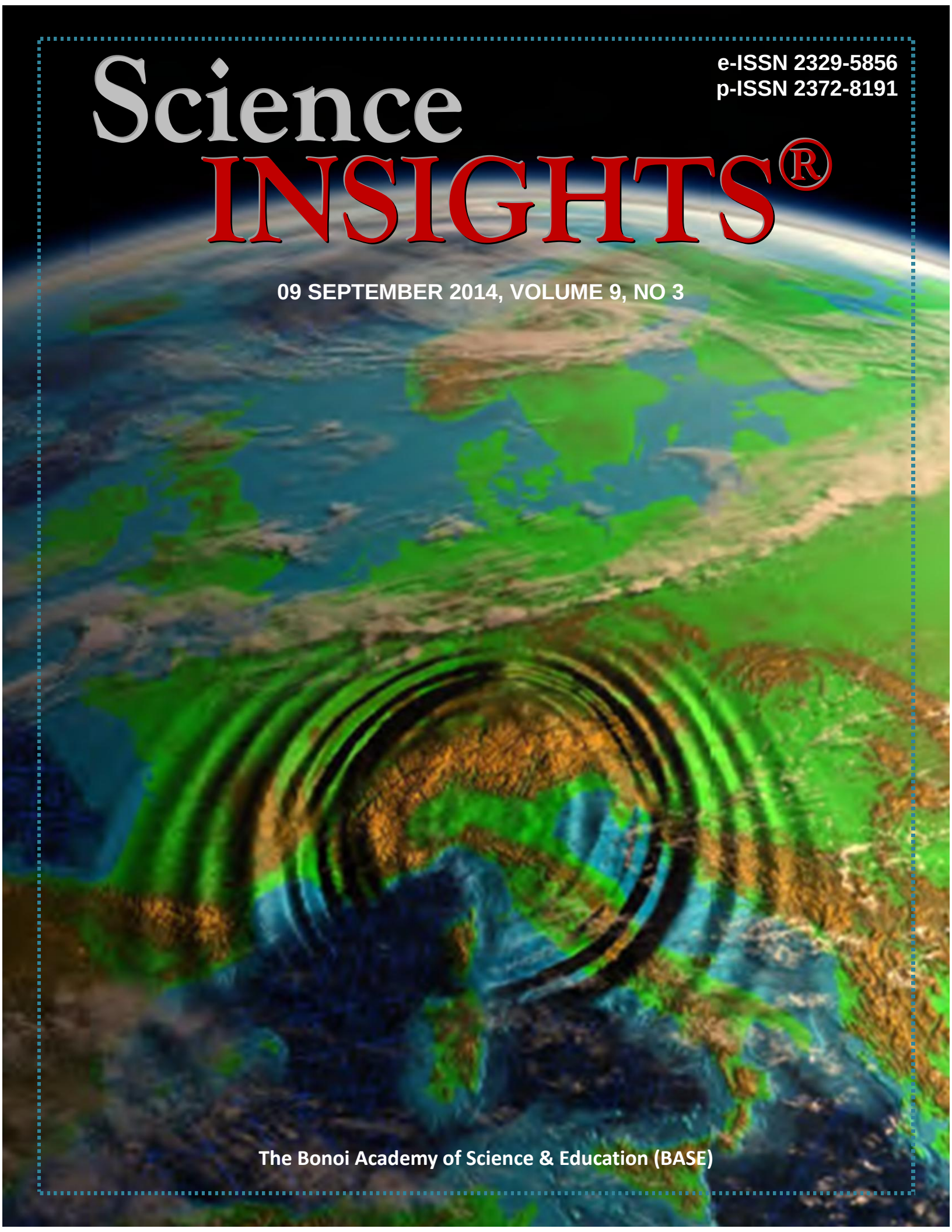
e-ISSN 2329-5856
p-ISSN 2372-8191

Science INSIGHTS®

09 SEPTEMBER 2014, VOLUME 9, NO 3



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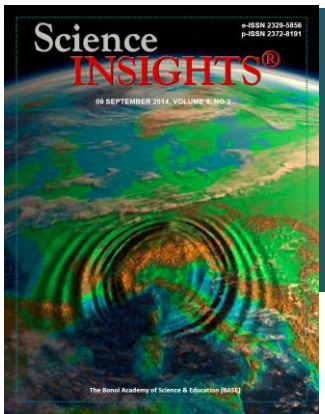

COVER
In some areas, we have reached an advanced level such as in the field of outer space exploration, but in some others, like earthquake prediction, we are still there where we just started. Even a lot of entities provide us information about the happened earthquakes, whereas no one can tell us when it will be. In fact, it is really hard for science to give us the original answer "Why is it like that?" See page 255.
Image: BASE illustrating group

p-ISSN: 2372-8191
e-ISSN: 2329-5856
DOI: 10.15354/issn.2329-5856

BASE

THE BONOI ACADEMY OF SCIENCE & EDUCATION

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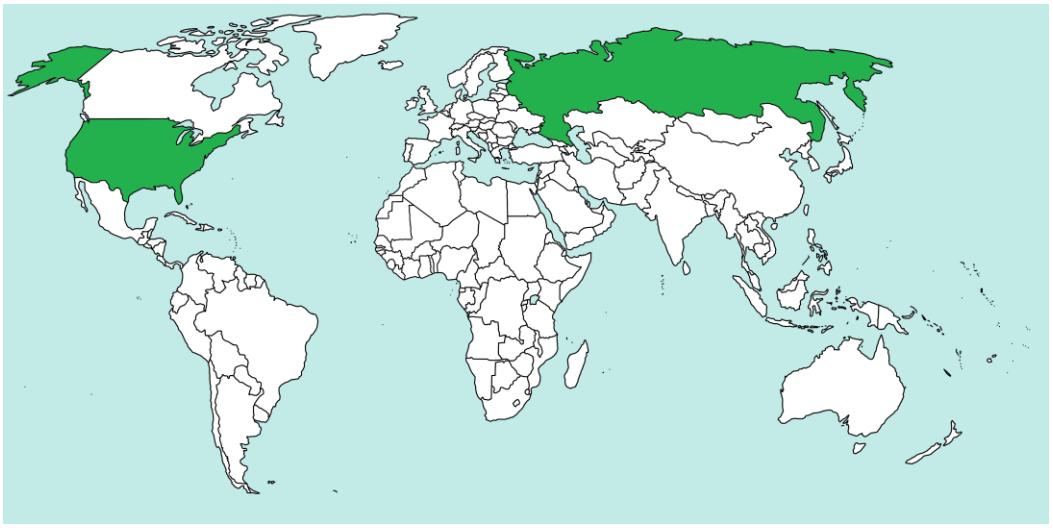
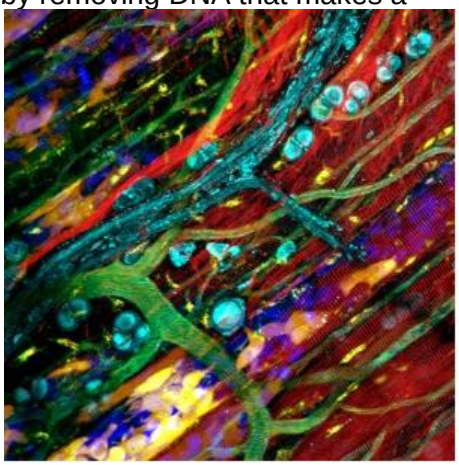


New York, USA

Injecting Bacteria Shrinks Tumors

Common soil bacteria injected into solid cancers in pet dogs and one human patient shrank many of the tumors. The preliminary findings offered hope that the experimental treatment could turn out to be more effective than existing cancer therapies for some inoperable tumors such as those of the lung, breast, and pancreas, which often fail to respond to radiation and chemotherapy. Radiation requires oxygen to kill cells, but the deep interior of tumors is nearly oxygen-free. Chemotherapy requires blood vessels to carry drugs into tumors, whose interiors generally lack such plumbing. "But these conditions make the tumors perfect for bacteria that thrive in low-oxygen environments," said oncologist Shibin Zhou of the Johns Hopkins Sidney Kimmel Comprehensive Cancer Center in Baltimore, Maryland, a senior author of the study. Doctors first tried using streptococcus bacteria to attack tumors 100 years ago, but that and recent attempts with salmonella proved to be toxic, ineffective, or both. The idea nevertheless made sense, and a decade ago Hopkins scientists resurrected the approach using Clostridium novyi soil bacteria. They genetically modified the bug by removing DNA that makes a toxic protein, and decided to inject only spores, which are less likely to cause infection. They then enlisted veterinary oncologists at seven pet clinics across the United States. Sixteen dogs, from a border collie to golden retrievers and shepherds, received injections of 100 million clostridium spores. The scientists chose dogs rather than common lab animals because their cancers are more genetically similar to humans', potentially making the results more relevant. Tumors shrank in three of the 16 dogs, and disappeared in three more, the researchers reported in Science Translational Medicine. At M.D. Anderson Cancer Center in Houston, a patient with retroperitoneal leiomyosarcoma, an aggressive cancer of the abdomen that had spread to her liver, lungs, bones, and arm, received an injection of 10,000 spores into a metastatic tumor in her arm. She initially ran a fever and felt severe pain (a sign that her immune system was attacking the cancer) but the tumor shrank in and around her arm bone. Tumors elsewhere continued to grow. What seems to happen, Zhou said, is that the spores release enzymes that destroy nearby tumor cells "so precisely we call it biosurgery." Also, the immune system senses the bacteria and dispatches tumor-killing cells. BioMed Valley Discoveries, a research and development company in Kansas City, Missouri, is recruiting patients with solid tumors that have not responded to therapy for a trial assessing the safety and optimal dose of clostridium, at M.D. Anderson and other sites. "We anticipate that proceeding through Phase 1 and future later-stage trials will take many years," said BioMed's Saurabh Saha. (Reporting by Sharon Begley; Editing by James Dalgleish).■



Kent, USA

Ancient Fossils on the Moon?

