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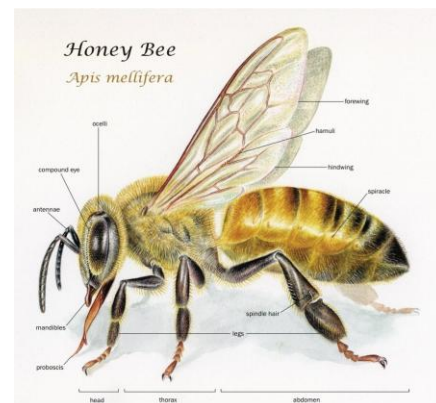
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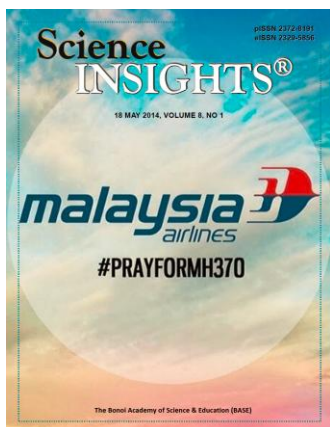
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COVER

Even science is marching forward, whereas the real ratio between the science advancement to trouble-solving ability is reduced dramatically compared to our ancestors. One bad manner that we human being cannot discard is finding excuses when facing unsolvable troubles. In fact, do we really need excuses for everything? One thing needing note is that science is science, and ability is ability. The more you know, the more you will find hard to deal with. See page 189.

Image: BASE illustrating group

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Love the Wave
Love the Earth

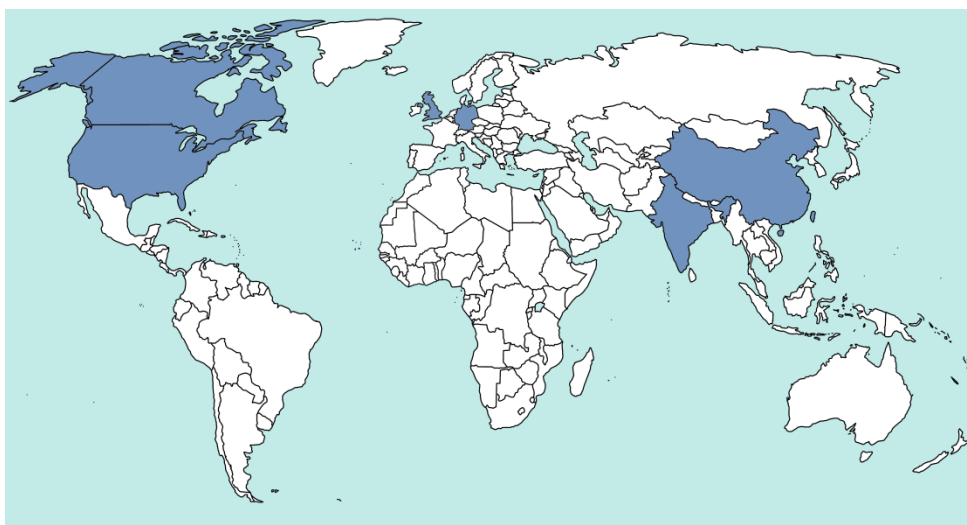


New Delhi, INDIA New Frogs in Troubled Indian Habitat



A total of 14 new species of so-called dancing frogs discovered by a team headed by University of Delhi professor Sathyabhama Das Biju in the jungle mountains of southern India. The study listing the new species brings the number of known Indian dancing frogs to 24 and attempts the first near-complete taxonomic sampling of the single-genus family found exclusively in southern India's lush mountain range called the Western Ghats, which stretches 1,600 kilometers (990 miles) from the west state of Maharashtra down to the country's southern tip. ■

Washington DC, USA



The Most Earth-Like Planet is Only 500 Light Years Away

Less than two months ago, NASA's Kepler mission announced the confirmation of 700 new exoplanets, but its latest news of a single exosolar system may be a bit more exciting. Kepler has now found an Earth-like planet that may have liquid water on its surface, and the new discovery is located less than 500 light years away. Since its launch in 2009, Kepler has been finding exoplanets with a deceptively simple technique. At any given time, it stares at thousands of stars, looking for a dip in the amount of light received from them. That dip can be caused by a planet passing in front of whatever star it is orbiting (from the perspective of Earth). By observing the time interval between these dips and the size of the dip, Kepler can calculate the planet's orbit and radius. When this data is combined with other data from the star, astronomers can build a rough picture of what the planetary system looks like. The new planet has been named Kepler 186f, and it is part of a five-planet system that is orbiting a red dwarf star (smaller and cooler than the Sun). What makes 186f so interesting is that its radius is only 1.1 times that of the Earth and it is orbiting its star in the habitable zone. This is the distance where, if the planet has water, then it is likely to remain in the liquid form. Liquid water is essential to life as we

know it, and planets in this zone remain the top candidates to harbor some form of life. Although NASA can't be sure about the mass of 186f, it can make an educated guess based on previous data from planets this size. Given that estimate and the planet's size, their guess is that 186f might be a rocky planet. The other planets in this planetary system are all smaller than 186f and orbit too close to the star to have any liquid water. Although the orbit of 186f is about 53 million kilometers from the star (Mercury's distance from the Sun), the star is much smaller. Therefore, this distance puts 186f far enough away to not boil off any water it may have. That is about all that we know about 186f for now. Kepler doesn't have the capacity to give information about the planet's atmosphere, its surface temperature, or even its density. But Kepler is achieving what it set out to find—Earth-sized planets. Getting details is left to a future telescope. And according to a recent analysis, there might be 17 billion Earth-sized planets in the Milky Way alone. That's more than enough to keep any Kepler successors busy.

What exactly is causing this bottleneck has been the subject of debate for more than 50 years. Explanations could include a paucity of Earth-like planets or self-replicating molecules. Other possibilities could be an improbable jump from simple prokaryotic life (cells without specialized parts) to more complex eukaryotic life –



after all, this transition took well over a billion years on Earth. Proponents of this “Rare Earth” hypothesis also argue that the evolution of complex life requires an exceedingly large number of perfect conditions. In addition to Earth being in the habitable zone of the Sun, our star must be far enough away from the galactic center to avoid destructive radiation, our gas giants must be massive enough to sweep asteroids from Earth’s trajectory, and our unusually large Moon stabilizes the axial tilt that gives us different seasons. These are just a few prerequisites for complex life. The emergence of symbolic language, tools and intelligence could require other such “perfect conditions” as well. While the emergence of intelligent life could be rare, the silence could also be the result of intelligent life emerging frequently but subsequently failing to survive for long. Might every sufficiently advanced civilization stumble across a suicidal technology or settle into an unsustainable trajectory? We know that a Great Filter prevents the emergence of prosperous interstellar civilizations, but we don’t know whether or not we already cleared it in humanity’s past or if it awaits us in the future. For 200,000 years, humanity has survived supervolcanoes, asteroid impacts, and naturally occurring pandemics. But our track record of survival is limited to just a few decades in the presence of nuclear wea-

ponry. And we have no track record at all of surviving many of the radically novel technologies that are likely to arrive this century. ■

Beijing, CHINA Chinese Strategists Reflect on the First Sino-Japanese War

China is gearing up for the 120th anniversary of the First Sino-Japanese War, which began in 1894 and ended with China’s defeat in 1895. The war was a devastating blow to China’s then-rulers, the Qing dynasty, as China had always considered Japan a ‘little brother’ rather than a serious competitor. The war is often seen as the defining point when power in East Asia shifted from China to Japan, as Tokyo claimed control of the Chinese territories of Taiwan and the Liaodong Peninsula (site of the port city of Dalian) as well as Korea (which changed from being a Chinese vassal to an officially independent state under Japanese influence). To commemorate the 120th anniversary of the war, *Xinhua* published a special supplement to its Reference News newspaper. The supplement consisted of 30 articles by members of the People’s Liberation Army “analyzing what China can learn from its defeat” in the Sino-Japanese war. Summing up the articles, *Xinhua* said that “the roots of China’s defeat lay not on military reasons, but the outdated and corrupt state system, as well as the ignorance of maritime strategy.” This conclusion has obvious modern-day applications, as China’s leadership is currently emphasizing both reform and a new focus on China’s navy. Other PLA officers argued that corruption was a major contributing factor to China’s defeat by the Japanese in 1895. Vice Admiral Ding Yiping, a deputy commander in the PLAN, blamed the defeat on “corruption and fatuity in politics.” Major-General Jin Yinan, a strategist at NDU, said that China’s Beiyang Fleet at the time had all the necessary equipment, but that the period of peace before the war led

to “the general mood of the fleet becoming depraved.” As part of these reforms, Xi has repeatedly warned about the danger of corruption, particularly in the military. In one of his first major policy pronouncements after being named Secretary General of the Communist Party, Xi urged China’s military to be ready for battle. “It is the top priority for the military to be able to fight and win battles and it is fundamental that the military consolidates itself through governing the troops lawfully and austerely,” Xi said in a speech in Guangzhou. One could say that Xi saw a “depraved” mood in China’s own military, where personal profit concerns outweighed national security. It’s no coincidence that a PLA general now highlights that same factor as a major cause in one of China’s most stinging military defeats. However, Xi Jinping has been pushing for more attention to go to China’s navy, as well as its coast guard. In support of this position, Vice Admiral Ding wrote that maritime strategy was a key to China’s defeat 120 years ago, and that the ocean remains central to national interests today. “State security cannot be ensured if maritime rights cannot be safeguarded,” Ding said. ■



