The Daily Star

SCIENCE & LIFE

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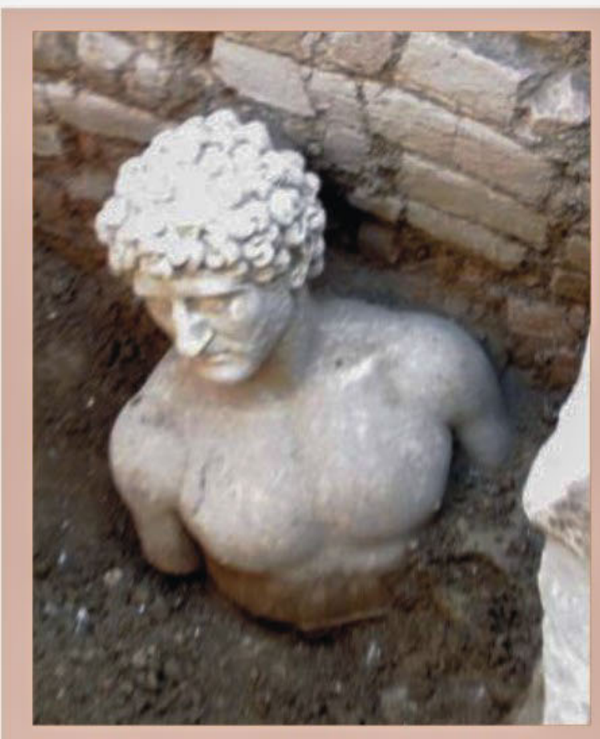
ATHLETE OF APOLLONIA



A marble bust of an athlete dating back to the Roman

Roman relics in Albania

Archaeologists unearthed a Roman bust from the 2nd century AD hailed as the most important archaeological find of the last 50 years in Albania, experts said Friday.

"It is an exceptional discovery, the most important in the last 50 years in Albania because the bust is still intact," French professor Jean-Luc Lamboley, who led the dig at Apollonia with Albanian archaeologists, told AFP.

Source: AFP

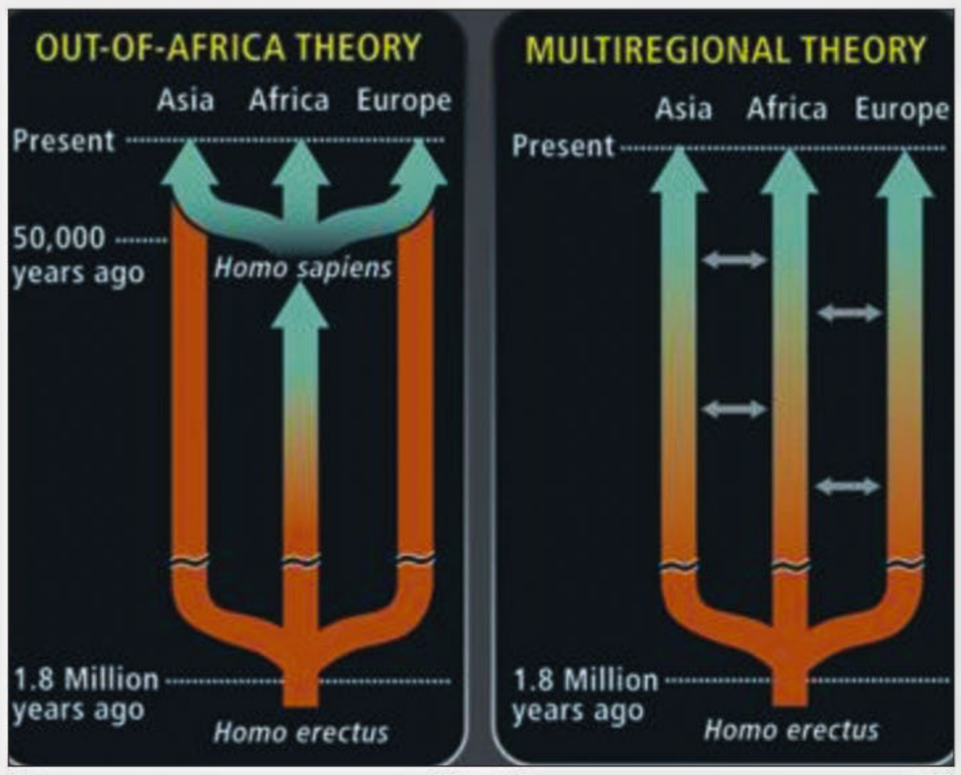
Origin of modern humans

MD. RIAJUL HOSSAIN

ACCORDING to our knowledge of evolution, life has originated 3.5 billion years ago in a form of single cell wrapping essential molecules required to form life. After that, complexity came in life forms, multicellular organisms emerged, and evolution turned to macroevolution from microevolution. The first dinosaurs appeared 245 million years ago and dominated the earth till 65 million years ago. A comet or sudden meteoric shower on earth was, probably, responsible for their extinction. Ancient humans originated later after that. I am going to focus the origin of modern humans according to paleontology, the earth science that studies fossil organisms and related remains, and genetic evidence found to date. Since the separation of archaic humans, the hominids, from the apes around 5-7 million years ago the evolutionary tree generated branches for the newer ones. From the hominids, the genus homo had diverged around 2 million years ago in Africa.