The surface of the moon may be littered with fossils from ancient Earth, scientists say, and new research is shedding light on the astonishing way that they arrived there. While it may seem like a surprising idea that fossils could travel between planetary bodies, experiments conducted by physicists at the University of Kent are proving that fossilized diatoms can survive the trip, according to Popular Science. Their findings suggest that meteorites are capable of transporting fossils between worlds, at least when impacts occur at certain speeds. As io9 relates, the journey from the Earth to the Moon would be a hazardous one for fossilized microorganisms,

involving two “shock events.” The first would consist of an impact strong enough to throw high-speed ejecta containing fossils into the air, which would then escape into space. As they reach another planetary body, like the Moon, there would be another shock event as the fossil-laden meteorites impact the surface at speeds as high as 3 kilometers per second. Spurred on by the debate over Martian meteorite ALH84001 and whether it contains fossils of diatoms, which would be evidence that life once existed on Mars, the University of Kent team decided to test the ability of fossils to survive such a journey intact. By using powdered diatoms — a type of microscopic algae with a hard silica shell — frozen inside a nylon bullet, they simulated fossilization and impact speeds. When the bullets were fired into a sack of water at speeds ranging between 0.25 and 3.1 miles per second, researchers were able to determine that small fossils could possibly survive a meteorite impact, with a few caveats. At impact speeds above 0.62 miles per second, none of the pseudo-fossilized diatoms survived impact. As the speed of impact increased, the surviving fragments became smaller. Meteoroids generally enter the Earth’s atmosphere at speeds between 6.8 and 44.7 miles per second before they strike the surface, posing a serious stumbling block to the survival of such fossils. Still, despite their fragmentation, the diatom fossils could still be recognized as biological in origin. Read more at http://www.inquisitr.com/1388113/ancient-fossils-may-be-found-on-the-moon/#JUwAWqMqCyBEvDet.99■

Durham, USA

Survival of the Flight Test

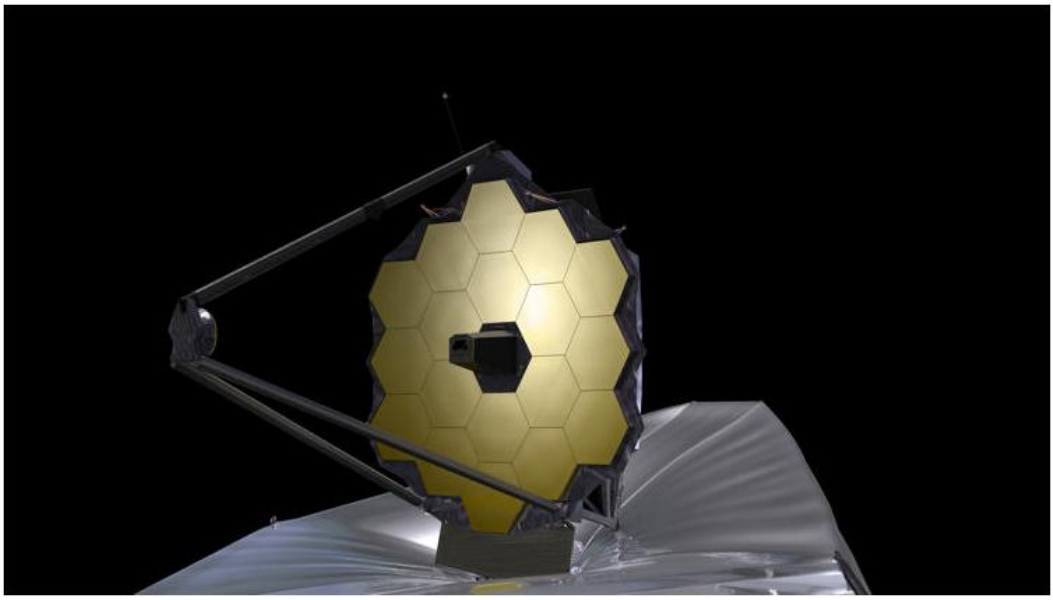
Traditionally, people have thought it impossible to witness biological evolution, since it takes place on timescales much longer than a single human life. However, airplanes follow the same patterns of evolution as flying animals do, but over an observable period of time, researchers say. "Here we show that we can witness evolution in our lifetime by watching the evolution of the flying human-and-machine species: the airplane," the authors wrote in the study, detailed in the Journal of Applied Physics. Adrian Bejan, a mechanical engineer at Duke University in Durham, North Carolina, and his colleagues analyzed aircraft designs from the earliest days of manned flight. "Airplanes are flying buildings," the researchers wrote. "Every model is a new human-and-machine design for moving our bodies, groups and belongings over the entire globe." The researchers found that airplanes follow the same principles as birds, bats and other flying animals: Larger designs are faster, more efficient and have greater flying range. Engine mass is proportional to the airplane's mass, in much the same way that the muscles, heart and lungs of a flying animal correspond with its body mass. In addition, an airplane's wingspan is proportional to fuselage length, and the amount of fuel needed is also proportional to body size. "This, again, is akin to what we see among the flying creatures in nature, showing that airplanes converge [on] the architectural design rules that unite them with their living counterparts," Bejan said in a statement. One exception to evolutionary trends among airplanes occurred with the Concorde, a retired supersonic passenger jet jointly built by British and French aircraft manufacturers in the 1960s. The Concorde could fly transatlantic flights, such as from New York to London, in less than half the time of other commercial airliners. The Concorde was small, with a long fuselage and short wingspan. In contrast to its predecessors, it had massive engines and poor fuel economy, the researchers said. Airplane design can be considered a flow system, which is

anything that has a branching pattern in its evolution, such as river basins, animal migration routes or city traffic.In 1996, Bejan developed a rule, known as the constructal law,which states that "for any finite flow system to persist, that is, be alive, it must evolve in such a way that it provides easier and easier access to its currents." In this case, the "living" system is the flying-man-and-airplane, and its "currents" include properties such as the flow of the vehicle body mass on the world map, air currents around the body, and water and heat currents in the airplane engine, Bejan told Live Science. Based on this model of airplane evolution, predicting the next phase of airplane design should be easy, the researchers said. They foresee the creation of more larger aircraft, with engine sizes and wingspans remaining proportional to fuselage sizes. The findings suggest that the evolutionary process can be applied to more than just biology, Bejan said. "Evolution belongs in physics," he said. (Reported by Tanya Lewis, edited by Julia Su). Original article on *Live Science*.■

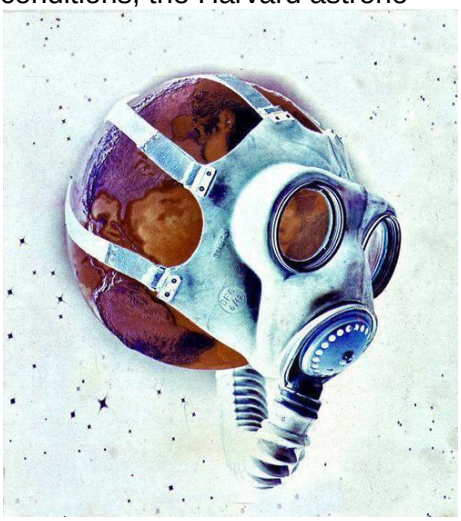
Washington DC, USA

Alien Pollution Might Reveal We are not Alone

Earthlings often wonder if life exists on other planets, and researchers said Wednesday that hunting for traces of pollution from distant worlds could provide the answer. Under certain conditions, astronomers in the next decade might be able to detect the presence of an industrialized alien society, according to a study by the Harvard-Smithsonian Center for Astrophysics. Already, astronomers can study the atmospheres of planets outside our solar system for the presence of oxygen and



methane, which could be produced by intelligent life or by microbes. But an extraterrestrial civilization might also spew chlorofluorocarbons (CFCs) into the atmosphere, much the same way we do on Earth, said the study. CFCs are chemicals used in solvents and aerosols that destroy the ozone layer. Astronomers may be able to detect evidence of these CFCs on faraway planets using the James Webb Space Telescope, an $8.7 billion project that NASA is scheduled to launch in 2018. The JWST will be between 10 and 100 times more powerful than NASA's Hubble Space Telescope, according to the US space agency. However, there are limits to what kinds of pollution the JWST might find, and under which conditions, the Harvard astrono



mers said. For instance, atmospheric levels of CFCs would have to be 10 times those on Earth for the JWST to be able to detect them. Also, the JWST would only be able to hunt for this pollution on Earth-like planets that are circling white dwarfs, which are once-potent stars that have died and lost all their hydrogen fuel. An even stronger instrument, which has not been invented yet, would be necessary to find pollution on a planet like Earth that is orbiting a bright star like our sun, said the report in The Astrophysical Journal. The study authors raised the possibility that while this method aims to detect intelligent life, it might lead not to actual life, but instead to a civilization that has annihilated itself. Some pollutants can persist in Earth's atmosphere for 50,000 years, while others last just 10 years -- and the absence of the latter might suggest that living sources are gone. "We could speculate that the aliens wised up and cleaned up their act," said co-author Avi Loeb. "Or in a darker scenario, it would serve as a warning sign of the dangers of not being good stewards of our own planet."■

