



COUNTING FIREFLIES

Super-Earths in two flavours



Astronomers suggest the super-Earths and sub-Neptunes might fall into two different density classes

NOW that known exoplanets have become almost as numerous as fireflies on a midsummer's eve, two top planet-finding missions are starting to disagree over the abundance of low-mass planets that are heavier than Earth but smaller than Neptune.

The Swiss-led HARPS mission suggests that between 30 and 50 percent of sunlike stars in the solar neighborhood host super-Earths and sub-Neptunes. Meanwhile, NASA's Kepler mission is finding that these planets circle roughly 15 percent of the stars in its far-flung field of view.

That discrepancy is of great interest to astronomers, because the number of planets in the weight class just above Earth hints at how many bodies of terrestrial proportions are likely to be discovered.

But there may not be a discrepancy at all.

"We know the Geneva team does a good job observing, and they have a good technique. And we know the Kepler telescope is working beautifully. So we wanted to see if there was a plausible, believable way in which you could have the difference between those two surveys," says Greg Laughlin, an astronomer at the University of California, Santa Cruz. In a paper posted online August 30 at arXiv.org, he and U.C. Santa Cruz graduate student Angie Wolfgang propose that there are two kinds of low-mass planets out there, one of which is more amenable to discovery by HARPS.

Laughlin and Wolfgang created a simulation based on the HARPS data. In it, they created a population of planets between one and 17 Earth-masses around the more than 100,000 stars being monitored by Kepler. Giving those virtual planets varying characteristics and orbital periods between one and 50 days, the researchers then asked whether simulated planet populations could reproduce the Kepler observations. The answer was "yes."

Source: Science News



NOT JUST TRASH

Plastic bottles to mitigate arsenic

CHOPPED up plastic bottles covered in a common chemical may be a simple and inexpensive method for removing arsenic from drinking water.

A team of chemists at Monmouth University, United States, found that bits of plastic coated with cysteine, a common molecule found in foods, bind to arsenic.

"Laboratory experiments have shown that the method has the potential to be very efficient and very cost effective," Tsanangurayi Tongesayi, lead author of the study and an assistant professor at the university told SciDev.Net.

"The method uses plastics which are cheap and locally available," he added. "[It] is eco-friendly because it involves recycling of plastic bottles [and] is also safe because the chemical ingredients used are not toxic."

In Bangladesh alone some 35 million people are exposed to arsenic contamination from drinking water, according to the Department of Public Health Engineering (DPHE), and estimates say around 100 million in the developing world are affected.

Arsenic has been linked to a variety of health problems from stomach pains and blindness to various cancers one in five deaths in Bangladesh has been linked to arsenic exposure.

Tongesayi presented his team's findings last week (31 August) at the annual meeting of the American Chemical Society. The researchers showed that the method can reduce the arsenic content from 20 parts per billion (ppb) two times higher than the safe standard set by the US Environmental Protection Agency for drinking water to 0.2 ppb.

Tongesayi said they were now looking for a commercial partner to scale up the process.

But Guy Howard, the UK Department for International Development's Research and Evidence Representative in South Asia, said: "Simply looking for a commercial partner is not the key to scaling up". The technology first has to be shown to work in field conditions, which may vary a lot and where other chemical species compete with arsenic for adsorption sites, he said.

Source: SciDev.net



The method uses cheap, locally available plastics, coated with a chemical

Gold comes from meteors?

ULTRA high precision analyses of some of the oldest rock samples on Earth by researchers at the University of Bristol provides clear evidence that the planet's accessible reserves of precious metals are the result of a bombardment of meteorites more than 200 million years after Earth was formed.

The research is published in Nature.

During the formation of Earth, molten iron sank to its centre to make the core. This took with it the vast majority of the planet's precious metals -- such as gold and platinum. In fact, there are enough precious metals in the core to cover the entire surface of Earth with a four-metre thick layer.

