

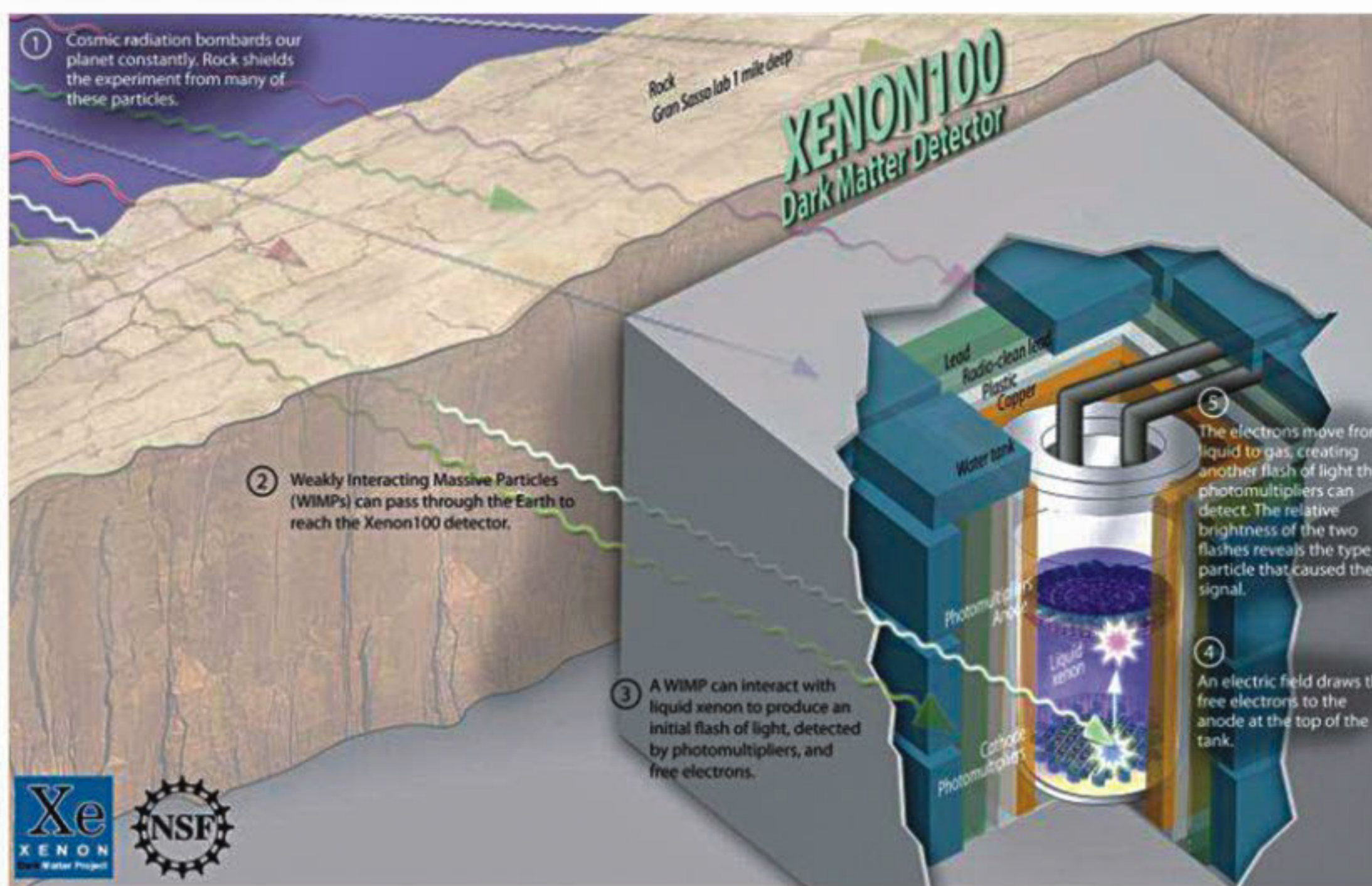
Homing in on dark matter

DARK matter, the mysterious substance that may account for nearly 25 percent of the universe, has so far evaded direct observation. But researchers from UCLA, Columbia University and other institutions participating in the international XENON collaboration say they are now closer than ever before.

Their new results, announced April 14 at the Gran Sasso National Laboratory in Italy, where the XENON experiment is housed deep beneath a mountain 70 miles west of Rome, represent the highest-sensitivity search for dark matter yet, with background noise 100 times lower than competing efforts.

Dark matter is widely thought to be a kind of massive elementary particle that interacts weakly with ordinary matter. Physicists refer to these particles as WIMPs, for weakly interacting massive particles. The XENON researchers used a dark-matter detector known as XENON100 -- an instrumented vat filled with over 100 pounds of liquid xenon -- as a target for these WIMPs, which are thought to be streaming constantly through the solar system and Earth.

And while the XENON100 experiment found no dark matter signal in 100 days of testing, the researchers' newly calculated upper limits on the mass of WIMPs and the probability of



The XENON100 experiment is located deep underground at the Gran Sasso National Laboratory in Italy to reduce contaminating signals from cosmic radiation.

their interacting with other particles are the best in the world, said UCLA physics professor Katsushi Arisaka, a member of the international collaboration.

