

ANNOTATIONS FROM THE LITERATURE

ASSUMPTIONS AFFECT CONCLUSIONS

Pagel MD, Harvey PH. 1989. Comparative methods for examining adaptation depend on evolutionary models. *Folia Primatologia* 53:203-220.

Summary. The authors state that different methods of studying evolutionary patterns and constructing phylogenetic trees depend on different models of how evolution occurs. This concept is applied to the process of proposing ancestral states, testing for coevolution of two or more characters, and statistical comparisons of continuous characters. This paper emphasizes the importance of implicit assumptions on methodology and therefore on conclusions.

GEOLOGY

Cox KG. 1989. The role of mantle plumes in the development of continental drainage patterns. *Nature* 342:873-877.

Summary. This paper extends and refines previous suggestions that link flood basalt volcanism, hot mantle plumes and continental drainage patterns. The basic idea is that mantle hot spots produce hot plumes that rise toward the surface, spreading laterally near the surface. If the plume rises below a continent, uplift may result, producing a dome. Fracturing of the dome may result in rifts, flood basalt volcanism, and a characteristic pattern of continental drainage. Specific examples in India, Brazil and southern Africa are described.

MOLECULAR CLOCK OR FOSSIL RECORD?

Easteal S. 1990. The pattern of mammalian evolution and the relative rate of molecular evolution. *Genetics* 124:165-173.

Summary. Most of the orders of living mammals first appear around the same stratigraphic level in the fossil record. Evolutionists have generally interpreted this to indicate that the various orders arose about the same time, in a kind of explosive evolution. But all orders are not equidistant according to molecular criteria. This has been interpreted as evidence against the hypothesis that mutations occur at a generally

constant rate through evolutionary time (the molecular clock hypothesis). The author of this paper prefers the molecular clock hypothesis over evidence from the fossil record, and concludes that molecular differences indicate that mammal orders arose at different times, but the fossil record is too incomplete to indicate the order in which they arose.

MOLECULAR PHYLOGENY OF PLANT FAMILIES?

Archie JW. 1989. Phylogenies of plant families: a demonstration of phylogenetic randomness in DNA sequence data derived from proteins. *Evolution* 43:1796-1800.

Summary. Archie examines the results of a study of phylogenetic relationships among nine plant families based on a set of DNA sequences derived from protein sequences for three proteins. Archie concludes that the DNA sequences used do not contain phylogenetic information, and suggests procedures for identifying whether other such sequences are useful in studying phylogeny.

PALEOBIOGEOGRAPHY AND PLATE TECTONICS

Jaeger J-J, Courtillot V, Tapponnier P. 1989. Paleontological view of the ages of the Deccan traps, the Cretaceous/Tertiary boundary, and the India-Asia collision. *Geology* 17:316-319.

Summary. The Deccan traps are flood basalts covering a large area of India. Paleomagnetic dating indicates the volcanism that produced the Deccan traps occurred across the boundary separating the Cretaceous from the Tertiary. Fossils from below the basalts are similar to those found in beds among the lava flows, which is interpreted as evidence against rapid mass extinction. Similarities of fossils from beds among the lava flows and from Asian deposits are interpreted as evidence that the Indian plate collided with Asia much earlier than previously thought, probably close to the Cretaceous-Tertiary boundary. If so, the intracontinental shortening caused by the collision could be as much as 4000 km.

Briggs JC. 1989. The historic biogeography of India: isolation or contact? *Systematic Zoology* 38:322-332.

Summary. Maps showing continental movements typically show India located on the north side of Antarctica, between southeast Africa

and western Australia, until about the Lower Jurassic. From this point, India is usually shown as traveling northward largely in isolation, finally colliding with the Asian continent during the lower Miocene sedimentation. The author shows that this scenario based on geophysical interpretations is not consistent with paleobiogeographical evidence. India does not show evidence of an endemic fauna or flora, but shows fossil similarities with other continents. The author supplies maps showing his interpretation of the evidence as indicating India made contact with Asia during Eocene sedimentation.

Comment. The conflict between interpretations based on geophysical vs paleobiogeographical evidence remains an unsolved problem for plate tectonic theory.

PALEONTOLOGY

Smithson TR. 1989. The earliest known reptile. *Nature* 342:676-678.

Summary. A nearly complete, articulated skeleton of a four-legged reptile has been recovered from the black shale member of the East Kirkton Limestone in Scotland. The skeleton is about 8 inches in length. Classification has not yet been completed, but it is neither a synapsid nor a diapsid.

Comment. The fossil was discovered by a private collector, and controversy has arisen over the proposed sale of the fossil for nearly \$350,000.

PRECAMBRIAN METAZOANS?