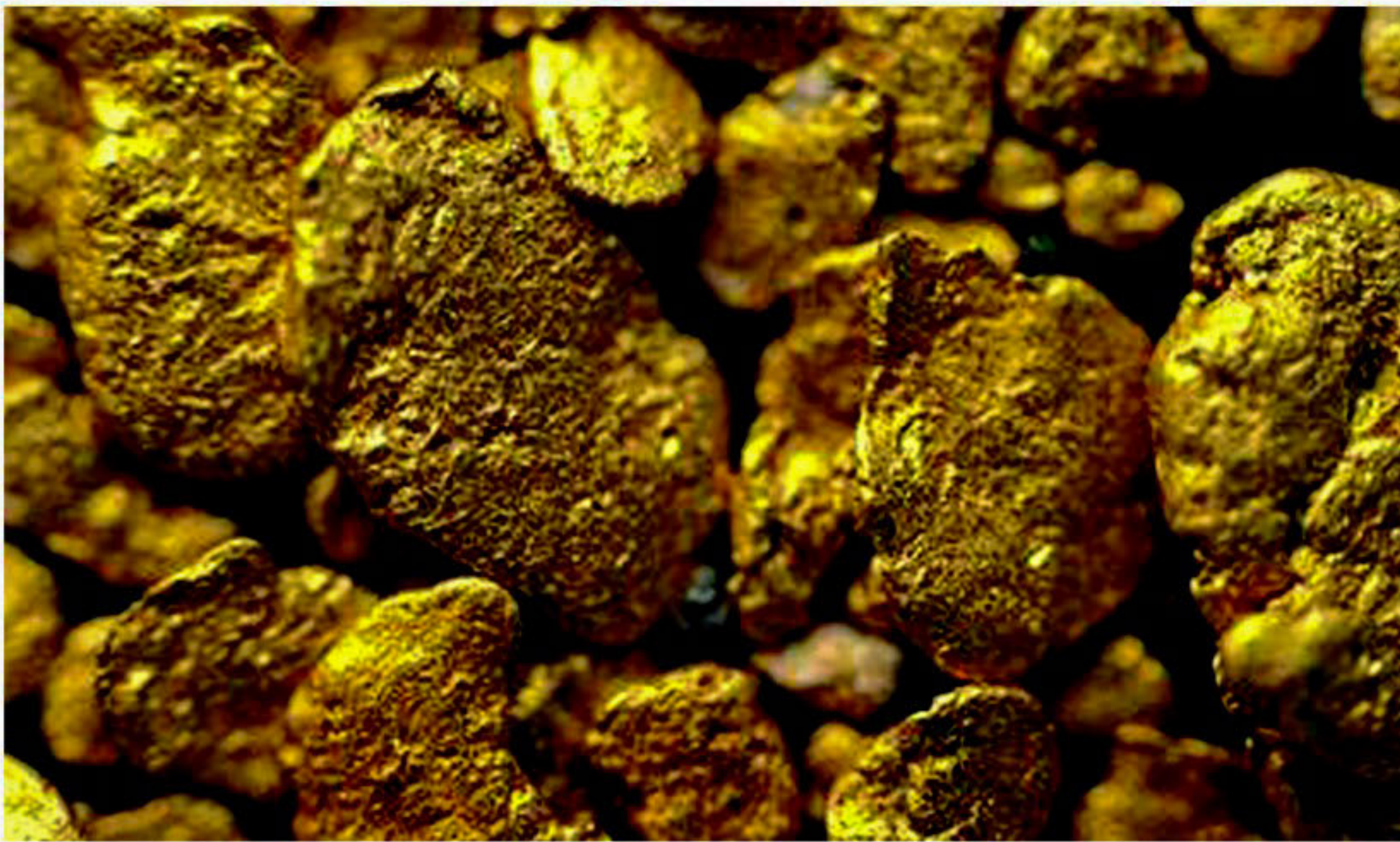
The removal of gold to the core should leave the outer portion of Earth bereft of bling. However, precious metals are tens to thousands of times more abundant in Earth's silicate mantle than anticipated. It has previously been argued that this serendipitous over-abundance results from a cataclysmic meteorite shower that hit Earth after the core formed. The full load of meteorite gold was thus added to the mantle alone and not lost to the deep interior.

To test this theory, Dr Matthias Willbold and Professor Tim Elliott

of the Bristol Isotope Group in the School of Earth Sciences analysed rocks from Greenland that are nearly four billion years old, collected by Professor Stephen Moorbath of the University of Oxford. These ancient rocks provide a unique window into the composition of our planet shortly after the formation of the core but before the proposed meteorite bombardment.