Ancient Shark Discovery May Rewrite Our Evolutionary History

Sharks are often seen as “living fossils,” examples of evolutionary excellence that have not altered their design significantly since they came into existence. Evolutionary biologists have theorized specifically that the creatures’ respiratory systems, fed by efficient gills, were present in the species since they first diverged on Earth more than 400 million years ago. But researchers have recently discovered a fossil record that appears to refute that theory. A study of the 325-million-year-old “shark-like” creature, published in scientific journal *Nature*, suggests that ancient sharks might have developed their gills after bony fish did. The authors of the study say the fossil, which represents the earliest identified cartilaginous fish with a preserved respiratory system, has a gill structure more like a modern bony fish than a shark. The scientists say the findings “invert the classic hypothesis, in which modern sharks retain the ancestral condition,” suggesting that sharks evolved their gills after bony fish, honing them over millennia. The structure supporting these early gills is believed to have been essential in the evolution of jaws, a mutation that paved the way for the evolution of many land-based vertebrates, including humans. The scientists say the findings “profoundly affect our understanding of evolutionary history.” ■

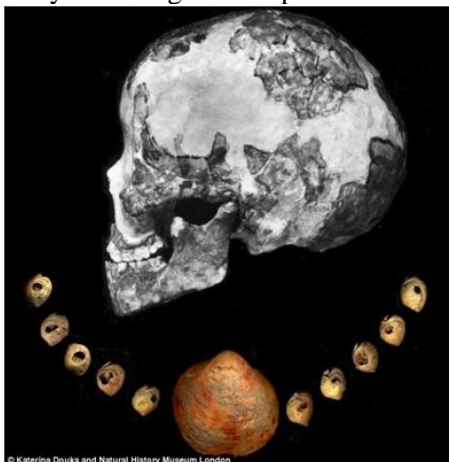
London, UK

C14 Dates Question Role of Near East in Early Human Migrations

Our ancestors migrated from Africa worldwide. Radiocarbon dating of human remains from one of the deepest prehistoric sites in the Near East throws into question widely-held ideas about how the first modern people spread across the world during the Palaeolithic era. C14 dates question role of Near East in early human migrations. Beads from the site of Ksar Akil, Lebanon, found closely associated with the skeleton of an early modern girl dating to between 39,000 to 41,000 years ago. The traditional view is that the first humans with anatomy like ours evolved in Africa, then from about 50,000 years ago started to spread into the Near East before continuing into Asia and Europe. But the new study suggests they may have settled the Near East a lot later than previously thought, and that therefore the region may not be the single vital crossroads through which early humans passed on their way to colonising the whole Eurasian landmass. If so, the story of our spread out of Africa may need to be rewritten. Instead of colonising the Levant then moving into Europe, our distant ancestors may have first settled in the central Asian steppes before turning west again. “Since the 1930s, many

prehistorians have believed the Levant was a major strategic point for people moving from Africa into the Middle East and Europe,” says Dr Katerina Douka of the University of Oxford, who led the research. “It sounds a straightforward and obvious idea, but these early humans didn’t necessarily follow the maps of today.” She adds that the region has received comparatively little attention from archaeologists, so theories tend to rest on a very small base of evidence - the Near East is the least-dated area of the Palaeolithic world. On top of this, the region’s hot dry conditions make scientific archaeology difficult - for example, the climate tends to destroy the collagen on which radiocarbon dating of bones depends. One of the most important sites in the region is Ksar Akil in modern-day Lebanon. Here, several fragments of ancient humans have been found over the years, crucially including a small part of a fos-

silised human known as Ethelruda, and another buried individual, whom archaeologists call Egbert. These have generally been seen as supporting the broader narrative of humans moving through the Near East into Asia and Europe. But until now, researchers hadn’t used radiocarbon dating to check how long ago these people lived. The authors of a new study, published in PLoS ONE, set out to remedy that. They used modern carbon-dating techniques on material found in the same archaeological layers as Egbert and Ethelruda at Ksar Akil - mostly beads made from sea shells, which were used as jewellery and are often considered a sign of complex symbolic behaviour akin to modern humans. They couldn’t radiocarbon-date the remains themselves - for one thing, both went missing in the twentieth century, although part of Ethelruda’s jawbone recently turned up again. For another, the collagen in the bones has degraded too far to be used in dating. Analysis of the results shows the remains are considerably younger than archaeologists had assumed - between 40.8 and 39.2 thousand years ago for Egbert and between 42.4 and 41.7 thousand for Ethelruda. This means Egbert is about the same age as the oldest directly-dated human found in Europe, at the Pesterca cu Oase in Romania, and younger than the oldest modern human teeth, found at Cavallo in Italy. ■



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Washington DC, USA Fuels from Corn Waste Not Better Than Gas

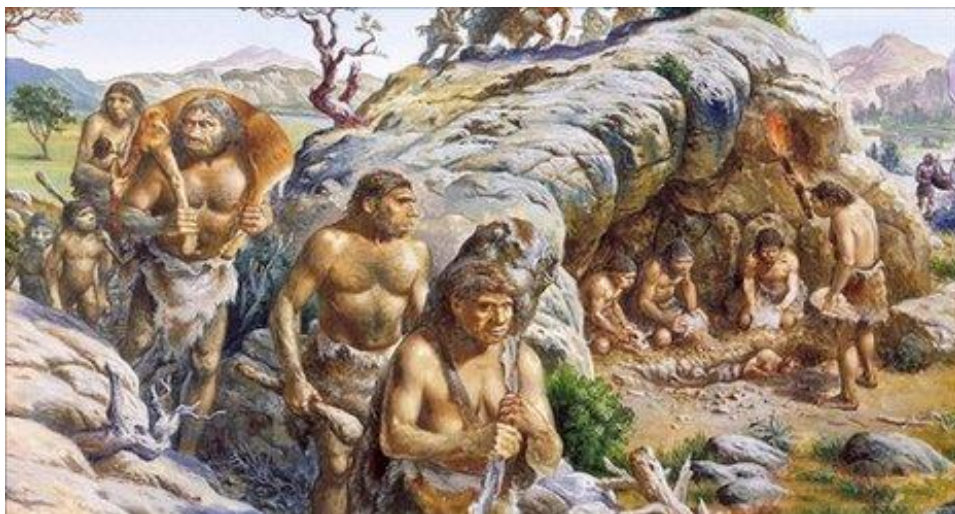
Scientists seek alternative fuels for gas every day. Biofuels made from the leftovers of harvested corn plants are worse than gasoline for global warming in the short term, a study shows, challenging the Obama administration's conclusions that they are a much cleaner oil alternative and will help combat climate change. A \$500,000 study paid for by the federal government and released Sunday in the peer-reviewed journal *Nature Climate Change* concludes that biofuels made with corn residue release 7 percent more greenhouse gases in the early years compared with conventional gasoline. While biofuels are better in the long run, the study says they won't meet a standard set in a 2007 energy law to qualify as renewable fuel. The conclusions deal a blow to what are known as cellulosic biofuels, which have received more than a billion dollars in federal support but have struggled to meet volume targets mandated by law. About half of the initial market in cellulose is expected to be derived from corn residue. The biofuel industry and administration officials immediately criticized the research as flawed. They said it was too simplistic in its analysis of carbon loss from soil, which can vary over a single field, and vastly overestimated how much residue farmers

