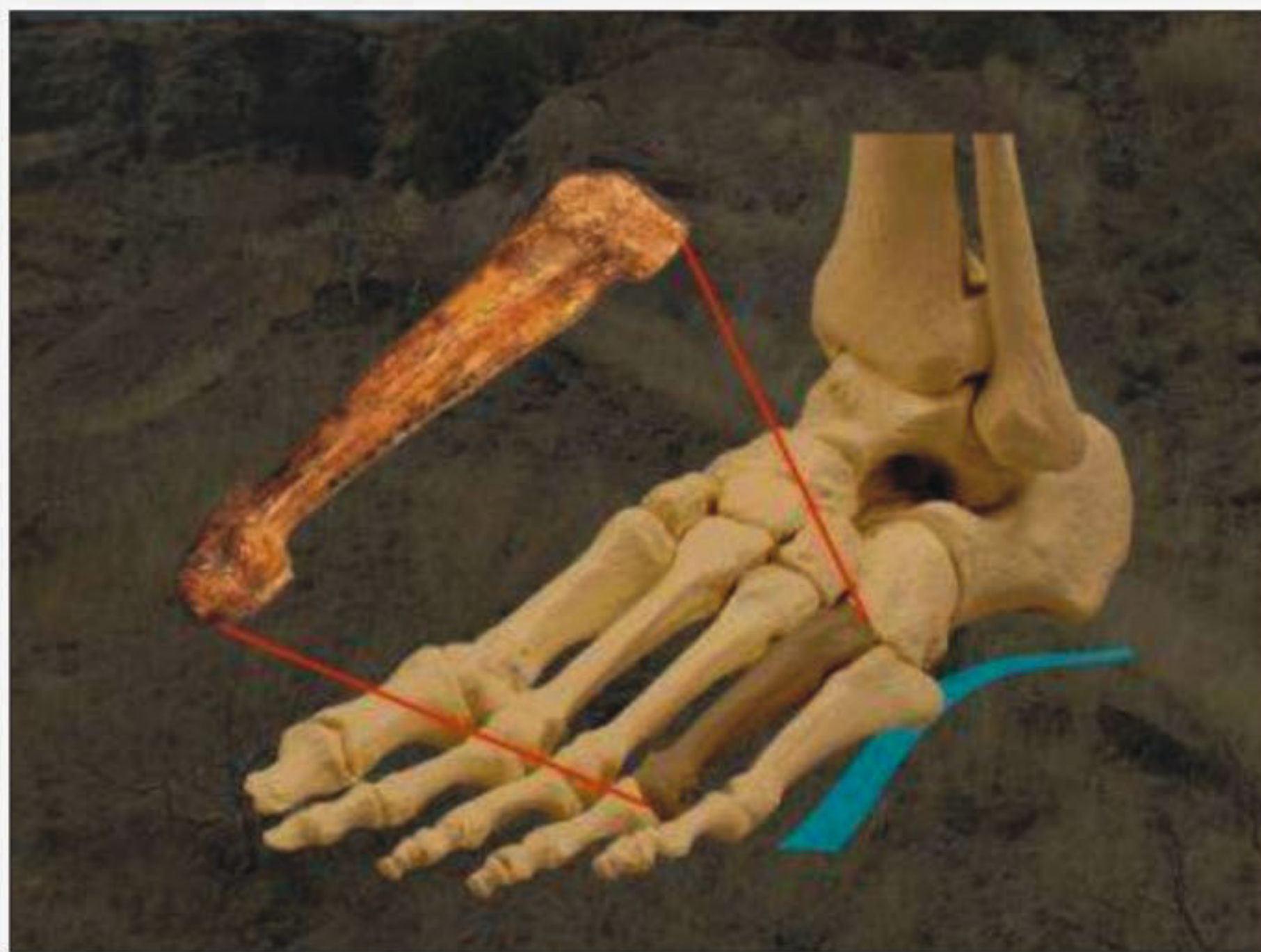


# New view of human evolution!

A fossilized foot bone recovered from Hadar, Ethiopia, shows that by 3.2 million years ago human ancestors walked bipedally with a modern human-like foot, a report that appears Feb. 11 in the journal *Science*, concludes. The fossil, a fourth metatarsal, or midfoot bone, indicates that a permanently arched foot was present in the species *Australopithecus afarensis*, according to the report authors, Carol Ward of the University of Missouri, together with William Kimbel and Donald Johanson, of Arizona State University's Institute of Human Origins.

