

'MISSING LINK' BOLSTERS BOLD THEORY ON DINO EVOLUTION

PARIS: An oddball, vegetarian dinosaur with the silhouette of a flesh-ripping velociraptor, whose fossilised remains were unearthed in southern Chile 13 years ago, is a missing link in dino evolution, researchers said yesterday. A revised assessment of the kangaroo-sized Chilesaurus, reported in the journal *Biology Letters*, bolsters a theory unveiled earlier this year that threatens to upend a long-standing classification of all dinosaurs. Dinosaurs were the monarchs of Earth for 160 million years until a space rock collided with the planet 65.5 million years ago and wiped out those confined to land.

The survivors, which could fly, are the direct ancestor of today's birds. "Chilesaurus genuinely helps fill an evolutionary gap between two big dinosaur groups," said co-author Paul Barrett, president of Britain's Palaeontographical Society and a researcher at the Natural History Museum. When first presented to the world in 2015, Chilesaurus-despite its penchant for plants-was lumped together with theropods, the suborder of meat-eating dinos that not only includes fleet-footed velociraptors but Tyrannosaurus rex, the ultimate carnivore.

Experts acknowledged at the time, however, that it was an awkward fit. One described the beast as "the most bizarre dinosaur ever found." An upright posture, powerful hind legs and foreshortened front limbs were all reminiscent of theropods. But an inverted, bird-like hip structure and flattened, leaf-shaped teeth-proof of an exclusively vegetal diet-suggested that it also shared traits with another major suborder, the Ornithischia.

Well-known ornithischians include Triceratops and the three-ton Stegosaurus, which boasted large armored plates along its spine and a brain the size of a walnut. "Chilesaurus initially looked like an earlier offshoot of the theropod line, but it seemed suspicious that it had all these adaptations for eating plants," Barrett said. It lived about 150 million years ago, far earlier than the handful of theropods known to have turned away from meat, he pointed out.

Common ancestor

To verify Chilesaurus' place in the dino family tree, Barrett and Matthew Baron of the University of Cambridge analyzed more than 450 anatomical features of early dinosaurs. What they found confirmed a hunch. "We realized that it was not a strange, early plant-eating theropod, but rather a strange plant-eating animal that was an offshoot of this other group, Ornithischia," Barrett said. Reassigning Chilesaurus to a new family tree might seem like something only a dino lover could find exciting.

But the new affiliation has major implications. For most of the last century, experts have agreed that theropods were more closely related to a third major evolutionary branch, the Sauropods, that included long-necked beasts such as Diplodocus and Brachiosaurus. But the neither-fish-nor-fowl Chilesaurus shows that the fearsome killers under the theropod umbrella shared, in fact, a greater affinity with the docile Ornithischia menagerie.

This was the bold theory that Baron and Barrett, along with other colleagues, proposed in a landmark study published last March in the journal *Nature*. "Our reorganization was putting Ornithischia and theropods much closer together, and this new animal helps cement that relationship," Barrett explained. "Chilesaurus gives us more confidence that this rearrangement was correct because it has a combination of features found in those two groups." The first dinosaur emerged some 228 million years ago.

The new findings support the idea that theropods and ornithischians shared a common ancestor as early as 225 million years ago, not long after the dino saga began. Ornithischia thrived for more than 100 million years, but dead-ended when the rogue rock smashed into what, today is the Yucatan peninsula in Mexico. The impact probably created a massive firestorm followed by a decades-long winter that destroyed vegetation, the starting point in the dinosaurs' food chain. Most theropods were wiped out too, although the forerunners of modern birds persevered.—AFP



IN SPACE: This NASA TV handout image shows the SpaceX Dragon cargo craft approaching the International Space Station. —AFP

'DRAGON CAPTURED' AS CARGO ARRIVES AT SPACE STATION

MIAMI: SpaceX's unmanned Dragon cargo vessel, carrying the first super-computer to space as part of its 6,400 pound payload arrived yesterday at the International Space Station. "And that is confirmed capture," said a NASA commentator as space station's robotic arm grabbed the spaceship at 6:52 am (1052 GMT).

The spaceship blasted off Monday from Cape Canaveral, Florida, carrying food, science experiments and other gear for the astronauts living in orbit.

It is the 12th mission for SpaceX under a \$1.6 billion contract with NASA. A key part of the cargo is a sophisticated supercomputer

made by Hewlett Packard Enterprise (HPE), called The Space borne Computer. Researchers want to see if the computer can survive the harsh conditions of space, and whether it could one day help astronauts navigate long missions in deep space, whether around the Moon or to Mars.—AFP

NEUTRON BEAMS, X-RAYS REVEAL MORE ABOUT T REX RELATIVE

ALBUQUERQUE: Researchers at a top US laboratory announced Tuesday that they have produced the highest resolution scan ever done of the inner workings of a fossilized tyrannosaur skull using neutron beams and high-energy X-rays, resulting in new clues that could help paleontologists piece together the evolutionary puzzle of the monstrous T rex. Officials with Los Alamos National Laboratory and the New Mexico Museum of Natural History and Science said they were able to peer deep into the skull of a "Bisti Beast," a rex relative that lived millions of years ago in what is now northwestern New Mexico.

