

Paleontology and Evolution in the News

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Abstract This is a review of recent media publications and journal articles about evolution and paleontology.

Keywords Turkana Basin · Early humans · Koobi Fora · Human evolution family tree · Laos · Oldest modern Asian · Multiple human species · *Tarbosaurus* · Stolen fossils · Mongolia · Court case · Joggins, Nova Scotia · UNESCO World Heritage Site · Sail-back reptile · Synapsid · Paleogene floras · Messel pit · Dinosaur eggs · Cretaceous · Primitive flying birds · Asteroid impact · Ammonites · Seymour Island, Antarctica · Hell Creek formation · Mass extinction · Mongolia · Digging fossil mammal · Pangolins · Ancient amber · Triassic

Introduction

Human fossils and dinosaurs are perhaps the two groups of animals that receive the most interest in the media. This column's entries are usually based on those research papers that are reported in the press. They generally seem to be the reports that would be of most interest to the general public, students, teachers, as well as the scientific community. However, that does not dismiss papers that are of great interest even though they do not make it to the news media. Often, this occurs because no press report was issued about the research by the supporting research organization. Below are my selections for this issue.

Early Human Fossils for Turkana Basin

John Noble Wilford wrote in *The New York Times* (<http://www.nytimes.com/2012/08/09/science/new-fossils-indicate-offshoots-in-human-family-tree.html?pagewanted=all>) on August 8, 2012, "New Fossils Indicate Early Branching of Human Family Tree" that "Fossil by fossil, scientists over the last 40 years have suspected that their models for the more human family tree—the single trunk, straight as a Ponderosa pine, up from *Homo habilis* to *Homo erectus* to *Homo sapiens*—were oversimplified. The day for that serious revision may be at hand." Many students of human evolution have been introduced to this notion for quite a while, but many details still remained to be discovered. A Google search (www.google.com) for human evolution family tree will list a large number of web sites containing many variations of the tree to choose from (be careful in the selection). His article is about the discovery of three new fossils that provides compelling evidence for multiple lines of evolution in our genus, *Homo*. The *Times* article and many others are based on the press release from the Turkana Basin Institute (<http://www.turkanabasin.org/discovery/knmer60000/>), "New Kenyan Fossils Shed Light on Early Human Evolution." An additional FAQ sheet from them is helpful to understand the significance of the discoveries (http://www.turkanabasin.org/wp-content/uploads/2012/07/FAQ_Kenyan-fossils-July-27th-2012.pdf). Their web site also contains a number of articles on human evolution that will be useful to educators. Also available are videos on YouTube (<http://www.youtube.com/watch?v=jCbYsdgWN5E>) and (http://www.youtube.com/watch?v=_V_j4CCZ6g&feature=relmfu) for viewing the fossils and their reconstructions. In addition, a series of quality images showing the fossils, the site, and the participants are available on (<http://www.flickr.com/photos/sbconnect/7747545016/in/photostream/>). Wilford writes that the fossils were collected between 2007 and 2009 by a