It is hypothesized through paleoanthropological study and genetic evidence that around fifty or seventy years ago, a group of few hundred or even several thousand Africans left Africa forever. The reason they left their motherland might be climate change or scarcity of food supply from the ocean although the reasons are not clear. However, they started a journey, a journey to remember, a journey of human history taking with them the physical and behavioral traits, the intelligence including capacity for language which characterizes modern humans. Scientists are getting the insight of this historical journey by doing research on fossilized bones or spearheads. However, modern technology and the advent of molecular biology have offered more sophisticated ways to discover the insight of that journey. Although the paleoanthropologists are more focused on fossils rather than the DNA, the genetic information could be a better option to find out the markers present there to make the evolutionary tree.

There are, in fact, two theories regarding the origin of modern humans, one is out-of-Africa hypothesis that postulates that humans with modern traits left Africa from fifty to seventy thousand years ago to settle the world. In doing so, they replaced the archaic hominids, such as Homo erectus that left Africa as early as 1.8 million years ago. This out-of-Africa hypothesis gained support after the discovery of so called "Mitochondrial Eve" in 1987, when Rebecca L. Cann and Allan C. Wilson at the University of California, Berkeley, published a groundbreaking paper based on mitochondrial DNA analysis and concluded that humans from different population all descended from a single female in Africa who lived about 200,000 years ago. This out-of-Africa hypothesis is also called single origin theory or total replacement theory due to its nature of little or no interbreeding among the ancient human populations such as Homo Neanderthals and Homo erectus that left Africa. On the other hand, the multiregional theory or so called candelabra theory of regional continuity proposed by Milford H. Wolpoff in 1988



suggests that diversity from within Homo erectus and has confined over several million years, with some exchange of genes. It gives the idea that the modern characteristics of humans evolved not just in Africa but in archaic hominid population in Asia and Europe and interbreeding among all these groups ensured that they remained a single species. However, both the theory has proponents and opponents.

To get a clearer picture, therefore, more and more research both paleoantropological and genetic study is required. In fact, comparative genomics could be a very promising tool for the purpose because it may not be possible to get the identity of human population simply by analyzing a piece of DNA but comparative genomics may reveal the desired picture, may help to achieve the goal of the scientists working to unfold the mystery of the human evolution, the very origin of modern humans.

STEALTHY HUNER

Whispering bats

WESTERN barbastelle bats in Europe typically ping out their echolocation calls softly enough to locate a moth for dinner before the moth hears them coming, says Holger Goerlitz of the University of Bristol in England.

It's the first documented case of a bat species outwitting its prey by quiet stealth, he and his colleagues say online in a Current Biology paper released August 19. The battle between bats and moths has become a classic system for studying the evolution of predators and their prey.

In searching for moths, barbastelles echolocate at about the 94 decibel level, roughly the equivalent of a busy highway, Goerlitz reports. This bat version of whispering is 10 to 100 times lower in amplitude than other aerial-hunting bats' echolocation calls. Those rank more in the range of jet engines and the vuvuzelas blaring at the latest World Cup, Goerlitz says.

People can't hear frequencies high enough to detect any of this bat racket "quite lucky for us," Goerlitz says.

To measure the loudness of the barbastelle calls, researchers needed to know how far away from a microphone a flying bat was when it pinged. So they set up a microphone array where bats swooped through at night. The slight differences in times that the calls took to reach different microphones let researchers figure out the bat's position for each of more than 100 calls.

This array also let the researchers answer the critical question of whether the barbastelle's softer echolocation was soft enough for stealth attacks on eared moths. Researchers restrained European moths called large underwings along the bat flight alley and monitored the activity of their auditory nerves.