Moscow, RUSSIA

Massive 39-Foot "Dragon" That Surprisingly Had No Teeth

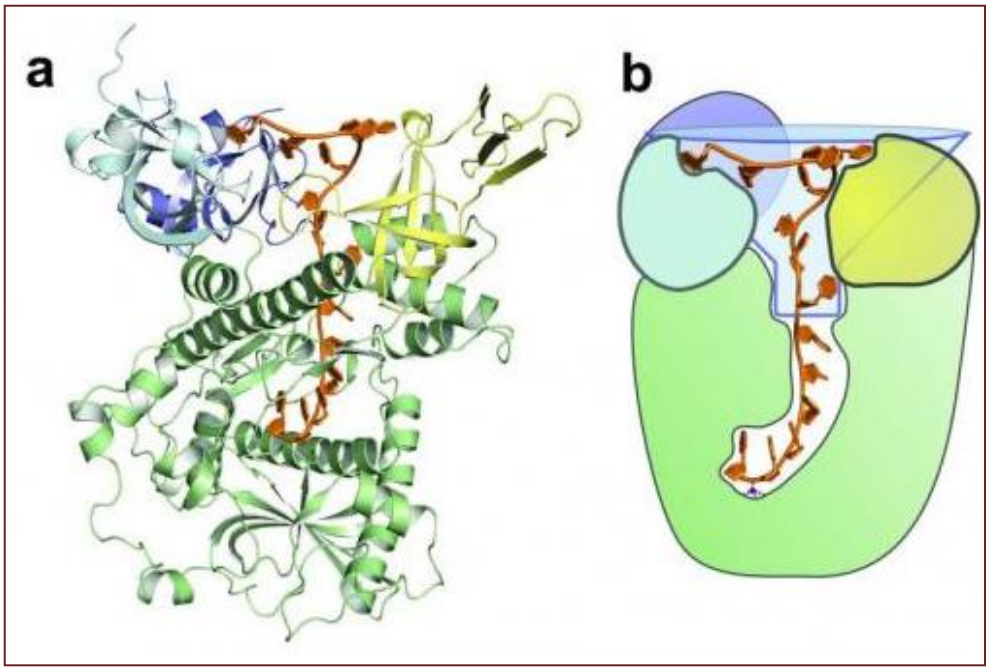
Researchers recently discovered that the massive pterosaur, which dominated the skies, probably lived everywhere in the world. And what researchers find especially interesting is that the dragon-like dinosaur replaced relatives that actually had teeth. According to Fox News, scientists said they don't yet understand some important changes in ecosystems during the Cretaceous period that resulted in the toothless pterosaur becoming the dominant creature in the sky. Scientists do say, however, that the dinosaurs were probably the first vertebrates to fly. They believe that some of them were so huge they had to get a running start before they could take off and fly. Scientists also think some of them had difficulties landing because of their massive size. At this point though, they still don't know a lot about pterosaurs because there are many holes in their fossil record. This species' bones are apparently more fragile than those of other dinosaur species, so very few of them have been recovered. Pterosaurs belong to the Azhdarchiadae family, and the reason scientists compare this particular family of dinosaurs to dragons is because their name, Azdarha, comes from the Persian word for dragon. Researchers say most Azhdarchiadae bones are preserved in sediment deposits. However, these types of fossils are rare for the late Cretaceous period when pterosaurs lived, so paleontologists have been having a difficult time putting together the lineage of this dinosaur species. In 2008, they conducted a study on the pterosaur fossils they did have. They looked at 32 bones in that study, although Alexander Averianov of the Russian Academy of Sciences was more recently able to study a larger sample. He looked at 54 samples of known Azhdarchidae fossils, including 51 bones and three tracks that had been fossilized. His study revealed that they probably lived in many different types of environments, although most of them probably lived close to rivers, lakes and coastlines. Scientists are now working on collecting data to learn more about pterosaurs by building an online database of fossils. The PteroTerra uses Google Earth to map out the distribution of the fossils.■


When life starts,
It is so fresh.
Who knows the future?
Sunny
Rainy
Droughty
Or
……


Working like a worker bee?
Relax yourself.....

BIOCHEMISTRY

How an Enzyme Distinguishes Cellular Messages



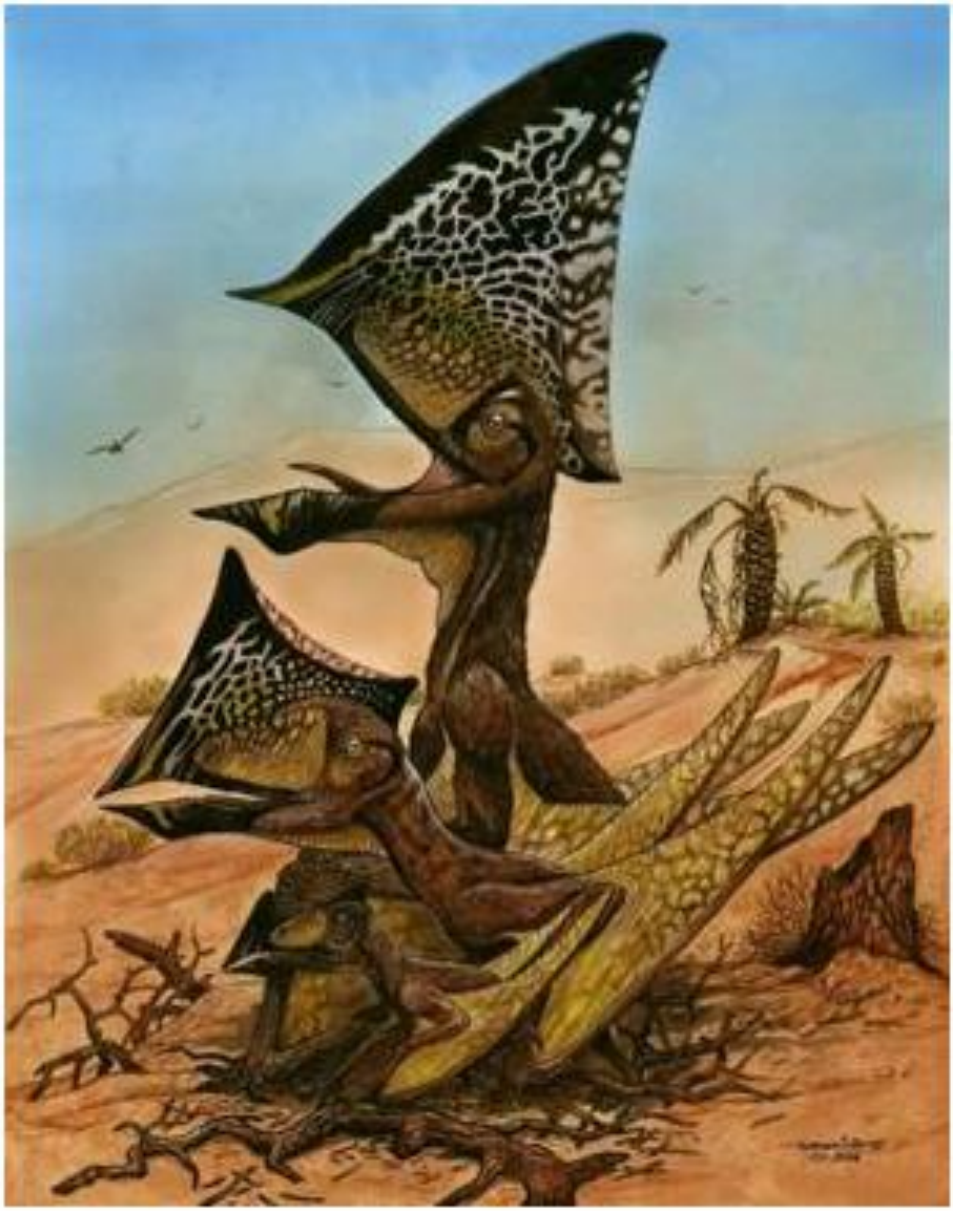
Every once in a while, we are forced to sort that stack of papers on the kitchen counter. Interspersed between the expired coupons and dozens of takeout menus are important documents like your car insurance or electric bill. So it isn't an option to simply drop it all in the trash at once – you need to read through the messages to be sure that you don't lose vital information. In the cell, proteins similarly read through messages to distinguish what needs to be saved and what needs to be discarded. But, here, the process takes on a much more important role. More than just clutter, messages that are marked for disposal can drastically alter the fate of a cell. In fact, stem cells use just such a mechanism to maintain their identity. So how does a protein detect the difference between two seemingly similar messages? Today, a team of Cold Spring Harbor Laboratory (CSHL) scientists, led by Professor and Howard Hughes Medical Institute Investigator Leemor Joshua-Tor, describe how the protein Dis3l2 uses numerous recognition sites to capture messages that are flagged for decay. Dis3l2 is a molecular machine that helps to preserve the character of stem cells. It serves as the executioner of an elegant pathway that prevents stem cells from changing into other cell types. The protein does this by acting like a garbage disposal for messages in the cell, cutting them up until they no longer encode useful information. But Dis3l2 is necessarily highly specific. While it must degrade messages that would alter the fate of the stem cell, discarding the wrong message could have devastating consequences. Therefore, Dis3l2 only targets specific messages that have been marked with a molecular flag, known as a "poly-U" chain. The enzyme ignores the majority of messages in the cell – those that go on to encode proteins and other critical messages – whose ends are decorated with a different type of chain, called "poly-A" tail. The CSHL scientists set out to understand how Dis3l2 is able to read and distinguish between these two chains. In work published today in Nature, they used a type of molecular photography, known as X-ray crystallography, to observe the structure of Dis3l2 while bound to a poly-U chain. "We saw that the enzyme looks a lot like funnel, quite wide at the top and narrow at the base," says Joshua-Tor. "The poly-U chain inserts itself into the depths of this funnel while the rest of the bulky message can remain in the wide mouth at the top." But how does the enzyme "read" the poly-U chain? Christopher Faehnle, PhD and Jack Walleshauser, lead authors on the paper, found that the interior of the funnel contains more than a dozen contacts that interact specifically with the poly-U chain. "Together, all of these points create a sticky web that holds the poly-U sequence deep within the enzyme," says Faehnle. "But other chains don't interact – they can slide right out. It has helped us understand how an enzyme can differentiate between two sequences in the cell." More than that, the work provides insight into how a stem cell maintains its identity. "Misregulation of any step in this pathway leads to developmental disorders and cancer," says Joshua-Tor. "We now have a much better appreciation of the terminal step, a critical point of control."