The researchers determined the tungsten isotopic composition of these rocks. Tungsten (W) is a very rare element (one gram of rock contains only about one ten-millionth of a gram of tungsten) and, like gold and other precious elements, it should have entered the core when it formed. Like most elements, tungsten is composed of several isotopes, atoms with the same chemical characteristics but slightly different masses. Isotopes provide robust fingerprints of the origin of material and the addition of meteorites to Earth would leave a diagnostic mark on its W isotope composition.

Dr Willbold observed a 15 parts per million decrease in the relative abundance of the isotope 182W between the Greenland and modern day rocks. This small but significant change is in excellent agreement with that required to explain the excess of accessible gold on



Rock analysis shows precious metals are the result of meteorite bombardment of the Earth

Earth as the fortunate by-product of meteorite bombardment.

Dr Willbold said: "Extracting tungsten from the rock samples and analysing its isotopic composition to the precision required was extremely demanding given the small amount of tungsten available in rocks. In fact, we are the first laboratory world-wide that has successfully made such high-quality measurements."

The impacting meteorites were

stirred into Earth's mantle by gigantic convection processes. A tantalising target for future work is to study how long this process took. Subsequently, geological processes formed the continents and concentrated the precious metals (and tungsten) in ore deposits which are mined today.

Dr Willbold continued: "Our work shows that most of the precious metals on which our economies and many key industrial

processes are based have been added to our planet by lucky coincidence when the Earth was hit by about 20 billion billion tonnes of asteroidal material."

This research was funded by the Natural Environment Research Council (NERC), the Science and Technology Facilities Council (STFC) and the Deutsche Forschungsgemeinschaft (DFG).

Source: Science Daily



ULTIMATE SHORTCUT



A THROWBACK!

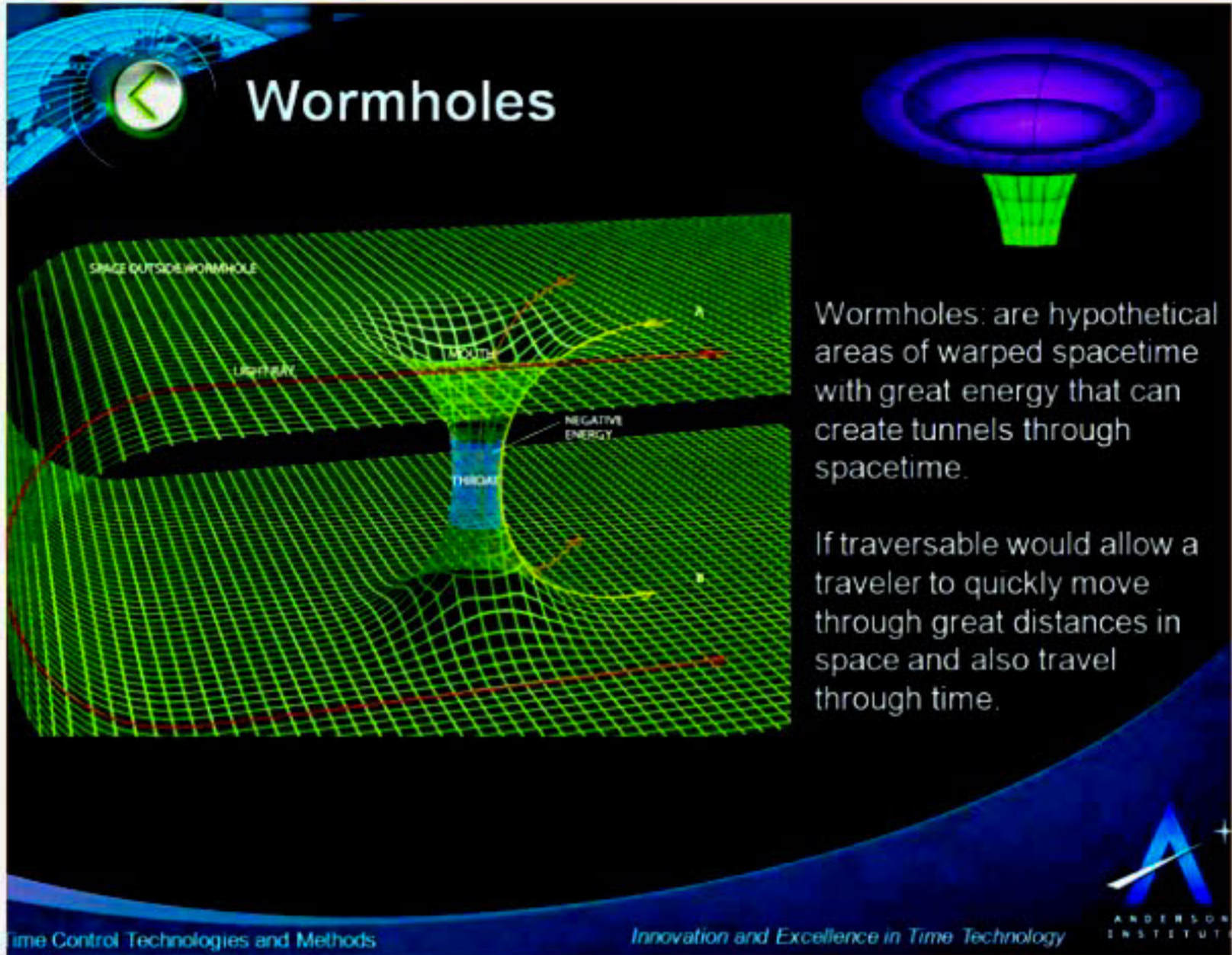
Wormholes as time machine!

