

**EXPLOSIVE EVOLUTION IN TERTIARY BIRDS AND MAMMALS FOLLOWING THE K-T CATAclysm.** A. Feduccia, Department of Biology, Coker Hall, CB# 3280, University of North Carolina, Chapel Hill, North Carolina 27599-3280, USA. [feduccia@bio.unc.edu].

The traditional view of avian evolution over the past century has largely been one of sluggish gradualism. Most of the living orders of birds and mammals were thought to have originated beginning at approximately the mid-Cretaceous or so, and progressively and gradually evolved into the present orders, passing unblemished through the K-T boundary. As a consequence of this early origin, many groups of birds and mammals were considered vicariant passengers on the Cretaceous drifting continents. For example, groups such as the ostriches and rheas were thought to have evolved on the southern landmass from a single flightless ancestor and drifted on the African and South American landmasses, respectively. Several recent molecular studies [1-3] have also suggested that birds and mammals are much older (by some 50 to 90%) than the fossil record indicates and one study [1] suggests that the continental breakup was an important mechanism in the ordinal diversification of birds and mammals.

However, for modern bird and mammal orders to have originated in the mid-Cretaceous would require that the fossil record of these two groups is horribly incorrect, and there is every reason to believe that the fossil record is fairly accurate. Obviously, one side or the other is simply wrong. Too, recent discoveries of fossil birds have revolutionized our view of avian evolution during both the Mesozoic and Cenozoic, and suggest a dramatic departure from the time-honored phylogenetic picture. According to this new model [4], birds endured massive extinctions at the end of the Cretaceous, underwent a dramatic K-T bottleneck, and then closely paralleled mammals in an explosive phyletic evolution in the early Tertiary. Birds, then, like mammals, underwent an initial Mesozoic adaptive radiation of archaic types, were devastated by the event that closed the Cretaceous Period, and underwent a major reorganization in the early Tertiary, with perhaps initial landbird and shorebird descent. All the major lineages of birds evolved within a time period of some 10 million years, with all the major orders appearing by the late Paleocene or early Eocene [5]. Gap analyses [6] support the hypothesis that the avian orders diverged from a common ancestor over a brief time interval following the K-T cataclysm.

**References:** [1] Hedges, S. B., Parker, P. H., Sibley, C. G., and Kumar, S. (1996) *Nature*, 381, 226-229. [2] Cooper, A. and Penny, D. (1997) *Science*, 275, 1109-1113. [3] Kumar, S., and Hedges, S. B. (1998) *Nature*, 392, 917-920. [4] Feduccia, A. (1995) *Science*, 267, 637-638. [5] Feduccia, A. (1999) *The Origin and Evolution of Birds*, 2<sup>nd</sup> ed., New Haven, Yale University Press. [6] Bleiweiss, R. (1998) *Geology*, 26, 323-326.