Source: Science News

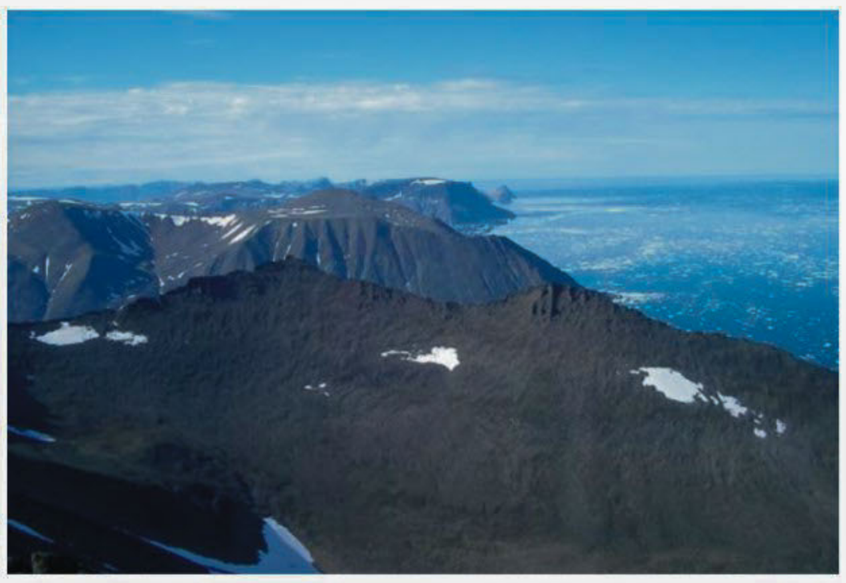
A western barbastelle bat gives its echolocation calls more softly than many other aerial hunters

Bit of old Earth

Ancient rocks hints at Earth's origin

OBAIDUR RAHMAN

Recently geochemists studying Arctic rocks have discovered evidence of ancient rock from the Earth's interior, which, they claim, is as old as the Earth itself. Much of the material that made up the early Earth was lost and modified as the processes of melted mantle began firing up magma to form Earth's crust and plate tectonics then mixed that crust back into the mantle below. Team-leader Dr. Matthew Jackson, Geochemist, Boston University and his group of international researchers discovered this recently from the lava samples of Greenland and Baffin Island in the Canadian Arctic only suggest this astounding possibility. Beneath this particular environmental setting lies a region of the Earth's mantle that has largely escaped the billions of years of melting and geological shake-up that has affected the rest of the planet. It must be understood that the mantle is the layer of viscous, super-hot rock that stirs below the solid crust of the planet's surface. Naturally, when covered by 5-to-25-mile-thick crust, this mantle, which actually makes up four-fifths of Earth's volume, is difficult to get to and study. And even when samples of the mantle are found, they usually happen to be relatively young and recycled, emerging at the surface of Earth as molten volcanic material. But the rocks that Dr. Jackson & company discovered were spewed up to the surface of Earth by an eruption about 60 million years ago. Scientists believe that the newly discovered mantle "reservoir" as it is now called, dates from just few tens of millions years after the Earth was first assembled from the collisions of smaller bodies. It is also believed that this reservoir very likely houses the basic elements of compositions of the mantle shortly after the formation of the Earth's interior core. The same very elements that existed before the 4.5 billion-years' process of crust formation and recycling, modified the composition of most of the rest of the Earth's interior. According to co-author Dr. Richard Carlson of Carnegie Institution's dept. of Terrestrial Magnetism, "This was a key phase in the evolution of Earth. It set the stage for everything that came after".



The rocks collected on Baffin Island were formed during a volcanic eruption 60 million years ago.

The team of scientists examined a variety of isotopes to asses the exact age of the rocks. It must be mentioned here that elements can occur in various forms which are known as isotopes and over-time ratios of these isotopes gradually change and this allows the researcher to estimate the rock's age. Studies of helium isotopes have shown that rocks have anomalously high ratios of helium-3 to helium-4. This helium-3 is generally extremely rare within the Earth whereas helium-4 is constantly replenished within the Earth by the decay of radioactive uranium and thorium. This high proportion of helium-3 strongly suggests that the lavas in Baffin Island must have come from a reservoir in the mantle that had never previously out-gassed its original helium-3. And this also strongly implies to the scientists that neither had it been subjected to the extensive chemical differentiation experienced by most of the mantle. Also by analyzing the lead isotopes in the lava samples, the researchers were able to date the rocks to between 4.55 and 4.45 billion years, slightly younger than the Earth, herself!

Researchers are hoping that this significant finding will offer a more detailed insight into Earth's early geochemical evolution, all the dynamics that are at play in the Earth's interior as well as even suggesting the possibility that this finding could even challenge the existing theories regarding the formation of Earth.

The contributor is a freelance science writer.

Pigment of oomph!

Photosynthesis unbound

A new kind of chlorophyll that catches sunlight from just beyond the red end of the visible light spectrum has been discovered. The new pigment extends the known range of light that is usable by most photosynthetic organisms. Harnessing this pigment's power could lead to biofuel-generating algae that are super-efficient, using a greater spread of sunlight than thought possible.