Nature 2014;
dx.doi.org/10.1038/nature13553

ARCHEOLOGY

Ancient 'Butterfly-Headed' Flying Reptiles

The newfound reptile species, *Caiuajara dobruskii*, lived about 80 million years ago in an ancient desert oasis. The beast sported a strange bony crest on its head that looked like the wings of a butterfly, and had the wingspan needed to take flight at a very young age. Hundreds of fossils from the reptile were unearthed in a single bone bed, providing the strongest evi-



dence yet that the flying reptiles were social animals, said study co-author Alexander Kellner, a paleontologist at the Museu Nacional/Universidade Federal do Rio de Janeiro in Brazil. Though pterosaur fossils have been unearthed in northern Brazil, no one knew of pterosaurs fossils in the southern part of the country. In the 1970s, a farmer named Dobruski and his son discovered a massive Cretaceous Period bone bed in Cruzeiro do Oeste in southern Brazil, a region not known for any fossils, Kellner said. The find was forgotten for decades, and then rediscovered just two years ago. The team dubbed the reptile *Caiuajara dobruskii,* after the geologic formation, called the Caiuá Group, where it was found, as well as the farmer who discovered the species, Kellner said. *C. dobruskii* belonged to a group of winged reptiles known as pterosaurs, which are more commonly known as pterodactyls. Hundreds of bone fragments from the species were crammed in an area of just 215 square feet (20 square meters). At least 47 individuals — and possibly hundreds more — were buried at the site. All but a few were juveniles, though the researchers found everything from youngsters with wingspans of just 2.1 feet (0.65 m) long to adults with wingspans reaching 7.71 feet (2.35 m). The fossils weren't crushed, so the 3D structure of the animals was preserved, the authors wrote in a research article published today (Aug. 13) in the journal PLOS ONE. The ancient reptiles' bony crests changed in size and orientation as the pterosaurs grew. Because the adult skeletal size (other than the head) wasn't much different from the juveniles', the researchers hypothesized that *C. dobruskii* was fairly precocious and could fly at a young age, Kellner said. Based on the sediments in which the bones were found, the area was once a vast desert with a central oasis nestled between the sand dunes, the authors wrote in the paper. Ancient *C. dobruskii* colonies may have lived around the lake for long periods of time and died during periods of drought or during storms. As the creatures died, the occasional desert storm would wash their remains into the lake, where the watery burial preserved them indefinitely, the researchers said. Another possibility is that the pterosaurs stopped at this spot during ancient migrations, though the authors suspect that is less likely. The bone bed, with its hundreds of individuals in well-dated geological layers, is some of the strongest evidence yet that the fruit-eating animals were social, Kellner said. This finding, in turn, strengthens evidence that other pterosaur species may have been social as well, the authors wrote in the paper. *Original article on Live Science*.

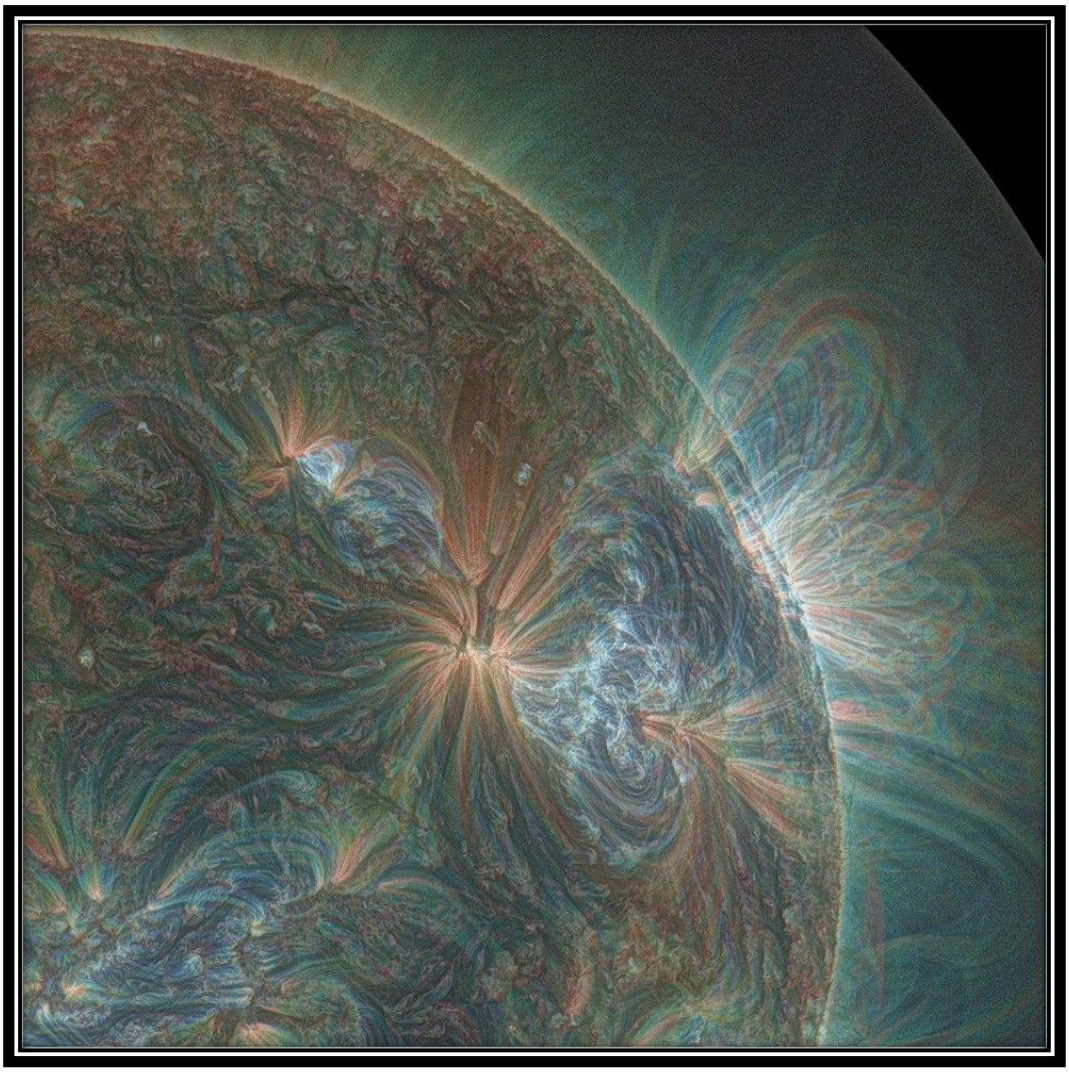
PLoS ONE 9(8): e100005


Who feeds us?


When you face the eruption
Do you feel the ending of the world?

An “Unusual” Solar Eruption

By NASA (2014) (USA)



The photo above is a colorized composite image taken by NASA's Solar Dynamics Observatory. It is made up of photos taken in several different wavelengths and by different satellites at different angles. In it, you can see the sun's outer magnetized atmosphere, which extends millions of miles into space, according to the observatory's Facebook page. The scientists observed the puffs exploding once every three hours, with a giant eruption of material released every 12 hours apparently caused by the smaller puffs, they wrote. Alzate explained the source of the jets on the the observatory's facebook page. The jets are localized, catastrophic releases of energy that spew material out from the sun into space. These rapid changes in the magnetic field cause flares, which release a huge amount of energy in a very short time in the form of super-heated plasma, high-energy radiation and radio bursts. The big, slow structure is reluctant to erupt, and does not begin to smoothly propagate outwards until several jets have occurred. Alzate said that while the jets appear to be the cause of the giant slow eruption, it is unclear how they cause it. She suggested the jets could either create shock waves or "magnetic reconfiguration" that could trigger the slow eruption.■

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Submission System

Mysteries of the Galaxy

WE ARE full of curiosity about the space. It is so mysterious. We are missed there in telling the stories about the birth of the stars and the moon and the earth when we are trying to figure out the deep space using the telescope. The literally galactic is the home of our earth, and too much mystery there. Maybe all following thoughts were true.

