Dramatic climate swings likely

DRAMATIC climate swings behind both last year's Pakistan flooding and this year's Queensland floods in Australia are likely to continue as the world gets warmer, scientists predict.

Researchers at the Universities of Oxford and Leeds have discovered that the El Niño Southern Oscillation (ENSO), the sloshing of the warmest waters on the planet from the West Pacific towards the East Pacific every 2-7 years, continued during Earth's last great warm period, the Pliocene.

Their results suggest that swings between the two climatic extremes, known as El Niño and La Niña, may even have occurred more frequently in the warmer past and may increase in frequency in the future. Extreme ENSO events cause droughts, forest fires and floods across much of the world as well as affecting fishery production.

Reporting in the journal Paleoceanography, the team of geochemists and climate modellers use the Pliocene as a past analogue and predictor of the workings of Earth's future climate.

The Pliocene (which lasted from 5 to 3 million years ago) had carbon dioxide levels similar to the present day, with global mean temperatures about 2-3ºC higher, so it is a useful test-ground for climate research.

Flooded road in Queensland, Australia

Lead Scientist Nick Scroxton from Oxford University's Department of Earth Sciences said: 'We know from previous studies that the mean state of the Pacific during the warm Pliocene was similar to the climate patterns observed during a typical El Niño event that we see today.

'However, until recently it was believed that a warmer Pacific would reduce the climate swings that cause the dramatic weather extremes throughout the region leading to a permanent state of El Niño. What we didn't expect was that climatic variability would remain strong under these warmer conditions.'

The team combined experiments performed on the Met Office Hadley Centre climate model, HadCM3, with the analysis of the chemical composition of lots of individual shells of small organisms, known as foraminifera.

These were collected from a deep sea sediment core in the East Equatorial Pacific, and provided a record of temperature in the upper layer of the ocean through time. They discovered that the range of temperatures experienced by these organisms during the Pliocene, was higher than what would be expected from just the seasonal cycle.

The extra variation in temperature can be explained by the additional extreme temperature swings provided by the El Niño/La Niña system.

The authors say the agreement in findings from both ocean data and modelling leaves little doubt that ENSO will persist in a warmer world. Earlier this year a team from Japan studying corals from the same period showed climatic variability in the western Pacific on a similar scale to today, questioning the idea of a permanent El Niño during the Pliocene.

This new study goes further, showing that the oscillation is Pacific-wide, and is likely to be caused by the El Niño/La Niña. This suggests that our warmer future will continue to be dogged, maybe even more regularly, by extreme climatic events.

Source: Science Daily

MATH MYTHS

Great math minds

DEBASHISH CHAKRABARTY


Ramanujan, another math prodigy

MANY of the mathematical legends have become a part of history; others are history in the making. Pappus ("old man") of Alexandria is the nameless giant and last of the ancient geometricians. Charles Babbage was the last of the Industrial Revolution mathematics machine-makers. Who, after watching "A beautiful mind" will ever forget the story of John Forbes Nash, Jr. battling his paranoid schizophrenia, not with pills but with logic and his winning a Nobel Prize in Economic Science? And then there are the truly monumental life sagas of the largely unknown like Srinivasa Ramanujan, Jakow Trachtenberg, Andrew Wiles and Grigori Perelman.

A young, self-taught Ramanujan, set sail for England in a merchant ship in 1914 just before the outbreak of WWI and became the first Indian to be elected a Fellow of Trinity College, Cambridge just before the war's end in 1918. Trachtenberg, imprisoned for 7 years in Nazi concentration camps, without pen or paper, worked mentally and developed speed arithmetic.The mathematics professor Wiles kept a 7 year-secret, working in recluse day and night and finally proved the 17th Century Fermat's Last Theorem in 1994. Perhaps most mysterious of them all is Perelman, the Russian genius who posted a series of eprints to the free arXiv server in 2002, that proved the 1904 Poincaré Conjecture. He continues to live in poverty refusing the $1,000,000 Clay Millennium Prize awarded to him. Each of their stories is so impressive that each one should be made into a movie. Then there are the legends we ourselves create. We all have our personal heroes and heroines. Each of them is a true legend.

And then there are the math myths. We are surrounded by many inspiring minds but the myths seem to linger on. Many have tried to dispel them. Paul Halmos, a Hungarian-born American mathematician. At the University of Connecticut's Gallery of Mathematicians, his portrait shares a wall with other great wizards such as Archimedes, Descartes, Euclid, Galileo and Newton. Not bad, at all. But I can hear you saying, "Who the hell was he"? Heard of Q.E.D. ("quod erat demonstrandum")? It's what mathematicians write at the end of proof. The more common end- of-proof mark is "?" which is Unicode symbol U+220E also known as "the Halmos". He made fundamental advances in the areas of probability theory, statistics, Hilbert spaces and algebraic structure of mathematics and won medals for his ability to communicate mathematics. His "I Want to Be a Mathematician: An Automathography" is well worth a read.

