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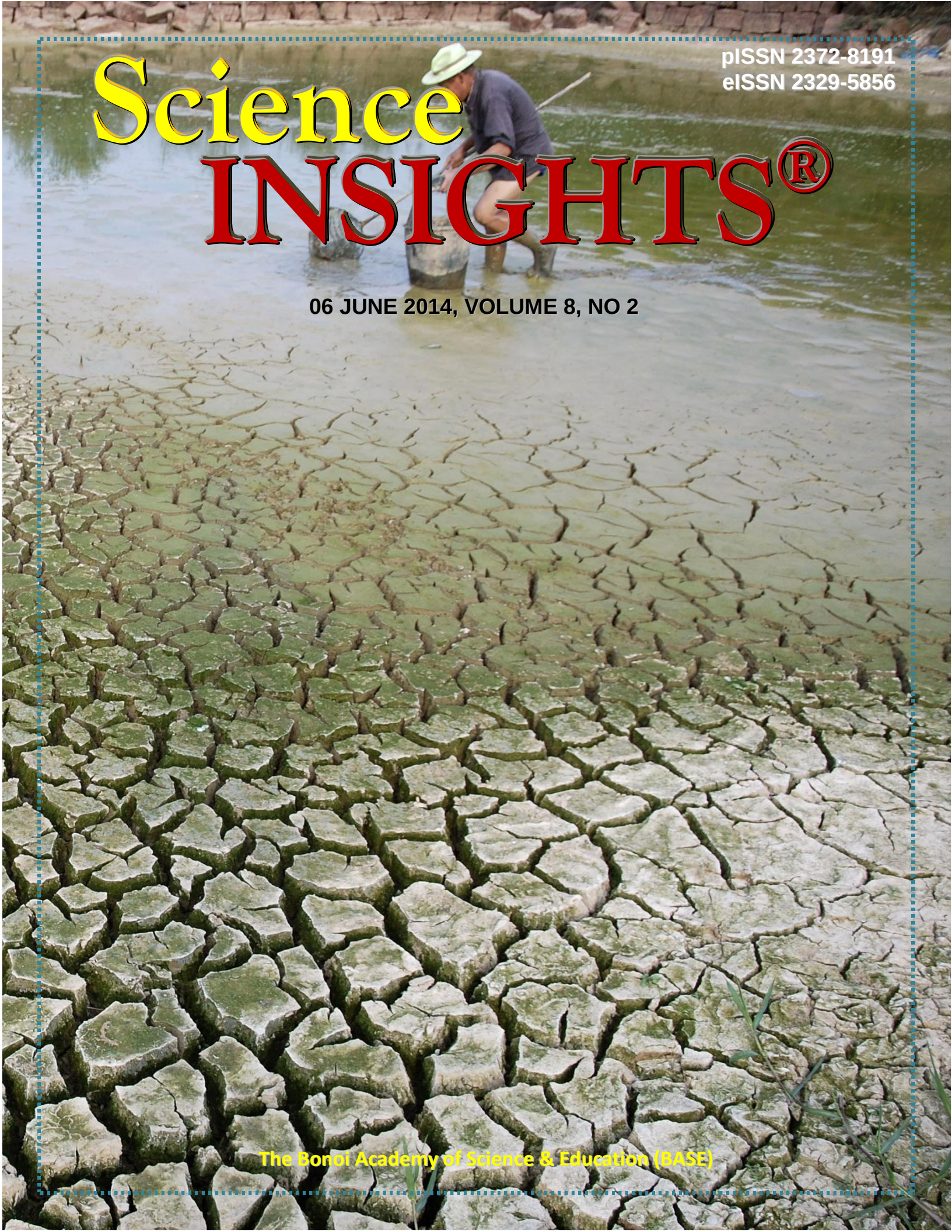

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Science INSIGHTS®: the Real Journal of Science and Education

►Mission: Let science reach the far corner by education

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Science Tests Idea | Science Speaks Truth | Science Makes Difference
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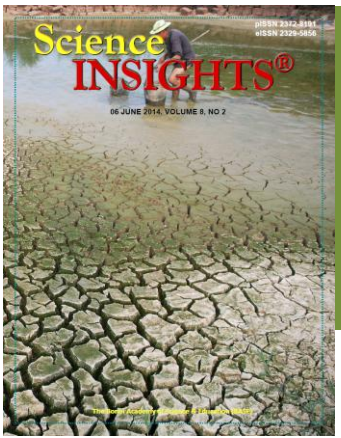
COMMON SCIENCE



COVER
The impact of the changing climate on the surrounding environments is unequal: some benefit from it, but some suffer from it. Agriculture is the very example for this. In the field of agriculture, weeds and pests are the winners of the increasing carbon dioxide, whereas the food crops failed in this competition. See page 205.

Image: BASE illustrating group

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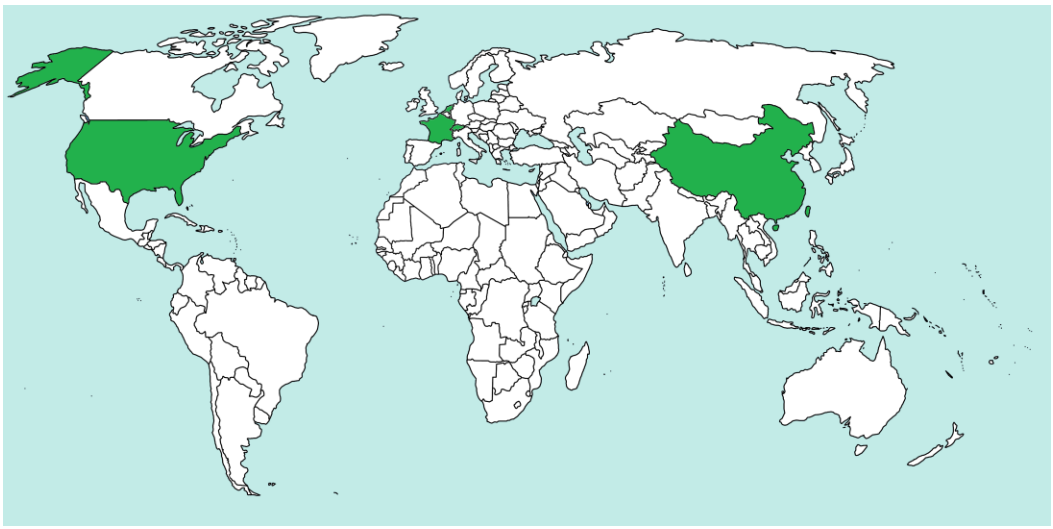
When life starts,
It is so fresh.
Who knows the future?
Sunny
Rainy
Droughty
Or
……