actually would remove once the market gets underway. The research is among the first to attempt to quantify, over 12 Corn Belt states, how much carbon is lost to the atmosphere when the stalks, leaves and cobs that make up residue are removed and used to make biofuel, instead of left to naturally replenish the soil with carbon. The study found that regardless of how much corn residue is taken off the field, the process contributes to global warming. The Environmental Protection Agency's own analysis, which assumed about half of corn residue would be removed from fields, found that fuel made from corn residue, also known as stover, would meet the standard in the energy law. That standard requires cellulosic biofuels to release 60 percent less carbon pollution than gasoline. Cellulosic biofuels that don't meet that threshold could be almost impossible to make and sell. Producers wouldn't earn the \$1 per gallon subsidy they need to make these expensive fuels and still make a profit. Refiners would shun the fuels because they wouldn't meet their legal obligation to use minimum amounts of next-generation biofuels. Still, corn residue is likely to be a big source early on for cellulosic biofuels, which have struggled to reach commercial scale. Last year, for the fifth time, the EPA proposed reducing the amount required by law. It set a target of 17 million gallons for 2014. The

law envisioned 1.75 billion gallons being produced this year. ■

Leipzig, GERMANY Neanderthals Had Shallow Gene Pool

Neanderthals were remarkably less genetically diverse than modern humans, with Neanderthal populations typically smaller and more isolated. Although Neanderthals underwent more genetic changes involving their skeletons, they had fewer such changes in behavior and pigmentation. Modern humans are the only humans alive today, but Earth was once home to a variety of other human lineages. The Neanderthals were once the closest relatives of modern humans, with the common ancestors of modern humans and Neanderthals diverging between 550,000 and 765,000 years ago. Neanderthals and modern humans later interbred – nowadays, about 1.5 to 2.1 percent of DNA of people outside Africa is Neanderthal in origin. Researchers first sequenced the Neanderthal genome in 2010. “One of the next goals was obviously to begin to explore the variation among Neanderthals,” said study author Svante Pääbo, an evolutionary geneticist at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany. Pääbo and his colleagues analyzed three Neanderthal genomes. One came from a 49,000-year-old specimen from Spain; another from a 44,000-year-old specimen from Croatia; and one from a Siberian specimen at least 50,000 years old. To pinpoint why Neanderthals might have been less genetically diverse, the researchers focused on 17,367 genes that encoded instructions for generating proteins. They concentrated on mutations that changed what amino acids went into those proteins. Such mutations have a good chance of altering the structure or function of those proteins. Although mutations that change the amino acid makeup of proteins can have benefits, more often than not, they have detrimental effects. One should expect natural selection to weed out these mutations over time,



as anyone bearing them is probably less fit and thus not as likely to survive to reproduce. However, such mutations can accumulate in small, isolated populations, since those groups have fewer normal versions of those genes in their gene pools to replace any mutant genes. The investigators found Neanderthals carried more copies of mutations that would alter the amino acid makeup of proteins than modern humans possess. This suggests that Neanderthal populations across Eurasia were likely small and isolated. On the other hand, genes involved with pigmentation and behavior changed more in the modern human lineage. The scientists detailed their findings online today (April 21st, 2014) in the journal *Proceedings of the National Academy of Sciences*. ■

Toronto, CANADA A 4,600-year Step Pyramid Uncovered in Egypt

A step pyramid, a few decades older than the Great Pyramid of Giza (the oldest of the Seven Wonders of the Ancient World), has been uncovered by archaeologists in southern Egypt. Although scientists were aware of the pyramid's existence, it remained buried under a thick layer of sand until a group of archaeologists started excavation works in 2010. The group, led by Gregory Marouard, a research associate at the University of Chicago's Oriental Institute, has recently presented the initial results of its activity at a symposium by the Society for the Study of Egyptian Antiquities, held in

Toronto. The step pyramid, which when built around 4,600 years ago was 13 meters (43 feet) high, has by now become about one third that, as the blocks it was constructed with have been pillaged throughout its centuries-long existence. It is one of seven so-called "provincial" pyramids built across central and southern Egypt by either the Pharaoh Huni (reign c. 2635-2610 BC) or Snefru (reign c. 2610-2590 BC). Those do not have internal chambers and were not intended for burial. In fact the purpose of the constructions remains a mystery. The most likely explanation so far is that they were used as symbolic monuments scattered over Egypt as confirmation of the pharaohs' divine powers. A possible clue to the purpose of the building could be the remains of an installation where food offerings appear to have been made,

found by the team of archaeologists. There's also hieroglyphic graffiti discovered on the pyramid's walls. The images include those of a book roll, a seated man, a four-legged animal, a reed leaf and a bird. The researchers believe the inscriptions and burials dates long after the pyramid was built and have little to do with its original purpose, to which according to scientists the construction served for less than 50 years. The pyramid was supposedly abandoned about the same time the building of the Great Pyramid of Giza started under Pharaoh Khufu. A hypothesis holds it that the creation of one of the ancient wonders led to all of the country's resources being poured into the big project, while smaller pyramids were left neglected. ■

Washington DC, USA Ancient Assassin Flies Found in Amber

An extinct species of assassin fly that lived during the age of the dinosaurs has been discovered inside a translucent tomb of amber. A male and a female of the newfound species, now called *Burmapogon bruckschi*, were preserved in pieces of Burmese amber from Myanmar's Hukawng Valley. The specimens measure less than an inch (2.5 centimeters) in length and are about 100 million years old. *B. bruckschi* joins more than 7,500 species of assassin flies that are alive to





day. The insects get their name from their precise and gruesome way of killing: After a mid-flight ambush, assassin flies stab their prey's exoskeleton and inject digestive juices so that they can suck out the liquefied insides like a milkshake, leaving an empty hull behind. But apparently, these two tiny predators weren't immune to oozing droplets of resin. Insects can become trapped in amber when they are engulfed in resin flowing from trees. Hardened amber droplets can thus provide rare snapshots of prehistoric life – and some of them are surprisingly rich scenes, like a spider attacking a wasp caught in its web. Previously, the history of assassin flies had been recorded only in limestone fossils. The amber-encased *B. bruckschi* specimens provide a rare 3-D view of the ancient creatures' bodies. Dikow identified a few features that set *B. bruckschi* apart from its living cousins: flattened antennae, a V-shaped eye structure, spiny hind legs and bristles covering its piercing mouthparts. The species, along with another type of ancient assassin fly, *Cretagaster raritanensis*, was described in the journal *American Museum Novitates* published on April 21st, 2014. This second creature was only recently identified as a new species; it was originally found in a

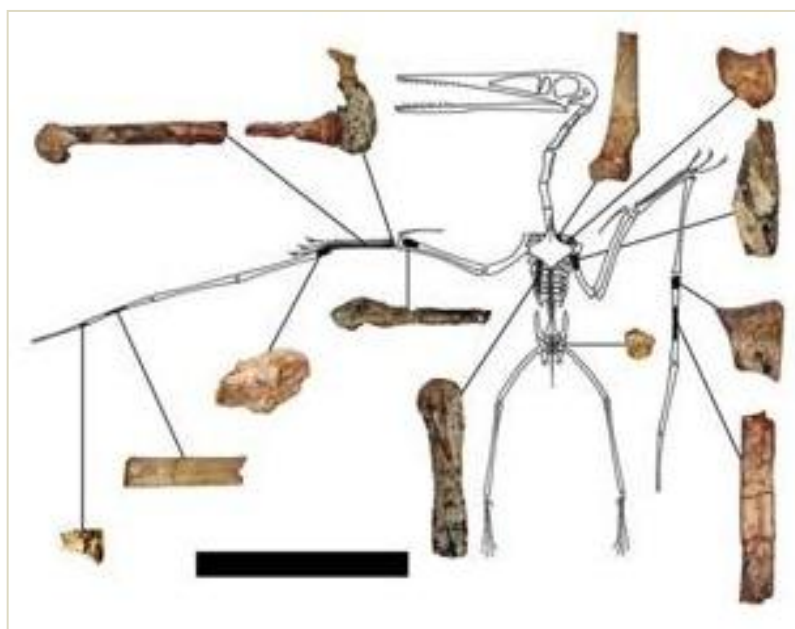
chunk of amber in New Jersey in 1999. ■

Washington DC, USA Ancient Flying Reptile from China Fills Evolutionary Gap

Scientists have found a fossil from 163 million years ago that represents the oldest known example of a lineage of advanced flying reptiles that later would culminate