XENON100 looks for a primary flash of light that occurs when a particle bounces off a xenon atom inside the detector and a secondary flash when an electron knocked free from a xenon atom by a collision is accelerated toward the top of the device by an electric field, said UCLA physics

researcher Hanguo Wang, who works closely with Arisaka. With this configuration, a WIMP will generate a signal fundamentally different from that of cosmic radiation or emission from the equipment itself, making it possible to identify background readings that could be mistaken for a positive detection, he said.

Even though the experiment did not detect a WIMP, the progress sets the stage for an ambitious next-generation project

called XENON1T, which will use a much larger, one-ton liquid xenon instrument with highly specialized light-detectors developed at UCLA that make it 100 times more sensitive than XENON100, said David Cline, a UCLA professor of physics and founder of UCLA's dark matter group.

The search for dark matter Ordinary matter, which makes up the stars, planets, gas and dust in our galaxy, emits or reflects light that can be observed using

telescopes on Earth or in space. However, the effect of dark matter, according to several theories, can be observed only indirectly by the gravitational force exerted on the more visible portions of the galaxy around us, Cline said.

Despite the differences between ordinary and dark matter, cosmologists believe the two have been linked since the beginning of the universe, with dark matter playing a key role in the coalescing of particles into stars, galaxies and other large-scale structures after the Big Bang.

Though dark matter exerts a tangible force on the galaxy as a whole, individual WIMPs have proved far more difficult to detect. Because these particles interact only very weakly with normal matter, the small signal that might come from a WIMP detection above ground would be drowned out by the cosmic radiation that constantly bombards Earth's surface, Cline said.

To eliminate the majority of this background noise, the XENON100 experiment is buried beneath almost one mile of rock in the Gran Sasso lab, the largest underground facility of its kind in the world. While dark matter particles can travel easily through the vast expanse of stone and pass through the detector, only the most energetic particles from space are able to follow, Arisaka said.

Source: Science Daily



SCIENCE & RABINDRANATH

The coming of a genius

In this column Dr. Ali Asgar's article titled "*Scientific thoughts of Rabindranath Tagore*" will be published in instalments, each having a separate heading - Editor, Science & Life

DR. ALI ASGAR

TO support my intuitive surmise let me explain a possible picture of the phenomenon of the development of a genius. Every second we are subjected to millions of information, only a very small fraction of these information do we usually respond to. This selection is a chancy matter to some extent, but is mostly guided by the urge for physical existence and immediate necessities. This creates a norm and most people react to the environment by their instincts which is more of the characteristics of animals. For humane, possessed with imagination and the concept of time that allow one to connect events of the past, the present and the possible future happenings. The response to the environment is indeterminate. The most important aspect of intelligence is curiosity and associated inspiration to solve puzzles, the mystery of nature. The sense of mystery arises from the sense of symmetry or harmony. Whenever a lack of harmony or symmetry is experienced by a creative mind he tends to solve it by seeking the missing link or by looking for a new order so that at the higher level of symmetry, which we may call a super symmetry, a new relation is discovered. Here a strong sense of beauty works which is a rarity.

A genius is possessed with the special bend of mind whose sense of beauty is deeper and more intricate to make it possible for him to discover or invent new concepts, understanding and knowledge. But this again is a chancy matter and not guided by any strict deterministic law.

My aim in his article is not merely to describe or bring forward the examples where Tagore's scientific ideas, his thinking and philosophy and activity are reflected, but also to indulge in the venture to discover the working of Tagore's mind when he got involved in science writing, promoting science, popularizing science, developing scientific institution, providing financial and moral support to science teachers and researchers and getting himself involved in the philosophical discourse with great scientists like Einstein.

To understand the mystery of how Tagore could get involved in so many different fields in a certain way and make his mark, we need to make guesswork and construct an intuitive picture of his unique personality.



FROZEN IN TIME

Eerie Antarctic lake

IN the eerie bluish-purple depths of an Antarctic lake, scientists have discovered otherworldly mounds that tell tales of the planet's early days.

Bacteria slowly built the mounds, known as stromatolites, layer by layer on the lake bottom. The lumps, which look like oversized traffic cones, resemble similar structures that first appeared billions of years ago and remain in fossil form as one of the oldest widespread records of ancient life. The Antarctic discovery could thus help scientists better understand the conditions under which primitive life-forms thrived. "It's like going back to early Earth," says Dawn Sumner, a geobiologist at the University of California, Davis.

Sumner and her colleagues, led by Dale Andersen of the SETI Institute in Mountain View, Calif., describe the discovery in an upcoming issue of Geobiology. "These are just incredibly beautiful microbial landscapes," she says.

Researchers have probed many Antarctic lakes to study the weird and wonderful microbes that live there; Andersen alone has dived into at least eight such lakes. But he says the discovery of the stromatolites rocketed East Antarctica's Lake Untersee "to the top of my list."