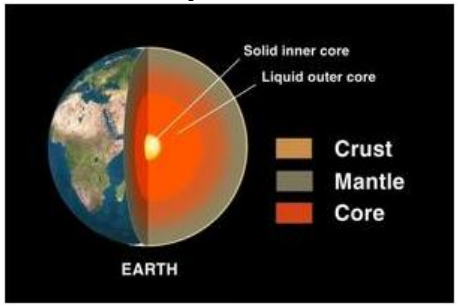
Miami, USA
2014 Atlantic Hurricane Season



The U.S. National Oceanic and Atmospheric Administration (NOAA) predicted a "near or below normal" 2014 Atlantic hurricane season, with eight to 13 tropical storms and three to six hurricanes, one or two of which would reach major Category 3 status. A typical season has 12 tropical storms, with six hurricanes and two major hurricanes. The six month-long hurricane season runs from June 1st to November 30th, 2014. Forecasters at Colorado State University, a leading U.S. extreme weather analysis team, last month predicted this year's season will see nine tropical storms, three of which will intensify into a hurricane and one becoming a Category 3 hurricane with winds above 111 miles per hour (178 kph). The lower forecast was based on cooler waters in the tropical Atlantic Ocean and expectations that El Niño - a climate pattern that creates strong wind shear, making it harder for storms to develop into hurricanes - will form this year, NOAA Administrator Kathryn Sullivan told a press conference in New York. The El Niño phenomenon, which occurs every three to six years and typically lasts about one year, is also marked by a warming of surface temperatures in the Pacific Ocean. NOAA earlier this month said it sees the likelihood of the weather pattern appearing over the summer at more than 65 percent. The last El Niño occurred in 2009. This year national forecasters will be armed with new, color-coded "potential storm surge maps" to graphically demonstrate the risk of coastal flooding from looming storms. The maps are the result of polling that found most Americans living on vulnerable coastlines paid too much attention to hurricane wind strength and not enough to storm surge before deciding whether to evacuate ahead of a storm. Superstorm Sandy's flooding of New York and New Jersey in 2012 recently highlighted the need for greater focus on the risk of storm surge.■

Aubière, FRANCE
Strange Rocks Found in Earth's Crustal Graveyard

Earth has multiple layers: the crust, the mantle, the liquid outer core and the solid inner core. Models of how the Earth's mantle works may need to change, thanks to two new studies that recreate the extreme conditions just above the planet's core. The deep mantle, a region that lies 416 to 1,800 miles (670 to 2,900 kilometers) below the Earth's surface, is impossible to reach and hard to see clearly with seismic signals. The little scientists do know about the mantle comes from earthquake waves, which speed up and slow down as they travel through different rock layers inside the Earth.



The deepest part of the mantle has weird blobs and seismic slow zones that have long puzzled scientists. Both new studies offer possible explanations for the strange seismic behavior. In the studies, researchers mimicked conditions inside the deep mantle with experiments in the laboratory. Teams working independently on different continents shot lasers at tiny specks of rock squeezed between diamond anvils. One team concluded that scientists had been wrong about the form that a certain rock takes in the deep mantle, which accounts for about half of Earth's volume. The other team found evidence for small amounts of Earth's most common surface rock, basalt, pooling in liquid form at the core-mantle boundary. The findings are published on May 22nd, 2014 in the journal Science. "These results are a new step forward in reproducing in the laboratory what is occurring in the very deep mantle," said Denis Andrault, lead author of one of the studies and a scientist at Blaise Pascal University in France. The study examining the form of mantle rocks found that a mineral called perovskite, which makes up about 80 percent of the deep mantle, behaves differently at depths greater than 1,365 miles (2,200 km) than it does above that level. It turns out that in the lowest part of the mantle, perovskite has two phases - different ways of arranging its atoms. One "H-phase" has iron and a hexagonal structure, while the other phase is iron-free. The H-phase is

more stable at the temperatures and pressures found close to the core, and is likely more common than the iron-free form of perovskite, said lead study author Li Zhang, a scientist at the Center for High Pressure Science and Technology Advanced Research in Shanghai. The findings suggest that the mineral makeup of the bottom half of the lower mantle may be different than that of the top half, Zhang said. "The constitution of the Earth's lower mantle may be significantly different than previously thought," he said. Geoscientists classify the inner Earth's layers according to the changes in rock type, which are often indicated by sudden changes in earthquake wave speeds. The discovery of the H-phase will spark a search through the deep Earth for places where perovskite changes over to the H-phase, the researchers said. Discovering the new H-phase also opens up possibilities for improving models of Earth's interior, said Quentin Williams, a professor at the University of California, Santa Cruz, who was not involved in the studies. Researchers can now better explore how the transition from one mineral phase to another influences the planet's tectonic convection cycle, and whether there is a seismic signal of the change. Researchers who model processes inside the Earth will also need to consider the effects of the other diamond-anvil experiment published in Science this week. The second study, by the team from Blaise Pascal University, indicates that foundered fragments of oceanic crust can melt at the core-mantle boundary. This is not a simple conclusion; basalt may melt easily beneath erupting volcanoes, but deep-mantle rocks behave weirdly because pressures there are a million times greater than at Earth's surface. And temperatures in the deep mantle are scorching: Estimates run from about 2,800 to 6,700 degrees Fahrenheit, or 1,530 to 3,700 degrees Celsius, though no one knows for sure. The new experiments revealed that oceanic crust (the basalt) melts at a lower temperature than surrounding mantle rocks do in the zone just above the core-mantle boundary, 1,800 miles (2,900 km) deep. The basalt stays molten only when it's contained in the old oceanic crust, the researchers think. As soon as the melt escapes upward into the mantle, the chemical mixing with mantle rocks turns the liquid back into a solid. The findings will influence the debate over how long molten crust pools near the core, what the source of the liquid is and how the new evidence may influence theories about the mantle plumes that feed hotspots and transfer heat within the Earth.■

Olympia, USA

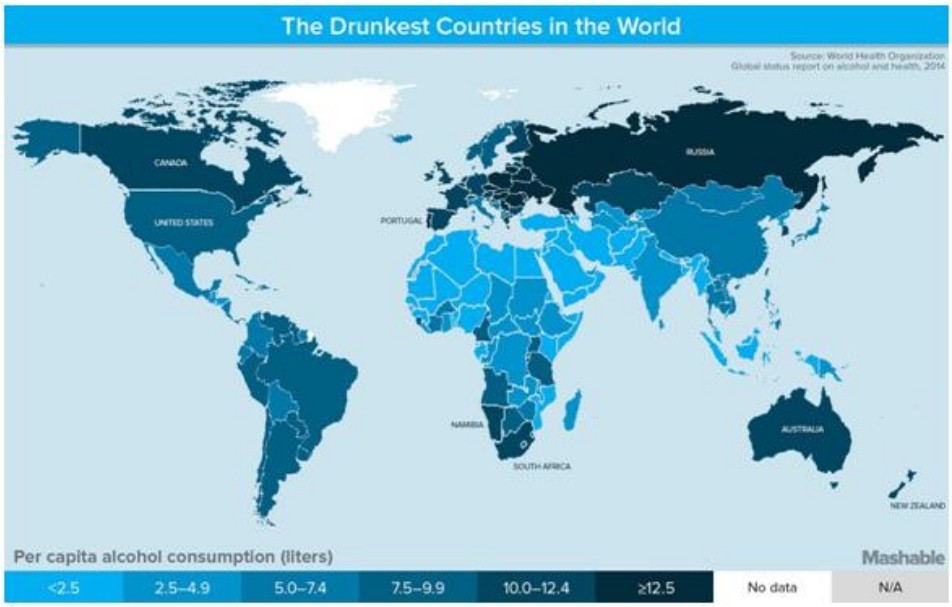
Birth Defect in Some Rural Washington State Babies Stumps Scientists