OBAIDUR RAHMAN

EINSTEIN'S Special Theory of Relativity showed how time itself could slow down, given one is travelling close to the speed of light. But the actual possibility of time-travel was sparked by idea of utilizing black holes as it is known that they warp space-time. But how to overcome the paradox that anything that falls into the black hole is drawn toward the singularity at its centre and crushed into nothingness. However, the Einstein's equations have solution which suggests that, the traveller might avoid the singularity of black hole and pass through a small passage into a different realm of space-time, say another Universe. And this passage is termed the Wormhole!

Wormhole is a hypothetical tunnel, connecting two different points in space-time. So, a trip through the wormhole could take much less time than a journey between the same starting and ending points in normal space-time. Take an example. First, consider the curvy aspect of space time as the surface of an apple. Now, the wormholes in space are like the earthly wormholes inside of the apple. Worms tunnel their way straight through from one surface of the apple to another, shortening the distance between the two points dramatically. This means, instead of walking on the surface of the apple, all the way from point A to the point B, one finds a shorter and much quicker path through the wormhole that exists inside the apple, where destinations remain the same and the journey is faster. It is believed that the ends of a wormhole could be intra-universe (both ends that exists in the same Universe) or inter-universe (where one end lies in one while the other is the connecting to a new Universe).

Wormholes are tunnels with just one entry and exit which links different parts of space time continuum. It is believed that if both ends of wormhole are brought together with the aid of an electromagnetic or gravitational field, it will be possible to keep entering them and re-entering them and travel backwards and forwards in space-time. The classical physics of Newton and Einstein, however, suggests that, once entered, a wormhole is likely to slam shut immediately. But according to quantum physics, there are ways out, and one suggestion includes the traveller would need an anti-gravity device to exert negative pressure to counter gravity which will ensure the journey and safe return of the traveller. But many ideas and concepts regarding the travelling through time via wormholes are still in the hypothetical stage. Many scientists believe that there are tiny wormholes, tinier than the atomic nucleus, which occur within the known space-time. Those are spontaneously created through quantum fluctuations. Scientists would then be able to harvest these wormholes and use them as time machines.



Wormholes are hypothetical areas of warped spacetime

Wormholes are hypothetical areas of warped spacetime with great energy that can create tunnels through spacetime. If traversable would allow a traveler to quickly move through great distances in space and also travel through time.

The contributor is a freelance science writer.

Human brain's animal bias



Right amygdala responds more to animal face than that of another person, a study has found

A part of your brain is hard-wired to respond to animals, whether cute and fluffy or ugly and threatening, a new study has found.

A research team showed pictures of people, landmarks, animals or objects to epilepsy patients, who were already wired up so doctors could watch brain activity related to seizures. The researchers monitored the activity in the patients' amygdalae, two roughly almond-shaped structures in the brain associated with emotions, fear and the sense of smell.

"Our study shows that neurons in the human amygdala respond preferentially to pictures of animals, meaning that we saw the most amount of activity in cells when the patients looked at cats or snakes versus buildings or people," said Florian Mormann, lead study researcher and a former postdoctoral scholar at Caltech.

"This preference extends to cute as well as ugly or dangerous animals and appears to be independent of the emotional contents of the pictures. Remarkably, we find this response behavior only in the right and not in the left amygdala," Mormann said.