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team led by Meave and Louise Leakey, the mother-and-daughter paleoanthropologists of the Koobi Fora Research Project. “Dr. Meave Leakey is the wife of Richard Leakey, a son of Louis and Mary Leakey, who produced the early evidence supporting Africa’s central place in early human origins. Mr. Leakey divides his time between Stony Brook University on Long Island, where he is a professor of anthropology, and the Turkana Basin Institute in Kenya.” They say that the discovery of three new fossil specimens is the most compelling evidence yet for the multiple lines of evolution in our own genus. “The fossils showed that there are at least two contemporary *Homo* species, in addition to *Homo erectus*, living in East Africa as early as two million years ago.” As illustrated on the web sites listed above, the specimens were uncovered from sandstone at Koobi Fora, a badlands near Lake Turkana. “The specimens included a well-preserved skull of a late juvenile with a relatively large braincase and a long, flat face, which has been designated KNM-ER 62000 (62000 for short). It bears a striking resemblance to the enigmatic cranium known as 1470, the center of debate over multiple lineages since its discovery in the same area in 1972.” The scientists say that the 1470 specimen was two million years old; the new face and fragmentary jaw are 1.9 and 1.95 million years old; the better-preserved lower jaw is younger, at 1.83 million years old. As usual in *New York Times* articles of this type, the reporter interviews scientists who are not associated with the discovery for their comments. In this case, it was Ian Tattersall of the American Museum of Natural History in New York City who concluded that “This new material certainly substantiates the idea, long gathering ground, that multiple lineages of early *Homo* are present in the record at Koobi Fora.” Dr. Tattersall continued, “And it supports the view that the early history of *Homo* involved vigorous experimentation with the biological and behavioral potential of the new genus, instead of a slow process of refinement in a central lineage.” Chris Stringer of the Natural History Museum of London, who had no part in the research, agreed that it looked as if the new discoveries “confirm the distinctiveness of 1470” and “therefore confirm the existence of a distinctive kind of early human around 1.8 to 2.0 million years ago.” But he noted that “there remain many uncertainties” about the 1470 fossil “and whether it might still be just a large specimen of *Homo habilis*.” Another problem, Dr. Stringer said, is that in the last three decades, as the number of fossils attributed to *H. habilis* has grown, it has become unclear how to define what is and is not a member of that *Homo* species. Determining if the new fossils belong to *H. rudolfensis* or *H. habilis*, he said, “would depend on ongoing comparisons with the original fossil assemblage” at Olduvai Gorge in Tanzania, where the first and many other *H. habilis* and contemporary specimens have been excavated. Google (www.google.com) lists 121 news articles related to this discovery. In addition to the press release, the source information

came from the article published by Meave G. Leakey and others in the journal *Nature*, “New fossils from Koobi Fora in northern Kenya confirm taxonomic diversity of early *Homo*” (Leakey et al. 2012). “Bernard Wood of George Washington University, who has studied the early *Homo* fossil record, wrote in a companion article also in *Nature*, “Palaeoanthropology: Facing up to complexity,” vol. 488, pages 162–163, doi:[10.1038/488162a](https://doi.org/10.1038/488162a), “In a nutshell, the anatomy of the specimens supports the hypothesis of multiple early *Homo* species.” Dr. Wood then weighed the pros and cons of placing the new fossils with the species *H. habilis*, first discovered in 1964, or a separate and controversial parallel species known as *H. rudolfensis*, to which 1470 has often been tentatively assigned. *H. erectus* emerged around the same time, joining the other two species in Africa.”

Oldest Modern Human Fossil in Laos

At the opposite end of the human evolution tree is the discovery of the oldest modern human in Asia (http://zeenews.india.com/news/eco-news/oldest-modern-human-fossil-in-southeast-asia-found-in-laos_794986.html), August 20, 2012. The article reports that researchers found the skull in 2009 in a cave in the Annamite Mountains in northern Laos and says this is the first time since the early 1900s that scientists dug for fossils in Laos. In those early excavations, several modern human skeletons were found, but in a different cave, and have been dated to be about 16,000 years old. However, the newly found skull has been dated between 46,000 and 63,000 years old. No artifacts have been found associated with the skull, leading to the suggestion by University of Illinois anthropologist Laura Shackelford, who led the study with anthropologist Fabrice Demeter, of the National Museum of Natural History in Paris, that the skull was not found at a dwelling or burial site. Perhaps the body was washed into the cave after the individual died. “The find reveals that early modern human migrants did not simply follow the coast and go south to the islands of Southeast Asia and Australia, as some researchers have suggested, but that they also travelled north into very different types of terrain,” Shackelford said. The researchers also say that this skull’s genetic data also reinforce the DNA studies that indicate that modern humans occupied that part of the world at least 60,000 years ago. “This fossil find indicates that the migration out of Africa and into East and Southeast Asia occurred at a relatively rapid rate, and that, once there, modern humans weren’t limited to environments that they had previously experienced,” said Kira Westaway of Macquarie University in Australia. An article also appeared in *Discover Magazine* (<http://blogs.discovermagazine.com/80beats/2012/08/22/human-skull-begins-to-fill-in-20000-year-gap-in-fossil-record/>) on August 20, 2012. The article contains an image of the skull and a brief discussion of its features. The

