

# ANNOTATIONS FROM THE LITERATURE

## ANTARCTIC PERMIAN FORESTS AND GLACIATION?

Taylor EL, Taylor TN, Cuneo NR. 1992. The present is not the key to the past: a polar forest from the Permian of Antarctica. *Science* 257:1675-1677.

**Summary.** Fifteen upright fossil stumps have been found on a mountain in the central Transantarctic Mountains at a latitude of about 84° South. Ranging from 8-18 cm in diameter, these stumps are associated with *Glossopteris* leaves and rooting structures. Distinct growth rings are preserved in the wood, but no frost rings were seen. Mean ring width was 4.5 mm, indicating rapid growth. The absence of frost rings and the large size of some of the growth rings suggest the trees grew in a warm climate, which is difficult to reconcile with the estimated Upper Permian paleolatitude for the area of 80°- 85° South.

## CREATION-EVOLUTION DEBATE

Dodson EO, Howe GF. 1990. Creation or evolution: correspondence on the current controversy. Ottawa, Canada: University of Ottawa Press.

**Summary.** This book is a collection of letters exchanged between two biologists, one an ardent biblical creationist and the other a devout theistic evolutionist. Dodson, the theistic evolutionist, is a Roman Catholic, while Howe, the young-earth creationist, is a Baptist. Written between 1980 and 1985, the letters include both scientific and religious issues. Both writers are firm in their convictions and are certain the other is deeply in error, yet they are able to debate the issues in a generally friendly manner. One receives the impression that, at least part of the time, they rather enjoyed the opportunity to match wits with each other. Howe seems more aggressive than Dodson, and at times more aggressive than necessary, but this may not be unusual for a person holding a minority position.

**Comment.** The letters are interesting from a sociological standpoint, but the scientific and religious arguments could not be thoroughly explored in a series of short letters. The book should be useful in

challenging the stereotypes of creationists as untrained in science and evolutionists as irreligious.

## GENETICS

Gesteland RF, Weiss RB, Atkins JF. 1992. Recoding: reprogrammed genetic decoding. *Science* 257:1640-1641.

**Summary.** Some messenger RNA (mRNA) sequences contain a set of instructions which specify an alteration in the way the genetic code is read. The authors propose the term “recoding” for this phenomenon. One kind of recoding is a shift in the reading frame. An example of frameshift recoding is in the production of a protein, release factor 2, needed for termination of translation in *E. coli*. The mRNA contains a stimulator sequence which can cause a +1 frameshift after codon 25, thus avoiding codon 26, which is a stop codon. In another case, 50 nucleotides are skipped in reading the mRNA for bacteriophage T4 gene 60. A second type of recoding is a change in the meaning of codons. For example, the codon UGA is normally a stop codon, but may be read as the amino acid selenocysteine if certain stimulator sequences are present in the mRNA.

**Comment.** Recoding has been discovered in viruses, bacteria, yeast, and animals. The authors believe that recoding may be universal and governed by diverse rules as yet undiscovered. As our understanding of genetics increases, the process is seen to be increasingly complex.

Jablonka E, Lachmann M, Lamb MJ. 1992. Evidence, mechanisms and models for the inheritance of acquired characters. *Journal of Theoretical Biology* 158:245-268.

**Summary.** Evidence is presented that certain changes in organisms may be transmitted through several generations of offspring even when no change in DNA sequence has occurred. An example is the degree of methylation of DNA. The addition of methyl groups to cytosine in a DNA sequence generally causes the DNA sequence to become inactive. During DNA replication, the pattern of methylation is preserved in the DNA copies. Thus the gene will also be inactive in the new cell. In unicellular organisms, the new individual will inherit the methylation pattern, and its gene will be inactive, despite the lack of change in DNA sequence. A similar argument would apply to genes that have been turned on by removal of the methyl group. Inheritance of the

condition of a gene rather than the sequence of the gene can be attributed to the presence of epigenetic inheritance systems (EIS).

EISs may be based on chromatin marking, such as methylation, by positive feedback regulatory loops, or, in a few cases, by structural inheritance. Positive feedback regulatory loops occur when a protein product stimulates further production of the protein. If the protein is transmitted to the daughter cell, the daughter cell will continue to produce the protein. Such inheritance does not depend on the sequence of the DNA, but on the presence of the regulatory protein. Structural inheritance occurs when a cellular structure is used as a template for constructing the daughter cell.

