

ANNOTATIONS FROM THE LITERATURE

BIBLICAL CHRONOLOGY

Gould SJ. 1991. Fall in the house of Ussher. *Natural History* 12(11):12-19.

Summary. Bishop James Ussher is well-known for establishing the time scale often found in Bibles and Bible commentaries, in which creation is set at 4004 B.C. Actually, the Bishop was more precise, setting the time of creation at midday, 23 October 4004 B.C. Gould gives an interesting thumbnail sketch of Ussher's life and the method he used to arrive at his date for creation. Although completely rejecting Ussher's conclusions, Gould argues that too many scientists today tend to judge the Bishop unfairly. Given the information available at the time, Ussher actually used good methods of scholarship to make his calculations.

Comment. Despite Gould's assurance that Ussher's chronology was hopelessly wrong, the sympathetic treatment of Ussher makes this paper interesting reading, even to those who believe Ussher's chronology to be more accurate than the one accepted by Gould.

END-CRETACEOUS IMPACT

Florentin J-M, Maurrasse R, Sen G. 1991. Impacts, tsunamis, and the Haitian Cretaceous-Tertiary boundary layer. *Science* 252:1690-1693.

Summary. The Cretaceous-Tertiary (K/T) boundary in southern Haiti is located in the Beloc Formation. A marker bed within this formation has the thickest ejecta layer and the largest microtektites yet found. Shocked quartz grains and high concentrations of iridium are also found in the bed. These features are interpreted as evidence of a nearby extraterrestrial impact.

Hildebrand AR, Penfield GT, Kring DA, Pilkington M, Camargo Z A, Jacobsen SB, Boynton WV. 1991. Chicxulub Crater: a possible Cretaceous/Tertiary boundary impact crater on the Yucatan Peninsula, Mexico. *Geology* 19:867-871.

Summary. A buried circular structure on the Yucatan Peninsula of Mexico may be a K/T impact crater. The structure's diameter is about 180 km, and was identified by gravity-field and magnetic-field

anomalies. Oil-well drilling cores from within and without this putative crater reveal limestone and broken-up rocks containing Cretaceous fossils. Andesitic igneous rocks are also present, but only within the crater. Shocked quartz grains have been found in drill core material. The K/T boundary within the structure appears to be depressed about 1000 m below its level in a well just outside the structure.

The geologic age of Chicxulub Crater is not precisely known, but the evidence is consistent with a Cretaceous-Tertiary boundary event. The crater is located in continental crust, apparently on a shallow water platform. The maximum excavation depth is calculated as 15 km. The crater is located geographically about midway between deposits of K/T boundary ejecta found in Haiti and northeastern Mexico. The authors suggest the Chicxulub Crater may have been formed by the impact of an extraterrestrial object, which may have contributed to the forces causing the end-K extinction.

GEOLOGY: TRENDS IN DEPOSITION

Jablonski, D. and D. J. Bottjer. 1991. Environmental patterns in the origins of higher taxa: the post-Paleozoic fossil record. *Science* 252:1831-1833.

Summary. Twenty-six orders of benthic marine invertebrates with good fossil records have first appearances in the Mesozoic and Cenozoic. The inferred energy levels of the depositional environments for the first appearances of each of these 26 orders were compared. Evidences of high-energy deposition were interpreted as indicating onshore environments, above normal storm wave base. Low-energy deposition systems were interpreted as indicating offshore environments, below normal storm wave base. Although many of these orders are today restricted to offshore environments, the authors report that 20 of the 26 orders have first appearances in onshore (high energy) environments. The high proportion of first appearances of benthic marine orders in high-energy deposits may indicate the general importance of catastrophes in fossilization.

MOLECULAR EVE?

Gyllensten U, Wharton D, Josefsson A, Wilson AC. 1991. Paternal inheritance of mitochondrial DNA in mice. *Nature* 352:255-257.