formal description of the find was published in Proceedings of the National Academy of Sciences, on August 20, 2012, doi: 10.1073/pnas.1208104109 (<http://www.pnas.org/content/early/2012/08/15/1208104109.abstract?sid=1c2f242b-1082-4aeb-8d12-f4fae75d21e6>) “Anatomically modern human in southeast Asia (Laos) by 46 ka.” The lead authors are Fabrice Demeter and Laura L. Shackleford. A large number of additional individuals contributed to the study. Their abstract, in part, states that “Uncertainties surround the timing of modern human emergence and occupation in East and Southeast Asia. Although genetic and archeological data indicate a rapid migration out of Africa and into Southeast Asia by at least 60 ka, mainland Southeast Asia is notable for its absence of fossil evidence for early modern human occupation. Here we report on a modern human cranium from Tam Pa Ling, Laos, which was recovered from a secure stratigraphic context. Radiocarbon and luminescence dating of the surrounding sediments provide a minimum age of 51–46 ka, and direct U-dating of the bone indicates a maximum age of ~63 ka. The cranium has a derived modern human morphology in features of the frontal, occipital, maxillae, and dentition. It is also differentiated from western Eurasian archaic humans in aspects of its temporal, occipital, and dental morphology. In the context of an increasingly documented archaic-modern morphological mosaic among the earliest modern humans in western Eurasia, Tam Pa Ling establishes a definitively modern population in Southeast Asia at ~50 kacal BP. As such, it provides the earliest skeletal evidence for fully modern humans in mainland Southeast Asia.”

Mongolian Dinosaur Controversy

The *Wall Street Journal* on August 20, 2012, published the Associated Press story about a Florida fossil dealer wanting his seized specimen returned (<http://online.wsj.com/article/AP4020fe03b0f94c29a7cf23208352b015.html>). “A Florida fossils dealer whose dinosaur was seized by the U.S. government so it could be given to the government of Mongolia wants it back. Lawyers for Eric Prokopi, of Gainesville, Fla., said in court papers filed Monday that he was victim of a media campaign stirred up by academic paleontologists.” See below for details about the paleontologists and the issue of illegal fossils removal and sale. The U.S. government seized the skeleton of *Tyrannosaurus bataar* which had been sold at an auction for \$1.05 million. The government said that the specimen was brought into the country with bogus documents which stated that the specimen was reptile bones from Great Britain. Prokopi indicated that the bones were brought into the country in March 2010 when they were just chunks of rocks and broken bones. He said he turned them into “an impressive skeleton.” “The court papers called the effort to return the 70 million-year-old

skeleton to Mongolia unprecedented, saying fossils from China, Kazakhstan, Mongolia and Russia have been openly sold on the international market and collected in the United States by people and museums for generations.” The original controversy came to light in news stories back in May, 2012. For example, Brian Switek on May 19, 2012, wrote, “Stop the *Tarbosaurus* Auction!” in *Wired* (<http://www.wired.com/wiredscience/2012/05/stop-the-tarbosaurus-auction/>). He said that “Tomorrow, a tyrannosaur will go up for auction in New York City. It shouldn’t. The *Tarbosaurus* was illegally collected and smuggled out of Mongolia. Fossil theft is a major problem. It can happen anywhere, but dinosaur poaching is especially persistent and pernicious in China and Mongolia. Prime specimens are regularly ripped from the rock to be sold to private individuals elsewhere around the world, all against the heritage laws meant to regulate the responsible collection and curation of dinosaurs and other prehistoric creatures.” The author cites several examples of individuals and even museums that were duped into receiving stolen goods. Negative publicity about the auction generated an online petition to stop the auction which was signed by over 500 “paleontologists, volunteers and concerned parties.” The intermingling in these articles of the generic names *Tarbosaurus* and *Tyrannosaurus* occurs because they are closely related and actually may be synonymous. An image of the specimen accompanies the article. See also Neil Kelley’s “Heritage Auctions: Stop the auction of illegally collected Mongolian dinosaur fossils” (<http://www.change.org/petitions/heritage-auctions-stop-the-auction-of-illegally-collected-mongolian-dinosaur-fossils>) for additional information. Ultimately, the lawsuit is beneficial because it expands public awareness of the issue of fossil smuggling.