EISs seem more common in unicellular organisms and in plants than in animals. This is believed to be a result of the early separation of the germ-line during development in animals. Heritable epigenetic variations have been called “epimutations,” which are believed to be considerably more frequent than DNA sequence mutations. Many inherited changes that are now thought to be caused by DNA mutations may actually be caused by epimutations.

Zouros E, Freeman KR, Ball AO, Pogson GH. 1992. Direct evidence for extensive paternal mitochondrial DNA inheritance in the marine mussel *Mytilus*. *Nature* 359:412-414.

**Summary.** Mitochondrial DNA (mtDNA) has been thought to be inherited only through females. Recently, some exceptions have been found to this rule, and this paper reports another such exception. Paternal mtDNA in *Mytilus* molluscs was estimated to be inherited at a rate of about 10%, which is a much higher rate than found in either mice or *Drosophila*.

Lewan MD. 1992. Role of water in petroleum formation. U.S. Geological Survey Circular 1074:46.

**Summary.** Laboratory experiments show that the presence of water is an important factor in the generation of petroleum. Two reactions are involved in petroleum formation. In the first reaction, insoluble kerogen is decomposed to soluble bitumen. This is accomplished by cleavage of weak noncovalent bonds in the kerogen, and does not require the presence of water. The second step is the decomposition of bitumen to oil. This step involves cleavage of covalent bonds, and requires the presence of water. The resulting oil is immiscible in the water-bitumen mixture and separates out. The production of oil is accompanied by an

increase in volume, causing a decrease in density and expulsion of the oil from the source rock.

Thompson AB. 1992. Water in the Earth's upper mantle. *Nature* 358:295-302.

**Summary.** Water is present in all magmas and mantle rocks. The presence of water lowers the melting point of rocks significantly. For example, under certain conditions of pressure and in the presence of excess water, the melting point of dry peridotite solidus is reduced from 1800° C to about 1100° C. The author suggests that as hot rock is cooled during subduction, water is released into the overlying mantle, reducing the melting temperature of the mantle. The author concludes that water diffused in molten rock has a much greater metamorphic effect than it does as an associated fluid.

**Comment.** It would be interesting to know what effect the lowered melting temperature of water-containing rocks would have on calculations of magma-cooling rates and the heat generated by plate movements.

## IMPACT CATASTROPHES

Claeys P, Casier J-G, Margolis SV. 1992. Microtektites and mass extinctions: evidence for a Late Devonian asteroid impact. *Science* 257:1102-1104.

**Summary.** One of the largest marine mass extinctions in the geologic record occurred in the Upper Devonian, at the Frasnian-Famennian (F-F) boundary. At least 70% of all species and about 50% of all genera are not found in stratigraphically higher layers. This paper reports the discovery of microtektite-like spherules associated with the F-F boundary in Belgium. These spherules suggest an extraterrestrial impact was associated with the F-F mass extinction. Upper Devonian impact craters include the Siljan Ring in Sweden and Charlevoix Crater in Quebec. The Siljan Ring is the largest known impact structure in Europe, with a diameter of 52 km. Charlevoix Crater has a diameter of 46 km, and would be near Belgium in tectonic plate reconstructions for the Upper Devonian.

Poag CW, Powars DS, Poppe LJ, Mixon RB, Edwards LE, Folger DW, Bruce S. 1992. Deep Sea Drilling Project site 612 bolide event: new evidence of a late Eocene impact-wave deposit and a possible impact site, U.S. east coast. *Geology* 20:771-774.

**Summary.** A boulder bed 60 m or more in thickness covers over 15,000 km<sup>2</sup> in an area including Chesapeake Bay. Trace quantities of

tektite glass and shocked quartz are associated with the boulder bed, indicating association with an extraterrestrial impact. The deposit is interpreted as due to a tsunami, with a wave height of as much as 500-1000 m. The size of the boulders suggests a nearby impact site. A possible impact crater has been located on the outer continental shelf some 200 km from the boulder bed. About 15×25 km in size, the crater could have been produced by a bolide about 1 km in diameter.

## MEGA-VOLCANISM IN THE ORDOVICIAN

Huff WD, Bergstrom SM, Kolata DR. 1992. Gigantic Ordovician volcanic ash fall in North America and Europe: biological, tectonomagmatic, and event-stratigraphic significance. *Geology* 20:875-878.