The writer studies at Dept. of Computer Science and Engineering BRAC University.

FOODCHAIN AT RISK

Vanishing top predators


A healthy coral reef ecosystem with sharks off Jarvis Island, an uninhabited island located in the South Pacific Ocean

THE loss of top predators, such as lions, wolves and sharks, is causing unpredictable changes to food chains around the world, according to a review written by 24 scientists.

These animals, called apex predators, play a crucial role in ecosystems, and their disappearance often due to hunting by humans and loss of habitat can lead to changes in vegetation, wildfire frequency, infectious diseases, invasive species, water quality and nutrient cycles, according to the authors led by James Estes, a professor of ecology and evolutionary biology at the University of California, Santa Cruz.

"The loss of apex consumers is arguably humankind's most pervasive influence on the natural world," the researchers conclude in a review published in the July 15 issue of the journal Science which examined findings from studies of ecosystems on land, in freshwater and in the ocean. [Images of These Predators]

The loss of these predators at the top of the food chain causes a cascade of effects down the line. The authors cite many examples, such as the decimation of wolves, which have since been reintroduced in Yellowstone National Park, led to over-browsing of vegetation by elk. The loss of lions and leopards in parts of Africa has led to changes in olive baboon populations and increased their contact with humans, which, in turn, has caused higher rates of intestinal parasites in both people and baboons.

"Predators have a huge structuring influence," said author Stuart Sandin of Scripps Institution of Oceanography at the University of California, San Diego, who has studied sharks' role in coral reef ecosystems. "When you remove them you change the biology, which is typically profound and complex. And in many cases it's not necessarily predictable."

Source: Live Science

GONE TO SEED!

Tale of the flying reptile

OBAIDUR RAHMAN

SINCE the time this blue planet became a warm-habitable rest for life, countless of species roamed this planet in such grandeur that this 3rd planet from the Sun practically became a celebration of life and all the spectacles of existence. As if one species was more spectacular than the other and the splendor of this is still being discovered and rediscovered today. And the most recent of which is the finding that Pterosaurs, the ancient flying reptiles from the Jurassic time, were not driven to extinction by birds, as previously thought. In fact, according to the latest information, the ancient "winged lizard" continued to thrive and diversify for millions of years afterwards the arrival of birds, by eating seeds instead of meat which practically cost them their teeth!

Published in the July 6th edition of the Journal of Systematic Paleontology, researcher Katy Prentice of University of Bristol, in her study, revealed that the mighty pterosaurs evolved in a most unusual way, which made them more and more particular through their 160 million years of reign here on Earth. But before getting into details, few words in the honor of pterosaurs are in order. To be simple, Pterosaurs were the flying reptiles that existed from the late Triassic to the end of the Cretaceous Period (220 to 65.5 million years ago) and they remain the earliest vertebrates (species with backbones) known to have evolved to master the art of flight. And much like their cousins the dinosaurs, pterosaurs stand out as one of evolution's great success stories and since they were uncontested in the air. Also, pterosaurs populated in all continents and evolved into a vast array of shapes and sizes. And with more than 120 named species, the smallest pterosaur measured no bigger than a sparrow; the largest reached a wingspan of nearly 40 feet (12 meters), wider than an F-16 fighter.

This recent work from the University of Bristol states that pterosaurs remained conventional for 70 million years, and then started to experiment with all kinds of new modes of life. This conclusion came after Prentice and her colleagues studied 50 different pterosaur species ranging from the giraffe-sized Quetzalcoatlus, which had a wingspan of 39 feet (12 meters) to a pterosaur, sizing to that of a blackbird. And these ancient creatures strolled across ancient grasslands preying on small dinosaurs as snacks just as a modern-day crane might target frogs and toads. This finding also tells that the pterosaurs became three times as diverse 125 million years ago than they were before birds evolved and were not pushed to extinction, as suggested, by earlier studies. It must be mentioned here that the birds, based on fossil and biological evidence, are a specialized subgroup of theropod dinosaurs. And according to this recent study, the pterosaurs responded to the new flyers by becoming larger and trying out new lifestyles and many of the new lifestyle adaptations were seen in the pterosaurs skulls, as they adapted to feed on different food sources. Some became seed-eaters, many ate fish, and later ones even lost their teeth, as discussed earlier. It was also found that the rest of the body also showed a surprising amount of variation between different groups, when considering that the body forms have to retain many features to allow flight.