Fossils Seized in Detroit

Here is another example, somewhat mysterious, of the problem of possible illegal fossils. Christina Hall wrote in the *Detroit Free Press* that “Hundreds of pre-historic fossils seized last year by U.S. Customs and Border Protection in Detroit are being donated to the University of Michigan” (<http://www.freep.com/article/20120810/NEWS06/120810059/Hundreds-fossils-seized-Detroit-last-year-donated-U-M>). The U.S. Customs and Border Protection provided an image of some of the fossils, most of which are trilobites but are part of a cache of 1,100 fossils. The fossils were seized in March 2011 after two Canadian men at the Ambassador Bridge, which spans the Detroit River, said they were attending a fossil trade show in Illinois. They were seized because the unidentified men did not properly declare the goods. “He said the agency tried to contact the men several times to reclaim the fossils and pay associated penalties, but they never got back in touch with customs and border

protection.” However, at the time, how much the penalties were was unknown. Because they did not reappear, the agency reached out to the University of Michigan paleontology department offering the fossils where they would be used for research and teaching. Daniel Fisher, the director of the university’s Museum of Paleontology, worked with customs and border protection on the donation. He is doing field work in Siberia and has infrequent email contact, Jim Erickson, a university spokesman, said in an email Friday.

Nova Scotia Family Finds Fossil Reptile

Often, amateur paleontologists make significant paleontological discoveries, and once in a while, a find is made serendipitously by people not particularly looking for them. Take the case of Patrick Keating and his family. While walking their dog Kitty along Nova Scotia’s Northumberland Shore this summer, they made what has been called the province’s most significant fossil discovery. The find was reported in CTV Atlantic (<http://atlantic.ctvnews.ca/family-makes-nova-scotia-s-most-significant-fossil-find-1.916896>). Included in the posting is the actual TV report and interviews with the discoverers and a number of images of the fossil. The Keatings and their dog Kitty found the rib cage, backbone, and partial sail of the first sail-back reptile to be found in Nova Scotia. A return to the site a week later yielded the skull of the reptile. The lucky family named the fossil “Superstar.” “We really had no idea how significant this was,” said Patrick Keating in a statement released Thursday. “My brother Peter and his kids took the pieces to the Nova Scotia Museum and when we learned what they were, we were truly amazed and so glad we brought them in.” The sail-back reptile is a mammal-like reptile, a synapsid that lived during the late Carboniferous Period or early Permian Period, making it 290 million to 305 million years old. It is thought that the “sail” was used a thermoregulation device. “According to the government release, paleontologists knew the sail-back reptile had once roamed the area as footprints were found in 1994 in Colchester County and isolated bones were discovered in 1845 on Prince Edward Island, but they are calling the Keating’s discovery the “province’s most significant fossil find.”” Nova Scotia is renowned for its rich fossil deposits, and the fossil cliffs at Joggins are designated as a UNESCO World Heritage site. Here, the steep beach is washed by tidal action, continually undermining its adjacent cliffs and uncovering not only the reptiles but also fossilized plants including early trees.

Plant Diversity in the Paleogene

On July 10, 2012, the Senckenberg Research Institute in Frankfurt issued a press release “The World’s Greatest Plant