The research helps resolve a long-standing debate between paleoanthropologists who think *A. afarensis* walked essentially as modern humans do and those who think this species practiced a form of locomotion intermediate between the quadrupedal tree-climbing of chimpanzees and human terrestrial bipedalism. The question of whether *A. afarensis* had fully developed pedal, or foot, arches has been part of this debate. The fourth metatarsal described in the *Science* report provides strong evidence for the arches and, the authors argue, support a modern-human style of locomotion for this species. The specimen was recovered from the Hadar locality 333, popularly known as the "First Family Site," the richest source of *A. afarensis* fossils in eastern Africa, with more than 250 specimens, representing at least 17 individuals, so far known.

"This fourth metatarsal is the only one known of *A. afarensis* and is a key piece of evidence for the early evolution of the uniquely human way of walking," says



This image shows the position of the fourth metatarsal *Australopithecus afarensis* (AL 333-160) recovered from Hadar, Ethiopia, in a foot skeleton

Kimbel. "The ongoing work at Hadar is producing rare parts of the skeleton that are absolutely critical for understanding how our species evolved."

Humans, uniquely among primates, have two arches in their feet, longitudinal and transverse, which are composed of the midfoot bones and supported by muscles in the sole of the foot. During bipedal locomotion, these arches perform two critical functions: leverage when the foot pushes off the

ground and shock absorption when the sole of the foot meets the ground at the completion of the stride. Ape feet lack permanent arches, are more flexible than human feet and have a highly mobile large toe, important attributes for climbing and grasping in the trees. None of these apelike features are present in the foot of *A. afarensis*.

"Understanding that the foot arches appeared very early in our evolution shows that the unique structure of our feet is funda-

mental to human locomotion," observes Ward. "If we can understand what we were designed to do and how natural selection shaped the human skeleton, we can gain insight into how our skeletons work today. Arches in our feet were just as important for our ancestors as they are for us."

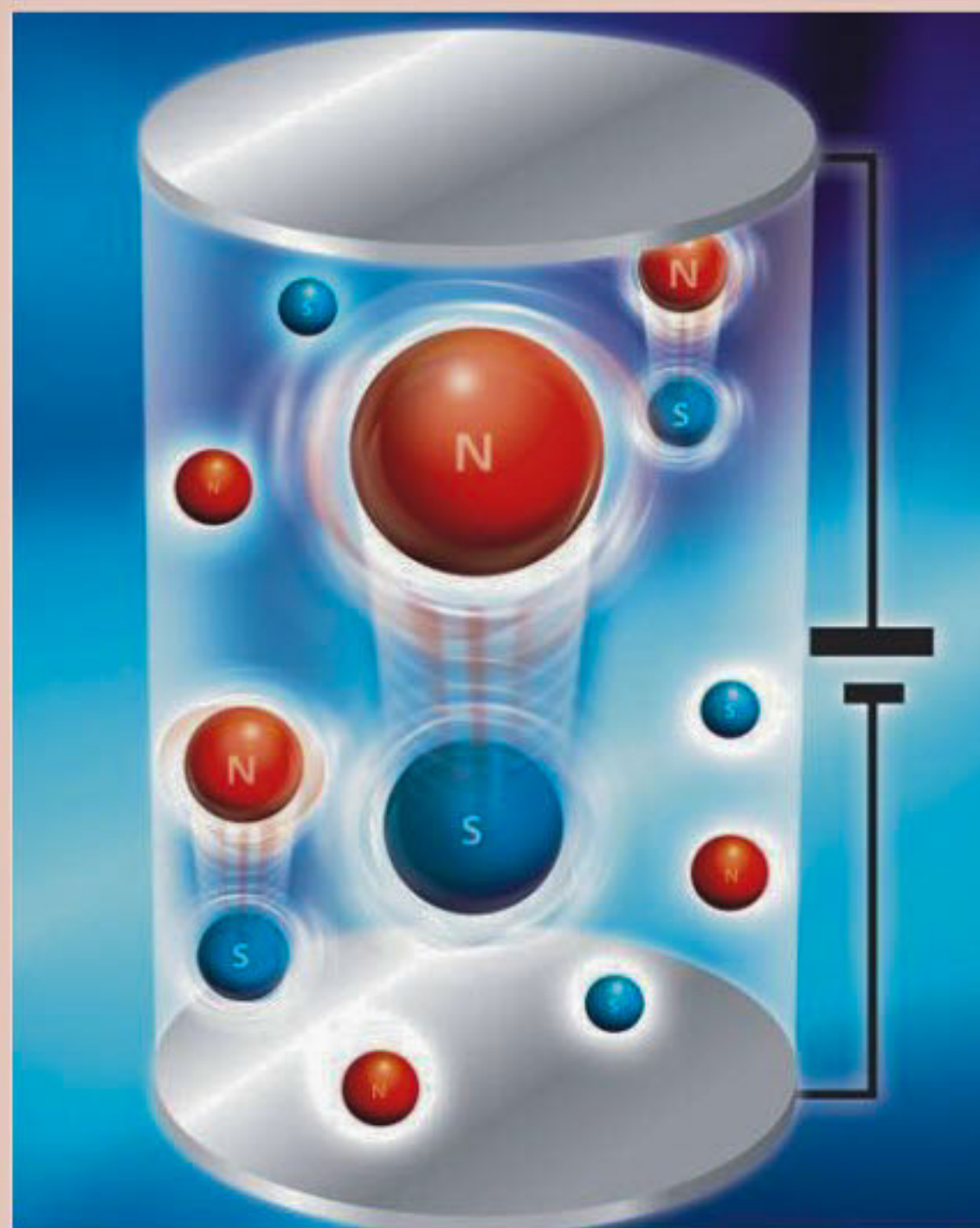
This species, whose best-known specimen is "Lucy," lived in eastern Africa 3.0-3.8 million years ago. Prior to *A. afarensis*, the species *A. anamensis* was present in Kenya and Ethiopia from 4.2 to 4.0 million years ago, but its skeleton is not well known. At 4.4 million years ago, Ethiopia's *Ardipithecus ramidus* is the earliest human ancestor well represented by skeletal remains. Although *Ardipithecus* appears to have been a part-time terrestrial biped, its foot retains many features of tree-dwelling primates, including a divergent, mobile first toe. The foot of *A. afarensis*, as with other parts of its skeleton, is much more like that of living humans, implying that by the time of Lucy, our ancestors no longer depended on the trees for refuge or resources.