In the words of Katy Prentice, "Usually, when a new group of animals or plants evolves, they quickly try out all the options. Pterosaurs were the first flying animals -- they appeared on Earth 50 million years before Archaeopteryx, the first bird -- and they were good at what they did. But the amazing thing is that they didn't really begin to evolve until after the birds had appeared." In the ancient of times the two groups divided up the aerial eco-space between them and continue to co-exist by avoiding any sort of conflicts. It is believed that the reign of Pterosaurs departed some 65 million years during the mass extinction that killed the dinosaurs.

The contiributor is a freelance science writer.


Pterosaurs were the flying reptiles that existed from the late Triassic to the end of the cretaceous period (220 to 65.5 million years ago).

EDITING GENOME

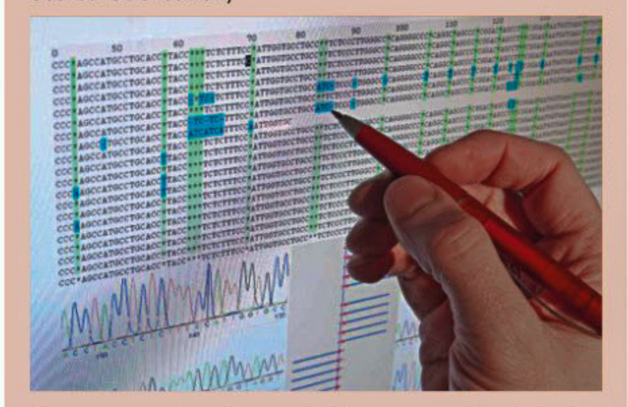
Rewriting life's code

THE power to edit genes is as revolutionary, immediately useful and unlimited in its potential as was Johannes Gutenberg's printing press. And like Gutenberg's invention, most DNA editing tools are slow, expensive, and hard to use -- a brilliant technology in its infancy. Now, Harvard researchers developing genome-scale editing tools as fast and easy as word processing have rewritten the genome of living cells using the genetic equivalent of search and replace -- and combined those rewrites in novel cell strains, strikingly different from their forebears.

"The payoff doesn't really come from making a copy of something that already exists," said George Church, a professor of genetics at Harvard Medical School who led the research effort in collaboration with Joe Jacobson, an associate professor at the Media Lab at the Massachusetts Institute of Technology. "You have to change it -- functionally and radically."

Such change, Church said, serves three goals. The first is to add functionality to a cell by encoding for useful new amino acids. The second is to introduce safeguards that prevent cross-contamination between modified organisms and the wild. A third, related aim, is to establish multi-viral resistance by rewriting code hijacked by viruses. In industries that cultivate bacteria, including pharmaceuticals and energy, such viruses affect up to 20 percent of cultures. A notable example afflicted the biotech company Genzyme, where estimates of losses due to viral contamination range from a few hundred million dollars to more than $1 billion.

Source: Science Daily


Genome-engineering technologies capable of fundamentally re-engineering genomes from the nucleotide to the megabase scale unveiled

GALACTIC TWIST

New spin on antimatter


Source: Live Science

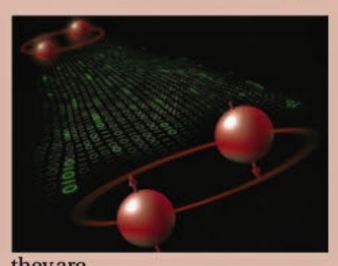
The puzzling prevalence of matter over antimatter in the universe might be related to the bizarre space-time stretching caused by our galaxy's spin, a new study suggests.

Though the universe today is almost completely made of matter, scientists don't understand why. The Big Bang that created the cosmos 13.7 billion years ago should have produced equal parts matter and antimatter, which would have annihilated, leaving the universe barren of either. Luckily, it didn't (hence the Earth and the life it supports are here).

To what we owe our good fortune, physicists haven't much of an idea. But a new study that takes the spinning of our galaxy into account could point the way.

DID YOU KNOW?

What is entanglement?



Entanglement is a term used in quantum theory to describe the way that particles of energy/matter can become correlated to predictably interact with each other regardless of how far apart they are.

Particles, such as photons, electrons, or qubits that have interacted with each other retain a type of connection and can be entangled with each other in pairs, in the process known as correlation. Knowing the spin state of one entangled particle - whether the direction of the spin is up or down - allows one to know that the spin of its mate is in the opposite direction.