in the largest flying creatures in Earth's history. The newly identified Jurassic period creature, a species named *Kryptodrakon* progenitor that was unearthed in the Gobi desert in northwestern China, was modest in size, with a wingspan of perhaps 4-1/2 feet. But later members of its branch of the flying reptiles known as pterosaurs were truly colossal, including *Quetzalcoatlus*, whose wingspan of about 35 feet was roughly the same as that of an F-16 fighter. Roughly 220 million years ago, pterosaurs became the first flying vertebrates to appear on Earth, with birds - first appearing about 150 million years ago - and bats - appearing about 50 million years ago - coming much later. Pterosaurs arose during the Triassic period not long after their cousins, the dinosaurs, also made their debut. Their wings were supported by an incredibly elongated fourth digit of the hand – the “pinky finger.” The pterosaurs remained largely unchanged for tens of millions

of years - with characteristics like long tails and relatively small heads - and none became very big. But later during the Jurassic period, some developed anatomical changes that heralded the arrival of a new branch called pterodactyloids that eventually replaced the more primitive forms of pterosaurs. Many of these pterodactyloids had massive, elongated heads topped with huge crests, lost their teeth and grew to huge sizes. Perhaps the defining characteristic of the group is an elongation in the bone at the base of the fourth finger called the fourth metacarpal, and *Kryptodrakon* is the oldest known pterosaur to have this advance, the researchers said. It lived in a river-dominated ecosystem far from the ocean in a region teeming with life, including a fearsome dinosaur predator called *Sinraptor* and a gigantic plant-eating dinosaur named *Mamenchisaurus* that boasted one of the longest necks of any creature ever to walk the planet. The origin of the pterodactyloids had been a little bit of a quandary, with their fossil record not extending back in time as much as some scientists had expected. *Kryptodrakon* is about five million years older than any other known member of the advanced pterosaur lineage. The research was published in the journal *Current Biology*. ■





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Science and the Ability and Capability of the Human Being: the Vanished Flight 370 Tells Us the Truth

Frederick F. Wang^{*,Δ}

The new century is dubbed as an informationized era with “knowledge big bang” suggesting that the ability and capability of our human being is unprecedented. However, the fact is not that optimistic. The vanished Flight 370 en route from Kuala Lumpur to Beijing tells us that we are still helpless under some devastating conditions that beyond our abilities to be dealt with. Even science is marching forward, whereas the real ratio between the science advancement to trouble-solving ability is reduced dramatically compared to our ancestors. One bad manner that we human being cannot discard is finding excuses when facing unsolvable troubles. In fact, do we really need excuses for everything? One thing needing note is that science is science, and ability is ability. The more you know, the more you will find hard to deal with. ■

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ARE we human beings in “megalomania”? We can launch huge man-made rollers onto the surface of the Mars, and we know the cellular functions of our body, and we suppose we are evolved from the Apes. Yes, we can do innumerable things and we know much of this world. This is the very reason why we are arrogant and high profile in facing difficulties today. Nevertheless, when the scenario was turned to another side, what could we see? Over thousands and millions of vic-

tims from the tsunami evoked by earthquakes, and periodic epidemics and mounting cancerous cases, and disastrous consequences due to human excessive activities, and yes again, we have too much questions in the mist. We know many, but much we don't know.

The disappearance of the Malaysia jetliner MH370 on March 8th, 2014, with 239 people on board while on a flight from Kuala Lumpur to Beijing led aviation experts to assume that whatever happened was too

quick to leave the pilots no time to place a distress call. For this vanished airline, overwhelmed supposes appeared within hours as showed in the Table 1. In following days, more than two dozen countries have plunged into the “long march” of the searching, which Malaysia was overseeing. In the days since the search has shifted to remote areas of the Indian Ocean, several countries have deployed planes and ships for the effort, including China, Australia, Malaysia, the U.S., Britain, New Zealand, Japan

and South Korea. For this, some thought that the search would have been the showcase of individual country's capabilities in science and military. All these were the facts, but also they are the reflections of our human being's real abilities in dealing with disasters.

We today have lots of cutting-edge technologies with well-known scientific bases, and also we can do things far more effective than ever before. Does this mean we can do everything? As the hunt for the Malaysia Airlines Flight 370, it has given us the answers. The radars were scanning when the flight took off, and the satellites outside of the earth were spying the activities on the ground, and the missing Boeing 777 equipped with modern components and parts that were designed and produced in advanced industrial assembly line. However, all these man-made proud products yet did not guarantee the safety of the flight. What's more, we cannot find any clues of the flight, then. This is just the thing we should focus on. It was a farcical performance we could see now. Why no physical trace of the plane has been found despite the more than two-month multi-agency international search effort?

Did the missing flight make a puzzle for us, or something else? It is the nature of our human being to deny our own responsibilities when the situation is getting complicated. For the flight search itself, some thought China was reaping what he has sown because China is bad blood with virtually all of its neighbors, many of whom are key players in the search. China has territorial disputes with India, Japan, the Philippines and Vietnam, and many other countries in the region are wary of its efforts to exert more control over Pacific shipping lanes that could impact their freedom of trade. Moreover, the Malaysia Airline even criticized China for being provided "misleading" signals at the earlier stage of the search that dramatically delayed the black box signals were caught. However,

Table 1. Some of the Possible Causes for the Plane Disappearing.

A Catastrophic Structural Failure. Most aircraft are made of aluminum which is susceptible to corrosion over time, especially in areas of high humidity. But given the plane's long history and impressive safety record, experts suggest that a failure of the airframe, or the plane's Rolls-Royce Trent 800 engines, is unlikely. More of a threat to the plane's integrity is the constant pressurization and depressurization of the cabin for takeoff and landing. In April 2011, a Southwest Airlines Boeing 737 made an emergency landing shortly after takeoff from Phoenix after the plane's fuselage ruptured, causing a 5-foot (1.5-meter) tear. The plane, with 118 people on board, landed safely. But such a rupture is less likely in this case. Airlines fly the 777 on longer distances, with many fewer takeoffs and landings, putting less stress on the airframe.

Bad Weather. Planes are designed to fly through most severe storms. However, in June 2009, an Air France flight from Rio de Janeiro to Paris crashed during a bad storm over the Atlantic Ocean. Ice built up on the Airbus A330's airspeed indicators, giving false readings. That, and bad decisions by the pilots, led the plane into a stall causing it to plummet into the sea. All 228 passengers and crew aboard died. The pilots never radioed for help.

Pilot Disorientation. The pilots could have taken the plane off autopilot and somehow went off course and didn't realize it until it was too late. The plane could have flown for another five or six hours from its point of last contact, putting it up to 3,000 miles (4,800 kilometers) away. This is unlikely given that the plane probably would have been picked up by radar somewhere. But it was too early to eliminate it as a possibility.

Failure of Both Engines. In January 2008, a British Airways 777 crashed about 1,000 feet (300 meters) short of the runway at London's Heathrow Airport. As the plane was coming in to land, the engines lost thrust because of ice buildup in the fuel system. There were no fatalities. Loss of both engines is possible in this case, but Hamilton said the plane could glide for up to 20 minutes, giving pilots plenty of time to make an emergency call. When a US Airways A320 lost both of its engines in January 2009 after taking off from LaGuardia Airport in New York it was at a much lower elevation. But Capt. Chesley B. "Sully" Sullenberger still had plenty of communications with air traffic controllers before ending the six-minute flight in the Hudson River.

A Bomb. Several planes have been brought down including Pan Am Flight 103 between London and New York in December 1988. There was also an Air India flight in June 1985 between Montreal and London and a plane in September 1989 flown by French airline Union des Transports Aériens which blew up over the Sahara.

Hijacking. A traditional hijacking seems unlikely given that a plane's captors typically land at an airport and have some type of demand. But a 9/11-like hijacking is possible, with terrorists forcing the plane into the ocean.

Pilot Suicide. There were two large jet crashes in the late 1990s – a SilkAir flight and an EgyptAir flight – that are believed to have been caused by pilots deliberately crashing the planes. Government crash investigators never formally declared the crashes suicides but both are widely acknowledged by crash experts to have been caused by deliberate pilot actions.

Accidental Shoot-Down. There have been incidents when a country's military unintentionally shot down civilian aircraft. In July 1988, the United States Navy missile cruiser USS Vincennes accidentally shot down an Iran Air flight, killing all 290 passengers and crew. In September 1983, a Korean Air Lines flight was shot down by a Russian fighter jet.