*Summary.* Volcanic ash beds in North America and Europe have been identified as probably coming from the same volcanic eruption. Correlation is based on several lines of evidence, including trace-element analysis. The ash is present in the form of K-bentonite beds which reach a thickness of 1-2 m and cover millions of square miles in eastern North America and northwestern Europe. The eruption produced at least 340 km<sup>3</sup>, and possibly more than 1100 km<sup>3</sup>, of ash, and may have been the largest such event recorded in the geologic record. The amount of volcanic dust is calculated to have been of the same order of magnitude as that expected from the postulated extraterrestrial event at the Cretaceous-Tertiary boundary event. The lack of any major extinction associated with this Ordovician volcanic event casts doubt on the interpretation that atmospheric dust was a major cause of extinction at the Cretaceous-Tertiary boundary.

## MOLECULAR PALEONTOLOGY

Cooper A, Mourer-Chauvire C, Chambers GK, von Haeseler A, Wilson AC, Paabo S. 1992. Independent origins of New Zealand moas and kiwis. *Proceedings of the National Academy of Sciences (USA)* 89:8741-8744.

*Summary.* Moas were giant flightless birds that lived in New Zealand during prehistoric times. They may have been extirpated by human settlers. Subfossil moa eggs, bones and skin have been found. Kiwis are also flightless birds, still surviving in New Zealand. The two groups have been thought to be each others' closest relatives, based on morphological similarity and similar distributions.

Recent developments in molecular paleontology have made it possible to analyze molecular sequences from fossil tissues. The authors used a sequence of about 400 base pairs from the mitochondrial 12S rRNA gene. Comparisons were made for four species of moa, three species of kiwis, the Australian emu and cassowary, the African ostrich, two species of South American rheas, and one species of South American tinamou. Results showed the four species of moas in one group, not closely similar to any of the other groups. The kiwis formed another distinct group, most similar to the emu and cassowary. The rheas and the tinamou were the most isolated groups.

The large flightless birds (known as ratites) are restricted to the southern continents, although ostrich-like fossils are known from Europe and Asia. This has sometimes been explained as the result of splitting of the Gondwanan land mass. However, neither the molecular data, reported in this paper, nor the fossil data, support such a scenario. The present distribution of ratites should not be used as evidence for the validity of plate tectonic reconstructions.

DeSalle R, Gatesy J, Wheeler W, Grimaldi D. 1992. DNA sequences from a fossil termite in Oligo-Miocene amber and their phylogenetic implications. *Science* 257:1933-1936.

**Summary.** Termites of the genus *Mastotermes* are known as fossils from Mexico and the West Indies, but today live only in northern Australia. The family contains no other living genera, but extinct genera are known as fossils from Brazil, Tennessee and Europe. The authors have recovered DNA from a fossil *Mastotermes* from Dominican amber supposedly 25 million years old. The DNA sequences recovered included over 200 base pairs from the nuclear 18S rRNA gene, and nearly 100 base pairs from the mitochondrial 16S rRNA gene. Comparison with DNA from the living species of *Mastotermes* showed 9 differences in the 16S DNA and 3 differences in the 18S DNA. The primitive appearance of these termites had led to suggestions they might be indicators of an evolutionary relationship between termites and cockroaches. This hypothesis was not supported by the DNA sequence comparisons made.

**Comment.** The recovery of intact DNA sequences from fossils believed to be 25 million years old is remarkable, since laboratory experiments indicate DNA decomposes rather quickly. The explanation for the survival of the DNA may be that oxygen was excluded by the

amber, and that the material may be much younger than generally thought.

Janczewski DN, Yuhki N, Gilbert DA, Jefferson GT, O'Brien SJ. 1992. Molecular phylogenetic inference from saber-toothed cat fossils of Rancho La Brea. *Proceedings of the National Academy of Sciences (USA)* 89:9769-9773.

**Summary.** Saber-toothed cats are the second most common fossil in the asphalt deposits of Rancho La Brea in southern California. DNA was extracted from bones of the saber-toothed cat and amplified using the PCR method. Two sequences were obtained, part of the mitochondrial 12S ribosomal RNA sequence, and a portion of the feline MHC class I gene. Sequences were compared with those from several orders of mammals, including various species of cats. Results indicate a close similarity of saber-toothed cats to living cat species, particularly the large cats.