Summary. Most of the DNA is located in the nucleus of the cell, but mitochondria also contain some DNA. Conventional wisdom has

held that mitochondrial DNA (mtDNA) is passed on only by the mother, since the ovum has many mitochondria, and the sperm does not contribute mitochondria to the fertilized egg. At fertilization, the sperm nucleus enters the ovum, leaving the paternal mitochondria behind. This paper reports that paternal mitochondria may not be entirely left behind. Traces of paternal mtDNA were detected in an experiment using mice. The frequency of paternal mtDNA was only 0.001 as compared to maternal mtDNA. This shows that mtDNA may not be exclusively transmitted by the maternal line. An interesting sidelight is that this result reduces the proposed time since the divergence of human races from a postulated “mitochondrial Eve” in Africa.

Hasegawa M, Horai S. 1991. Time of the deepest root for polymorphism in human mitochondrial DNA. *Journal of Molecular Evolution* 32:37-42.

Summary. By comparing mitochondrial DNA sequences in humans, an evolutionary “gene tree” has been produced that indicates all humans share a common ancestry from a woman who supposedly lived at a time variously estimated as 100,000-300,000 years ago. This woman has been dubbed “Eve” in the press. This hypothesis has stirred a great deal of controversy, especially from anthropologists who believe some human fossils to be more than one million years old. The “Eve” hypothesis implies that these older fossil humans are evolutionary side branches rather than ancestors of modern humans.

The original study used DNA restriction fragments for comparison. Other studies have used the actual nucleotide sequences of non-coding mitochondrial DNA. This study reports a comparison of nucleotide sequences from previous studies, using a newer statistical method. The conclusion is that all humans share an ancestral “Eve” who lived about 280,000 years ago. This is essentially in agreement with the original estimate based on restriction fragments.

Vigilant L, Stoneking M, Harpending H, Hawkes K, Wilson AC. 1991. African populations and the evolution of human mitochondrial DNA. *Science* 253:1503-1507.

Summary. Sequences of two segments of mitochondrial DNA from 189 people were compared. Sequences were identical within populations, but different among populations. A phylogenetic tree showed the deepest branches leading to African sequences. A molecular clock calibrated to the supposed divergence of humans and chimpanzees placed the age of the ancestor of modern humans between 169,000

and 249,000 years ago. This supports the controversial hypothesis that all modern humans share a recent common ancestor.

Wolpoff M, Thorne A. 1991. The case against Eve. *New Scientist* 130(1774, 22 June):37-41.

Summary. The “Eve hypothesis” states that all modern humans descended from a single African female that lived some 200-300 Ka ago. This lineage supposedly spread over the world, replacing previous populations rather than mixing with them. The “Eve hypothesis” is based on comparisons of mtDNA sequences in various human populations. Wolpoff uses fossil evidence to oppose the “Eve hypothesis.” According to Wolpoff, differences among modern populations can be seen in fossil skulls in the same respective geographical regions, indicating that the modern populations in each region are locally derived. Since the fossils are dated at older than the date for “Eve,” Wolpoff concludes that present populations cannot be derived from Africa so recently.

Comment. Wolpoff’s argument hinges critically on the accuracy of dating of fossils. The “Eve hypothesis” depends critically on the validity of a mtDNA molecular clock. Although neither argument is compelling, the debate is interesting, particularly the point that all human populations seem much more closely related than expected if the human lineage were millions of years old.

MOLECULAR PHYLOGENY

Bulmer M, Wolfe KH, Sharp PM. 1991. Synonymous nucleotide substitution rates in mammalian genes: implications for the molecular clock and the relationship of mammalian orders. *Proceedings of the National Academy of Sciences (USA)* 88:5974-5978.

Summary. The molecular-clock hypothesis postulates that the rate of mutation is essentially constant when averaged over geologic time. If true, groups that diverged from each other at a particular time should show the same degree of difference when compared among themselves or to another group. The most reliable molecular clocks should involve mutations that have no phenotypic effect, such as those affecting the third base position in a codon. These are known as silent substitutions, and are used to make comparisons in this paper.