Alien Capture. May be this is an excuse cause. Some believe the UFO, but some not. For scientists, they have a *de facto* belief for the existence of alien outside our planet. If the flight was really captured by some alien, it would be "good news" because we can still hope the passengers could come back someday. ■

Table 2. Amazing Facts Highlighted by Malaysian Airliner Mystery.

The coordinated search for missing Malaysia Airlines flight 370 has highlighted some interesting facts about the world and airplanes, including just how easy it is for a Boeing 777 airplane to simply vanish, despite the seeming pervasiveness of modern technology and network location services. There was still much we have yet to learn about the details of the case, but amid all the theories and conjecture, ABC News has gleaned some impressive nuggets of information over the course of the two-week long investigation. Here are 16 of them.

1. Some parts of the Indian Ocean can reach 25,000 feet deep. That's 20 times the height of the Empire State Building, which measures 1,250 feet tall.
2. Brain death can occur at 45,000 feet in the air. Airplane oxygen masks can only provide about 10 to 15 minutes of air for passengers, which is more than enough time for a pilot to return a plane to lower altitude.
3. Two passengers used stolen passports -- one from Austria and one from Italy -- to board the flight. After the 9/11 terrorist attacks, Interpol introduced a worldwide database of lost or stolen passports, which has details of more than 40 million stolen or lost travel documents (passports, identity documents, visas) from 167 countries. The only countries that regularly check travelers against the database are the United Arab Emirates, the U.S., Britain, France and Switzerland according to Interpol officials.
4. Intense focus has been placed on finding the plane's black boxes, consisting of a cockpit voice recorder and a flight data recorder. Both are bright orange and each about the size of a coffee maker. Searchers only have about 30 days to find the boxes before the box stops pinging, making it much more difficult to locate. Even after the pinging stops, the batteries last for years and the data should be intact.
5. The flight data recorder will detail the last 25 hours of the plane's activity, from engine performance to the position of flight control surfaces, while the cockpit voice recorder tapes the sounds on the flight deck and cycles after two hours.
6. Both cockpit voice and flight data recorders work to an ocean depth of 20,000 feet, with a signal range of about 2 nautical miles, depending on variables like sea conditions. The signals are located using a device operated on the surface of the water or towed to a depth. The deeper the water the more difficult it will be to detect the pings.
7. There are approximately 41,821 airports in the world, 13,513 in the United States alone.
8. Kuala Lumpur, Malaysia, is the world's 28th busiest airport with a yearly estimated traffic of more than 37 million travelers. Atlanta, Ga., ranks first, with more than 92 million people passing through and second is Beijing's Peking Airport with more than 78 million.
9. Flying is still one of the safest methods of transportation. On average, travelers would need to take one flight a day for about 10,000 years before they would be involved in a fatal crash.
10. The European Transport Safety Council (ETSC) estimates 90 percent of aircraft accidents worldwide are survivable.
11. The best option to maximize your chances of walking away from a plane crash is to sit in the rear end of the plane. One study found those sitting near the plane's tail are 40 percent likelier to survive than those in the first few rows.
12. The search is taking place in an extremely remote part of the Indian Ocean between Australia and the Antarctic known as the "roaring forties" for its sharp westerly winds and rough waters.
13. The ocean surface current in the Indian Ocean close to the equator is around 1 to 2 knots. A drifting object in the water around the equator can shift between 26 to 52 miles a day (728 miles in 14 days). But around 200 miles further from the equator, the current is much weaker at less than 0.5 knots.
14. A Boeing 777-200 is 70 yards long and needs at least 4,000 feet of runway to land safely. But the plane would not be able to take off again on a runway of that length.
15. Many pilots use flight simulators. They can be assembled at home and range from simple software on personal computers that can be purchased off the Internet for \$30, to sophisticated full-motion simulators for professional pilots, which cost thousands.
16. A pilot's experience is calculated in flight hours. The Malaysian plane's captain, Zaharie Ahmad Shah, had more than 18,000 flying hours. Most major airlines require pilots to have at least 2,500 flight hours under their belt, while regional carriers generally require a minimum of 1,500 hours. ■

the Malaysia Airlines is most likely happy if the missing plane could not be found. If missing Flight 370 would be found and it could be proven that Malaysia Airlines or the Malaysia government was responsible for the fate of the plane (as showing the Malaysian Airliner Mystery in

Table 2), the cost for the airline and the government could be devastating. Malaysia's government did not search for the plane for four hours after its disappearance. With every day that has gone by since the plane vanished on March 8, 2014, so has the chance of finding evidence that

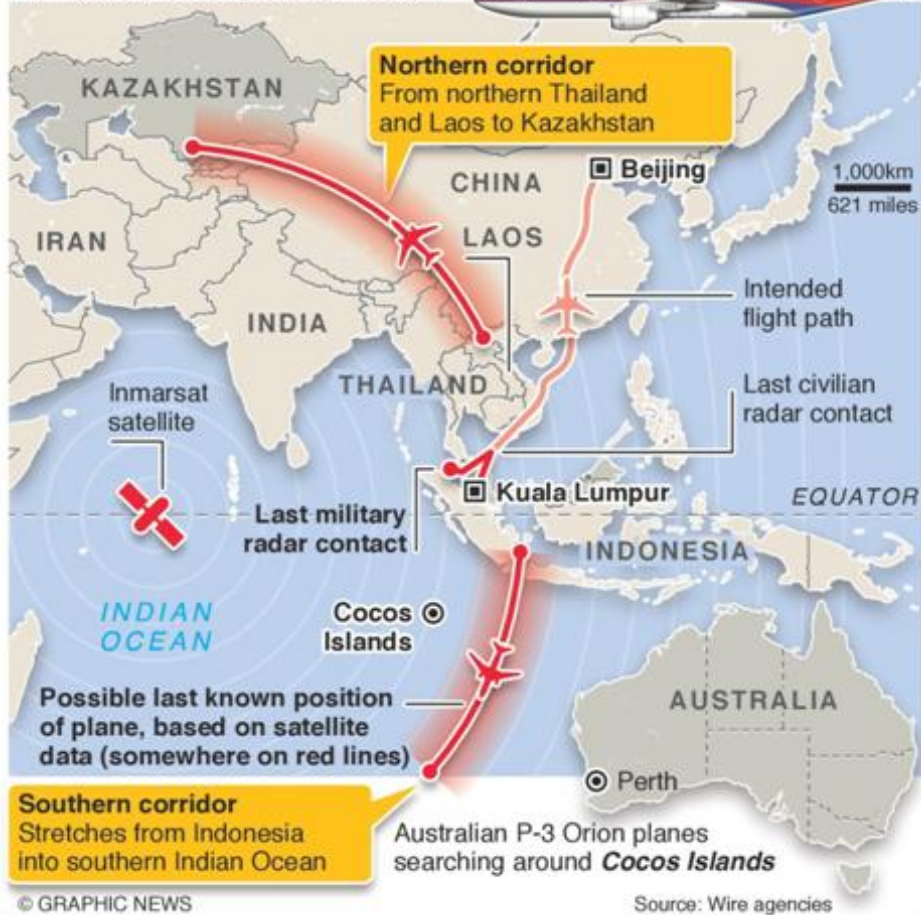
either one of the two parties could have been responsible. As reported by the *Mirror*, Australia is contributing almost \$90 million in the search for Malaysia Airlines Flight MH370, and other countries are also covering their own costs. What incentive is there really for Malaysia Airlines or

Air corridors searched for missing jet

The hunt for missing flight MH370, which disappeared during a routine commercial flight on March 8 with 239 people on board, now extends along two vast air corridors, covering a tenth of the planet

SEARCH CORRIDORS

Twenty-six countries looking for plane, with Australia leading southern search



Malaysia's government to find the missing aircraft? For Malaysia, they may really wish the vanished jet could not be found, it is unacceptable for the relatives of the plane's passengers. That is the fact so far that we did not find any meaningful clues of the Flight even hundreds of billions of dollars have been consumed by the searching. It is also a fact that we