Researchers study fossil stromatolites, from 3 billion years ago or more, to understand how life got a foothold on Earth. Today, stromatolites actively form in only a few spots in the ocean, like off the western coast of Australia and in the Bahamas. They also grow in some freshwater environments, like super-salty lakes high in the Andes and in a few of Antarctica's other freshwater lakes. But scientists have never seen anything like the size and shape of Untersee's stromatolites.

Drawn by its extremely alkaline waters and high amounts of dissolved methane, Andersen and his colleagues traveled to Untersee in 2008 to drill through its permanent ice cover and collect water samples.

Source: Science News



Eerie blue light suffuses the otherworldly bottom of Lake Untersee, Antarctica



MADE TO ORDER

Cuckoos mimic hawks!



Cuckoos and sparrow hawks have almost identical patterns on their underbellies

A study has shown that reed warblers - a cuckoo host species - are less likely to attack more "hawk-like" cuckoos.

This helps the parasitic birds to lay their eggs undisturbed.

The visible similarity between cuckoos and sparrow hawks was already clear, but this is the first study to show the effect the trickery has on host birds.

The findings are published in the journal Behavioural Ecology.

Playing hawk Cuckoos are brood parasites; after laying an egg in another bird's nest, they leave the unsuspecting host to raise their chick.

To fool their victims into caring for their young, cuckoos first need to lay an egg in the right nest, without being "mobbed" or attacked by the nest's owner.

"We noticed in another experiment that great tits and blue tits were just as afraid of cuckoos as they were of sparrow hawks," explained Dr Justin Welbergen from the University of Cambridge, UK, who led this research.

Source: BBC



CHITON EYES

Rock-eyed sea creature



This lined chiton, whose anterior end is to the right, lives about 50 feet below the water's surface near Whidbey Island, Washington.

A tiny sea mollusk uses eyes made of a calcium carbonate crystal to spot predators lurking above, researchers say of the first such rocky lenses found in the animal kingdom.

While scientists had discovered the hundreds of eye-like structures on the surface of this armored mollusk, called a chiton, decades ago, they didn't know what they were made of or whether they could actually see objects or just sensed light. [Image of chiton eyes]

"Turns out they can see objects, though probably not well," said study researcher Daniel Speiser, who recently became a postdoctoral fellow at the University of California, Santa Barbara.

Source: Live Science



OGRES OF PAST

Tale of another Jurassic monster

OBAIDUR RAHMAN

Paleontologists have very recently unearthed a new species of gigantic theropod dinosaur in China. Based on the fossilized remains of the skull and jaw bones, it is presumed to be one of the largest carnivorous dinosaurs ever to be found. It might be the long lost relative of the legendary predator, the mighty T-Rex. Details of the research, which have been published online in the 1st April edition of the scientific journal Cretaceous Research, testimonies that the ancient creature has been named "Zhuchengtyrannus magnus", meaning the "Great Tyrant from Zhucheng", chiefly because the bones were found in the city of Zhucheng, in eastern China's Shandong province. It is this very site that holds one of the largest concentrations of dinosaur bones in the whole world. According to Paleontologists, this is because this very area was a large flood plain where many dinosaur bodies were washed together during floods which eventually started the process of fossilization of their remains. Given the fact that only portions of the skull and jaw bones (so far) have been recovered, the team of researchers was successful in estimating the size of the ancient beast. Measuring about 11 meters long (36 feet), 4 meters tall (13 feet) and weighing about 6 tones (13,000 pounds, equivalent to that of a school bus), Zhuchengtyrannus magnus (Z. Mag from now on) belongs to the group of gigantic theropods called tyrannosaurines, the Jurassic creature which roamed N. America and Eastern Asia during the late Cretaceous period that lasted from 99 to 65 million years ago. They were especially known for their small arms, two-fingered hands and large powerful jaws that could deliver brutally powerful and



Newly named dinosaur species Zhuchengtyrannus magnus

an astonishing array of paleontological wonders which is why some of the most significant ones were made in that very region. It was back in 2009 when the bones of Z. Mag were found and the discovery was made when construction crews were digging the foundations for a museum where other fossils were to be preserved. During the time of excavations, aside from the remains of Z. Mag, the scientists unearthed physiological belongings of another gigantic species of duck-billed dinosaur which is known as Shantungosaurus giganteus, which might have been Z. Mag's prey, as well as some unidentified Ankylosaurs.

The study was led by Dr. David Hone from the School of Biology and Environmental Science at University College Dublin, Ireland who was also the lead author of the paper. And amongst other participators, was the famed Xu Xing of the Beijing Institute of Vertebrate Paleontology and Paleoanthropology in China, who named this very creature along with more than 30 other dinosaurs in his distinguished career.

The contributor is a freelance Science Writer.



QIS YOUS KHOW?

What is a time capsule?



since about 1939. There are two types of capsules: intentional and unintentional. Intentional time capsules are placed somewhere deliberately, to be accessed at a particular future date. Unintentional capsules are usually archaeological in nature.

A time capsule is a cache of goods / information created to serve as a mode of communication with people in the future. These may include archaeologists, anthropologists or historians. The capsules are sometimes buried at sites where events are held. The term has been used