Muyzer G, Sandberg P, Knapen MHJ, Vermeer C, Collins M, Westbroek P. 1992. Preservation of the bone protein osteocalcin in dinosaurs. *Geology* 20:871-874.

**Summary.** Osteocalcin is a protein of about 50 amino acids, found in bone. Immunological assays were used to test for the presence of osteocalcin in various fossil materials. Strongly positive tests were obtained for several modern and Pleistocene vertebrates. Positive tests were also obtained for four Cretaceous and one Upper Jurassic dinosaur. Two dinosaur fossils and three control materials tested negative.

**Comment.** The authors attribute the unexpected preservation of proteins in fossil dinosaurs to burial conditions, especially a limited maximum temperature. No doubt burial conditions are important, but one wonders whether the fossil may actually be much younger than conventional interpretations would permit.

## MOLECULES VS MORPHOLOGY

Sturmbauer C, Meyer A. 1992. Genetic divergence, speciation and morphological stasis in a lineage of African cichlid fishes. *Nature* 358:578-581.

**Summary.** Lakes Victoria, Malawi and Tanganyika are noted for their diversity of cichlid fishes, of which there are hundreds of species. The main lineages of Lake Tanganyika cichlids are highly diversified

morphologically. The genus *Tropheus* consists of six species endemic to Lake Tanganyika. These species differ primarily in coloration, and are quite similar morphologically. Despite their morphological uniformity, the extent of variation of mitochondrial DNA sequences is greater among the six species of *Tropheus* than among the entire species flocks of either Lake Victoria or Lake Malawi. The basis for the disparity between morphological and genetic diversity is unknown. One possible explanation might be that past fluctuations in lake level have isolated parts of the lake, resulting in genetic divergence. It is not clear why morphological divergence would not have occurred concurrently.

## ORIGIN OF LIFE

Weber AL. 1992. Prebiotic sugar synthesis: hexose and hydroxy acid synthesis from glyceraldehyde catalyzed by iron (III) hydroxide oxide. *Journal of Molecular Evolution* 36:1-6.

**Summary.** Several sugars can be produced from glyceraldehyde in a reaction catalyzed by iron (III) hydroxide oxide. Among the products were sorbose, fructose, psicose, tagatose, dendroketose, and about ten other substances, some unidentified. Sugars are an important component of living cells, and their production is an essential part of any model that attempts to provide a naturalistic explanation for the origin of life. This experiment adds to the evidence that such an explanation is not likely to be forthcoming in the foreseeable future.

**Comment.** Although the reaction did produce sugars, it did not produce ribose. Ribose production is considered to be essential in any explanation for the origin of life. Even if ribose had been produced in the reaction, serious problems would remain. These include the problem of chirality, chemical interference from other products of the reaction, and the fact that most catalysts eventually decompose the sugars to acids, alcohols and hydroxyacids. These problems, together with the fact that ribose was not produced, continue to be serious difficulties for the theory of a naturalistic origin of life.

## PALEOBOTANY

Crepet WL, Nixon KC, Friis EM, Freudenstein JV. 1992. Oldest fossil flowers of hamamelidaceous affinity, from the Late Cretaceous of New Jersey. *Proceedings of the National Academy of Sciences (USA)* 89:8986-8989.

**Summary.** Well-preserved, apetalous fossil flowers have been discovered in a Cretaceous deposit in New Jersey. The flowers have a unique combination of characteristics now found in separate genera of two families: Platanaceae and Hamamelidaceae. The fossils are considered to be an extinct taxon of Hamamelidaceae because they possess certain derived characteristics of that family. The mosaic nature of the fossil flowers will likely cause changes in the evolutionary interpretation of relationships among hamamelidaceous plants.

The presence in the fossils of staminoidal nectaries that are somewhat petal-like is considered to be of considerable evolutionary significance. The closest relatives of the Hamamelidaceae lack petals, whereas many modern genera have petals. It is proposed that the petal-like staminoidal nectaries in the fossil represent an evolutionary transition in the development of petals in modern taxa. This hypothesis is complicated by the fact that fully formed petals are known from an older fossil of a sister group, the Rosidae. Accordingly, petals in the two groups must have separate and independent origins.

## PALEONTOLOGY

Bengtson S, Yue Z. 1992. Predatorial borings in Late Precambrian mineralized exoskeletons. *Science* 257:367-369.