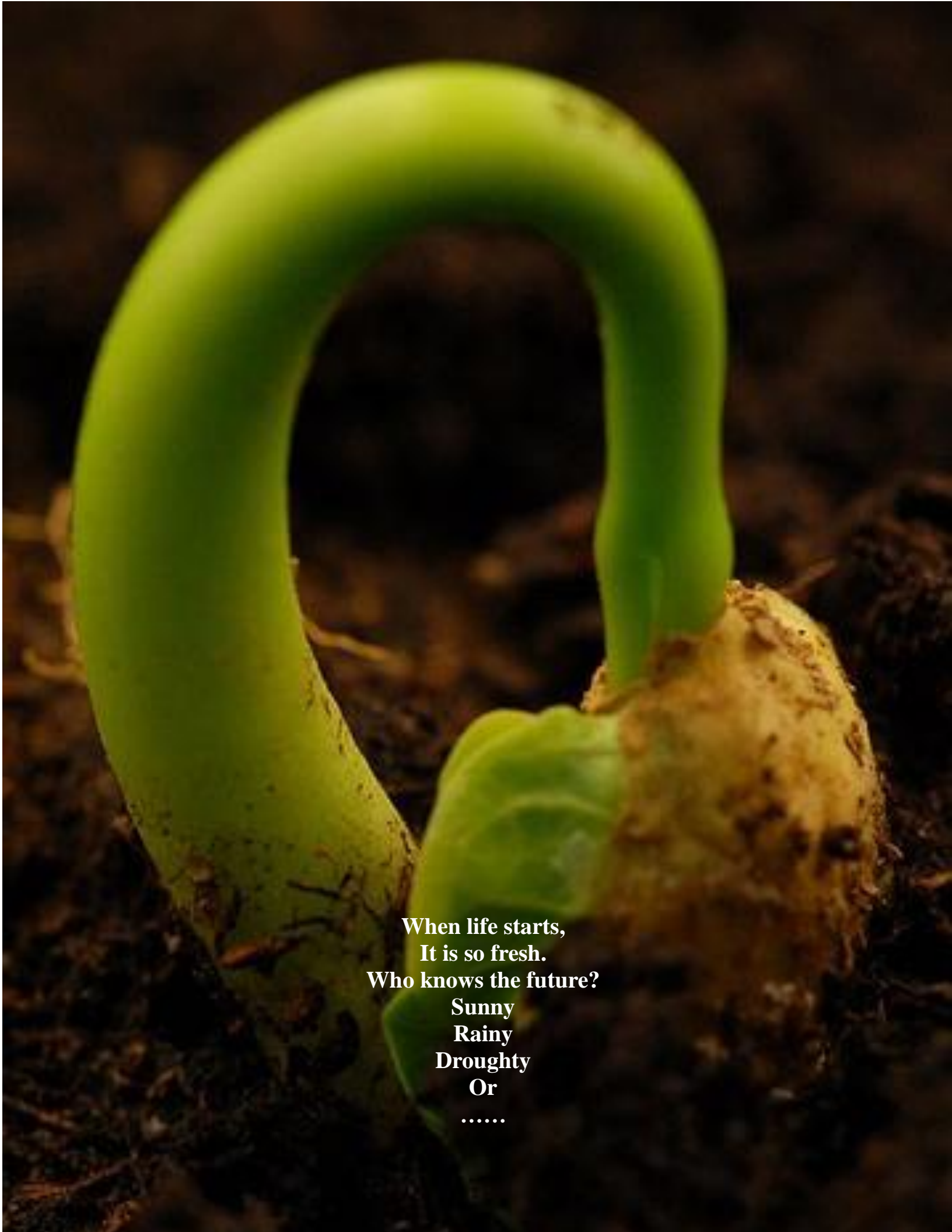
cannot find the missing plane using cutting-edge scientific techniques even we know it was just there, below the deep sea or somewhere else, no matter how far our human being has reached our arms into far outer space. Maybe some day in the future, 10 years, 50 years, 100 years or more, the lost plane would be found occasionally and headlined the would-be

news, which is just the thing we human being can do.

Excuse is always there. If you are out to excuse something, you can always trump up a charge. In this case, the Malaysia government can excuse herself any time if she does not want to pay for the accident because the Malaysian police has invested the pilot for some clues. Could they find any from the already dead guy? For other entities, seeking "reasonable" excuses are not that difficult. The direct one is that "our science knowledge is limited in doing this, we need time".

Undoubtedly, science is science, and the only thing that science can do is making us live better and convenient than ever, and minimizing the damage once the disasters struck. When our ancestors were not yet understand the thundering storm and earthquake, they just escaped from it. For them, the daily work was to hunt and find safety habitat, but never thought about that one day their descendents can fly outside the planet. Today, we modern people know how the thundering storm and earthquake are, but can we avoid them? Only the same thing every day as our forefathers did: escaping and seeking for new safety places for living. Science is marching forward, but the ability and capability of our human being is still limited. The further you advance, the more you do not know.■



A young green plant with a curved stem and a root ball, growing in dark soil. The stem is bright green and arches over the root ball. The root ball is light brown and textured. The background is dark and out of focus.

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



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

MATERIAL

Diamond No Longer Nature's Hardest Material

Diamond will always be a girl's best friend, but it may soon lose favor with industrial drillers. The gemstone lost its title of the "world's hardest material" to man-made nanomaterials some time ago. Now a rare natural substance looks likely to leave them all far behind – at 58% harder than diamond. Zicheng Pan at Shanghai Jiao Tong University, Shanghai, China, and colleagues simulated how atoms in two substances believed to have promise as very hard materials would respond to the stress of a finely tipped probe pushing down on them. The first, wurtzite boron nitride has a similar structure to diamond, but is made up of different atoms. The second, the mineral lonsdaleite, or hexagonal diamond is made from carbon atoms just like diamond, but they are arranged in a different shape. Only small amounts of wurtzite boron nitride and lonsdaleite exist naturally or have been made in the lab so until now no one had realized their superior strength. The simulation showed that wurtzite boron nitride would withstand 18% more stress than diamond, and lonsdaleite 58% more. If the results are confirmed with physical experiments, both materials would be far harder than any substance ever measured. Doing those tests won't be easy, though. Because both are rare in nature, a way is needed to make enough of either of them to test the prediction. Rare mineral lonsdaleite is sometimes formed when meteorites containing graphite hit Earth, while wurtzite boron nitride is formed during volcanic eruptions that produce very high temperatures and pressures. If confirmed, however, wurtzite boron nitride may turn out most useful of the two, because it is stable in oxygen at higher temperatures than diamond. This makes it ideal to place on the tips of cutting and drilling tools operating at high temperatures, or as corrosion resistant films on the surface of a

space vehicle. Paradoxically, wurtzite boron nitride's hardness appears to come from the flexibility of the bonds between the atoms that make it up. When the material is stressed some bonds re-orientate themselves by about 90° to relieve the tension. Although diamond undergoes a similar process, something about the structure of wurtzite boron nitride makes it nearly 80% stronger after the process takes place, says study co-author Changfeng Chen at the University of Nevada, Las Vegas, USA, an ability diamond does not have. Natalia Dubrovinskaya from the University of Heidelberg in Germany has carried out similar research. The more that is understood about what influences the hardness of materials, the more it will become possible to design hard materials to order. However, she



points out that in order to prove the theory, single crystals of each material would be needed. So far there are no known ways to isolate or grow such crystals of either material. Wurtzite Boron Nitride is a new superabrasive material that is manufactured by detonation. It is the next step in the boron nitride generation which includes a well-known superabrasive - cubic boron nitride, as well as, graphite similar in structure - hexagonal boron nitride. This new material has a polycrystalline structure that provides superior cutting properties and, moreover, sharpens itself during cutting. Polycrystalline structure means plenty of crystals are bonded chemically together that work at the same time. In this case the material removal rate and finishing level of the Wurtzite Boron Nitride cannot be compared to even the cutting characteristics of other well-known materials. ■

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10.1103/PhysRevLett.102.055503