An alarming number of babies in a rural swath of central Washington state over the last four years have been born with a rare and fatal defect that leaves them without part of their brain and skull, and scientists are stumped. In a three-county area that includes the city of Yakima, 26 babies born between 2010 and 2013 suffered from anencephaly, which occurs early in pregnancy when the fetal neural tube does not close, according to Juliet VanEenwyk, an epidemiologist with the Washington State Department of Health. The number of cases is four times the national average, VanEenwyk said, and health officials haven't been able to work out the cause. An initial investigation launched after local health workers sounded the alarm in 2012 did not yield a clear cause for the cluster of cases, she said. Common risk-factors for fetal neural tube disorders, such as obesity in the mother, were not higher among those affected, compared with others living in the area, she said. Scientists have also been struck by the fact that spina bifida, another disease caused by neural tubes failing to fully close, has not impacted families in central Washington at higher rates. Spina bifida is generally twice as prevalent as anencephaly. "That's one of the things that's really strange about this," said VanEenwyk. In June, 2014, the state health department will convene an advisory group made up of experts, officials and locals to determine how to move the investigation forward. That investigation may take the form of in-depth interviews with women whose babies were affected as well as testing for elevated levels of pesticides. The latter would be tricky, VanEenwyk said, since pesticides tend to move quickly throughout the body. Another area of possible exploration is the amount of folic acid, a B vitamin that helps prevent fetal neural tube disorders, present in the affected pregnant mothers, VanEenwyk said. In the three-county area, 60 percent of pregnant women - 10 percent above the statewide average - do not take a folic acid supplement, VanEenwyk said, although that figure did not appear to be higher among women whose babies were born with the defects.■

Geneva, SWITZERLAND

The Drunkest Countries in the World

The average person who is 15 or older, globally, drinks 26.2 cups of pure alcohol in a given year, according to a new report from the World Health Organization (WHO). That equates to a little less than half an ounce of pure alcohol each day. The highest consumption levels continue to be found in the developed world, the report states, noting in particular in the WHO European Region (including countries like Austria, Germany, Russia and the UK) and the WHO Region of the Americas (including all of the countries in North, Central and South America). The countries that consume the most of it, per the WHO's 2014 report, vary widely. Their habits can be attributed to a number of factors, including sociodemographic, rates of abstention, level of economic development, culture (i.e., if a country is overwhelmingly Muslim) and the preferred beverage types (vodka versus, say, sangria). The report states that

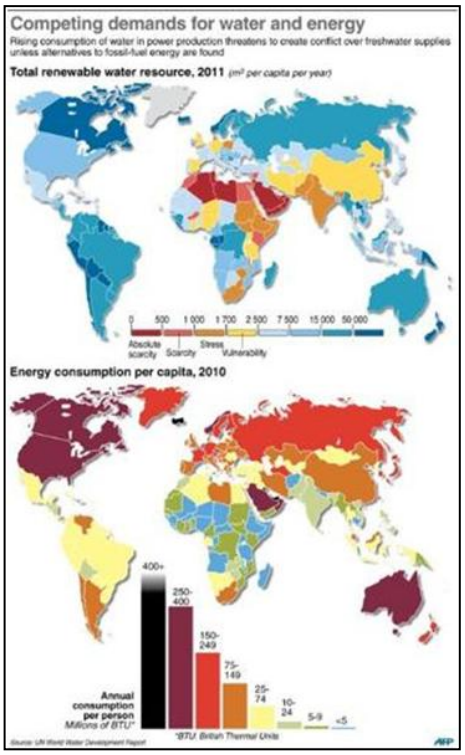


"intermediate levels of consumption" are found in the WHO Western Pacific Region, which stretches from China in the north and west to New Zealand in the south and French Polynesia in the east, and the WHO African Region, which includes the majority of central and southern Africa. The lowest consumption levels are found in the WHO South-East Asia Region and particularly in the WHO Eastern Mediterranean Region. Countries there include Afghanistan, Pakistan, Iran and Syria. The report detailed alcohol consumption in its nearly 200 member states. More than three million people died in 2012 as a result of harmful use of alcohol, the report states, highlighting how alcohol consumption increases the risk of developing more than 200 diseases, including liver cirrhosis and some cancers. "More needs to be done to protect populations from the negative health consequences of alcohol consumption," Dr. Oleg Chestnov, WHO Assistant Director-General for Noncommunicable Diseases and Mental Health, said in an announcement that accompanied the report. "The report clearly shows that there is no room for complacency when it comes to reducing the harmful use of alcohol."■

Paris, FRANCE

A Future of Thirst: Water Crisis Lies on the Horizon

The next time your throat is as dry as a bone and the Sun is beating down, take a glass of clean, cool water. Savour it. Sip by sip. Vital and appreciated as that water is, it will be even more precious to those who will follow you. By the end of this century, billions are likely to be gripped by water stress and the stuff of life could be an unseen driver of conflict. So say hydrologists who forecast that on present trends, freshwater faces a double crunch - from a population explosion, which will drive up demand for food and energy, and the impact of climate change. "Approximately 80 percent of the world's population already suffers serious threats to its water security, as measured by indicators including water availability, water demand and pollution," the Nobel-winning Intergovernmental Panel on Climate Change (IPCC) warned in a landmark report in March 2014. Already today, around 768 million people do not have access to a safe, reliable source of water and 2.5 billion do not have decent sanitation. Around a fifth of the world's aquifers are depleted. Jump forward in your imagination to mid-century, when the world's population of about 7.2 billion is expected to swell to around 9.6 billion. By then, global demand for water is likely to increase by a whopping 55 percent, according to the United Nations' newly published World Water Development Report. More than 40 percent of the planet's population will be living in areas of severe water stress, many of them in the broad swathe of land that runs along north Africa, the Middle East and western South Asia.Yet these scenarios do not take into account changes in rainfall or snowfall or glacier shrinkage caused by global warming. As a very general rule, wet countries will get wetter and dry countries will get drier, accentuating risk of flood or drought, climate scientists warn. But whether people will heed their alarm call is a good question. "When seismologists talk about an area at risk from an earthquake, people generally accept what they say and refrain from building their home there," says French climatologist Herve Le Treut. Water squabbles in the hot, arid sub-tropics have a long history. In recent years, the Tigris, Euphrates and Nile have all been the grounds for verbal sparring over who has the right to build dams, withhold or extract "blue gold" to the possible detriment of people downstream. "There will clearly be less water available in sub-tropical countries, both as surface water and aquifer water, and this will sharpen competition for water resources," says Blanca Jimenez-Cisneros, who headed the chapter on water for the big IPCC report. Citing a 2012 assessment by US intelligence agencies, the US State Department says: "Water is not just a human health issue, not just an economic development or environmental issue, but a peace and security issue." Rows over water between nations tend to be resolved without bloodshed,