Diversity for the Paleogene,” (http://www.senckenberg.de/root/index.php?page_id=5210&year=2012&action=press&id=2351) which began: “Scientists from the Senckenberg Research Institute in Frankfurt have investigated the extensive collection of fruits and seeds from the Messel pit. They found 140 different plant species, 65 of which were previously unknown. They show that Messel had one of the world’s most diverse floras of the Paleogene—the era between about 65 and 23 million years ago.” The sediment in the pit was deposited during the Eocene in a lake in which coal formed. And because of the condition in the lake during the deposition, the fossils are excellently preserved. The Messel locality near Darmstadt is well known for yielding specimens of dwarf horses, the primate Ida, and jewel beetles. However, the plant fossils from Messel are also unique in their diversity. A team of scientists from the Senckenberg Research Institute in Frankfurt, the University of London, and the Florida Museum of Natural History now provides an overview of the wealth of plant life 47 million years ago in a 250-page monograph published in the journal *Abhandlungen der Senckenberg Gesellschaft für Naturforschung*, 570, by Margaret E. Collinson, Steven R. Manchester, and Volker Wilde: *Fossil Fruits and Seeds of the Middle Eocene Messel biota, Germany*, 2012, 251 pages, two figs, three tabs, 76 plates, ISBN 978-3-510-61400-4. These scientists described 140 plant species from the collections of Senckenberg and the Hessian State Museum in Darmstadt. The seeds and fruits, as well as many leaves, flowers, and pollen grains, were recovered during excavations by both institutions in the previous decades, but they had not been studied in detail before. “We have found numerous remains of a diversity of flowering plants and some conifers,” says Dr Volker Wilde, head of the paleobotany section at the Senckenberg Research Institute in Frankfurt. “More than 60 types of plants could not be assigned to any known family—they are genuine new discoveries.” Included in the study are plants that were previously unknown at Messel which are described in the monograph. Altogether, it shows that the Messel site is one of the richest sites for flowering fossil plants. The plants contain a great variety of dispersal methods; some developed wings on their seeds and relied on the wind, while others depended on animals to spread them, and in others, the seeds were contained in exploding capsules that scattered their seeds over a wide area. “From the flora described we are also able to draw conclusions about the diet of animals 47 million years ago,” the Frankfurt paleobotanist explains. “Fruits and seeds in the digestive tracts of vertebrates indicate that they were an important part of their food. Tiny holes in seeds also show that the famous Messel weevils also fed on certain plants.” The diversity of the flora is ideal for reconstructing the climatic and environmental conditions of the Paleogene. The scientists analyzed around 30,000 plant remains and have concluded that climate was a

warm and tropical layered jungle 47 million years ago. A brief mention of the study is found on the web in examiner.com (<http://www.examiner.com/article/largest-paleogene-plant-diversity-ever-found-revealed-from-messel-site>), but it contains an image of the Messel fossil pit. Wikipedia (http://en.wikipedia.org/wiki/File:Messel_Pit_during_the_Eocene.jpg) shows the location of the site on a paleogeographic map of the Eocene while a full article (http://en.wikipedia.org/wiki/Messel_pit) describing this UNESCO World Heritage site appears to be accurate, not only describing its history of discovery but also providing a review of some of the fossils that have been found there, which includes mammals, birds, reptiles, fish, and insects.

Dinosaur Eggs Are Linked to Birds

Researchers from the Complutense University of Madrid and the Universitat Autònoma de Barcelona identified in Lleida a series of dinosaur eggs with a unique characteristic: they are oval in shape. The discovery represents proof in favor of the hypothesis that birds and non-avian theropods, dinosaurs from the Cretaceous Period, could have a common ancestor. The press release from the Universitat Autònoma de Barcelona (UAB) is titled “Fossil egg discovered in Leida links dinosaurs to today’s birds” (<http://www.uab.es/servlet/Satellite/latest-news/news-detail/fossil-egg-discovered-in-lleida-links-dinosaurs-to-today-s-birds-1096476786473.html?noticiaid=1341988002858>). The new type of dinosaur egg has been given the scientific name of *Sankofa pyrenaica*. The eggs were discovered in the Montsec area of Lleida, in the south Pyrenees, an area rich in dinosaur egg sites, most of which are Upper Cretaceous sauropods living around 70 million years ago. “Non-avian dinosaur eggs are symmetrical and elongated. Asymmetry in bird eggs is associated to the physiology of birds: they take on this shape given the existence of only one oviduct which can only form one egg at a time. In this case, the isthmus, the region in the oviduct creating the eggshell membrane, is what gives the egg its asymmetrical shape. Thanks to this shape, the wider end contains a bag of air which allows the bird to breathe in the last stages of its development. This evolutionary step was still relatively underdeveloped in dinosaurs.” Few news media responded to the press release, although one of them, examiner.com, posted the story written by Paul Hamaker, “Fossil eggs from Spain connect birds and dinosaurs” (<http://www.examiner.com/article/fossil-eggs-from-spain-connect-birds-and-dinosaurs>), on July 12, 2012. He reinforced the fact that modern and ancient birds produced oval-shaped eggs due to internal mechanisms involved in egg laying by birds. “These are the first eggs discovered that indicate birds and non-avian theropods had a common ancestor. The eggs were found in Lleida Spain by