PALEONTOLOGY

Mini Longneck Dino Discovered in South America

A long-neck relative of *Apatosaurus* and *Diplodocus* has been discovered in South America, becoming the first of its kind ever found on that continent. Discovered in rock from the Early Cretaceous Period about 140 million years ago, the new dinosaur lived later than its relatives found in Africa, Europe and North America, which hail from the Jurassic, the period before the Cretaceous. At about 30 feet (9 meters) long, the new long-neck is also a relative pipsqueak. Other dinosaurs in this group, the diplodocids, are more than 66 feet (20 m) long, said study researcher Pablo Gallina, a paleontologist at the Universidad Maimonides in Buenos Aires. Gallina and his colleagues excavated the fossil during three trips to Patagonia in 2010, 2012 and 2013. The fossil site is in Argentina's Neuquén province, where the landscape is dry and scrubby, with reddish dirt hills. In the Early Cretaceous, the environment would have been semi-arid, bordering a large desert on the supercontinent of Gondwana, Gallina said. The skeleton is fragmentary, but the researchers were able to use the shape of the animal's vertebrae to determine that it was a new species. They dubbed the dinosaur *Leinkupal laticauda*. In the language of the native Mapuche people of Patagonia, "lein" means "vanishing," and "kupal" means "family." The researchers chose this name because previously discovered diplodocid relatives come from the Jurassic, meaning *L. laticauda* may have been among the last of its line. The second part of the dinosaur's name has meaning, as well. "Lati" comes from the Latin for "wide," and "cauda" from the Latin for "tail." The vertebrae suggest that *L. laticauda* had a very broad, muscular tail, which may have allowed it "remarkable con-



trol and fortitude,” Gallina said. Diplodocids are famed for their long necks and long tails; the earliest discovered specimens came from the rich Jurassic fossil beds in Colorado. They had also been discovered in Africa, which led paleontologists to suspect they lived in South America as well. At the time this group of dinosaurs lived, the two continents were combined into one, called Gondwana. Previous Patagonian fossil finds came from the upper or Late Cretaceous, about 100 million to 66 million years ago. *L. laticauda* is the first dinosaur ever found in the region from the Early Cretaceous, Gallina said. When the bones were first discovered in 2010, they looked unpromising and damaged by erosion. But the paleontologists could find no other bones to excavate, so they began the process of digging out the skeletal fragments. It wasn't until the bones were out of the ground that the researchers began to realize they had something unique on their hands, Gallina said. ■

PLoS One, DOI:
10.1371/journal.pone.0097128

BIOLOGY and INSECTOLOGY

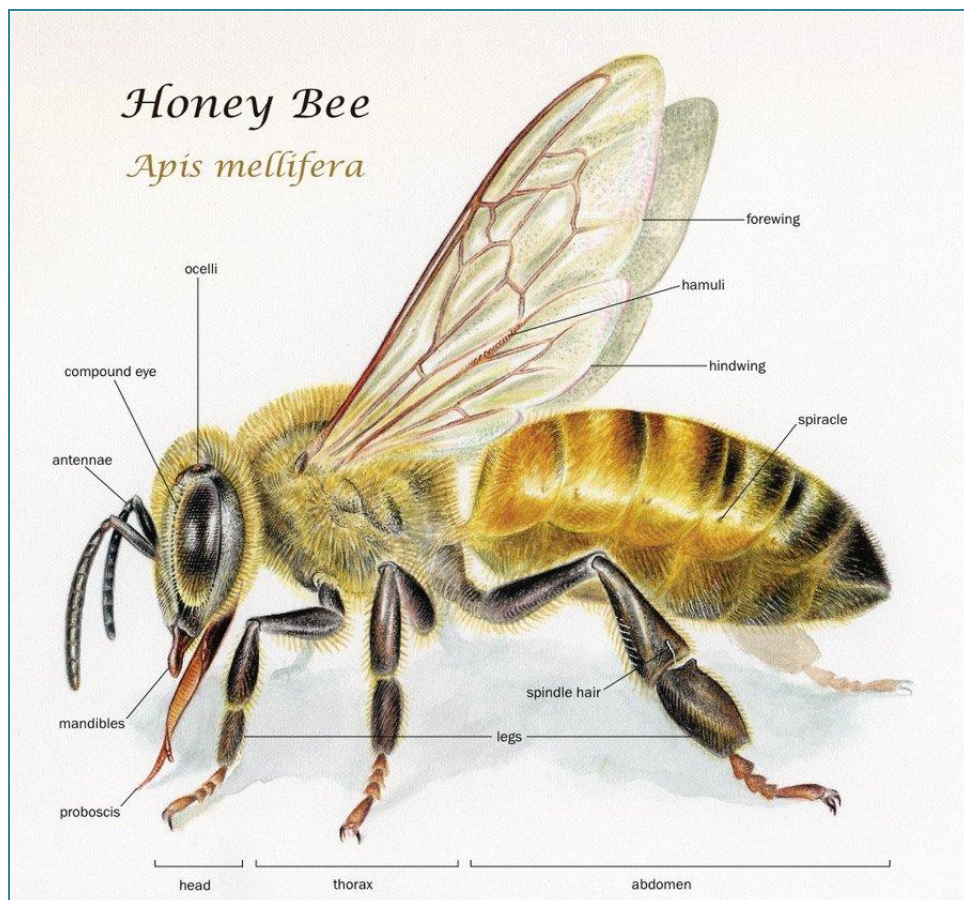
What is Killing the Honeybees!

A new study seems to strengthen the evidence linking pesticides used on

crops to colony collapse disorder in honeybees. Colony collapse disorder, or CCD, is a phenomenon in which honeybees inexplicably disappear from their hives. The bodies of the dead bees are typically never found. Researchers led by Chensheng Lu of Harvard University have pinpointed the collapse of honeybee colonies on a class of pesticides known as neonicotinoids – insecticides that also act as nerve poisons and mimic the effects of nicotine. Scientists specifically looked at how low a dose of two neonicotinoids, imidacloprid and clothianidin, affected healthy bee hives over the course of a winter. The results of the study “reinforce the conclusion that sub-lethal exposure to neonicotinoids is likely the main culprit for the occurrence of CCD,” the authors wrote in their paper, published May 9th, 2014 in the *Bulletin of Insectology*. Colony collapse disorder was first widely reported in America in 2006. Since then, a complex web of factors has been attributed to the mass honeybee die-offs, including everything from disease, parasites, and poor nutrition to the stress of being trucked around the country each year to pollinate different orchards. Many scientists have theorized that a combination of these factors with exposure to pesticides could be causing the CCD phenomenon. In contrast, the new study found that long-term exposure to small

amounts of neonicotinoids wasn't compromising the bees' immune resistance to pathogens. The hives had just as many infections when they weren't exposed to pesticides. This suggests that “neonicotinoids are causing some other kind of biological mechanism in bees that in turn leads to CCD,” scientists said. Three neonicotinoids are currently banned in the European Union, but these pesticides are still widely used in the United States. Most corn planted in the United States, for example, is treated with neonicotinoids. And while bees don't pollinate corn, they are exposed to the chemical since the corn's pollen floats to flowers and other crops nearby. In October 2012, the Harvard team setup 18 hives at three locations in Massachusetts. At each location, four hives were fed high fructose corn syrup laced with neonicotinoids and two were left untouched. Researchers planned to monitor the hives over the winter since that's when the die-outs occur. By the spring of 2013, researchers said half of the colonies treated with pesticides had abandoned their hives – the key symptom of CCD. The ones that were left weren't in good shape. Their honeybee clusters were very small and either lacked queen bees or developing bees, the study said. Only one of the untreated colonies was lost, and in that case the bees' bodies were actually inside their hives and showed symptoms that appeared to be caused by a type of parasite. The new study replicates a previous experiment done by the same group in 2010. In that study, the team only tested imidacloprid and found a higher rate of collapse – 94% of pesticide-treated colonies disappeared. They think the disparity might be related to a colder winter, which stresses the bees and exacerbates the effects of pesticides. It's still not clear what role neonicotinoids play in causing the honeybees to leave their hives during the winter, but the researchers note that it might be related to “impairment of honey bee neurological functions, specifically memory, cognition, or behav-

ior.” It has been previously suggested that neonicotinoids affect the bees' ability to remember how to get back to their hives. The bees get lost, which would explain why beekeepers usually can't locate the dead bodies. The big challenge is that some bee researchers have found several things to gripe about with this study, including the small sample size, which was also a criticism of the initial experiment. At IFLScience.com, entomologist Jake Bova notes that hive abandonment is not a definitive sign of CCD. “Honey bees may abandon their hives for any number of different reasons, and this study doesn't control for any of them.” Other critics have taken issue with the delivery method of the pesticides. In response to the first study, May Berenbaum, head of entomology at the University of Illinois, noted to The Boston Globe that there's been “no evidence of neonicotinoids in commercially available high fructose corn syrup” and that fact “undermines the premise of bees being exposed to pesticides through the food provided by beekeepers.” Cooper also said the authors “do not account for the fact the France still observes CCD each year, even though they banned neonicotinoids 5 years ago.” Objections to the study seem to belie the fact that any research on colony collapse disorder gives much-needed attention to a global crisis that puts us all at risk. One-third of the food we eat depends on



insect pollination, mostly by honeybees that are raised and managed by beekeepers. There is no good replacement for honeybees, which are easy to manage in masses and are unmatched in the variety of crops they can pollinate. Everything from apples and cherries to broccoli, pumpkins, and almonds depends on honeybees. Over the last six years, American beekeepers have lost 30% of their hives each win-

ter on average. Some winter losses are expected, but normally in the 5 to 10% range. The Harvard study comes out just before the United States Department of Agriculture is set to release its annual report of winter honeybee losses. In a media alert, the department said that losses are “expected to be significant due to several contributing factors, including exposure to neonicotinoid pesticides.” ■

Bull Insectol 2014,67:125



Who feeds us?