Birthplace of the Sun

How many sun-like stars in the Milky Way? Stars like our sun are born in clusters with other similar stars. These stellar siblings form from the same gas cloud, and so they have the same chemical composition. Yet we've examined 100,000 stars within 325 light-years of Earth and found only two that are a close match to the Sun. Our sun is alone, meaning it was either kicked out or drifted out of its cluster 4.5 billion years ago. A good candidate for its birthplace was Messier 67, a cluster in the Cancer constellation around 2,900 light-years away. The stars there are a similar age, temperature, and chemistry to our sun. However, astrophysicists from the National Autonomous University of Mexico did simulations in 2012 and found that M67 simply didn't work. The Sun would have needed an unlikely alignment of several massive stars to kick it out, and the necessary speed would've ripped apart the planetary disk, keeping Earth from ever forming. In addition, the vertical bobbing of M67 in the galactic plane is five times greater than the Sun's, and they should be the same. It's possible the Sun's cluster simply doesn't exist anymore, and all of its cousins have drifted apart. Another hypothesis is that it came from closer to the center of the galaxy, where a lot of Sun-like stars are found. The best chance for figuring out the answer is the European Gaia satellite. Launched in 2013, Gaia is mapping the chemical makeup of one billion stars. The mission is due to finish by 2018 and will give unprecedented knowledge about the evolution of the galaxy.

Waves Made of Stars

We detect the invisible waves to tell us more about the stars. Discoveries in astronomy often aren't made just by looking through a telescope and seeing what's there. Sometimes, an observatory produces a vast array of data from a piece of the sky, and scientists take years to make conclusions from the information. The Sloan Digital Sky Survey is one such project. Using a telescope in New Mexico, it's spent the last decade observing 930,000 galaxies, 120,000 quasars, and nearly half a million stars in the Milky Way. Using this data, a team of astronomers noticed something about the vertical distribution of stars. These often clump together, and the team noticed a pattern in 300,000 stars that resembles a sound wave. They coined the term "cosmoseismology" for their paper, suggesting something had caused the galaxy to "ring like a bell." The most likely explanation is that something collided with and passed through our galaxy in the last 100 million years. The researchers weren't able to pinpoint what—it may have been a dwarf galaxy or possibly a dark matter structure. It may have been multiple events, and they even note that the wave may be the result of something ongoing. Once again, the researchers hope the billion stars mapped by Gaia will provide answers. They suspect that there may be a rich pattern of wave structures hidden throughout the galaxy, which will open up a brand new window into its history.

High-Velocity Clouds

What are the High-velocity clouds (HVCs)? HVCs were discovered in 1963. These collections of interstellar gas move in different speeds and directions to the Milky Way's rotation, off by at least 50 kilometers (32 mi) per second. They're mostly made of hydrogen and are believed to be falling into the galaxy from intergalactic space. Where they come from, though, is yet to be resolved. Jan Oort, one of the discoverers of the clouds, suggested the gas is a remnant of the formation of the galaxy. Another explanation is that gas ejected from the Milky Way is falling back in as a Galactic Fountain. If this were the case, the rising gas would be hard to spot due to all the other material in the way. The material may come from objects in orbit around our galaxy. One such item is Complex H, a small galaxy itself, believed to be in a retrograde orbit around the Milky Way. As it moves, it excretes gas onto our galaxy. One HVC, Smith's Cloud, moves toward the Milky Way's disk at around 73 kilometers (45 mi) per second and will merge with our galaxy in around 27 million years. Its trajectory suggests it already passed through the Milky Way 70 million years ago. This should've ripped the cloud apart, and scientists

believe a halo of dark matter may have kept it together.

Magellanic Clouds

If you think about the Magellanic Clouds, how can you define them? Magellanic Clouds are companion galaxies to the Milky Way, discovered during Ferdinand Magellan's pioneering voyage around the world in the 16th century. The Large Magellanic Cloud is 14,000 light-years across and around 160,000 light-years from Earth. The Small Magellanic Cloud is half the diameter of its cousin but 30,000 light-years farther away. For comparison, the Milky Way is 140,000 light-years across. The clouds are 13 billion years old and were believed to orbit the Milky Way. However, measurements taken by Hubble suggest they're moving twice as fast as we originally thought. If that's the case, the Milky Way shouldn't be massive enough to keep them in orbit. Figuring out if they are in orbit has become a new mystery. If they are, it would mean the Milky Way could be twice as massive as previously thought. Whether the clouds are here to stay or merely passing by, they attract plenty of mystery. Scientists recently solved a four-decade-long question about the source of the Magellanic Stream, a ribbon of gas that stretches halfway around the Milky Way. They discovered that most of it came from the smaller cloud, though levels of oxygen and sulfur in newer regions match the larger cloud. In 2007, Australia's Parkes telescope picked up a burst of radio waves while examining the small cloud. The power behind the blast indicates an extreme event, such as a collision of neutron stars or the death of a black hole. It almost certainly came from farther away than the cloud, but its exact source remains a puzzle.

Galaxy X

The most popular astronomical conspiracy theory is the existence of "Planet X." It suggests that a planet the size of Jupiter orbits the Sun on an erratic orbit, secretly tracked by NASA. While there are a lot of problems with that idea, there's a very real possibility of the existence of "Galaxy X." It's a dwarf galaxy on the opposite side of the Milky Way to us, which we can't see due to the gas and dust in the way. Galaxy X would be up to 85 percent dark matter. UC Berkeley theoretical astronomer Sukanya Chakrabarti is leading the hunt. She's developed a method for finding dark galaxies by examining ripples in the distribution of hydrogen gas in spiral galaxies. Hydrogen gas extends up to five times farther out from the center of the galaxy than the area populated with stars, and so orbiting galaxies will make ripples in the gas. Chakrabarti predicts that Galaxy X will have a mass around one-hundredth of the Milky Way's. The method to find the hidden galaxy has been tested on other galaxies with a known companion and can find bodies just one-tenth as massive as even that.

The Problem of Lithium

The lithium problem is one of the longstanding niggles of cosmology. Lithium is the third-lightest element in the universe, after hydrogen and helium, and models of the Big Bang predict what levels of those elements we should expect to find. Those models work for everything but lithium. In the Milky Way's oldest stars, the isotope lithium-7 is found at around one-third of expected levels. Lithium-6 appears at a rate of around 1,000 times too much, although it's much harder to count. No explanation has worked. Potential answers throw off the amounts of other elements. And the problem has only gotten more difficult. Research suggesting the early galaxy was populated with microquasars added to the woes. These miniature black holes produce jets of super-hot plasma with enough energy to fuse hydrogen into helium. In 2012, a team from Sweden and Germany calculated that if 1 percent of the Milky Way's microquasars produced lithium-7, they'd produce a similar amount to that expected from the Big Bang. In short, microquasars make the lithium problem twice as big. A recent explanation relies on the existence of axions, a theoretical dark matter particle. Predictions of lithium-7 levels depend on calculations of the amount of light in the early universe. This is worked out from the cosmic microwave background, which appeared after around 380,000 years. Axions could've cooled photons in that time, causing us to underestimate levels of light and hence overestimate lithium-7.

Galactic Warp

In many galaxies, the dust and gas between stars is concentrated in a thin layer. Our Milky Way is no exception. "Thin" is relative, of course—the disk is around 240 light-years thick at its thinnest points, but that's still a tiny fraction of the width of the galaxy. We happen to be embedded deep within this layer, which consists almost entirely of atomic hydrogen and helium. While some of these disks are flat, many of them are bent and curved. This is known as galactic warp. Some look like the integral-sign used in calculus or a stretched letter S. Some are U-shaped, and others don't have any symmetry at all. Multiple things may cause the warps. In fact, it seems likely there must be an ongoing process, as

models suggest that warps would naturally flatten with time if galaxies simply formed that way. In the Milky Way, the disk is flat relative to the plane of the galaxy where we are. In one direction, it curves north of the galactic plane, while in the opposite direction, it curves down before curling back up again right at the end. In many ways, it resembles a wave. Scientists from UC Berkeley were able to describe the warp as a combination of three vibrations in the disk. The first is a flapping at the edges, combined with a sinusoidal wave like the skin of a drum and a saddle-shaped oscillation. Combined, they give our galaxy a note 64 octaves below middle-C. They believe a likely explanation is a result of the Magellanic Clouds plowing through the dark matter halo around the Milky Way. The interaction of the clouds was previously discounted because it was thought they lacked enough mass to cause the warp. The researchers suggest that a vibration in the halo as the clouds move through it, similar to the wake of a ship, could resonate through the galaxy and cause the disk to warp.

Diffuse Interstellar Bands

Since its discovery in the 19th century, spectroscopy has been one of the most important techniques in astronomy. It involves examining the wavelength of radiation from objects in space to figure out, among other things, what they're made of. Every atom and molecule absorbs different wavelengths of light. By examining the patterns in light that reaches us, we can figure out what it's passed through. In 1922, astronomer Mary Lea Heger observed bands that matched nothing we knew of. Scientists concluded these bands were the result of *something* in interstellar space, but they had no idea what. Hundreds of the bands have been discovered in the infrared, ultraviolet, and visible spectrums. The cause of these diffuse interstellar bands became the "classic spectroscopic problem of the 20th century." Books were filled with speculation, covering "all conceivable forms of matter." Large carbon-based molecules are the most likely candidate, and they may contain as much as 10 percent of the galaxy's carbon. In 2011, diffuse interstellar bands were found for the first time in the direction of the Milky Way's core. This offers a clue: It means the molecules can apparently withstand the harsh environment of the center of our galaxy. The new bands were also found further into the infrared spectrum than ever before. Thomas Geballe, an astronomer working in Hawaii, hopes that the new observations may bring the scientific community closer to an answer. The molecules might actually give a clue to the origins of life, as the bands may come from complex chemicals that helped to seed the Earth.