The images detail the dinosaur's brain and sinus cavities, the pathways of some nerves and blood vessels and teeth that formed but never emerged. Thomas Williamson, the museum's curator of paleontology and part of the team that originally collected the specimen in the 1990s, said the scans are helping paleontologists figure out how the different species within the T. rex family relate to each other and how they evolved. "We're unveiling the internal anatomy of the skull so we're going to see things that nobody has ever seen before," he said during a news conference Tuesday.

T rex and other tyrannosaurs were huge, dominant predators, but they evolved from much smaller ancestors. The fossilized remnants of the Bisti



NEW MEXICO: A model of a monstrous, bone-crushing Tyrannosaurus rex sits on display in the main room of the New Mexico Museum of Natural History and Science in Albuquerque, New Mexico. —AP

Beast, or Bistahieversors sealeyi, were found in the Bisti/De-Na-Zin Wilderness Area near Farmington, New Mexico. Dry, dusty badlands today, the area in the time of the tyrannosaur would have been a warmer, swampy environment with more trees. The species lived about 10 million years before T rex.

Scientists have said it represents one of the early tyrannosaurs that had many of the advanced features - including big-headed, bone-crushing characteristics and small forelimbs - that were integral

for the survival of T rex. Officials said the dinosaur's skull is the largest object to date for which full, high-resolution neutron and X-ray CT scans have been done at Los Alamos. The technology is typically used for the lab's work on defense and national security. The thickness of the skull, which spans 40 inches, required stronger X-rays than those typically available to penetrate the fossil.

That's where the lab's electron and proton accelerators came in. Sven Vogel, who works at the Los Alamos

Neutron Science Center, said the three-dimensional scanning capabilities at the lab have produced images that allow paleontologists to see the dinosaur much as it would have been at the time of its death, rather than just the dense mineral outline of the fossil that was left behind after tens of millions of years. The team, which included staff from the University of New Mexico and the University of Edinburgh, is scheduled to present its work at an international paleontology conference in Canada next week.

Kat Schroeder, a Ph.D. candidate at the University of New Mexico who has been working on the project for about a year, said the scanning technology has the ability to uncover detail absent in traditional X-rays and the resulting three-dimensional images can be shared with fellow researchers around the world without compromising the integrity of the original fossil. Schroeder's work centers understanding the behavior of dinosaurs, so seeing the un-erupted teeth in the Bisti Beast's upper jaw was exciting. "Looking at how fast they're replacing teeth tells us something about how fast they're growing, which tells me something about how much energy they need and how active they were," she said. "It's those little things that enable us to understand more and more about prehistoric environments."—AP

US TEEN DRUG OVERDOSE DEATHS INCH UP AFTER YEARS OF DECLINE

NEW YORK: After years of decline, teen deaths from drug overdoses have inched up, a new US government report shows. The drop in teen deaths had been a rare bright spot in the opioid epidemic that has seen adult overdose deaths surge year after year - fueled by abuse of prescription painkillers, heroin and newer drugs like fentanyl.

"This is a warning sign that we need to keep paying attention to what's happening with young people," said Katherine Keyes, a Columbia University expert on drug abuse issues who wasn't part of the study. It's not clear why teen overdose deaths increased in 2015 or whether the trend will continue, said lead researcher Sally Curtin of the US Centers for Disease Control and Prevention. The CDC released the report Wednesday focusing on adolescents aged 15 to 19.

The overdose death rate rose to 3.7 per 100,000 teens in 2015, from 3.1 the previous year. Most of the deaths were accidental and were mainly caused by heroin, researchers found. Clearly, drug overdoses have been a far smaller problem in teens than in adults. Tens of thousands of adults die from overdoses each year compared to about 700 to 800 teens. Another difference:

Unlike adults, overdose deaths in teens have not been climbing every year.

To their surprise, CDC researchers found that teen overdose deaths actually fell after 2008, and dropped as low as about 3 per 100,000 during 2012 through 2014. The drop tracks with previously reported declines in teen drug use, smoking, drinking, sex and other risky behaviors, Keyes said. Some experts believe those declines are related to more time spent on smartphones and social media. The decline was driven by boys, who account for about two-thirds of teen overdose deaths. The boys' rate fell by a third in those years, but the girls' rate held fairly steady.

Then came the increase. The rate among boys rose to 4.6 per 100,000 in 2015 from 4 the year before. Among girls, it increased to 2.7 from 2.2. Though small, it was the highest overdose death rate for girls since at least 1979, Curtin said. Health expert said it's likely teen overdoses edged up in 2015 because of the increasing availability of newer and more lethal kinds of opioids like fentanyl, which is sometimes mixed with heroin. "If the drugs are more potent, your chances of it (drug use) being fatal have perhaps increased," Curtin said. —AP

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Kuwait Times
248 33 199





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