They found the activity in the right amygdala was not only greater, but neural responses were also faster for the animal pictures. The researchers then found the same response among people not suffering from epilepsy.

Past amygdala research has usually focused on human faces and fear, so it was a surprise to see that neurons in the right amygdala respond more to animals of all kinds than to human faces, according to Ralph Adolphus, a team member and professor at Caltech.

Source: Live Science

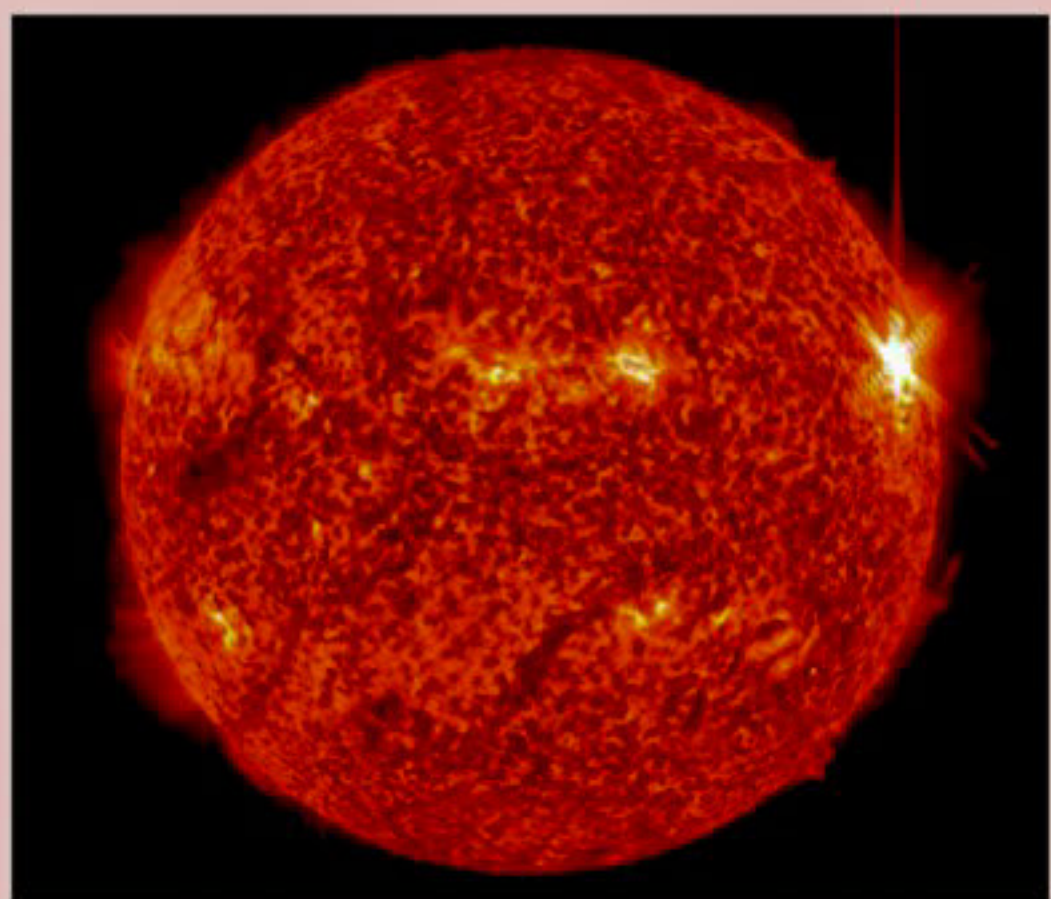


'ENCORE BURSTS'



DID YOU KNOW?

Storms in the Sun



Source: Live Science

Many storms erupting from the surface of the sun last longer and are more powerful than thought, new research shows.

Scientists had regarded solar flares as dramatic one-off events that blaze up and die down in due course. But about 15 percent of them have a second distinct peak of strong energy emission minutes or hours later, and this encore burst often outshines the first, scientists using NASA's Solar Dynamics Observatory (SDO) spacecraft have observed.

The discovery is expected to lead to better space weather forecasts.

A naked tiger has stripes!



If a tiger loses all his hair, he'll still be striped. Tiger stripes are like fingerprints, each individual cat's markings are unique. And they're not just hair, the stripes are in their skin. Seems to be a thing with cats, since your house cat's fur markings are also skin deep!