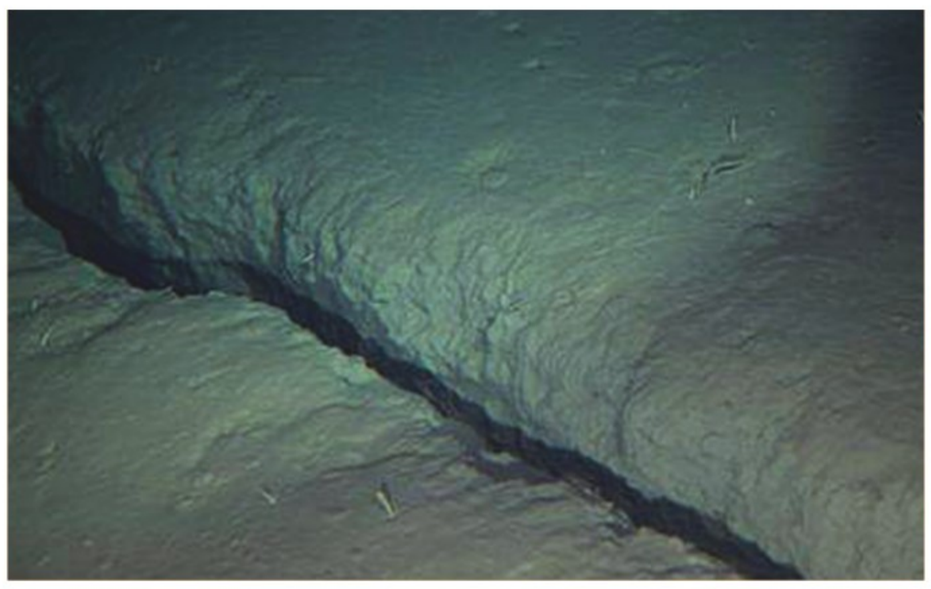
Big earthquakes not on the rise

WHILE Earth seems to be getting slammed with frequent mega-earthquakes lately, big quakes are not on the rise.

That's the message from two studies presented here this week at the annual meeting of the American Geophysical Union. Two research teams using different statistical methods both found that theglobal risk of big earthquakesis not higher than usual. Neither team found any evidence that big earthquakes can trigger other big earthquakes over long distances.

"We tend to see patterns in random processes, that's just something we do," said Andrew Michael, a U.S. Geological Survey scientist who presented his work Wednesday (Dec. 7). "In particular, people expect when something's random for it to be uniformly spread out, but, in fact, really random processes have a lot of clustering in them."

That clustering can make it look like there are patterns in the short term, Michael said, even when the long-term statistics don't show any meaningful variation.



The many large earthquakes that have shaken our planet lately are the result of random events, not a pattern suggesting an uptick in such quakes. Shown here, one of the fissures that opened up on the seafloor after the March 2011 earthquake struck off Japan's coast.

The rate of big earthquakes

On a local level, earthquakes do cluster and trigger one another, with a main shock often surrounded by fore- or aftershocks. But whether large earthquakes that occur thousands of miles across the globe from each other are related is a separate question.

In research presented Monday (Dec. 5), University of California San Diego geophysicist Peter Shearer and UC Berkeley statistician Philip Stark reported that the recent rate of magnitude-7.5 to magnitude-8 quakes is close to its historical average. Since 2004, magnitude-8 quakes have been more common than usual, the researchers reported, but this blip is consistent with normal variation, the researchers reported.

Such giant earthquakes are expected to occur at least once during the 111-year history of the catalogue of quake data, they said.

Random patterns

In a second study, the USGS's Michael used three statistical methods to find out if large earthquakes cluster together or if what looks like clusters is just random variability. A first glance at global earthquakes since 1900 does look very clustered, he said. But as soon as you remove aftershocks from the equation, that pattern disappears.

"That tells us that all the clustering we were seeing on the global scale was just an effect of local clustering," Michael told LiveScience.

Michael also looked at time periods after a large quake to see if other large quakes peaked in the following months and years. Again after removing direct aftershocks, he found no such evidence. A third test again failed to uncover evidence of clustering.

"Really, if you take any data set and you look for patterns in it and you insist on things happening in a very similar way, things will always look very surprising," he said. "Even in random sequences you can sort of define yourself into a corner where things seem unique."

The risk of earthquakes hasn't gone down either, Michael warned, and people living near areas where large quakes have hit should keep their guard up. Aftershocks to giant quakes like the March 2011 Tohuko quake in Japan can be very large themselves, he said.

"There is localized higher risk," he said. "There just isn't global higher risk."

Source: Live Science

DICEY WORLD

Uncertainty Principle

The principle that the momentum and position of a particle cannot both be precisely determined at the same time.