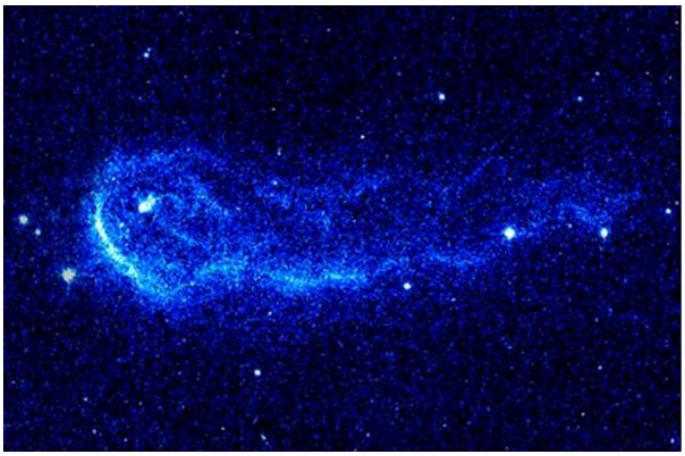
Hypervelocity Stars

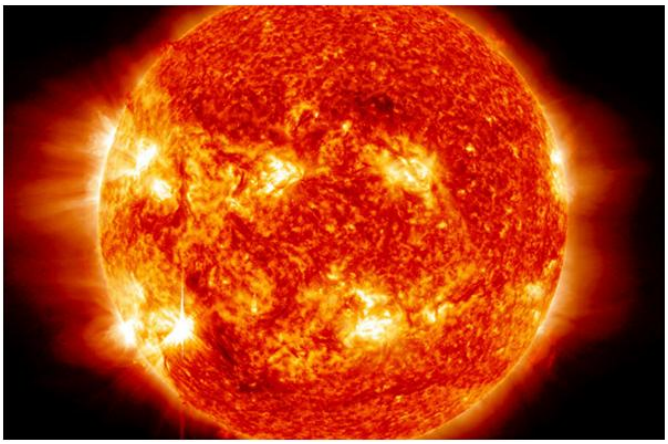
Most stars orbit the galactic center at roughly the same speed as our sun, around 230 kilometers (143 mi) per second. Yet some stars, around one in every billion, travel three times faster than that. They're known as hypervelocity stars. The first was discovered by astronomers from the Harvard-Smithsonian Center for Astrophysics in 2005, but we've since found dozens. The interesting thing about them is that they're moving so fast that they can escape the orbit of the galaxy altogether. The mysterious thing about them is the source of this speed. One of the fastest ever discovered, HE 0437-5439, is believed to have a complicated past. The theory is that a triple-star system passed through the center of the galaxy, when the central black hole ripped one star out. That kicked away the other two, which later merged into the super-hot blue giant blasting out of the Milky Way at 2.5 million kilometers (1.6 million mi) per hour. The closest hypervelocity star to Earth, LAMOST-HVS1, may have also been booted out by an interaction with the central black hole. But it could have come from the disk, indicating a middleweight black hole in our galaxy. They're somewhere between supermassive black holes and those of stellar mass. Only one has ever been observed, and it's not in our galaxy.

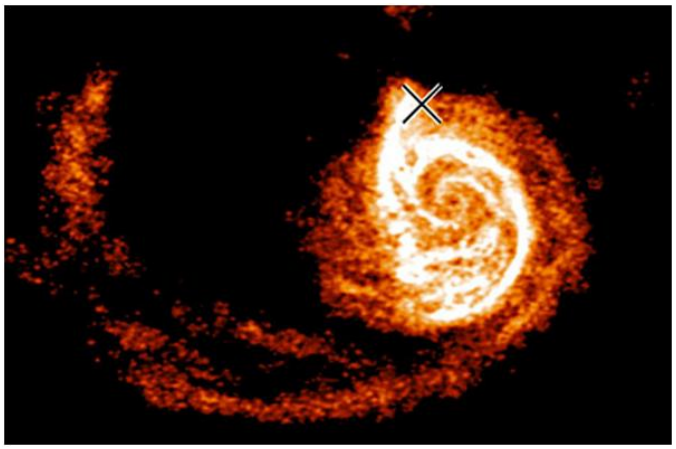
Willman 1

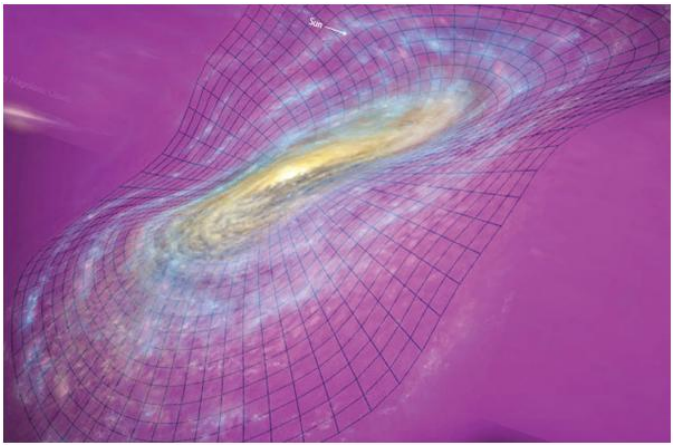
A team of astronomers from New York University in 2004 found an unusual object when they were examining data from the Sloan Digital Sky Survey. They were looking for dim companion galaxies to the Milky Way, but what they found didn't fit into the galaxy box. In fact, the group of stars didn't fit into any box at all. It was called SDSSJ1049+5103, or Willman 1 for short. It orbits around 120,000 light-years from the Milky Way. It may be a dwarf galaxy, or possibly a globular cluster, but there are problems with both theories. Globular clusters tend to have several hundred thousand stars, while Willman 1 has less than a thousand. It may be a cluster from a smaller galaxy, described by one physicist as piggybacking into our galaxy "like a tiny mite riding in on a flea as it, in turn, latches onto a massive dog." If it is a galaxy rather than a cluster, that may throw a spanner into the works for another theory. Computer simulations of the origins of the Milky Way indicate there should be hundreds of smaller galaxies nearby, but only 20 have been found. One explanation for this was that a mass of less than 10 million suns is

too little to produce many stars, making the galaxies invisible. Further observation of Willman 1 suggests its mass is only about half a million suns, well below that limit. It's possible that there may be unaccounted for dark matter in Willman 1, or that it had some mass stripped away. Either way, it's a clump of stars that currently provides far more questions than answers.■







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Earthquake: Why Can't We Still Predict It and What Science Can Do?

Fuzhou Wang

Science Insights 2014; 9(3):255-258
doi: http://dx.doi.org/10.15354/si.14.vw015
Science Insights is published by The Bonoi Academy of Science & Education, Chapel Hill, NC 27510, USA

p-ISSN: 2372-8191
e-ISSN: 2329-5856
DOI: 10.15354/issn.2329-5856

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Earthquake: Why Can't We Still Predict It and What Science Can Do?

Fuzhou Wang*,Δ

SUMMARY Before the word "science" was created; people were curious upon the bases of the world and sought the possible explanation of it. That time the things the ancestors encountered were so complex that they could not decipher them in a reasonable way. However, the appearance of so-called science made all these things be changed. Till today, science makes our life change in an unprecedented speed. Facing today's explosive information, we are filled with curiosity in accompany with knowledge-induced anxiety. When we walk forward more, we found far more things we do not know. In some areas, we have reached an advanced level such as in the field of outer space exploration, but in some others, like earthquake prediction, we are still there where we just started. Even a lot of entities provide us information about the happened earthquakes, whereas no one can tell us when it will be. In fact, it is really hard for science to give us the original answer "Why is it like that?" although we know something about the focused question. The only thing that science can do is justifying the theories using its own ways. It is understandable because science itself was a product of people's thought, and it needs to be perfected *per se*.■

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Submitted: 19 August 2014
Revised: 21 August 2014
Accepted: 22 August 2014

Doi: 10.15354/si.14.vw015

SCIENCE INSIGHTS 2014; 9(3):255-258.

How to Cite This Paper: Wang F. Earthquake: why can't we still predict it and what science can do? Science Insights 2014;9(3):255-258.
DOI: http://dx.doi.org/10.15354/si.14.vw015.

Keywords: Science – Knowledge – Limitation – Earthquake – Life

SCIENCE advances in an unprecedented speed. It is so hard for us to browse all the scientific knowledge appeared every day, as thus we just do as the info-picker through fast-glancing at the topics and titles without in-depth reading on the whole scientific stories. However, science still cannot tell you when the earthquake will happen, even though scientists now know something about the possible underlying causes and formations. One more interesting thing is that scientists can only do the *post hoc* "prediction" on the earthquake. So this is the real reason why the consequence of each earthquake is so severe. Along with the frequent occurrence of earthquake as well as the inadequate knowing on its prediction, people's expectation and science's lagging make this balance be imbalance.

A large number of agencies and entities built up different types of seismic monitoring systems, but are they working well for our life? Some of them are just tell you where, when and what size of the magnitude (see the recent earth quakes with magnitude over 7.0 in the Table 1).