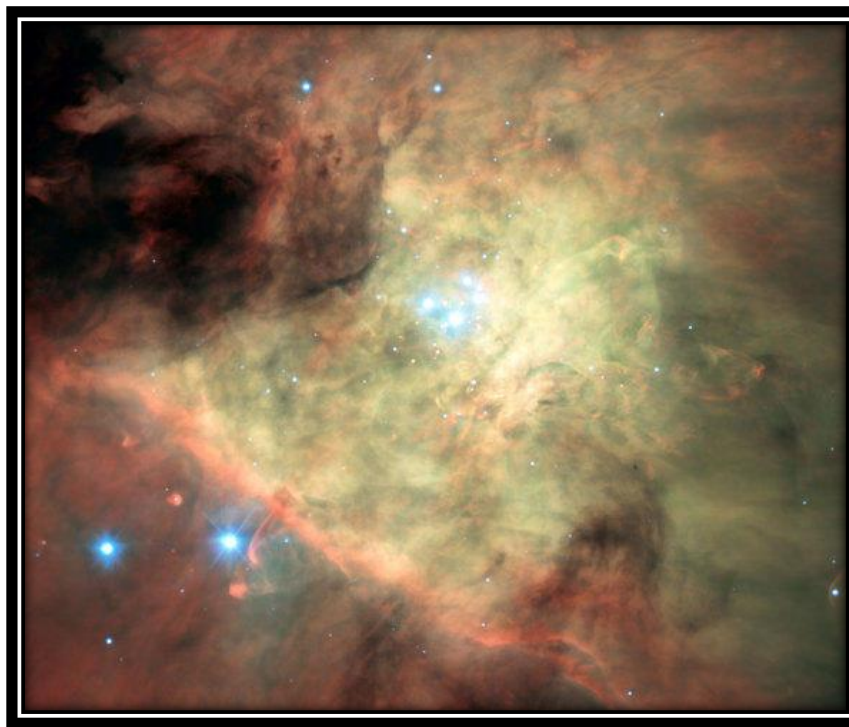
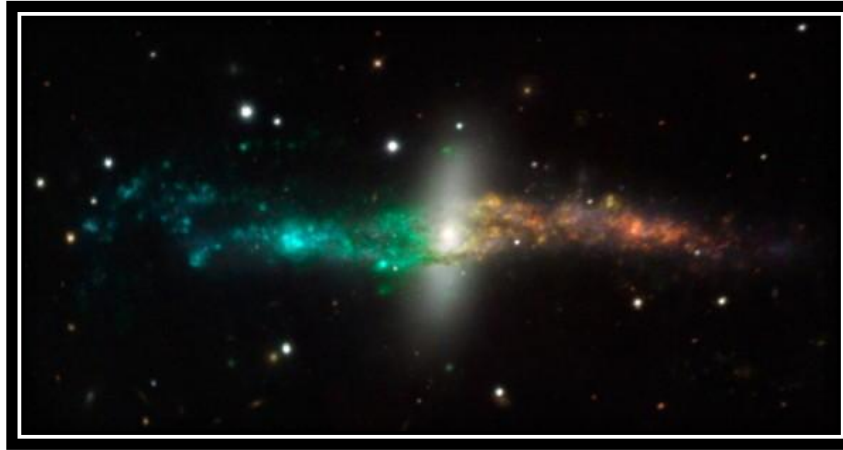
FORTHCOMING ISSUE
06 JUNE 2014



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

3-D Views of the Universe (2014)

By European Southern Observatory



High-Tech Telescope Multi Unit Spectroscopic Explorer (MUSE) Creates 3D Views of the Universe. This mosaic view of the Orion nebula was created using the MUSE spectrograph, which splits the light into its component to reveal the chemical and physical properties of each point. This color composite of the unusual polar ring galaxy NGC 4650A was created from data from the MUSE instrument on ESO's Very Large Telescope in Chile. MUSE uses 24 spectrographs to split light into its component colors (spectra) to assemble images and spectra of different regions of the sky. Studies of these colors can provide insight to astronomers about the composition and movements of various objects. Once the images have been split into a variety of wavelengths, astronomers can move through different views of the object, like a channel surfer tuning into different television channels. ■

Amazing Macro Views of Snowflakes

A SNOWFLAKE is either a single ice crystal or an aggregation of ice crystals which falls through the Earth's atmosphere. They begin as snow crystals which develop when microscopic supercooled cloud droplets freeze. Snowflakes come in a variety of sizes and shapes. Complex shapes emerge as the flake moves through differing temperature and humidity regimes, such that individual snowflakes are nearly unique in structure. Snowflakes encapsulated in rime form balls known as graupel. Snowflakes appear white in color despite being made of clear ice. This is due to diffuse reflection of the whole spectrum of light by the small crystal facets.

Formation of Snowflakes

Snow crystals form when tiny supercooled cloud droplets (about 10 μm in diameter) freeze. These droplets are able to remain liquid at temperatures lower than $-18\text{ }^{\circ}\text{C}$ ($0\text{ }^{\circ}\text{F}$), because to freeze, a few molecules in the droplet need to get together by chance to form an arrangement similar to that in an ice lattice, then the droplet freezes around this "nucleus". Experiments show that this "homogeneous" nucleation of cloud droplets only occurs at temperatures lower than $-35\text{ }^{\circ}\text{C}$ ($-31\text{ }^{\circ}\text{F}$). Once a droplet has frozen, it grows in the supersaturated environment, which is one where air is saturated with respect to ice when the temperature is below the freezing point. The droplet then grows by deposition of water molecules in the air (vapor) onto the ice crystal surface where they are collected. Because water droplets are so much more numerous than the ice crystals due to their sheer abundance, the crystals are able to grow to hundreds of micrometers or millimeters in size at the expense of the water droplets. This process is known as the Wegener-Bergeron-Findeisen process. The corresponding depletion of water vapor causes the droplets to evaporate, meaning that the ice crystals grow at the droplets' expense. These large crystals are an efficient source of precipitation, since they fall through the atmosphere due to their mass, and may collide and stick together in clusters, or

aggregates. These aggregates are usually the type of ice particle that falls to the ground. Guinness World Records list the world's largest (aggregate) snowflakes as those of January 1887 at Fort Keogh, Montana; allegedly one measured 15 inches (38 cm) wide.

Symmetry of Snowflakes

A snowflake often exhibits six-fold radial symmetry. The initial symmetry can occur because the crystalline structure of ice is six-fold. The six "arms" of the snowflake, or dendrites then grow independently, and each side of each arm grows independently. Most snowflakes are not completely symmetric. Since the micro-environment is very nearly identical around the snowflake, each arm can grow in nearly the same way. However, being in the same micro-environment does not guarantee that each arm grows the same; indeed, for some crystal forms it does not because the underlying crystal growth mechanism also affects how fast each surface region of a crystal grows. Empirical studies suggest less than 0.1 per cent of snowflakes exhibit the ideal six-fold symmetric shape.

Uniqueness of Snowflakes

You cannot find two snowflakes are alike. Although possible, it is very unlikely for any two randomly selected snowflakes to appear exactly alike due to the many changes in temperature and humidity the crystal experiences during its fall to earth. Initial attempts to find identical snowflakes by photographing thousands of them with a microscope from 1885 onward by Wilson Alwyn Bentley found the wide variety of snowflakes we know about today. In 1988, Nancy Knight was documenting snowflakes for the National Center for Atmospheric Research and found two identical snowflakes of the hollow column type, though it was subsequently clarified that the snowflakes were, with near certainty, distinct at the atomic level. ■



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