The Hadar project is the longest running paleoanthropology field program in the Ethiopian rift valley, now spanning more than 38 years. Since 1973, the fieldwork at Hadar has produced more than 370 fossil specimens of *Australopithecus afarensis* between 3.4 and 3.0 million years ago -- one of the largest collections of a single fossil hominin species in Africa -- as well as one of the earliest known fossils of *Homo* and abundant Oldowan stone tools (ca. 2.3 million).

Source: Science Daily



## POLAR OPPOSITES



Currents of magnetricity are born when north poles and south poles split up and move around independently

## MAGNETRICITY Electricity's sister!

A team of physicists in England has created magnetic charges isolated north and south magnetic poles and induced them to flow in crystals no bigger than a centimeter across. These moving magnetic charges, which behave almost exactly like electrical charges flowing through batteries and biological systems, could one day be useful in developing "magnetronic" devices though what such devices would do is anybody's guess.

In magnets, poles always come in pairs. No matter how many times you cut a magnet in half, down to the atoms themselves, each piece will always have a north and a south, a dipole.

But the magnetic molecules that make up a crystalline material called spin ice are arranged in triangular pyramids that prevent them from lining up comfortably with all of their poles pointing in the same direction. In an awkward compromise, each pyramid tends to have two magnets pointing inward and two pointing outward. In 2009 Steven Bramwell of the University College of London found that sometimes a molecule squirms and flips. Two poles, a north and a south, are born. The molecule itself stays put, but these ghostly poles, which aren't actually attached to a physical object, can move around independently of each other as chain reactions of flipping molecules carry them from pyramid to pyramid.

"Eventually they get so far apart that they lose all memory of each other," says Bramwell. "The dipole splits in half and becomes two monopoles."

Source: Science News



## IT'S IN THE PSYCHE

### Making of a dictator

Famously sadistic dictators like Saddam Hussein and Joseph Stalin share a personality profile marked by narcissism and paranoia, political psychologists say. But what of authoritarian-style dictators like Hosni Mubarak? Could an ordinary, well-meaning person turn into a repressive despot?



Egypt's toppled tyrant

Perhaps not overnight, but power does have an effect on the psyche, according to psychological research. The most famous example is the 1971 Stanford Prison Experiment, in which students were randomly assigned to be either "prisoners" or "guards" in a makeshift "prison." The guards became so abusive, and the prisoners so passive, that the experiment was shut down after less than a week.