"This is a very important new development, and is the first new type of chlorophyll discovered in an oxygenic organism in 60 years," says biological chemist Robert Blankenship of Washington University in St. Louis.

The newfound pigment, dubbed chlorophyll f, absorbs light most efficiently at a wavelength around 706 nanometers, just beyond the red end of the visible spectrum, researchers report online August 19 in Science. This unique absorbance appears to occur thanks to a chemical decoration known as a formyl group on the chlorophyll's carbon number two. That chemical tweak probably allows the algaelike organism that makes chlorophyll f to conduct photosynthesis while living beneath other photosynthesizers that capture all the other usable light.

"In nature this very small modification of the pigment happens, and then the organism can use this unique light," says lecular biologist Min Chen of the University of Sydney in Australia. Chen and her colleagues identified the new pigment in extracts from ground-up stromatolites, the knobby chunks of rock and algae that can form in shallow waters. The samples were collecte the Hamelin pool in western Australia's Shark Bay, the world's most diverse stromatolite trove.

Previously there were four known chlorophylls made by plants and other photosynthesizing organisms that generate oxygen: a, b, c and d. Chlorophyll a, the standard green type, is found in photosynthesizers from algae to higher plants. It absorbs mostly blue light around 465 nanometers and red light around 665 nanometers (it reflects green light, hence plants look green). Chlorophylls b and c are found in fewer organisms and absorb light in a similar range as chlorophyll a does, but shifted a bit. Chlorophyll d, found in a specific group of cyanobacteria, absorbs the most light at roughly 697 nanometers, a slightly shorter wavelength than the absorption of the new chlorophyll.

While some bacteria make chlorophyll-like pigments that absorb even longer wavelengths of light, these creatures aren't harnessing light to split water, the step in photosynthesis that generates oxygen. Scientists didn't think that wavelengths absorbed by chlorophyll f would have enough oomph to split water either, but it turns out they do, says Chen.

"This challenges our conception of the limit of oxygenic photosynthesis," she says.

The find may also enable scientists to engineer algae that are more efficient producers of oil for biofuels, says algae biologist Krishna Niyogi of the University of California, Berkeley. Microbes bearing the new chlorophyll could soak up rays that most microbes can't make use of.

Source: Science News

An organism bearing a never-before-seen form of chlorophyll, dwells in knobby chunks of rock and algae known as stromatolites (above) that pepper Shark Bay, Australia.

Happy Oddity!

Why cosmos has more matter than anti-matter?

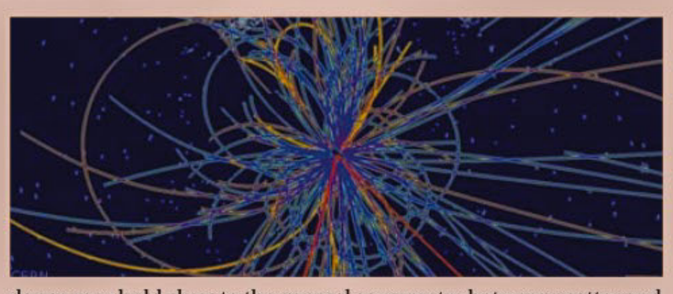
A recent atom smasher experiment may help finally explain why our universe is mostly made of matter, and not its bizarro-universe sibling, antimatter.

Antimatter is a strange kind of stuff with opposite properties from regular matter. When a particle, such as a proton, meets with its antimatter partner, the antiproton, the two annihilate each other in a powerful explosion.

Scientists think the universe was made of roughly equal parts matter and antimatter just after it formed, but these would have quickly destroyed each other. The universe that remains is made of the small surplus of matter that was left over.

But why would there have been a surplus of matter to begin with?

To answer that question, scientists sent protons and antiprotons on a collision course in the Fermilab Tevatron particle accelerator in Batavia, Ill. When the particles smashed together, they created debris that included about 1 percent more matter than antimatter. This overabundance may hold clues to the general asymmetry between matter and antimatter in the universe.



"We don't really understand the source of this matter asymmetry," said Don Lincoln, a physicist at Fermilab who worked on the experiment. "The stuff we've observed, we know is just hints. It's not the final story it doesn't explain everything."

Source: LiveScience

DO YOU KNOW?

What is cosmophobia?

Cosmophobia is an irrational fear that the world is about to end, and is sparked off by a belief among people that a cosmic end is near. The fear is ancient, and people have been readying for doom on and off - expecting floods, earthquakes, epidemics, drought, or even a collision with another planet. The latest bout was set off by the movie 2012, where the Mayan calendar counts December 21, 2012 as the last day. Earlier, the 2000 millennium frenzy had everyone believe that the end was near. For ages now, there have been apocalyptic predictions which have fuelled cosmophobia, but until now, they have all come to nought.