Nieves López-Martínez and Eric Vicens,” paleontologists at the Universities. The article contains an image of a crow’s egg which clearly shows the asymmetric shape of its egg. A similar article, “Oval Eggs Suggest Dinosaur/bird Link,” posted by UPI.com (http://www.upi.com/Science_News/2012/07/12/Oval-eggs-suggest-dinosaurbird-link/UPI-13421342129852/) on July 12, 2012, includes an image of the dinosaur eggs showing their oval shape. The researchers published their study in the journal *Palaeontology*, Nieves López-Martínez, Enric Vicens. “A new peculiar dinosaur egg, *Sankofa pyrenaica* oogen. nov. oosp. nov. from the Upper Cretaceous coastal deposits of the Aren Formation, south-central Pyrenees, Lleida, Catalonia, Spain.” (López-Martínez and Vicens 2012). Their paper describes the geological setting of the Upper Cretaceous of their study area as well as the formal description of the new eggs. This is what they have to say in the discussion section of the paper: “The overall prismatic eggshell structure and the asymmetric egg shape of the new late Cretaceous egg type *Sankofa pyrenaica* oogen. nov. oosp. nov. associate it with theropod carnivorous nonavian dinosaurs and birds (Varricchio et al. 1997, 2002). However, the only direct evidence of egg parent is the presence of in situ embryonic remains. Failing this, only indirect data can help us to infer the phylogenetic affinities of the depositor of *Sankofa*, particularly to discriminate between birds and nonavian theropod dinosaurs. Cretaceous theropod eggs are relatively frequent in the fossil record, but only a few of them have been referred to a particular body taxon (genus), based on their association with embryonic materials or with brooding adults.”

Hunting by Dinosaurs

“Dinosaur Fossils show ‘Wolf-like’ Species, *Sinocalliopteryx*, Preyed on Primitive Birds” is the headline in the Huffington Post on August 29, 2012 (http://www.huffingtonpost.co.uk/2012/08/29/dinosaur-fossils-sinocalliopteryx_n_1839534.html?utm_hp_ref=uk). The story is about a wolf-like dinosaur that hunted primitive flying birds that had not mastered the art of fast takeoffs evidenced by the remains of early birds in the belly of the six-foot-long dinosaur *Sinocalliopteryx*. The preservation of the stomach fossils are such that the researchers say that they were only partially digested. The dinosaur lived during the Lower Cretaceous, about 120 million years ago and was found in China’s Liaoning region. Researcher Scott Persons said that “The fact that this *Sinocalliopteryx* had not one but three undigested birds in its stomach indicates it was a voracious eater and a very active hunter.” Images of drawings of the dinosaur accompany the article, one showing the dinosaur attacking a bird and the other swallowing its prey. The drawings also give the reader the artist’s interpretation of how the dinosaur looked. In another version of the article (<http://www.huffingtonpost.com/2012/08/30/dinosaur-fossil-last->

[meal_n_1843903.html](#)), there is an image of the well-preserved skeleton. These articles and 60 like it were based on the press release of August 29, 2012, “Rare find: Feathered dinosaur feasts on flying food” (http://www.eurekalert.org/pub_releases/2012-08/uoarfff082812.php). But most of the details come from the research article in *PLoS ONE* by Lida Xing, Phil R. Bell, W. Scott Persons, Shuan Ji, Tetsuto Miyashita, Michael E. Burns, Qiang Ji, and Philip J. Currie, “Abdominal Contents from Two Large Early Cretaceous Compsognathids (Dinosauria: Theropoda) Demonstrate Feeding on Confuciusornithids and Dromaeosaurids” (Xing et al. 2012). The authors say in their abstract that “two skeletons of the large compsognathid *Sinocalliopteryx gigas* include intact abdominal contents. Both specimens come from the Jianshangou Beds of the lower Yixian Formation (Neocomian), Liaoning, China. The holotype of *S. gigas* preserves a partial dromaeosaurid leg in the abdominal cavity, here attributed to *Sinornithosaurus*. A second, newly-discovered specimen preserves the remains of at least two individuals of the primitive avialan, *Confuciusornis sanctus*, in addition to acid-etched bones from a possible ornithischian. Although it cannot be stated whether such prey items were scavenged or actively hunted, the presence of two *Confuciusornis* in a grossly similar state of digestion suggests they were consumed in rapid succession. Given the lack of clear arboreal adaptations in *Sinocalliopteryx*, we suggest it may have been an adept stealth hunter.” The paper contains eight figures that show skeletal parts and stomach contents among others.