**Summary.** *Cloudina* is a fossil of a tube-dwelling organism found in upper Precambrian sediments in several parts of the world. Stratigraphically, *Cloudina* is the lowest fossil known to have a mineralized skeleton. Examination of more than 500 tubes from a deposit in China showed that about 2.7% of the tubes had borings that appear to be those of a predator. This shows that predators were present when these Precambrian fossils were living. The evidence from Precambrian fossils of predator-prey relationships indicates a greater diversity and more complex relationships among Precambrian organisms than previously understood.

Chafetz HS, Buczynski C. 1992. Bacterially induced lithification of microbial mats. *Palaios* 7:277-293.

**Summary.** Stromatolites are lithified structures believed formed from algal mats by the trapping of detrital carbonate particles. More recently, it has been discovered that some of the carbonate is precipitated by micro-organisms, thought to be principally cyanobacteria. This paper reports that carbonate precipitation occurred on cyanobacterial filaments only in the presence of live bacteria. It appears, therefore, that the precipitation is actually accomplished by bacterial decay. Precipitation began within a few hours after death. Carbonate precipitation by bacteria occurs after burial of the cyanobacterial mat.

Foote M. 1992. Paleozoic record of morphological diversity in blastozoan echinoderms. *Proceedings of the National Academy of Sciences (USA)* 89:7325-7329.

**Summary.** The “Cambrian explosion” is well-known for the sudden appearance of fossils with a great diversity of body types. Similar patterns of great initial diversity may be seen in some taxonomic groups in other parts of the geologic column. In this study, the author examines the fossil record of blastozoans, an extinct group of echinoderms. Results show that the ratio of morphological diversity to taxonomic diversity is greatest in Cambrian deposits. Morphological diversity itself is greatest in Ordovician deposits.

**Comment.** This trend is contrary to the intuitive evolutionary expectation of a single ancestral type giving rise to an increasing diversity over time. The standard explanation is an evolutionary radiation into previously unoccupied ecospace. However, the repeated pattern of sudden appearance of diversity seems consistent with expectations based on a catastrophic model of deposition.

Han T-M, Runnegar B. 1992. Megascopic eukaryotic algae from the 2.1-billion-year-old Negaunee iron-formation, Michigan. *Science* 257:232-235.

**Summary.** *Grypania spiralis* is a spirally coiled Precambrian fossil found in Montana, China and India. It is believed to have been a photosynthetic alga. Fossils similar to *Grypania* have been found recently in Michigan. These fossils are believed to be 2.1 billion years old, which is believed to be as much as a billion years older than previously known *Grypania* fossils. Since *Grypania* is believed to be a eukaryote, the purported evolutionary origin of eukaryotes is pushed back to before 2.1 billion years ago.

Kerr RA. 1991. Old bones aren't so bad after all. *Science* 242:32-33.

**Summary.** The completeness of the fossil record has been much debated. Two recent studies have addressed this problem for marine molluscs. In one survey, 16 studies of live/dead associations were reviewed. Of living species, 83%-95% were found dead at the same site. In short-term studies, only 33%-54% of the dead species were found living, but this figure rose to 75% over longer study periods. One conclusion was that a study should last as long as the longest-lived species. Rare shells and small shells are least reliable. Another study (Valentine 1989) in Baja California ascertained that 77% of living species are found as fossils. Increased searching might bring the total to 85%. These two studies suggest that the fossil record for molluscs might be more complete than many have thought.

Lepper BT, et al. 1991. Intestinal contents of a Late Pleistocene mastodont from midcontinental North America. *Quaternary Research* 36:120-125.

**Summary.** A nearly complete, well-preserved skeleton of an American mastodont was recovered in a peat deposit being excavated for a golf-course pond in Licking County, Ohio. A mass of plant material was found in the stomach position of the fossil, and was analyzed for bacteria. Living bacteria were recovered, of the species *Enterobacter cloacae*, a common species of intestinal bacteria. Soil samples from near the bones failed to produce any bacteria of that species. This is the first time living bacteria have been recovered from Late Pleistocene large mammals.

## RAPID SPECIATION

Weinberg JR, Starczak VR, Jorg D. 1992. Evidence for rapid speciation following a founder event in the laboratory. *Evolution* 46:1214-1220.