often using international fora, says Richard Connor, who headed the UN water report. Failing a slowdown in population growth or a swift solution to global warming, the main answers for addressing the water crunch lie in efficiency. In some countries of the Middle East, between 15 and 60 percent of water disappears through leaks or evaporation even before the consumer turns the tap. Building desalination plants on coasts in dry regions may sound tempting, "but their water can cost up to 30 times more than ordinary water," notes Jimenez-Cisneros. Efficiency options include smarter irrigation, crops that are less thirsty or drought-resilient, power stations that do not extract vast amounts of water for cooling, and consumer participation, such as flushing toilets with grey water, meaning used bath or shower water. Above all, the message will be: don't waste even a single drop.■

Amsterdam, NETHERLANDS

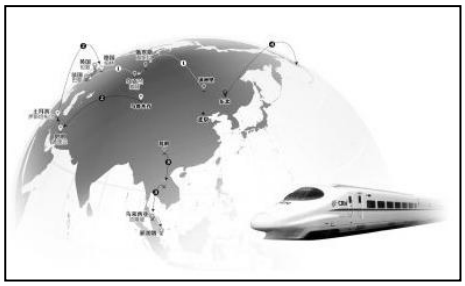
Researchers think water helped ancient Egyptians build the pyramids

Long before the days of trucks and cranes, the ancient Egyptians were building pyramids out of giant bricks stacked hundreds of feet high. Even getting the stones to the construction site would have been an ordeal in Bronze Age. According to a new study published by researchers at the University of Amsterdam, workers may have placed the rocks on a sledge (a platform of sorts) and then wet the sand underneath, making it twice as stiff. The firm ground made it a heck of a lot easier to pull the rock along, reducing the amount of workers needed to get each stone to its destination. You can witness the difference a little water makes simply by walking on a beach below the high tide line, versus dry patches further up. The study tells us not only about how our predecessors got along, but how it could help us as well. The transport of granular materials like sand, coal and concrete currently account for 10 percent of the world's energy consumption. If we can come up with a more efficient way to move those things around, we could potentially save a ton of energy (and cash) in the process.■

Beijing, CHINA

China may build an undersea train to America

China is planning to build a train line that would, in theory, connect Beijing to the United States. According to a report in the Beijing Times, citing an expert at the Chinese Academy of Engineering, Chinese officials are considering a route that would start in

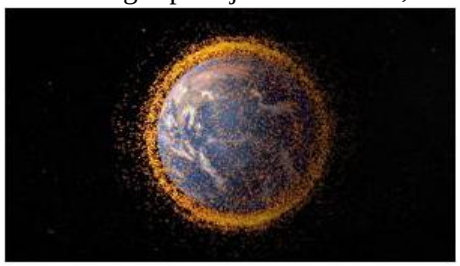


the country's northeast, thread through eastern Siberia and cross the Bering Strait via a 125-mile long underwater tunnel into Alaska.
"Right now we're already in discussions. Russia has already been thinking about this for many years," says Wang Mengshu, the engineer cited in the article. The proposed "China-Russia-Canada-America" line would be some 8,000 miles long, 1,800 miles longer than the Trans-Siberian railroad. The tunnel that the Chinese would help bore beneath the icy seas would be four times the length of what traverses the English Channel. That's reason enough to be skeptical of the project, of which there are few details beyond what was attributed to the one official cited by the state-run Beijing Times. Meanwhile, a report in the state-run China Daily insists the country does have the technology and means to complete a construction project of this scale, including another tunnel that would link the Chinese province of Fujian with nearby Taiwan. In the past half decade or so, China has embarked on an astonishing rail construction spree, laying down tens of thousands of miles tracks and launching myriad high-speed lines. It has signaled its intent to build a "New Silk Road" - a heavy-duty freight network through Central Asia that would connect with Europe via rail rather than the old caravans that once bridged West and East. A map that appeared on Xinhua's news site outlines the route below, alongside a parallel vision for a "maritime Silk Road." While some of its neighbors watch China's rise warily, the main plank of Beijing's soft power pitch has always been its stated desire to improve economic ties and trade with virtually everyone. "China's wisdom for building an open world economy and open

international relations is being drawn on more and more each day," trumpets the Xinhua report that accompanies the map above, according to the Diplomat. To that end, Beijing has assiduously resurrected the narrative of the ancient Silk Road as well as given prime billing to the tales of China's famed Ming dynasty treasure fleets, which sailed all across the Indian Ocean. Seen in such grand historic perspective, a tunnel to Alaska doesn't seem too far-fetched.■

Washington DC, USA
Clean Up Space Junk or Risk Real-Life "Gravity" Disaster

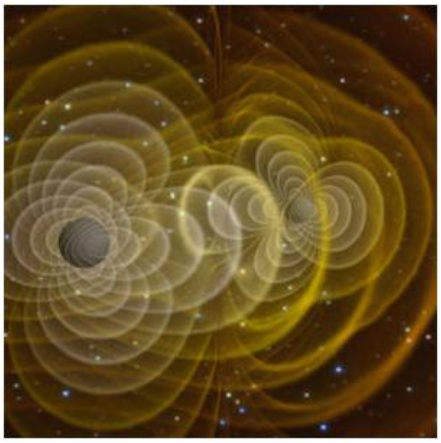
While the plot of the hit Hollywood film "Gravity" is fictional, the United States must bolster efforts to address the alarming amount of space junk surrounding Earth, or risk potentially catastrophic collisions in orbit, lawmakers said today (May 9th, 2014). Such real-life accidents could resemble the horrifying destruction depicted in the movie, they said. In a hearing before key members of the U.S. House of Representative's Committee on Science, Space and Technology, experts discussed the challenges of managing the growing threat of space junk. Participants included representatives from the U.S. Department of Defense, Federal Aviation Authority (FAA) and Federal Communications Commission (FCC), along with experts in space law and space situational awareness. "Orbital debris, or space junk as it is sometimes called, is not science fiction. It is a growing problem," Rep. Eddie Bernice Johnson (D-Texas) said in her opening remarks. "Dealing with the increase in orbital debris will not be easy." Within the Department of Defense, the Joint Functional Component Command for Space (JFCC-Space) currently tracks 23,000 objects in low-Earth orbit. NASA officials have estimated that roughly 500,000 pieces of space junk larger than a marble circle the planet, and there could be more than 100 million tiny fragments, some as small as flecks of paint, that race around Earth at blistering speeds of 17,500 mph (28,000 km/h). George Zamka, a former NASA astronaut and the current deputy associate administrator in the Office of Commercial Space Transportation at the FAA recalled his own harrowing experiences with orbital debris during space shuttle missions. Not only have NASA space shuttles and the International Space Station had to dodge space junk over time,