When we seek the answers to this long-suspending thorny question, we must face the fact that our science is still under the control of the power of The Almighty. If you look back, think about, and study them carefully, you will find no matter how hard we human beings work on the so-called science, and how confident we are when disclosing some existing facts or rules that stayed there from the beginning of the world. Today's science, in fact, just reveals part of the facts through different man-developed means. In other words, science is just a passive human action through it we discover the "deep-buried" facts. Therefore, it is impossible for us if we want to reveal the mystery of the world via science, because science itself is merely a mental product that is used intentionally by human being.

Events if frequently happened but without evitable solutions that mean the event itself is lacking of the consistency. The amounts of the rules in charge of the world's existence are consistent and therefore we can find some that can be used for our daily activities. This is the very thing that determines the reason why we are not yet completely elucidate each aspect of the things we faced. If you studied in-depth more, you will find much more unclear. Besides, our human beings invented the word "science" to differentiate their work from "creative rules". We have different types of languages that make us difficult to be understood each other, but today we are not affected by this anymore. In order to build up the complete theory, science uses her own man-made ways to make its theory "rationalized". One exact example is the origin of the human being, science advocates the evolutionary theory, from which we human beings derived from ancient apes, and also provides a large number of "evidence" to verify such declaration. Nonetheless, our advanced science cannot reproduce such an environ-

Table 1. Recent earth quakes with magnitude over 7.0

Date & Time	Magnitude	Region
2011-03-11 05:46:23.0	9	Near East Coast Of Honshu, Japan
2011-03-11 05:46:23.1	8.4	Off W Coast Of Northern Sumatra
2011-03-11 05:46:23.2	8.3	Sea Of Okhotsk
2011-03-11 05:46:23.3	8.1	Offshore Tarapaca, Chile
2011-03-11 05:46:23.4	8	Off W Coast Of Northern Sumatra
2011-03-11 05:46:23.5	7.9	Rat Islands, Aleutian Islands
2011-03-11 05:46:23.6	7.9	Santa Cruz Islands
2011-03-11 05:46:23.7	7.9	Near East Coast Of Honshu, Japan
2011-03-11 05:46:23.8	7.8	Iran-Pakistan Border Region
2011-03-11 05:46:23.9	7.8	Iran-Pakistan Border Region
2011-03-11 05:46:23.10	7.7	Pakistan
2011-03-11 05:46:23.11	7.7	Scotia Sea
2011-03-11 05:46:23.12	7.7	Sea Of Okhotsk
2011-03-11 05:46:23.13	7.7	Queen Charlotte Islands Region
2011-03-11 05:46:23.14	7.7	Kep. Mentawai Region, Indonesia
2011-03-11 05:46:23.15	7.6	Offshore Tarapaca, Chile
2011-03-11 05:46:23.16	7.6	Solomon Islands
2011-03-11 05:46:23.17	7.6	Philippine Islands Region
2011-03-11 05:46:23.18	7.6	Costa Rica
2011-03-11 05:46:23.19	7.6	Off East Coast Of Honshu, Japan
2011-03-11 05:46:23.20	7.6	Kermadec Islands Region
2011-03-11 05:46:23.21	7.5	Bougainville Region, P.N.G.
2011-03-11 05:46:23.22	7.5	Southeastern Alaska
2011-03-11 05:46:23.23	7.4	South Of Fiji Islands
2011-03-11 05:46:23.24	7.4	Solomon Islands
2011-03-11 05:46:23.25	7.4	Offshore El Salvador
2011-03-11 05:46:23.26	7.4	Kermadec Islands Region
2011-03-11 05:46:23.27	7.4	Guerrero, Mexico
2011-03-11 05:46:23.28	7.4	Bonin Islands, Japan Region
2011-03-11 05:46:23.29	7.3	New Ireland Region, P.N.G.
2011-03-11 05:46:23.30	7.3	South Sandwich Islands Region
2011-03-11 05:46:23.31	7.3	Offshore Guatemala
2011-03-11 05:46:23.32	7.3	Off East Coast Of Honshu, Japan
2011-03-11 05:46:23.33	7.3	Fox Islands, Aleutian Islands
2011-03-11 05:46:23.34	7.3	Fiji Region
2011-03-11 05:46:23.35	7.3	Vanuatu Region
2011-03-11 05:46:23.36	7.2	Kuril Islands
2011-03-11 05:46:23.37	7.2	Bougainville Region, P.N.G.
2011-03-11 05:46:23.38	7.2	Guerrero, Mexico
2011-03-11 05:46:23.39	7.2	Colombia
2011-03-11 05:46:23.40	7.2	Near East Coast Of Honshu, Japan
2011-03-11 05:46:23.41	7.2	Eastern Turkey
2011-03-11 05:46:23.42	7.2	Off W Coast Of Northern Sumatra
2011-03-11 05:46:23.43	7.2	Near S Coast Of Papua, Indonesia
2011-03-11 05:46:23.44	7.2	Southwestern Pakistan
2011-03-11 05:46:23.45	7.2	Near East Coast Of Honshu, Japan
2011-03-11 05:46:23.46	7.1	Bohol, Philippines
2011-03-11 05:46:23.47	7.1	Off East Coast Of Honshu, Japan
2011-03-11 05:46:23.48	7.1	Maule, Chile
2011-03-11 05:46:23.49	7.1	Banda Sea
2011-03-11 05:46:23.50	7.1	Santa Cruz Islands
2011-03-11 05:46:23.51	7.1	Near East Coast Of Honshu, Japan
2011-03-11 05:46:23.52	7.1	Off East Coast Of Honshu, Japan
2011-03-11 05:46:23.53	7.1	Vanuatu
2011-03-11 05:46:23.54	7.1	Vanuatu
2011-03-11 05:46:23.55	7.1	Eastern New Guinea Reg., P.N.G.
2011-03-11 05:46:23.56	7.1	Vanuatu
2011-03-11 05:46:23.57	7.1	Maule, Chile
2011-03-11 05:46:23.58	7.1	Bio-Bio, Chile
2011-03-11 05:46:23.59	7	Andreanof Islands, Aleutian Is.
2011-03-11 05:46:23.60	7	Near Coast Of Southern Peru
2011-03-11 05:46:23.61	7	Gulf Of California
2011-03-11 05:46:23.62	7	Santa Cruz Islands
2011-03-11 05:46:23.63	7	Santa Cruz Islands

From http://www.emsc-csem.org/, access to 09/01/2014.

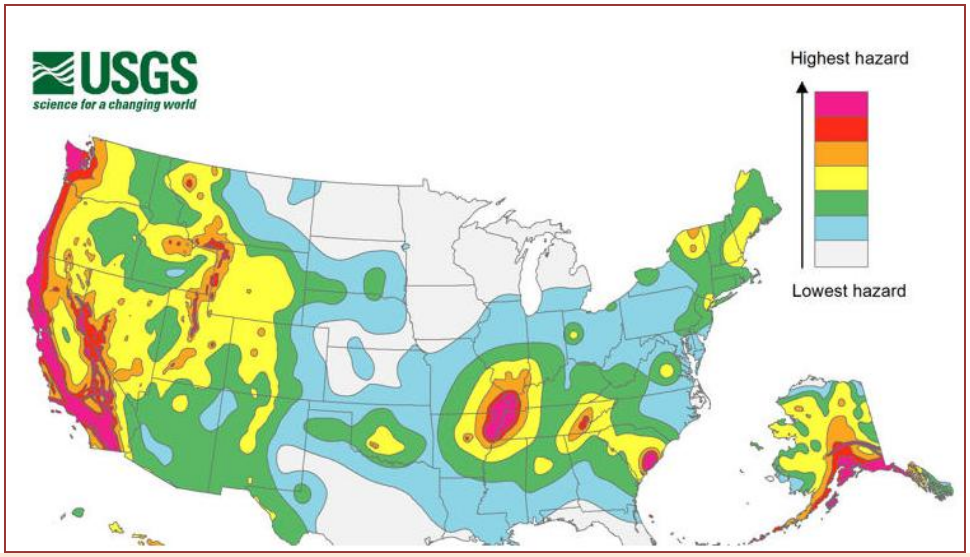


Figure 1. The Earthquake Tendency in the United States.

