# ANNOTATIONS FROM THE LITERATURE

## ANTHROPOLOGY: ORIGIN OF MAN

Swisher CC, Rink WJ, Anton SC, Schwarcz HP, Curtis GH, Suprijo A, Widiasmoro. 1996. Latest *Homo erectus* of Java: potential contemporaneity with *Homo sapiens* in Southeast Asia. Science 274:1870-1874.

***Summary:*** Hominid fossils were first discovered in Java in the late 1880s. They have been given the name *Homo erectus*, more popularly known as "Java Man." Conventional dates for "Java Man" are about 500,000 years, with other "erectines" dating as far back as about 2 million years. The *Homo erectus* group is frequently interpreted as a direct ancestor of modern humans. Fossil cattle teeth from the same deposits ranged in dates from 27,000 to 53,000 years by electron spin resonance and uranium-series dating. This date overlaps with fossils of modern *Homo sapiens*, raising the possibility that the two types of hominids might have co-existed.

***Comment:*** The implication that "erectines" overlapped with humans of modern appearance is highly interesting. The exact relationships of "erectines" and modern humans are of great interest, and it is to be hoped that further studies will clarify this point. Fossil neanderthals have also been reported to overlap with modern humans. Creationists should be aware, however, that evolutionary theory no longer predicts that an ancestral species will necessarily disappear when its descendant appears. Thus it is consistent with evolutionary theory for *Homo erectus* to be the ancestor of *Homo sapiens*, yet the two species be found living at the same time.

## CATASTROPHISM

Erwin DH. 1996. The mother of mass extinctions. Scientific American 275(1):72-78.

***Summary:*** The largest mass extinction in the geologic record is at the top of the Permian. An estimated 90% or more of the fossil species found in Upper Permian rocks are not found in higher strata. Groups that disappeared include: two-thirds of the families of reptiles and

amphibians; nearly one-third of the orders of insects; and nearly half the families of marine invertebrates, including the last of the trilobites. Marine fossils from Paleozoic rocks are predominantly immobile types, such as brachiopods, crinoids, and rugose corals. Mesozoic rocks contain more mobile types, such as crabs, snails and fish. The cause of this mass disappearance is not known, but may be related to extensive volcanism in Siberia, or to changes in sea level. There is no evidence for a large end-Permian extraterrestrial impact.

***Comment:*** Two features of this mass disappearance are of particular interest. First, the change in ecological types from largely immobile Paleozoic types to more mobile Mesozoic types may be an important signal of the processes responsible for catastrophic deposition of the geologic column. Second, the apparent relationships among flood basalts, sea-level changes and mass disappearances may suggest fruitful areas of investigation for catastrophists. In a catastrophic model, the causes of mass disappearances need not necessarily be restricted to the immediate stratigraphic level in question, but may be part of a more extensive geologic process.

## EFFECT OF MUTATIONS

Baker RJ, Van Den Bussche RA, Wright AJ, Wiggins LE, Hamilton MJ, Reat EP, Smith MH, Lomakin MD, Chesser RK. 1996. High levels of genetic change in rodents of Chernobyl. Nature 380:707-708.

***Summary:*** The nuclear accident at Chernobyl released radiation into the surrounding vicinity. The genetic effects of this radiation on the mitochondrial cytochrome b gene of mice in the area were studied. Nine Chernobyl mice were compared with 10 mice from outside the contaminated area. The Chernobyl mice had more than ten times as many nucleotide differences, implying a mutation rate at least ten times greater than in the non-Chernobyl mice. Each Chernobyl mouse had a unique gene sequence. Despite the high mutation rate, the mice appeared normal morphologically, and continue to thrive and reproduce in the area around Chernobyl. It appears that the genome of these rodents is remarkably resilient to mutational changes.

***Comment:*** Mammals may be more tolerant both to radiation and to high mutation rate than has been thought. Nevertheless, the danger from radioactive wastes should not be minimized.

## EXOTIC STONES

Bennett MR, Doyle P, Mather AE. 1996. Dropstones: their origin and significance. Palaeogeography, Palaeoclimatology, Palaeoecology 121:331-339.