but two major events have added considerably to the debris problem in orbit. In 2007, China intentionally destroyed a defunct satellite as part of an anti-satellite test that created a vast cloud of debris. The 2009 collision between two unmanned spacecraft, one a U.S. communications satellite and the other a dead Russian satellite, created even more debris. In their testimonies, the witnesses also suggested ways that Congress might approach policies related to space traffic management. Currently, the Department of Defense oversees surveillance of space as part of its national defense duties, yet with civil agencies, private companies and commercial space travelers all potentially sharing the space environment in the near future, it may be time to re-examine the policing of this increasingly congested orbital region, said Brian Weeden, a technical advisor with the Secure World Foundation, an organization dedicated to the peaceful and sustainable use of outer space. The FAA is the sole federal agency with the authority to grant licenses to commercial space operators. Part of this regulatory process includes working with private companies to ensure their rocket launches will not generate even more debris in orbit, Zamka said. But, the FAA does not have the authority to regulate commercial activities in space. That job falls to the FCC for communications satellites, and to the National Oceanic and Atmospheric Administration (NOAA) for commercial Earth-watching spacecraft. As such, determining which agency should manage space traffic will likely pose a considerable challenge, Weeden said. In his testimony, he recommended the government assign the task to an agency that already has significant expertise with mitigating space debris, or create a new federal entity to oversee space surveillance.■

Boston, USA
Do Gravitational Waves Cause Tiny Earthquakes?

Earth can serve as a giant detector for theoretical ripples in the fabric of space-time given off by stars, black holes and other massive objects in deep space, researchers say. The moon could be employed in the same way and potentially return even better results, scientists added. Gravity is the consequence of masses such as planets warping the fabric of space and time around them, according to Einstein's theory of general relativity. When massive bodies such as stars and black holes move, they are predicted to radiate ripples in space-time called gravitational waves. When a gravitational wave passes through an object, it should trigger very small but potentially detectable vibrations. Gravitational wave detectors range



from instruments that can fit on desks to devices that are miles long. However, so far no one has reported directly detecting a gravitational wave. Scientists reasoned that Earth itself could be used as a gravitational wave detector. One might potentially detect the combined effects of gravitational waves streaming through the planet by analyzing its seismic activity - that is, how much Earth shakes. In the new study, researchers focused on gravitational waves with frequencies of 0.05 to 1 hertz, a band largely overlooked by other detection efforts. Potential emitters in this range include pairs of cosmic objects such as white dwarfs, neutron stars and black holes as they orbit each other. Gravitational waves with such frequencies also may be given off by rapidly spinning neutron stars known as pulsars. The scientists employed supercomputers to comb through a year's worth of publicly available data from a global network of 40 seismometers normally used to study earthquakes and the internal structure of the Earth. They did not detect the effects of gravitational waves per se, but they set a new upper limit for the amount of energy the planet might receive from gravitational waves of these frequencies. This upper bound improves by a factor of a billion the limits set by previous lab experiments, researchers said. The researchers intend to carry out a similar analysis using seismometers that NASA's Apollo missions placed on the moon. These could provide even better data than instruments on Earth because the moon is far less seismically active than Earth, lead study author Michael Coughlin, a physicist at Harvard University, told Space.com. Coughlin and his colleague Jan Harms detailed their findings online March 13rd, 2014, in the journal *Physical Review Letters*.■

Paris, FRANCE
Electrical Stimulation of Brain Alters Dreams

Scientists on Sunday said they had used a harmless electrical current to modify sleep so that an individual has "lucid dreams," a particularly powerful form of dreaming. The discovery provides insights into the mechanism of dreaming -- an area that has fascinated thinkers for millennia -- and may one day help treat mental illness and post-trauma nightmares, they said. Lucid dreams are considered by many psychologists to be an intermediate stage between two forms of consciousness. They lie between so-called rapid eye movement (REM) dreams - which are concerned with the immediate present and have no access to past memories or anticipated events in the future - and being awake, which brings into play abstract thought and other cognitive functions. In lucid dreaming, a state believed to be unique to humans, elements of secondary consciousness combine with REM dreams. A characteristic is that the dreamer becomes aware that he or she is dreaming and is sometimes able to control the dream's plot. They may dream, for instance, of putting an aggressor to flight or of averting a catastrophic accident. Researchers led by Ursula Voss at the J.W. Goethe University Frankfurt, used a technique called transcranial alternating current stimulation (tACS) to explore the causes of lucid dreaming. The gadget comprises two small boxes with electrodes that are placed next to the skull and send a very weak, low-frequency electrical signal across the brain. The team recruited 15 women and 12 men aged 18 to 26, who spent up to four nights in a sleep laboratory. After the volunteers had experienced between two and three minutes of REM sleep, the scientists applied tACS, or a "sham" procedure that produced no current, for around 30 seconds. The current was below the sensory threshold, so that the subjects did not wake up. They then woke up the volunteers and asked them what they had been dreaming. The volunteers were tested at frequencies of two herz (Hz), six Hz, 12 Hz, 25 Hz, 60 Hz and 100 Hz. "The effect... was only observed for 25 and 40 Hz, both frequencies in the lower gamma frequency band," Voss said. "This band has linked with conscious awareness, but a causal relationship had so far not been established. Now it is." When the volunteers were stimulated with 25 HZ, "we had increased ratings for control of the dream plot, meaning they were able to change the action at will," she added. The study, reported in the journal Nature Neuroscience, gave several anecdotes from the recruits about what they had dreamt. The battery-operated tACS was applied so that the current flowed between the frontal and temporal regions, located on the forward top and side of the brain respectively. The study suggests that frontotemporal tACS might help to restore dysfunctional brain networks which are fingered in schizophrenia and obsessive-compulsive disorder. Applied during REM sleep, it could also one day help victims of post-traumatic stress disorder to overcome recurrent nightmares by placing them in charge of the dream plot, the paper theorises. The tACS gadget itself is a recognised medical invention designed to be used only for research purposes. Voss said, though, that it seemed inevitable that a similar device would one day be invented for consumers, enabling sleepers to latch onto lucid dreaming, for better or worse.■

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Pests versus Crops in the Context of Climate Change

Fuzhou Wang

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EDITORIAL

Pests versus Crops in the Context of Climate Change

Fuzhou Wang*[,Δ]

The pace of climate change is matched the science development. We are paying for the climate change when we are enjoying the benefits of science. The impact of the changing climate on the surrounding environments is unequal: some benefit from it, but some suffer from it. Agriculture is the very example for this. In the field of agriculture, weeds and pests are the winners of the increasing carbon dioxide, whereas the food crops failed in this competition. How to deal with these thorny problems rose from the development of science? In fact, agriculture itself also is developing, modified crops against various pests, and increased production of staple food crops. However, the advanced growing of agriculture cannot reverse the decline of nutrients of crops resulted from the climate change. What would be the solution for this problem?■