OBAIDUR RAHMAN

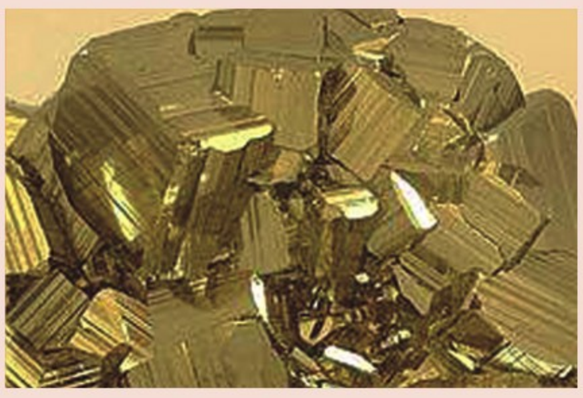
A fundamental principle of physics, especially of quantum mechanics, is Heisenberg's Uncertainty Principl. It states that one can never know for sure both the position and the velocity of a particle. That means the more accurately one knows about the position of a particle, the less accurately one knows about its velocity. The uncertainty principle, also known as Indeterminacy Principle, was developed by German physicist Werner Heisenberg in 1927. The concept relates to the inherent indeterminacy in the simultaneous measurement of the position and velocity of a particle. And once the velocity of the particle is precisely known, the knowledge of its position in space becomes completely indeterminate.

in order to determine the future position as well as velocity of a particle, one needs to be able to measure its present location and velocity very accurately. And the most effective way to achieve that is to shed some light on that particle. The light scattered by the particle will point at the position of the particle under scrutiny. The amount of light required for the purpose is small, may be least one quantum. But here is the catch.

This quantum of light will disturb the position particle as well as and alter its velocity in a very unpredictable way. Besides, the more accurately one tries to measure the position, shorter wavelength of light with higher energy will be needed for it. That means the velocity of the particle will be disturbed furthermore. But this will do the trick of finding the precise location of the position of the particle, though not of its speed. In fact, the more you accurately you may try to measure the position of the particle, the less accurately you can measure its speed.

FOOL'S GOLD

Treasure for solar cell developers



Pyrite (Courtesy Oregon State University).

PYRITE, better known as "fool's gold," was known to the ancient Romans and has led prospectors astray for centuries. But it has now also helped some researchers discover related substances that they say offer new, cheap and promising options for solar energy.

The new compounds, unlike some solar cell materials made from rare, expensive or toxic elements, would be benign and could be processed from some of the most plentiful elements, say the scientists. Findings have been published in the research journal Advanced Energy Materials.

Apparently ever the unwanted sibling, pyrite itself is as considered about as useless for solar energy as it is as a substitute for the yellow metal, which it deceptively resembles. But for more than 25 years, the mineral, also called iron pyrite, was known to have some qualities that made it of interest for solar energy. That spurred the recent research.

The results have been anything but foolish, said Douglas Keszler, a chemist at Oregon State University, where the U.S. Energy Department-funded investigations are under way.

"We've known for a long time that pyrite was interesting for its solar properties, but that it didn't actually work," he explained. "We didn't really know why, so we decided to take another look at it. In this process we've discovered some different materials that are similar to pyrite, with most of the advantages but none of the problems.

"There's still work to do in integrating these materials into actual solar cells," Keszler said. "But fundamentally, it's very promising."

Source: World Science

UNIVERSAL BIAS

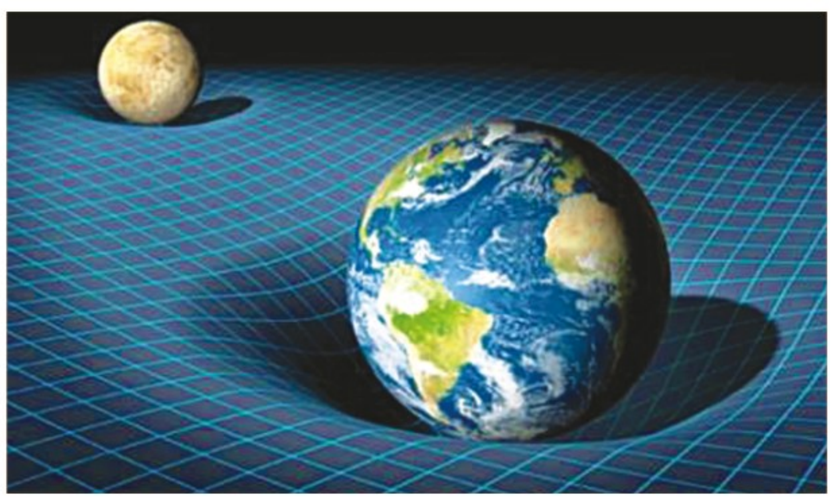
Mystery of gravitation

DEBASHISH CHAKRABARTY

EARLY in the seventeenth century Rene Descartes proposed a mechanistic approach to physics, asserting that all causal influence is transmitted by direct contact between material entities. Like Aristotle, he rejected the idea of vacuum, believing that there can be no space (extension) without substance. In accord with his philosophy, Descartes denied the intelligibility of weight as a primitive quality of matter, and argued that material bodies are impelled toward the Earth by the impulse of particles of a "second species of matter" continually arriving at the Earth from all directions. Galileo, in his Dialogue Concerning Two New Sciences (1638), chose not to commit himself to any particular cause of gravity, indicating that he thought such speculations were premature at the present state of science. He wrote

The present does not seem to be the proper time to investigate the cause of the acceleration of natural motion [i.e., gravity], concerning which various opinions have been expressed by various philosophers, some explaining it by attraction to the center, others to repulsion between the very small parts of the body, while still others attribute it to a certain stress in the surrounding medium which closes in behind the falling body and drives it from one of its positions to another.