End of Cretaceous Extinctions

By now, most geologists and paleontologists accept the asteroid explanation for the extinction of the dinosaurs 65 million years ago resulting later in the mammals rise to prominence. However, Eddie Wrenn wrote in Mail Online, September 6, 2012, that “Dinosaur die-outs have been the second of two massive extinctions: Researchers believe huge underwater volcanoes ‘killed off all the sea-life first’” (<http://www.dailymail.co.uk/sciencetech/article-2199277/Dinosaur-die-second-massive-extinctions-Huge-underwater-volcanoes-killed-sea-life-first.html?ito=feeds-newsxml>). He writes that new research reveals a different explanation—that there were two extinctions—the first one resulted from volcanic eruptions that warmed the earth and killed life on the sea floor—eruptions formed the Deccan Plateau in India. A little later, the dinosaur extinction event was triggered by an asteroid six miles in diameter that collided with the earth in Mexico’s Yucatan Peninsula. The researchers believe that the first extinction may have lasted about 100,000 years, starting about 200,000 to 300,000 years before the impact. The authors believe that first extinction killed off some of

the life on the ocean floor, while the impact caused the extinction of many of the swimmers. Thomas Tobin, lead author of the scientific paper, found evidence for their proposed explanations in a fossil-rich area on Seymour Island, off the Antarctic Peninsula. Because their explanation for the extinction involves the production of aerosols (fine particles) during the eruption, to help the reader, the article includes an image of an underwater volcanic eruption near Tonga in 2009 to help them imagine what it may have been like 65 million years ago, an artist’s impression of the asteroid impact and images of giant fossil ammonites found in Antarctica. The article is based on a press release written by Vince Stricherz from the University of Washington “Dinosaur die out might have been second of two closely timed extinctions” (<http://www.washington.edu/news/2012/09/05/dinosaur-die-out-might-have-been-second-of-two-closely-timed-extinctions/>). Tobin said that fossil-rich area of Seymour Island “has very thick sediment deposits and, for a given interval of time, might contain 10 times more sediment as the well-known Hell Creek Formation in Montana. That means scientists have much greater detail as they try to determine what was happening at the time.” Here is the reference to the research paper: Thomas S. Tobin, Peter D. Ward, Eric J. Steig, Eduardo B. Olivero, Isaac A. Hilburn, Ross N. Mitchell, Matthew R. Diamond, Timothy D. Raub, Joseph L. Kirschvink. “Extinction patterns, $\delta^{18}\text{O}$ trends, and magnetostratigraphy from a southern high-latitude Cretaceous–Paleogene section: Links with Deccan volcanism,” (Tobin et al. 2012). And here is what the authors say in their abstract: “Although abundant evidence now exists for a massive bolide impact coincident with the Cretaceous–Paleogene (K–Pg) mass extinction event (~65.5 Ma), the relative importance of this impact as an extinction mechanism is still the subject of debate. On Seymour Island, Antarctic Peninsula, the López de Bertodano Formation yields one of the most expanded K–Pg boundary sections known. Using a new chronology from magnetostratigraphy and isotopic data from carbonate-secreting macrofauna, we present a high-resolution, high-latitude paleotemperature record spanning this time interval. We find two prominent warming events synchronous with the three main phases of Deccan Traps flood volcanism, and the onset of the second is contemporaneous with a local extinction that pre-dates the bolide impact. What has been termed the K–Pg extinction is potentially the sum of multiple, independent events, at least at high latitudes.”

Early Digging Mammal

A fossil mammal the size of a badger has been found in the Naran Bulal region of southern Mongolia possessing sharp digging claws. A report was published on August 28, 2012,