***Summary:*** Fine-grained sediments sometimes contain rocks that are unexpectedly large or of a different composition. These are called dropstones, and are typically interpreted as the result of ice rafting and inferred to be evidence of past glaciation. However, dropstones are sometimes found in geologic settings that do not seem compatible with glaciation. Another explanation is needed to account for some dropstones. Three other explanations are available. Stones may be transported in the crops or stomachs of vertebrates, or in the roots of rafting plants. Water may transport stones, either by flotation or through the motion of turbidites. A third alternative is that stones may have moved as projectiles, generally from volcanic sources, but possibly from extraterrestrial impacts, or even due to human rock-throwing. Thus, inferences of glaciation based on the presence of dropstones may need to be re-evaluated.

***Comment:*** Several claims of pre-Pleistocene glaciation have been made, including the Permo-Carboniferous glaciation of the southern hemisphere. Climatic indicators sometimes suggest warm-climate fossils when glaciation was supposedly occurring. Other explanations for striated rocks, dropstones and tillites are known, and all claims for pre-Pleistocene glaciation should be evaluated critically.

## GENOME OF YEAST

Dujon B. 1996. The yeast genome project: what did we learn? Trends in Genetics 12:263-270.

***Summary:*** The genome of the baker's yeast, *Saccharomyces cerevisiae*, has now been completely sequenced. This is the first complete sequence for a eukaryotic organism, and permits comparison with the genomes of previously sequenced eubacteria and archaea. The yeast genome contains something over 12 million nucleotide pairs, with an estimated 6000 genes. Probably the biggest surprise of the sequencing project is the large number of "orphan genes" for which no function is known, either in yeast or in any other organism. About 2000 genes appear to fit this description at present, and it appears

likely that a significant number will remain even after further analysis and comparison. This point may be the most interesting one gained from the yeast genome sequencing project.

***Comment:*** Genome sequencing studies so far show large numbers of genes unique to each species. If this pattern continues, it may weaken confidence in the evolutionary conjecture that gene duplication and divergence can account for the increase in the number of genes and gene functions needed to account for evolution of organisms of increasing complexity.

## MASS MOVEMENT

Beutner EC, Craven AE. 1996. Volcanic fluidization and the Heart Mountain detachment, Wyoming. Geology 24:595-598.

***Summary:*** A block of sedimentary rock some 1500 $km^2$ broke away from a location near the eastern border of Yellowstone National Park and slid southeast across the surface for a distance of at least 30 km, and possibly more than 50 km. The block includes Ordovician to Eocene rocks, moving during a time of volcanic activity in the Absaroka ranges. Estimates for the time involved for the movement range from a million years to perhaps less than an hour. The problem has been to explain why the block moved at all. A highly unusual microbreccia on the sliding surface has features that appear to indicate the material was fluidized, apparently by volcanic gases injected onto a bedding plane. The combination of formation of a breakaway fault and reduction of friction by the fluidized material allowed the block to slide down a 1-2 degree slope. More study is needed to determine the amount of time involved, but it could not have been very long.

***Comment:*** The Heart Mountain detachment must have involved conditions unlike anything observed in the modern world.

Brack P, Mundil R, Oberli F, Meier M, Rieber H. 1996. Biostratigraphic and radiometric age data question the Milankovitch characteristics of the Latemar cycles (Southern Alps, Italy). Geology 24:371-375.

***Summary:*** Finely laminated sediments are found in numerous places, including the Italian Alps. Such sequences may show patterns of repeating variation of lamina thickness. One such sequence involves hundreds of carbonate cycles in the Middle Triassic Latemar platform. These have been explained as due to the Milankovitch cycle of

20,000 years. At least 598 cycles are reported, implying a total time of about 12 million years. However, a combination of index fossils and radiometric dating indicates a maximum age of 4.7 million years for the deposits, and probably less than 4 million years. This suggests that the patterns in the laminae may not be a result of the Milankovitch cycle. The authors suggest that ancient carbonates may not supply sufficient data for unambiguous identification of Milankovitch cycles.