Extremes aside, more mundane sorts of power can also influence behavior. A 2010 study published in the journal *Psychological Science* found that people primed to think of themselves as well-off were worse at reading other people's emotions than people primed to think of themselves as poor. The reason, said study co-author Dacher Keltner of the University of California-Berkeley, may be that people without much power need to build alliances with one another to get by. People in charge, on the other hand, can do what they please.

It may also isolate you from others. A 2006 study, also published in *Psychological Science*, used an unusual method to demonstrate this phenomenon: The researchers had participants draw a letter "E" on their foreheads. First, though, the volunteers were primed to think of themselves as either more or less powerful. The more powerful group was three times more likely to draw the "E" on their forehead so that it would be backwards to others. The implication, the researchers reported, is that powerful people become more self-oriented and care less about the perspectives of others.

A third study, this one published in 2009 in *Psychological Science*, found that people trained to think of themselves as powerful were more likely to believe they had control over a situation even when they were participating in a random activity such as rolling dice.

Source: Live Science



## TAKING A SPIN



## HOPEFUL 54

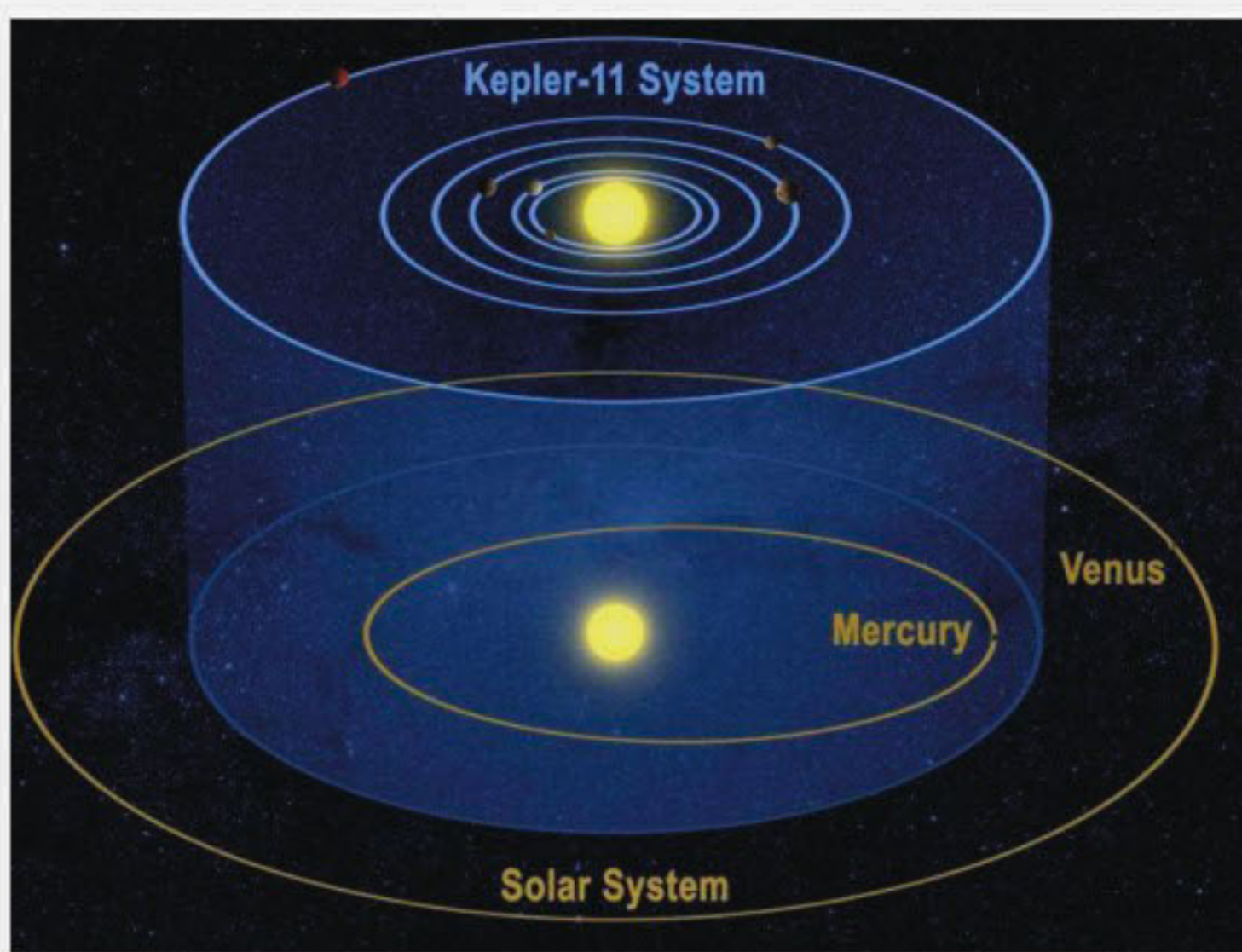
# Habitable exoplanets

OBAIDUR RAHMAN

NASA'S Kepler Spacecraft Telescope (KST) which was launched on 06 March 2009 with the objective of discovering Earth-like planets orbiting other stars in the constellations of Cygnus and Lyra. And on 02 February 2011, scientists from NASA announced that they have discovered with the aid of KST 54 new exoplanets (planets outside our solar system) where conditions are hospitable to extra-terrestrial life-forms! That means those 54 exoplanets are in the Goldilocks Zone, the region in a planetary system where the distance from a star and its orbiting planet is just right to maintain liquid water on its surface.

Using a "transiting" technique, Kepler spacecraft's ultra-precise photometer measures the tiny decreases in a star's brightness that occurs every time a planet that crosses in front of its host star. And with the aid of such mechanism, KST so far, have identified more than 1,200 planets (and counting) and of these 68 are approximately the size of the Earth, while 288 are super-Earth-sized; 662 are Neptune-sized, 165 are the size of Jupiter and 19 are larger than Jupiter. And of the 54 new planets that are thought to be in the habitable zone, five are about the size of Earth while the remaining 49 habitable zone candidates range from super-Earth sized (up to twice the size of Earth) to larger than Jupiter. And all these discoveries are the result of the observational studies conducted by NASA scientists between 12 May 12 and 17 Sept 2009, scanning more than 156,000 stars in KST's field of view, which basically covers 1/400 of the sky. According to Dr. William Borucki, head of Kepler's science program at NASA's Ames Research Center, "The fact that we've found so many planet candidates in such a tiny fraction of the sky suggests there are countless planets orbiting sun-like stars in our galaxy. We went from zero to 68 Earth-sized planet candidates and zero to 54 candidates in the habitable zone, some of which could have moons with liquid water". Along with this discovery, KST also identified a six-planet alien solar system, a significant astronomical finding,