in news.scotsman.com (<http://www.scotsman.com/news/uk/badger-fossil-may-hold-key-to-the-secrets-of-evolution-1-2491991>) entitled “Badger” fossil may hold key to the secrets of evolution.” The article reports that *Emanodon antelios* lived only a few million years after the dinosaurs became extinct 65 million years ago during the Paleocene 57 million years ago. Its large sharp claws and strong arms indicate that the animal was built for digging and probably is a very distant relative of present-day pangolins. “Lead researcher Dr Peter Kondrashov, a bone specialist from Kirksville College of Osteopathic Medicine in Missouri, U.S., said: “Only a handful of Asian Palaeocene mammals are known by their post-cranial skeleton, which makes *Emanodon* a unique source of very important information about its habits, lifestyle and affinities.” He also said “Few other fossil mammals presented as many controversies in the scientific world as *Emanodon* did and we are glad the new skeleton helped us resolve them.” An image shows the skeletons of a Chinese pangolin (*Manis pentadactyla*) and *Emanodon antelios*. The research was published in the *Journal of Vertebrate Paleontology*, and a press release was released on August 27, 2012, through Eurekalert (http://www.eurekalert.org/pub_releases/2012-08/sov-fso082212.php), “Fossil skeleton of strange, ancient digging mammal clears up 30-year evolutionary debate.” The release also contains an image of the skeletal elements of *Emanodon*. Of interest is the history of its discovery: “The first specimen was discovered by a team of Soviet paleontologists in 1979 but remained unstudied for more than thirty years. The new specimen preserves most of the arms, legs, and backbone of the badger-sized animal, including many bones that were not preserved in the first specimen. The authors of the new study made detailed comparisons among the bones of *Emanodon* and those of modern mammals and concluded that *Emanodon* was highly specialized for digging. It may have dug for food, for shelter, or both” (Kondrashov and Agadjanian 2012).

Triassic Mites in Amber

Ancient amber has been one of the great sources for fossils that normally would not be preserved in any other environment. And although present-day arthropods include most of the species within the animal kingdom as fossils they represent only a small fraction of those that lived in the past. Jonathan Ball describes on August 28, 2012, in BBC News, “Triassic Amber yields ‘ancient mites’” (<http://www.bbc.co.uk/news/science-environment-19400520>). He writes that the researchers hope that two plant-eating mites and one insect “will provide important insight into early evolution of this highly diverse family of animals... As Prof David Grimaldi from the

American Museum of Natural History in New York, and lead author of the study, explained: ‘Amber is an extremely valuable tool for palaeontologists because it preserves specimens with microscopic fidelity, allowing uniquely accurate estimates of the amount of evolutionary change over millions of years.’” While these specimens are from Triassic amber 230 million years old, the previous oldest arthropod-bearing amber was found in 135-million-year-old Cretaceous deposits. These specimens came from outcrops near the village of Cortina in the Dolomite Alps in northeast Italy, deposits that were excavated by Prof Eugenio Ragazzi and Dr Guido Roghi of the University of Padova. The specimens are only tiny droplets, but part of the research team, Alexander Schmidt, of Georg-August University, Göttingen, was able to recover 70,000 of them, then screening them for any that contained fossils. The tiny arthropods were studied by Grimaldi and Evert Lindquist, an expert on gall mites at Agriculture and Agri-Food Canada in Ottawa. “The new mite species are the oldest fossils of an extremely specialised group called Eriophyoidea. This contains about 3,500 living species, all of which feed on plants and sometimes form abnormal growth called ‘galls’.” As Prof Grimaldi observed, “You would think that by going back to the Triassic you’d find a transitional form of gall mite, but no.” Even 230 million years ago, all of the distinguishing features of this family were there—a long, segmented body; only two pairs of legs instead of the usual four found in mites; unique feather claws; and mouthparts. The article contains an image of the amber droplets and images of the mites. The scientists detailed their findings online Aug. 27 in the journal *Proceedings of the National Academy of Sciences*, doi: [10.1073/pnas.1208464109](https://doi.org/10.1073/pnas.1208464109) (<http://www.pnas.org/content/early/2012/08/21/1208464109>) “Arthropods in Amber from the Triassic Period” by Alexander R. Schmidt, Saskia Jancke, Evert E. Lindquist, Eugenio Ragazzi, Guido Roghi, Paul C. Nascimbene, Kerstin Schmidt, Torsten Wappler, and David A. Grimaldi. The supplemental material for the article contains additional images of the specimens, a stratigraphic chart of the main Triassic amber deposits of the world. The nearly 200 media reports were probably alerted to the article by the press release issued by the American Museum of Natural History (www.amnh.org/about-us/press-center/oldest-occurrence-of-arthropods-preserved-in-amber).

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