***Comment:*** Possible rejection of Milankovitch cycles as the explanation for cyclic patterns of variation in laminated sediments should stimulate efforts to find better ways of explaining the origin of thin laminae in sediments. It seems remarkable that a lake should maintain relatively constant conditions of deposition over periods in excess of 100,000 years, much more so for the longer periods often suggested by the Milankovitch cycle interpretation.

## ORIGIN OF THE EYE

Loosli F, Kmita-Cuniss M, Gehring WJ. 1996. Isolation of a Pax-6 homolog from the ribbonworm *Lineus sanguineus*. Proceedings of the National Academy of Sciences (USA) 93:2658-2663.

***Summary:*** The Pax-6 gene is a master control gene for eye formation. It has been found in humans, birds, fish, insects, roundworms, mollusks, echinoderms, and others. Here it is reported from another phylum, the ribbon worms. The wide diversity of organisms in which these genes are found is interpreted to mean that the Pax-6 gene was present before the evolutionary separation of the various phyla in which it is found.

***Comment:*** This result confirms a pattern that is becoming increasingly clear — the homeobox genes that control development are remarkably similar in organisms that are remarkably dissimilar. The evolutionary explanation for the similarity is simply common ancestry, but how does one explain the differences in eye structure? How can the same master gene produce eyes as different as the vertebrate eye and the insect eye? A further enigma is how to explain the evolutionary inference that the gene for producing eyes apparently evolved before there were any animals with eyes. Perhaps there is a better interpretation — that similar genetic patterns reflect a common Designer, with unique gene interactions in each separately created lineage.

## ORIGIN OF LIFE

Lazcano A, Miller SL. 1996. The origin and early evolution of life: prebiotic chemistry, the pre-RNA world, and time. Cell 85:793-798.

***Summary:*** Several lines of evidence indicate that life must have originated in a relatively short time, certainly less than 10 million years. This figure is necessary because the entire ocean passes through hydrothermal vents every 10 million years. Temperatures at hydrothermal vents are about 350º C. At this temperature, organic compounds are destroyed. The primordial atmosphere was probably rich in carbon dioxide, implying the absence of the reducing conditions needed for abiotic synthesis of organic compounds, probably requiring an autotrophic beginning. Ribose decomposes rapidly, with a half-life of only 44 years at 0º C, and only 73 minutes at 100º C. Adenine has a half-life of 204 days at 100º C. The minimum cellular genome is estimated at about 562,000 nucleotide pairs, close to the 580,000 nucleotide pairs of *Mycoplasma genitalium*. The limited time for the complex metabolic processes of life to arise contrasts with the conservation of these processes since the origin of life.

***Comment:*** It is probably logically impossible to disprove the naturalistic origin of life, but this hypothesis has failed so many experimental tests and theoretical considerations that it seems an appropriate conclusion would be to abandon the hypothesis and search for alternatives.

## PALEONTOLOGY: *ARCHAEOPTERYX*

Elzanowski A, Wellnhofer P. 1996. Cranial morphology of *Archaeopteryx*: evidence from the seventh skeleton. Journal of Vertebrate Paleontology 16:81-94.

***Summary:*** *Archaeopteryx* is a fossil that possesses characteristics of both birds and reptiles. Its skull was rather poorly preserved in previous specimens, but parts of it are better preserved in the recently discovered seventh specimen. This specimen apparently was buried rapidly, before the brain could disintegrate. The skull shows some distinctly avian features, and some that appear to be uniquely shared with theropod dinosaurs. The authors conclude that *Archaeopteryx* was a bird rather than a feathered dinosaur.

***Comment:*** The status of *Archaeopteryx* has been controversial. Creationists generally regard it as an extinct type of bird. Additional information on the structure of *Archaeopteryx* is always of interest.

## PALEONTOLOGY OF CHORDATES

Shu D-G, Morris SC, Zhang X-L. 1996. A *Pikaia*-like chordate from the Lower Cambrian of China. Nature 384:157-158.