Bulmer et al. report on comparisons of DNA differences at third codon positions for 58 genes among primates (humans), artiodactyls

(cattle) and rodents, with some lagomorphs (rabbits) and carnivores (dogs) also included. Each of these orders is believed by evolutionists to have diverged at approximately the same time. The results of this study indicate that the differences between primates and artiodactyls are much less than between either of these groups and rodents, even for similar types of substitutions. This conclusion violates the assumptions of the molecular clock.

Comment. An alternative interpretation of the data, not considered by the authors, is that each of these groups has a separate ancestry, and is not related to the others by a common ancestry.

Gorr T, Kleinschmidt T, Fricke H. 1991. Close tetrapod relationships of the coelacanth *Latimeria* indicated by haemoglobin sequences. *Nature* 351:394-397.

Summary. Evolutionists have debated which group of fish makes the best ancestor for tetrapods. Much of the debate has focused on the lungfishes and the group including the coelacanth, with the ray-finned fishes also mentioned at times. This paper reports a comparison of amino-acid sequences for alpha and beta hemoglobin chains for the coelacanth and several other species pertinent to the debate. For alpha globin, the coelacanth sequence was more similar to amphibian sequences, and the lungfish was least similar. For beta globin, the ray-finned fishes were more similar to amphibians, and the lungfish was least similar. All matchings were less than 60%. The coelacanth had the greatest number of unique similarities with amphibians. The authors conclude that the coelacanth is the closest living relative of tetrapods.

PALEOECOLOGY

Russell MP. 1991. Modern death assemblages and Pleistocene fossil assemblages in open coast high energy environments, San Nicolas Island, California. *Palaios* 6:179-191.

Summary. Four fossil assemblages and four death assemblages of subtidal molluscs were compared on San Nicolas Island. Two habitats were represented: sandy bottom and rocky bottom. Habitat type could not be inferred merely from presence or absence of species, but could from the relative frequencies of the species. Death assemblages did not form on the sandy substrate, but formed in sediment traps around boulders.

PALEONTOLOGY

Bardack D. 1991. First fossil hagfish (Myxinoidea): a record from the Pennsylvanian of Illinois. *Science* 254:701-703.

Summary. A fossil hagfish has been discovered in the Francis Creek Shale of the Carbondale Formation of Will County, Illinois. This formation is classified as Pennsylvanian (Upper Carboniferous). This is the first fossil record of a hagfish to be discovered. The single specimen has features suggesting it may be a juvenile. The fossil differs from living hagfish enough for it to be placed in a new genus. It is considered to be basically modern in its characteristics. The newly discovered hagfish does not show any characteristics of lampreys or other groups, showing that the hagfish group was separate and distinct at the time the organism was living.

Gribin J. 1991. Rocks reveal world's oldest mollusc. *New Scientist* 132(1800/1801, 21-28 December 21):10.

Summary. Chitons are flat, oval-shaped, soft-bodied animals with a shell of eight overlapping plates. They are commonly found attached to rocks in the ocean. A chiton has been found in lower Cambrian deposits on the Yorke Peninsula of South America. This earliest known fossil mollusc extends the record of chitons back from the upper Cambrian.

Ramskold L, Xianguang H. 1991. New early Cambrian animal and onychophoran affinities of enigmatic metazoans. *Nature* 351:225-228.

Summary. A Cambrian worm-like fossil has been discovered in Yunann Province of China. The fossil is about 6 cm long, with 11 pairs of legs. The authors interpret the structure of this fossil to suggest similarities with certain problematic Cambrian fossils such as *Microdictyon* and *Hallucigenia*. Referred to as "lobopods," these fossils are placed by the authors in the phylum Onychophora.

Thwaites T. 1991. Duck-billed platypus had a South American cousin. *New Scientist* 131(1783, 24 August):13.

Summary. The duck-billed platypus is found only in Australia and its origins are unknown. No platypus fossils have been found outside of Australia. Recently, an upper-right platypus molar has been found in Patagonia. The fossil was found in lower Tertiary (Paleocene) sediments.

Comment. This discovery strengthens the case for paleofaunal similarity between Australia and South America, but does little to solve the riddle of the origin of the platypus or its possible relationships.