Mount JF. 1989. Re-evaluation of unconformities separating the “Ediacaran” and Cambrian systems, South Australia. *Palaios* 4:366-373.

Summary. The top of the proposed Ediacaran stratotype in the Flinders Ranges of South Australia was previously believed located at a regional unconformity. Reinterpretation suggests it is an abrupt facies change instead, and that the Ediacaran System stratotype may actually lie well within the Lower Cambrian.

RAPID CHANGE IN BIRDS

Diamond J, Pimm SL, Gilpin ME, LeCroy M. 1989. Rapid evolution of character displacement in myzomelid honeyeaters. *American Naturalist* 134:675-708.

Summary. A volcanic explosion, probably about four centuries ago, destroyed all life on Long Island, an island about 50 km off the northeastern coast of New Guinea. Long Island and two nearby islands have been repopulated by a bird fauna different from that of other islands in the area which were not depopulated by the volcanic activity. The difference in species composition has apparently affected the body sizes of two species of honeyeaters.

Nine cases are known in which two species of the same genus are found living on the same newly populated island. In only one of these nine cases the two species do not occur together on any other island. In only this case individuals from Long Island differ in size as compared to individuals from other islands where the two species do not coexist. The larger species has increased in size on Long Island, while the smaller species has decreased in size. This appears to be a case of character displacement, in which size has changed in response to competition pressures, preventing one species from out-competing and eliminating the other species from the island. This change could not have taken longer than four centuries, and might have taken much less time.

RAPID CHANGE IN INSECTS

Mallet J. 1989. The evolution of insecticide resistance: have the insects won? *Trends in Evolution and Ecology* 4:336-340.

Summary. Resistance of insects to chemical pesticides has developed rapidly. Mechanisms of resistance include adaptations that increase behavioral avoidance, reduce cuticle permeability, increase the rate of destruction of insecticide molecules, and decrease sensitivity to the insecticide. Most of these mechanisms seem to depend on single genes, or very few genes, contrary to the expectations of neo-Darwinian theory. "Standard population genetic models have been of little use...." Mutations in regulatory genes seem more important than mutations in structural genes.

RAPID OIL FORMATION

Didyk BM, Simoneit BRT. 1989. Hydrothermal oil of Guaymas Basin and implications for petroleum formation mechanisms. *Nature* 342:65-69.

Summary. Oil being released in association with hydrothermal vent activity in the Gulf of California has been radiocarbon dated at less than 5000 years. The oil has similar chemical and physical properties to ordinary crude oil.

SPECIATION AND MUTATIONS

Paigen K. 1989. Experimental approaches to the study of regulatory evolution. *American Naturalist* 134:440-458.

Summary. Regulatory polymorphisms have been described for the genes for production of beta-globin in man and beta-glucuronidase in mice. Several steps in the regulatory process could potentially be modified by mutation, but only a limited number of such mutations is actually found. The types of mutations differ in different systems, and the regulatory differences between closely related species can be different from the polymorphisms found within a species. The types of mutations actually known in the condition called thalassemia are listed. Single substitutions accounted for 28 out of the 37 mutants known. Addition or deletion of one or a few bases were found in nine cases, the longest being a 25-base genetic deletion. The results suggest that speciation events may involve genetic mechanisms beyond those normally observed within populations.

SPECIATION, BOTTLENECKS AND ENVIRONMENTAL STRESS

Carson HL, Wisotzkey RG. 1989. Increase in genetic variance following a population bottleneck. *American Naturalist* 134:668-673.

Summary. A laboratory population of an endemic Hawaiian species of *Drosophila* was accidentally subjected to sustained high temperatures which killed most of the flies. The population was reconstituted from about a half dozen larvae which survived. After this population bottleneck, new combinations of chromosome 4 inversions were noted. This increase in genetic variance is the opposite of the decrease generally expected after a population bottleneck. The author does not discuss the possible effect of the high temperature, which has been reported

to increase the rates of recombination in *Drosophila* (see Parsons 1988, Biological Journal of the Linnaean Society 35:49-68).

TAPHONOMY, FOSSILS AND CATASTROPHES

Greenstein BJ. 1989. Mass mortality of the West-Indian echinoid *Diadema antillarum* (Echinodermata: Echinoidea): a natural experiment in taphonomy. *Palaios* 4:487-492.

Summary. During 1983 a mass die-off of sea urchins occurred throughout the Caribbean, due to disease. Mortality rates exceeded 98% in Jamaica and Curacao, and probably elsewhere. Samples taken around the island of Bonaire showed no increase in echinoderm material associated with this mass mortality event, indicating that the reef environment was not favorable to the preservation of evidence for echinoid mass mortality. Mass preservation of echinoderms in the fossil record should be interpreted as the result of unusual taphonomic processes such as rapid burial by catastrophes.