Parts of 16 states have the highest risk for earthquakes: Alaska, Hawaii, California, Oregon, Washington, Nevada, Utah, Idaho, Montana, Wyoming, Missouri, Arkansas, Tennessee, Illinois, Kentucky and South Carolina. Much of the country west of the Rockies, along with parts of Oklahoma and Tennessee and sections of central Arkansas, northern Alabama, Georgia, South Carolina, Indiana, Illinois, Ohio, Michigan, Virginia, New York and New England saw an increase in shaking hazards for small buildings like houses. At the same time much of North Carolina, the northern tip of South Carolina, patches of Texas, New Mexico, Oregon, Utah, Nebraska, Arkansas, Kentucky, Tennessee, Ohio, Pennsylvania and New York saw hazard levels lower slightly. And using a different type risk analysis for tall buildings the shaking hazard in New York City dropped ever so slightly. The maps sidestep the issue of earthquakes created by injections of wastewater from oil and gas drilling in Oklahoma and other states, saying those extra quakes weren't included in the analysis. So far this year, nearly 250 small to medium quakes have hit Oklahoma. Much of the research and cataloging was done by the nuclear industry in response to the quake and tsunami that crippled Japan's Fukushima reactor. And researchers at the University of California, Berkeley came up with a better model to simulate shaking.■

Map from the USGS: http://pubs.usgs.gov/of/2014/1091/

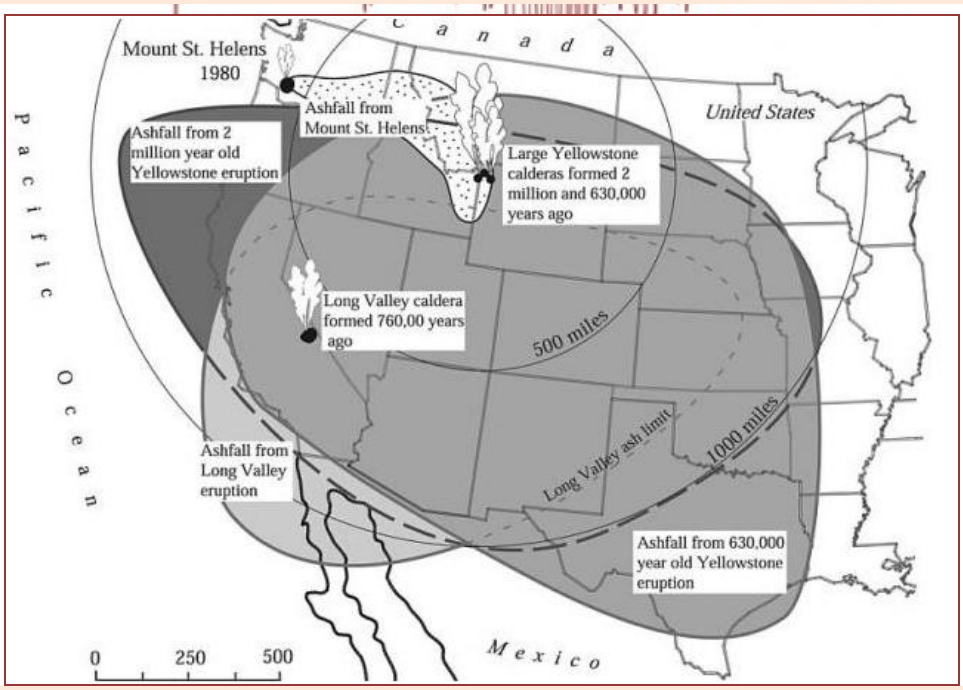
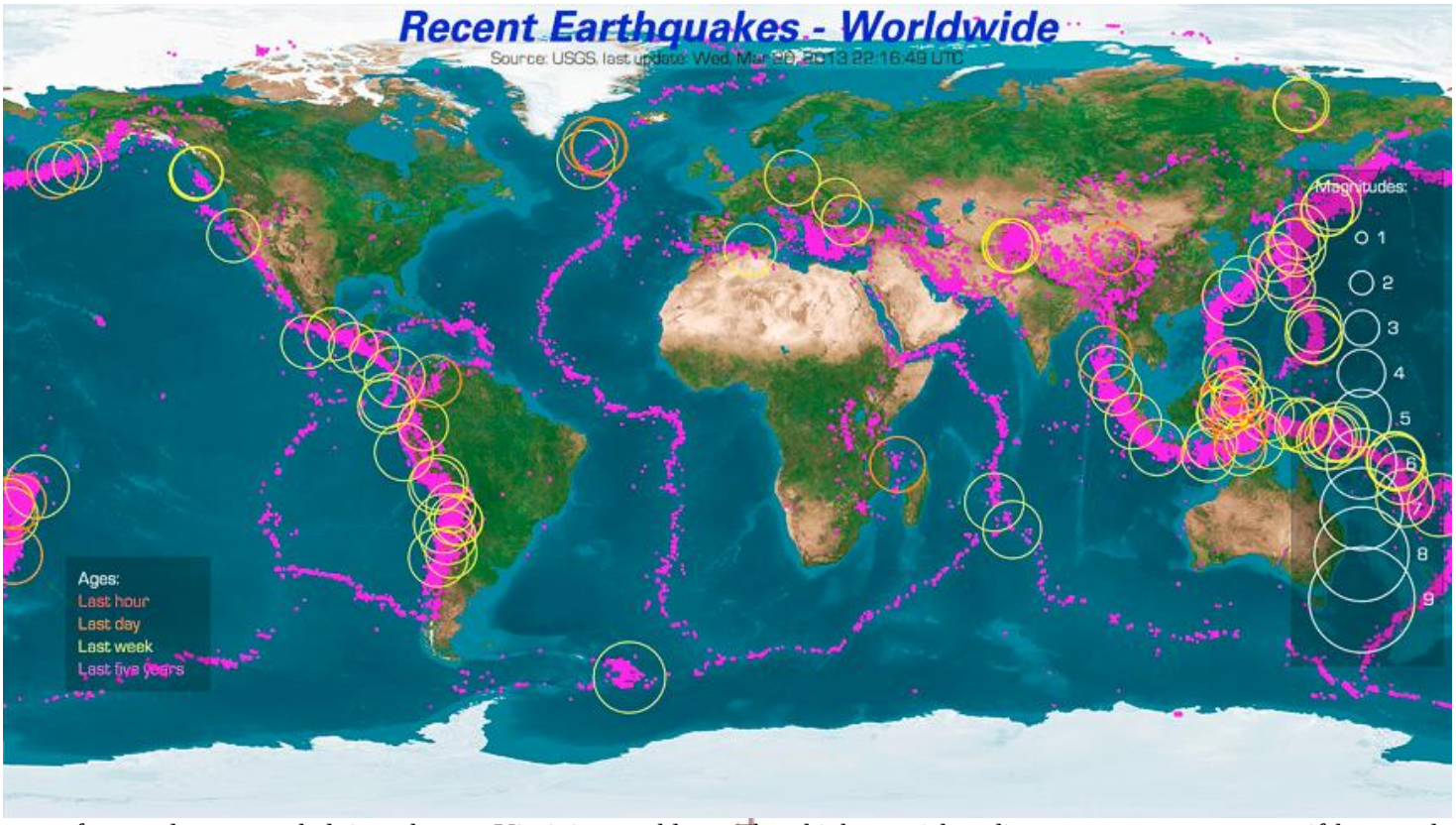


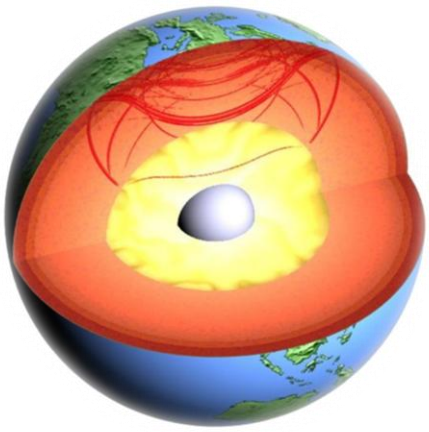
Figure 2. Effect of Yellowstone Volcano Eruption on the Entire World.

Many U.S. residents would be at risk of dying or suffering from the results of an eruption. When volcanoes erupt, they shoot out lava, which becomes ash during the eruption as it's shattered into tiny particles. Volcanic ash is made up of tiny, dust-like fragments of jagged rock, minerals, and volcanic glass. Most of the United States could get covered with the ash, as it was in the previous large eruptions at Yellowstone. More than a dozen states could be covered entirely or partially with ash and debris. More importantly for those outside the U.S., the effects of a Yellowstone eruption would be worldwide, according to the U.S. Geological Service, including the "injection of huge volumes of volcanic gases into the atmosphere could drastically affect global climate."■



ment for modern apes helping them "become" men. Could it be? We today sent out the aerospace craft into far outside space for exploring other stars, but we cannot clearly depict our own earth where we live every day. We can build our houses on "rock" using quake-resistant techniques. But we don't know when the earthquake will happen. This is absolutely as our ancestors did not understand many natural phenomena that time, as today we do not know this existing shaking phenomenon well. Maybe it is just a random episodic, or maybe it is only from the unseen hand, or maybe it is merely due to too simple to be ignored, or maybe something else.

Newly presented data showed that the risk of earthquake increased markedly over the world including one-third increase of the United States. The U.S. Geological Survey updated its national seismic hazard maps recently for the first time since 2008, taking into account research from the devastating 2011 earthquake and tsunami off the Japanese coast and the surprise 2011 Virginia temblor. The highest risk places have a 2 percent chance of experiencing "very intense shaking" over a 50-year lifespan. Volcano eruption, a major reason generally accompanied with earthquake, is considered as one of the key threatens to the human being. However, could we predict it? Maybe distinct mechanisms exist for both earthquake and volcano eruption, and at least we can escape from the would-be eruption. However, for the earthquake we cannot. If the current thoughts on the disappearance of the dinosaurs were correct, so if huge volcano eruption happened, we human being also would have been the same fate as the dinosaurs were (see the possible effect of Yellowstone volcano eruption on the entire world Figure 2). But if they were wrong, we just make a joke for ourselves: that science tells us so.



Therefore, why can't we predict earthquake using our up-to-date scientific knowledge? Just let science be science, we do not need to be that censorious on the human-made so-called science. Just remember the original meaning, also the real meaning, of it: knowledge. So science means only a collection of the accumulating knowledge which shows up the people's understanding of the world. As thus, it is understandable that we don't know everything, of course, let alone the prediction.■

Conflict of Interests

None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