**Summary.** *Nereis acuminata* is a marine polychaete annelid worm often used in studies of environmental pollution. The species has a wide distribution, including the coastlines of North America, Europe, Africa and the western Pacific. The species also exists in a laboratory culture started in 1964 from 5 or 6 individuals. The population of the culture expanded to several thousand individuals by 1986. At that time, four pairs of worms were transferred to Woods Hole Oceanographic Institution, and a new subculture established. This subculture also expanded to several thousand individuals. Thus, this laboratory subculture had gone through two significant bottlenecks

This paper reports the results of experiments designed to test whether the lab subculture was still interfertile with the natural parental species. No population of these worms was found at the site of the original collection for the laboratory culture. However, two populations were found located 11 and 37 km from the parental site. These populations were tested for reproductive isolation with the laboratory population. Both populations interbred successfully with each other, but neither population produced viable offspring when crossed with the laboratory culture. This strongly suggests that reproductive isolation was produced in the laboratory culture over a period of less than 30 years. The authors propose that divergence in sex pheromones may have contributed to the apparent speciation. The founder effect may have played an important role in the process, but this has not been tested.

## **SOUTHERN HEMISPHERE BIOGEOGRAPHY**

Hill RS. 1992. *Nothofagus*: evolution from a southern perspective. Trends in Ecology and Evolution 7:190-194.

*Summary.* *Nothofagus*, the southern beech tree, is restricted to the southern hemisphere, principally in Australia, New Zealand and South America, with fossils also from Antarctica. The distribution of the genus has been interpreted as supporting the concept of the union of the land masses in Pangaea. *Nothofagus* fruits are not adapted for survival in sea water, and the conventional wisdom is that the presence of *Nothofagus* on the southern continents is strong evidence of a former land connection. However, some evidence suggests that overwater dispersal across the Tasman Sea may have occurred. All four *Nothofagus* pollen types are found in Australia in sediments believed much older than any *Nothofagus* fossils in New Zealand. The New Zealand fossils are all Cenozoic, deposited after the isolation of New Zealand. Such overwater dispersal weakens the significance of *Nothofagus* fossils as a key to understanding southern biogeography.

## **VERTEBRATE PALEONTOLOGY**

Begun DR. 1992. Miocene fossil hominids and the chimp-human clade. Science 257:1929-1933.

*Summary.* Some fossils from Hungary have been re-classified in the genus *Dryopithecus*, resulting in significant changes in evolutionary interpretation of human and ape relationships. The fossils were formerly

classified in the genus *Rudapithecus*. The reclassification permits analysis of additional characters of the genus *Dryopithecus* and their comparison with other hominoids. *Dryopithecus* and *Gorilla* share several traits now interpreted as being primitive. Begun concludes that several characteristics shared by *Australopithecus* and *Pan* (chimps) are actually derived, rather than primitive as had been thought. The result of this reinterpretation is that chimpanzees are thought to be more closely related to humans than to gorillas. Although this relationship has been supported by molecular studies, most morphologists have placed chimpanzees closer to gorillas, based on similarities such as knuckle-walking.

**Comment.** An alternative interpretation is presented in Nature 359:676-677. It proposes that the fossil ape, *Graecopithecus*, is closer than *Dryopithecus* to the ancestry of hominines. *Graecopithecus* is said to be especially similar to the gorilla, but is dated at 8-10 million years old. In evolutionary terms, this implies a date of at least 9 million years for the divergence of gorillas and humans. This presents a conflict with molecular evolution, since molecular comparisons between the two species are interpreted as indicating a much more recent time for divergence.

Ducrocq S, Buffetaut E, Buffetaut-Tong H, Jaeger J-J, Jongkanjana-sontorn Y, Suteethorn V. 1992. First fossil flying lemur: a dermopteran from the Late Eocene of Thailand. *Palaeontology* 35:373-380.

**Summary.** Flying lemurs, also known as colugos, are gliding mammals presently found only in Southeast Asia. They have been linked to various groups of fossils, most often the extinct Plagiomenidae, but more recently the extinct Paromomyidae. The new fossil is sufficiently similar to living flying lemurs to be classified in the same family. Fossils previously identified as dermopterans are now reinterpreted as not belonging to that group. The new fossil is said to be the only valid record of a fossil dermopteran.

Ducrocq S, Buffetaut E, Buffetaut-Tong H, Jaeger J-J, Jongkanjana-sontorn Y, Suteethorn V. 1992. First fossil marsupial from South Asia. *Journal of Vertebrate Paleontology* 12:395-399.