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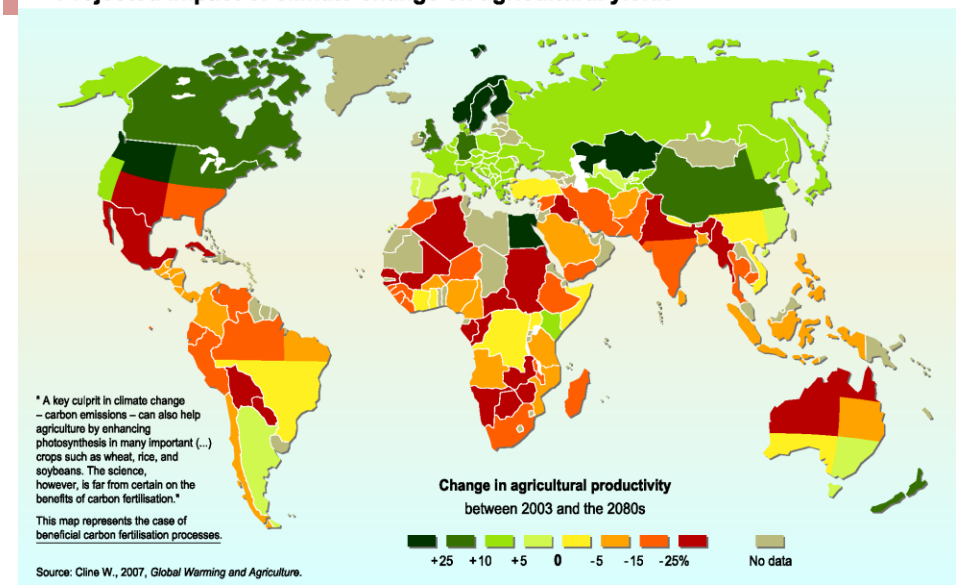
Extreme climate changes, polar glacier melting, and abnormal record-breaking temperatures have been becoming the hot topics that were discussed worldwide and concerns about the future derived from them. It seems difficult to slow down the pace of climate change. One big reason is that we human beings need development. What is the underlying determinant for this unstoppable process?

Maybe you would say it was from the human activities, or maybe you would like to say it was due to the indifferent attitudes. Yes, all these reasons are reasonable, whereas they are not the original contributors to the climate changes. So, what is the fundamental reason? It is science. That is to say science should pay for it. When our human being is complacent the progress and advancement of science and technology, we ignore their potential effects on our surrounding environments. That science makes our life better, but also science changes the climate.

One more intriguing thing is the beneficiaries of climate change in agriculture: weed and insect pests, or the nutrients the crops have? In the context of climate change, who benefits more?

A new federal climate report released by the National Climate Assessment and Harvard University said that the weeds and crop-devouring insects are going to be winners under any climate change scenario, and the biggest losers are us. From the report, the scientists declared that rising carbon dioxide levels, warming temperatures and more frequent extreme weather events did not treat all plants,

Projected impact of climate change on agricultural yields



insects and soil nutrients equally, the final effects are skewed.

This April (2014) was the first month in human history when carbon dioxide levels averaged greater than 400 parts per million in the atmosphere. It is an arbitrary but ominous milestone. How does this change alter the crops, weeds, and pests?

Although carbon dioxide is the core ingredient of photosynthesis from which a plant (food crops and their weedy nemeses) coverts energy from the sun into sugar to thrive, some plants turn the gas into a competitive edge more efficiently than others. A lot of worst weeds benefit the most from high carbon dioxide. What's more, many weeds are incredibly adaptive to environmental changes, including warmer temperatures, or extreme events such as droughts or floods, which may help them further choke out critical crops. Insect pests, even more than weeds, thrive in warmer temperatures, which can increase the speed at which the menaces grow and reproduce, and the chances that their progeny will survive to continue feeding on and infecting crops with harmful bacteria, viruses and fungi. More seriously, some of the pests began to expand and migrate to new territories where once too cold for them to host.

Dealing with these weeds and bugs creates a two-fold threat to public health: The increased use of herbicides and insecticides. More chemical dousing means higher costs to farmers and greater contamination of soil, food, and water. The most widely used herbicide in the United States, glyphosate (also known as Roundup), loses its efficacy on weeds grown at the levels of carbon dioxide projected to occur in the coming decades. Much of the increase has been linked to evolving resistance among weeds to the widely used chemicals. Many farmers are then driven to apply greater quantities of glyphosate, or supplement with other more toxic herbicides such as 2,4-D (2,4-Dichlorophenoxyacetic acid), a common systemic pesticide or herbicide used in the control of broadleaf weeds. It is one of the most widely used herbicides in the world.

One big concern is the nutrients of food crops, including wheat, rice and soybeans, has been affected by the changing climate. The nutritional impacts of these large environmental perturbations are one of the biggest public health challenges. Nearly two billion of the world's people receive the majority of their zinc and iron from food crops. The minerals are critical for a healthy, functioning body, i.e. everything from the immune system to the brain. A lack of protein is also dangerous, and can lead to stunted growth and losses in muscle mass, including a weakened heart. Although we can now produce more calories than we need to feed every person on the planet, what we really have a problem with is malnutrition. A higher carbon dioxide world is going to work against us. Carbon dioxide may help a plant produce more sugars, starches and other high-energy carbohydrates. A resulting low-level swap of protein for carbohydrates may increase risks of obesity, diabetes, heart disease and other chronic diseases in both the developed and developing worlds, declared by Dr. Samuel Myers, an environmental health expert at the Harvard School of Public Health.

A host of climate changes impact on the food system, including high temperatures during the transportation of goods and potential effects on valuable insects such as bees and other pollinators. It is necessary for agriculture to adapt to the changing environment, whether that is diversifying the types of crops that fill farmers' fields or employing technological tools. One major reason is the poorer, the more vulnerable, because the higher prices for food preclude the poor from obtaining expensive meat and seafood that could supplement the lower nutrient content found in staple foods, as emphasized by professor Diana Liverman from the University of Arizona.