***Summary:*** The Chengjiang fossil locality of China has become famous for the exceptional quality of preservation of its Lower Cambrian soft-bodied animals. Among these is a cephalochordate that appears similar to *Pikaia* from the Middle Cambrian Burgess Shale of Canada. The new fossil is named *Cathaymyrus*. Another Chengjiang fossil, *Yunnanozoon*, was originally described as a chordate, but has been re-evaluated as a probable hemichordate.

***Comment:*** The discovery of *Cathaymyrus* pushes back the fossil record of the phylum Chordata to the Lower Cambrian, emphasizing the breadth and restricted stratigraphical interval of the "Cambrian Explosion."

## PALEONTOLOGY: ORIGIN OF TURTLES

Lee MSY. 1996. Correlated progression and the origin of turtles. Nature 379:812-815.

***Summary:*** Turtles have one of the most distinctive body plans among all vertebrates. They appear abruptly in the fossil record, without any clear morphological intermediates. Two groups of "parareptiles" — procolophonoids and pareiasaurs — have been proposed as sister group to the turtles. Lee advocates the pareiasaurs, a group of fossils found in Permian rocks of the Old World. Some pareiasaurs have a dorsal ridge of osteoderms, which provide anchorage for muscle attachment. Other pareiasaurs, such as *Scutosaurus*, have a dorsal covering of largely separated osteoderms. In the genus *Anthodon*, the osteoderms are united to form a rigid dorsal covering. Lee proposes that these genera form a morphological series leading to turtles. The stratigraphically lowest turtles are from Upper Triassic rocks. Interestingly, other groups of partially armored reptiles are also present in Triassic rocks, the placodonts and archosauromorphs.

***Comment:*** Of the two groups proposed as most similar to turtles, pareiasaurs appear to be better candidates than the procolophonoids. However, very large gaps in any putative morphological series remain unfilled. It is intriguing to note that several groups of partially armored reptiles are found in Permian and/or Triassic rocks: pareiasaurs; placodonts; archosauromorphs; and turtles. It would be interesting to explore the question of whether this might reflect an ecological or taphonomic process.

## PALEONTOLOGY: STROMATOLITES

Grotzinger JP. Rothman DH. 1996. An abiotic model for stromatolite morphogenesis. Nature 383:423-425.

***Summary:*** Stromatolites are structures thought to be produced a layer at a time by the activities of cyanobacteria. This mode of growth has been observed in modern stromatolites, but fossil stromatolites rarely have fossilized bacteria, and it is not certain that this is the only method for their formation. In this study, Precambrian stromatolites from northwestern Canada were examined. Both microscopic textures and fractal patterns of growth geometry were interpreted as being produced abiotically. It seems that many types of stromatolites may be explained as the result of purely physical processes.

***Comment:*** Precambrian stromatolites are often interpreted as evidence of living organisms during Precambrian deposition. This article shows the dangers of making such assumptions without additional evidence of microorganisms within the stromatolite.

## PSEUDOGENES

Petrov DA, Lozovskaya ER, Hard DL. 1996. High intrinsic rate of DNA loss in *Drosophila*. Nature 384:346-349.

***Summary:*** Pseudogenes are gene sequences that resemble ordinary genes, but which have apparent defects that would be expected to prevent them from functioning. Processed pseudogenes are virtually absent from *Drosophila*, but are common in mammals. The authors propose that the reason for this is that deletions are more common and larger in *Drosophila* than in mammals. The result is that *Drosophila* pseudogenes are expected to be eliminated relatively rapidly, while mammal pseudogenes might remain in the genome almost indefinitely.

***Comment:*** Pseudogenes are considered to be functionless, yet their persistence and high frequency in mammals seems strange. An alternative explanation for this is that at least some pseudogenes in mammals are not functionless, but may play a role in gene regulation. Some conjectures as to what functions they might have could include participating in gene switching by providing alternative binding sites for regulatory factors; producing short transcripts that somehow participate in gene regulation; or providing sequence information that could be modified by such activities as gene conversion or RNA editing.