**Summary.** A single tooth discovered in Middle Miocene sediments from Thailand has been identified as belonging to a marsupial. This is the first record of marsupials from southern Asia. The tooth has been referred to a new genus in the opossum family, Didelphidae. Fossils of

this family have been found throughout most of the world, except Australia. The taxonomic contrast between this didelphid fossil and Australian Miocene marsupial fossils seems to weaken the hypothesis that marsupials reached Australia via southern Asia.

Elzanowski A, Wellnhofer P. 1992. A new link between theropods and birds from the Cretaceous of Mongolia. *Nature* 359:821-823.

**Summary.** A juvenile skull from Mongolia shares some features with theropod dinosaurs and some with primitive birds such as *Archaeopteryx* and *Hesperornis*. Similarities with *Archaeopteryx* include the broad palatal shelf and the conical maxillary teeth which lack serrations and carinae. Similarities with *Hesperornis* include the broad palatal shelf and the configurations of some sinuses, which differ from those in theropods. Similarities with theropods include the tetradial palatine.

This upper Cretaceous specimen is much too “late” to be ancestral to *Archaeopteryx*. The authors suggest it may be the closest yet found to the ancestry of birds.

Fox RC, Youzwshyn GP, Krause DW. 1992. Post-Jurassic mammal-like reptile from the Palaeocene. *Nature* 358:233-235.

**Summary.** Discovery of a fossil lower jaw with teeth has resulted in an argument over its interpretation. The fossil was found in the Paleocene Paskapoo Formation in Alberta, Canada. The discoverers interpret the fossil as a cynodont, a group of mammal-like reptiles not previously found in sediments above the Middle Jurassic. In conventional geologic terms, this implies a time gap of some 100 million years, during which no mammal-like reptiles were preserved as fossils. This interpretation of the fossil has been attacked by Sues (*Nature* 359:278), who argues that the fossil’s characteristics do not show it to be a cynodont. Sues points out that some of the fossil’s characteristics are not shared with any known cynodont, and implies that it may actually be a mammal fossil. Hecht (*New Scientist* 135:18) quotes one paleontologist as saying he would have no problem calling the fossil a mammal-like reptile if it were found in Triassic sediments. Another paleontologist is quoted by Hecht as stating he would have suspected it was a dinosaur if it were found in Cretaceous sediments. It is hoped that additional material can be discovered that will clarify the fossil’s identity.

Norell MA, Novacek MJ. 1992. The fossil record and evolution: comparing cladistic and paleontologic evidence for vertebrate history. *Science* 255:1690-1693.

**Summary.** Phylogenetic hypotheses based on the fossil sequence should be independent of those based on cladistic methods. This paper compares the two methods for 24 groups of vertebrates. The correlation between age rank and clade rank was statistically significant for 18 of the groups. Correlations for the other six groups were not significant. This result tends to support the contention that the supposed direction of evolution is frequently, but not always, recorded in the fossil record. However, cladistics is heavily dependent on the direction of character polarity, which is often determined from the fossil record, making it difficult to accept the two methods as truly independent.

Sereno PC, Novas FE. 1992. The complete skull and skeleton of an early dinosaur. *Science* 248:1137-1140.

**Summary.** Dinosaurs are commonly believed to form a natural group with a common ancestry. This conclusion is supported with an extensive list of shared derived characteristics (synapomorphies). The discovery of a complete dinosaur skeleton from the Upper Triassic of Argentina provides additional evidence bearing on the question of dinosaur relationships. The new material is of the genus *Herrerasaurus*, once classified as a theropod, but more recently considered to belong to a group ancestral to the other dinosaurs. Cladistic analysis had suggested 59 characteristics linking dinosaurs as a natural group. Including the new fossil material in the analysis reduced the number of linking characteristics to eight from the original list, and added five others. The authors conclude that *Herrerasaurus* is a theropod. This implies that both saurischians and ornithischians must have existed before the Upper Triassic sediments were deposited. Another implication is that sauropod dinosaurs must also have existed during Upper Triassic deposition, although fossil sauropods are not known in Triassic sediments.

**Comment.** This discovery illustrates how sensitive cladistic analysis is to addition or omission of taxa. It also suggests another example of diversity at first appearance in the fossil record.