All agricultural practices (from GMO to organic to conventional) have roles to play. We are completely transforming the environmental con-

ditions under which humanity has lived throughout its evolution. We need face the changing climate, but more importantly, we need face the reality of the changes in weeds

and pests resisting to herbicides or/and pesticides, and especially the changes in nutrients in food crops. Who will be the final winner in this complicated race? Is it science?■


Love the Wave
Love the Earth

EVOLUTION

Study: kiwi and elephant bird belong to same lineage

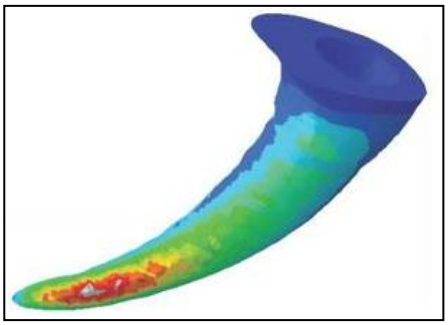
New Zealand's pint-sized kiwi and Madagascar's now-extinct, but once-towering, elephant bird are related -- two offshoots of the group of flightless birds called ratites, a group responsible for species throughout the Southern Hemisphere. The realization came about after researchers at the University of Adelaide, in Australia, analyzed DNA from the two species. The chicken-like kiwi and the giant elephant bird, extinct for centuries, would have been quite the odd couple placed side-by-side. The largest elephant bird species tipped the scales at some 600 pounds. Kiwis barely breach ten. But they both evolved from the same small bird that occupied Antarctica some 50 million years ago. "It's about as bizarre a finding as you can get," Adelaide biology professor Alan Cooper said. Previously, scientists believed the Kiwi, New Zealand's national bird, was most closely related to Australia's emu and the cassowary. The new research helps the kiwi and its countrymen out from under the shadow of their neighbors down under. Cooper was relieved by the discovery, as it was his research that first pinned the state bird to Australia. "It's taken me 20 years to fix the picture, for which I am obviously very apologetic." The new DNA analysis is detailed in the latest edition of the journal *Science*.■

Science 2014; 344:898.

BIOLOGY

Why Spider Fangs Are Nature's Perfect Needles

A spider's fangs are natural injection needles, making them perfectly suited for piercing the skeletons of prey and delivering a kiss of venom, a new study finds. The toothy barbs of a large wandering spider are curved in order to hold the spider's prey in place, and their conical shape helps them resist deformation. Understanding the biomechanics of spider fangs could inspire new medical injection devices, researchers say. "For biomedical applications, for example, the spider fang may lead to the design of new infusion techniques, new blood-bypassing instruments and many other life-saving technologies," said Benny Bar-On, a biomaterials scientist at the Max Planck Institute of Colloids and Interfaces in Germany and co-author of the study published on May 27, 2014, in the journal *Nature Communications*. Spider fangs have evolved to penetrate the external skeleton of the arachnids' prey, usually insects, in order to inject venom, the researchers said. As such, the fangs have to be able to withstand significant forces without deforming or breaking. In this study, Bar-On and his colleagues



investigated the structural mechanics of the wandering spider *Cupiennius salei*, which is mostly found in Central America. Wandering spiders don't build a web to catch their prey; instead, they hunt around on the ground. The researchers chose *C. salei* because it's easy to breed this species in large numbers year round in the laboratory. They modeled its fangs structurally in experiments and in simulations. Unlike other biological injection needles, such as mosquito and bee stingers, the fangs of these spiders are curved. The curvature enables the arachnids to attack from different directions and hold their prey in place as they inject their venom, the researchers found. The hollow, conical shape of the spiders' fangs gives them nearly optimal stiffness per unit volume, a measure of their resistance to deformation, making them ideally suited for piercing prey. The fangs are a composite of protein and chitin, a carbohydrate molecule found in the shells of many insects and crustaceans, whose microscopic structure is well suited for its purpose, the results suggest. Understanding the biomechanics of spider fangs could reveal how other sharp structures, from a scorpion's stinger to a mammoth's tusk, evolved in nature, the researchers said. Furthermore, the fangs' design might inspire scientists to develop better injection needles and other medical devices.■

Nature Communications 2014; 5:3894

BASE

THE BONOI ACADEMY OF SCIENCE & EDUCATION

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Exomoons May Harbour Life Too

By NASA

In the Star Wars universe, everyone's favourite furry aliens, the Ewoks, famously lived on the "forest moon of Endor". In scientific terms, the Ewok's home world would be referred to as an exomoon, which is simply a moon that orbits an exoplanet – any planet that orbits a star other than our sun. Although more than 1,000 exoplanets have been discovered since the first one was found in 1995, only a handful of those are thought to be habitable, at least by life as we know it. New research shows that exomoons, too, could provide habitable environments. Although we are yet to find exomoons, we have good reasons to believe that there should be many, even more than exoplanets.


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


Help those in need…

Stop wasting foods

Mysteries of Our Planet

In 1970, geologists were still putting the finishing touches on plate tectonics, the model that explains how the Earth's surface takes shape. More than 40 years later, many riddles still remain when it comes to our planet. For instance, dozens of spacecraft have mapped the surface of Mars more accurately than Earth's ocean depths. Here are some of Earth's biggest unsolved mysteries.

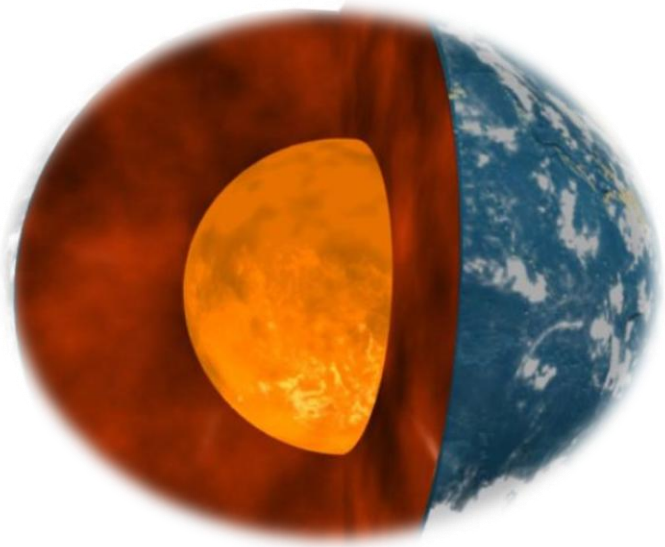
Why are we all wet?

Scientists think Earth was a dry rock after it coalesced 4.5 billion years ago. So where did this essential chemical, H_2O, come from? Perhaps an interstellar delivery system, in the form of massive impacts about 4 billion years ago. Pummeled by icy asteroids, the Earth could have replenished its water reservoirs during the period, called the Late Heavy Bombardment. But the beginnings of Earth's water are shrouded in mystery because so little rock evidence remains from this time period.

What's down there in the core?

The stuff of legend and lore, Earth's core has long fascinated writers as well as scientists. For a while, the composition of Earth's unreachable core was a solved mystery … at least in the 1940s. With meteorites as proxy, scientists gauged the planet's original balance of essential minerals, and noted which were missing. The iron and nickel absent in Earth's crust must be in the core, they surmised. But gravity measurements in the 1950s revealed those estimates were incorrect. The core was too light.

Today, researchers continue to guess at which elements account for the density deficit beneath our feet. They're also puzzled by the periodic reversals in Earth's magnetic field, which is generated by the outer core's flowing liquid iron.



How did the moon get here?