around the star system Kepler-11, which is 2,000 light-years from our very own Earth. Although the discovery of these 54 planets is exciting however, just because they are in the habitable zone that does not mean these planets are teeming with life-forms. Detailed study of the proper size, composition, temperature, atmospheric conditions of the exoplanets and much more are in order to ensure the fact that these planets house either microbial extra-terrestrial life forms or advanced civilization like ours and to even much more. Having said that, it is unanimously agreed that such discovery is truly a profound one and in the words of Charles Bolden, NASA administrator, "In one generation we have gone from extraterrestrial planets being a mainstay of sci-



This artist's conception shows the Kepler-11 planetary system and our solar system from a tilted perspective

ence fiction, to the present, where Kepler has helped turn science fiction into today's reality. These discoveries underscore the importance of NASA's science missions, which consistently increase understanding of our place in the cosmos".

The contributor is a freelance science writer



## MOOD CHANGE



## DID YOU KNOW?

### Chemical that drives squid mad



Longfin squid

A newfound chemical drives male squid berserk, and the molecule appears similar to ones seen in humans, scientists now say.

Future research might investigate whether comparable human semen proteins have similar effects, investigators added. Scientists investigated the longfin squid (*Loligo pealeii*), which live for nine to 12 months, usually mating and laying eggs in the spring, when the animals migrate from deep offshore waters to shallower waters along the Eastern Seaboard from North Carolina to Maine. Females mate several times with multiple males, who compete fiercely over females. While in the field, scientists noticed that male squid were visually attracted to the tens of thousands of eggs laid on the seafloor. After just one touch of the eggs with their arms or heads, the researchers found that males immediately and dramatically went from swimming calmly to extreme aggression, including grappling, fin beating and forward lunging. The culprit appears to be a single protein, a pheromone found on the outside surface of egg capsules. Coming in contact with this molecule will typically cause males to battle with other males, apparently in an attempt to get at females, even when females are not around.

Source: Live Science

### How can we foretell earthquake?



however, still inexact; the Chinese have failed to predict several earthquakes since 1975, but they have advanced the science of earthquake prediction.

We now know that small tremors (foreshocks) often occur before a larger movement. Changes also occur in the electric and magnetic properties of rocks, and growing tension often causes swellings and cracks in the ground. When rocks crack, a radioactive gas, radon, is often released. Radon dissolves in water and so, if the radon content in well water builds up, an earthquake may be on the way.