since the 1950s found its way to the Caribbean and nicked Florida in 2014.

It is not unprecedented for a tropical disease to reach other warm regions. But one strain of the chikungunya virus has found a way to survive in mosquitoes that live in temperate zones, leading to recent forays into Italy and France. North America, China and Europe are now fair game.

In 2005 researchers were surprised that Reunion, the tropical island in the Indian ocean, became a hot spot for chikungunya. The island had little or no Aedes aegypti, the tropical mosquito that typically carries the virus around Africa and Asia. Researchers soon found out that the African chikungunya that hit Reunion had mutated to thrive inside a new carrier, the Asian tiger mosquito, Aedes albopictus. Reunion, like many parts of the world, has tiger mosquitoes.

Specifically, the virus underwent a single amino acid change in one of its glycoproteins, a carbohydrate-protein mix called E1, making virus replication much easier in the tiger mosquito. When the mosquito takes a blood meal from a person carrying mutated chikungunya, the pathogen proliferates rapidly in the insect's midgut and travels to its saliva.

As a result, the mosquito's next bite is like a hypodermic needle loaded with virus. Other mutations found later seemed to help this virus adapt to the tiger mosquito, its new host.

Within a few years the virus showed up in Italy and France, ferried from person to person by black-and-white striped tiger mosquitoes. Italy reported about 200 infections in 2007.

A second surprise came in 2013 when chikungunya showed up on the sun-splashed Caribbean island of Saint Martin. A traveler apparently arrived in Saint Martin carrying the virus and was bitten by a local mosquito, which then spread it to other people. This launched the epidemic in the West.

Meanwhile, Ae. Aegypti is spreading the Asian strain of chikungunya in Latin America and the Caribbean, with tens of thousands of cases confirmed and more than 1 million suspected. The epidemic has stretched to Brazil, which has reported hundreds of cases of person-to-mosquito-to-person spread.

The best that can be said about a case of chikungunya is that it confers lifetime immunity. People rarely get it twice. But once is bad enough.

Sources:
Geology,
Scientific American,
student.societyforscience.org

Brain Teasers

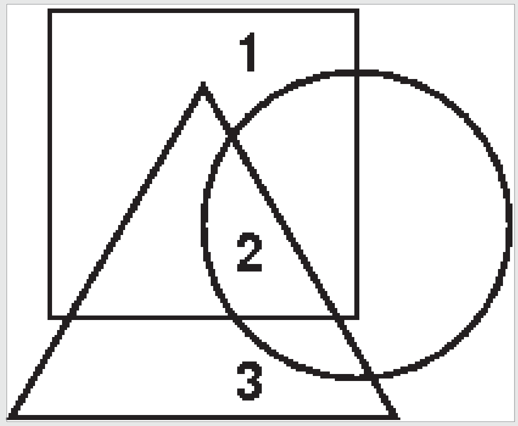
Find the numbers

The numbers 1, 2, 3 are filled in in these shapes. Place the remaining numbers from one to ten in the seven divisions of this shape made by a square, triangle and circle. You must satisfy the following constraints:

. the circle, square, and triangle must individually sum up to 30.

. The three outer (non-overlapping) parts of the circle, square, and triangle must also sum up to 30.

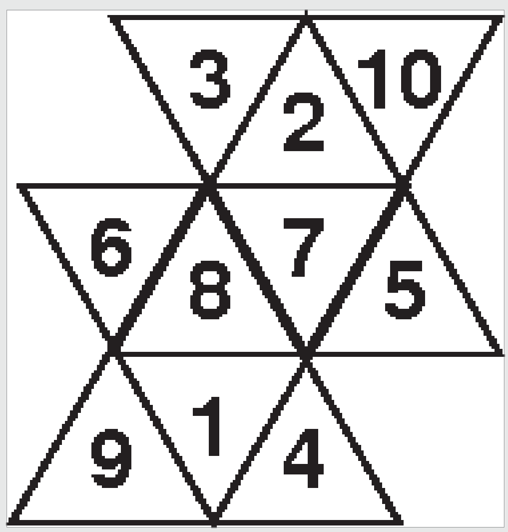
Hint: One sector can be left empty.



Triangle Sums

This set of triangles has been filled with the numbers 1 to 10 so that each group of four small triangles makes a larger triangle whose numbers add up to 22. There are four such overlapping triangles. It turns out that you can rearrange the numbers (again from 1 to 10 only) in four different ways so that the numbers in each large triangle add up to 18, 20, 24 and 26. Can you find these rearrangements?

Adapted from the book by Steve Ryan



Find the way!