Did a titanic collision between the Earth and a Mars-size protoplanet form the moon? There's no universal consensus on this giant impactor theory, because some details don't pan out. For example, the chemical composition of both rocky bodies matches so closely it suggests the moon was born from Earth, not a separate impactor. But a fast-spinning young Earth could have flung off enough molten rock during impact to form a chemically similar moon, other models suggest. And is there a relationship between these events and the rise of life on Earth, wondered Kevin McKeegan, a geochemist at the University of California, Los Angeles. "These are important planetary issues as we

consider the possible histories of Earth-like exoplanets in the habitable zone," McKeegan said.

Where did life come from?

Was life brewed on Earth or sparked in interstellar space and delivered here on meteorites? The most basic life components, such as amino acids and vitamins, have been found on ice grains inside asteroids and in the most extreme environments on Earth. Figuring out how these parts combined to form the first life is one of biology's biggest hurdles. And no direct fossil traces of Earth's first inhabitants, which were probably primitive, rock-chewing bacteria, have yet been found.

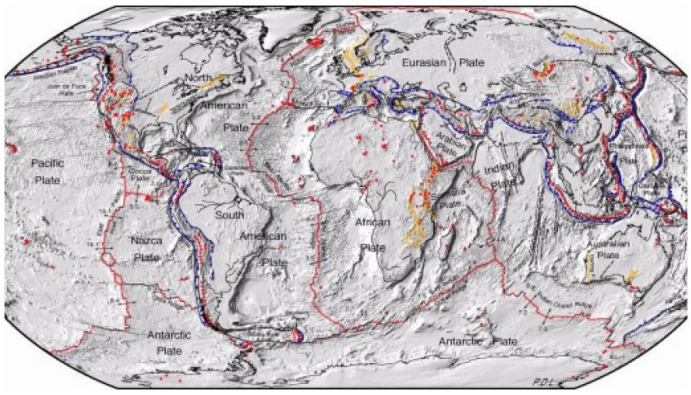
Where did all the oxygen come from?

We owe our existence to cyanobacteria, microscopic creatures that helped to radically transform Earth's atmosphere. They pumped out oxygen as waste, and filled the skies with oxygen for the first time about 2.4 billion years ago. But rocks reveal oxygen levels cruised up and down like a roller coaster for 3 billion years, until they stabilized around the Cambrian Period about 541 million years ago. So did bacteria spike the air, or was there another contributing factor? Understanding the shift to an oxygen-rich Earth is a key factor in decoding the history of life on our planet.

What caused the Cambrian explosion?

The appearance of complex life in the Cambrian, after 4 billion years of Earth history, marks a unique turning point, said Donna Whitney, a geologist at the University of Minnesota. Suddenly there were animals with brains and blood vessels, eyes and hearts, all evolving more quickly than during any other planetary era known today. A jump in oxygen levels just before this Cambrian explosion has been offered as explanation, but other factors could explain the mysterious rise of the animals, such as the arms race between predator and prey.

When did plate tectonics start?



Thin plates of hardened crust knocking about Earth's surface make for beautiful mountain sunsets and violent volcanic eruptions. Yet geologists still don't know when the plate tectonics engine revved up. Most of the evidence has been destroyed. Just a handful of tiny mineral grains called zircons survive from 4.4 billion years ago, and they tell scientists the first continental-like rocks already existed. But the evidence for early plate tectonics is controversial. And geologists still wonder how continental crust forms, said G. Lang Farmer, a geochemist at the University of Colorado, Boulder. "It's amazing to me that these fundamental aspects of how Earth works remain so enigmatic," Farmer said.

Will we ever predict earthquakes?

At best, statistical models can tease out a forecast of future earthquake probability, similar to weather experts who warn of coming rain. But that hasn't kept people from trying to predict when the next one will hit — with no success. Even the biggest

experiment failed by 12 years, when geologists predicted an earthquake at Parkfield, Calif., by 1994, and set up instruments to catch the coming temblor. The actual quake hit in 2004. One of the biggest hurdles is that geologists still don't understand why earthquakes start and stop. But there have been advances in predicting aftershocks and manmade earthquakes, such as those linked to wastewater injection wells (as used in fracking).■

Are the Theories of Our Solar System's Evolution Correct?

Are we evolving? Were we created by the God? It is a question asked by general people, but scientists say we are evolving including our solar system. If it is true, why the scientists cannot nail down the fact? Several theories want to explain the evolution of the solar system. Nonetheless, are they so far correct or not?

The subject is too lengthy to delve deeply into each theory; however, we shall attempt to briefly show why they cannot be true and give references to more information where available. Our solar system functions with precision more accurately than an expensive clock or watch. The question of course is, if not created by an all powerful and all knowing God, how then could it have developed into such a precision system? Accidental? We will see the fallacies of those theories which have been put forth by the evolutionists. Like the "Big Bang" and all other wild guesses, they simply would not have occurred. The fact that brilliant men with advanced education will grasp at such unreasonable ideas that make them look foolish, only to avoid acknowledging the existence of an almighty God is most difficult to comprehend. When sound proof is available for His being and His power.

The primary two theories which have been promoted and grasped blindly by others are: A giant star wandered past our sun and swept clouds of gases from it which then balled together and formed planets. They refer to this as the planetesimal group of theories. A preschooler may have thought this was a great answer, but Astronomers and many others know full well that stars don't just happen to pass by others or wander around. It doesn't happen. The second wild guess is that a gigantic swirling cloud of gas formed itself into our sun, planets, moons, comets, and asteroids, forming our solar system. All the various planetesimal theories had about been discarded as hopeless by 1940. But beginning in the forties, a number of evolutionists among whom were Carl Friedrich von Weizsäcker, Fred Lawrence Whipple, Lyman Spitzer Jr., Harold Clayton Urey, Fred Hoyle and Gerald P. Kuiper, began pressing for a new study, concerning the gas cloud guess. These and other scientists knew and still know that gas in outer space, or anywhere else always spreads outward, never coagulating.

From those two main ideas, there have been 7 separate theories (better classified as fantasies) and all have absolute reasons they could not have happened as proposed. The Evolutionists can think of no other better ideas so they, again sweep the facts under the rug and go their merry way, teaching error as scientific fact in our schools.

All of the 7 fantasies are listed below with also the number of reasons they could not work.

Nebular hypothesis: There are six specific reasons that this could not have occurred, either of them would have been sufficient to render it impossible

Fission theory: There are four sound reasons this could not have occurred.

Capture theory: Also four solid reasons this could not have developed.

Accretion theory: Only one reason is needed to prove this to be a totally silly idea.

Planetary collision theory: There are five very solid reasons this could not have happened, any one of which is more than proof.

Stellar collision theory: Two very sound proofs that this could not have formed our Solar system.

Gas cloud theory: two reasons this dould not occur, one of which is explained in the 1st section of the first 'main section' above.■


RIOT
TODAY'S WORLD
who should pay for this…


FREEDOM

AUTHOR GUIDE

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