The first of these opinions is essentially the assertion of innate attraction and the third is a variation of Aristotle's proposal, which attribute the motive force of object in natural motion to a propagating interaction with a posited medium. (Aristotle's model has sometimes been ridiculed as being akin to a perpetual motion machine, but it is in essence just a crude description of a propagating wave.) The second opinion mentioned by Galileo is much less clear, but it seems to be alluding to an explanation of gravitation attraction based on repulsion and involving the very small parts of the body. Unfortunately Galileo didn't elaborate on this brief allusion, nor did he cite the philosophers who held that opinion, apparently because he considered these "opinions" to be common knowledge. But his comment suggests that people had speculated about the possibility of attributing the effects of gravity to repulsion acting on the microscopic parts of bodies. It's possible that he had in mind the bombardment of Descartes' "second species of matter".



All objects attract one another.

In the second half of the century, Isaac Newton deduced from a combination of terrestrial and celestial phenomena that every two particles of matter are compelled toward each other with a force directly proportional to their masses and inversely as the square of the distance between them. This "universal gravitation" provided a unified account of a wide range of phenomena that had previously seemed inexplicable and unrelated, but it was apparently contrary to the mechanistic precepts of Descartes, because it implied that widely separated bodies exert forces on each other directly, without explicit reference to any intervening substance. In private correspondence, Newton disavowed the notion of direct action at a distance, but at the same time he allowed for the possibility that the means by which the action of gravity is transmitted may not be material in which case the Cartesians would still regard it as unintelligible action at a distance.

Acknowledging the success and utility of Newton's concept of universal gravitation, many continental scientists - such as Huygens, Leibniz, and the Bernoullis - sought some way of reconciling it with the mechanical philosophy of Descartes. In other words, they sought an explanation of universal gravitation in terms of direct contact between material entities.

MICROBE POWER

Deep-sea battery

SCIENTISTS have discovered an unusual kind of battery at the bottom of the Pacific Ocean: a living one, fueled by microbes that live near hydrothermal vents.

As they munch on noxious chemicals bubbling from the seafloor, these critters create electrical currents that flow through the walls of the chimneylike structures they inhabit.

"The amount of power produced by these microbes is rather modest," said Harvard biologist and engineer Peter Girguis, who presented his research December 5 at a meeting of the American Geophysical Union. "But you could technically produce power in perpetuity."

Girguis hopes to tap this power to run seafloor sensors. He and his colleagues measured the current by implanting an electrode in the side of an underwater chimney 2,200 meters below the surface at the Juan de Fuca Ridge off the Pacific Northwest coast.

To better understand the current's source, the researchers built an artificial chimney in the laboratory. One tube that mimicked the inside of the chimney was filled with dissolved hydrogen sulfide, which smells like rotten eggs but is palatable to vent microbes. A second tube, outside of the chimney, contained only seawater.

The scientists grew a film of microbes on a piece of pyrite, a metallic mineral found in natural chimneys, that connected the two tubes. The current the microbes produced in the pyrite increased when they were given more food, suggesting this current is how the microbes make contact with the oxygen in the seawater outside of the chimney. Pyrite seems to shunt electrons created as the microbes break down hydrogen sulfide to these oxygen molecules, which react to form water.

Source: Science News.

Microbes feeding off hydrothermal vents at the bottom of the Pacific Ocean inhabit into natural batteries

ANTARCTICA SHINES

Icy bastion of space science

South Pole Telescope in profile, with sun dog (arc and rainbow), caused by ice crystals.

Source: Live Science

Meteorite, or ALM, was found on Dec. 5, 1912. "I regard the discovery of the ALM as the start of astronomy in Antarctica, which will thus be 100 next year," said astronomer Michael Burton at the University of New South Wales in Sydney.

Astronomers are now carrying out cutting-edge research in the South Pole that could shed light on the greatest secrets of the universe.

"Amazingly, the South Pole now ranks with the grand research laboratories such as Fermilab and CERN," said theoretical physicist Francis Halzen of the University of Wisconsin-Madison.

DID YOU KNOW?

What's the Death Star?

There is a current scientific hypothesis that the sun has a companion which is currently about 1-1.5 light years away. It is believed that it has an elliptical orbit which, every 26 million years, sends matter towards the earth causing mass Extinction events. It was the discovery of these seemingly regular events that gave rise to the hypothesis in the first place. The star is predicted to be most likely a red or brown dwarf and has been named Nemesis or "Death Star".