THE E-K BOUNDARY

h22 Extinction of the dinosaurs < ammonoids >

... I saw that under the sun, the race is not to the swift, nor the battle to the strong,
... nor favor to the skillful: but time and chance in all. —Ecclestiastes, Douay-Rheims version.[1]

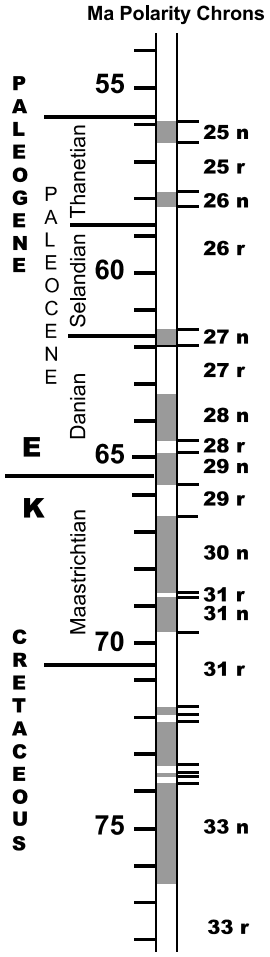

Figure ***h22.1*** Portion of the 0 to155 million years ago geomagnetic polarity time scale (GPTS) *after* S. C. Cande and D. V. Kent, 1995.[5] Chrons are numbered from the present back as 1n (normal) 1r (reversed), 2n and so on. Period and epoch boundaries are established using fossils and are positioned using estimated sedimentation rates. In 2005, ICS put the E-K boundary at 65.5±0.3 Ma.

Lyell, who made "uniformity of process" a career, noted that "there appears ... to be a greater chasm between the organic remains of the Eocene and Maastricht beds, than between the Eocene and Recent strata; for there are some living shells in the Eocene formations, while there are no Eocene fossils in the [underlying] newest secondary group." He surmised "that a greater interval of time may be indicated by this greater dissimilarity in fossil remains" and, extrapolating from known thicknesses of Recent to basal Eocene, likely an "equal, or even greater series, intermediate between the Maastricht beds and the Eocene strata."[2] The existence of Paleocene strata makes him partly right but also atop the Maastricht is a thin bed that by its composition (*see* Topic *h23*) records a catastrophe.

The time horizon that separates the younger Cenozoic Era from the older Mesozoic Era is a boundary through which much marine and terrestrial life that was evolving does not pass. Classically it is recognized by the extinction of marine ammonoids at the end of the Mesozoic. This time horizon can be extended into terrestrial strata; originally accomplished where fossiliferous marine strata containing the boundary intertongue with fossiliferous terrestrial strata, and with increasing precision using time indicators such as radiometrically dated bentonites and microfossils of such as pollens.

The time horizon between the Tertiary (T) Period and the older Cretaceous (K) Period is commonly referred to as the K-T boundary. However, the Tertiary, as a designation, is no longer there. "It's gone," reports Naomi Lubick. In its place, ICS (International Commission on Stratigraphy) responsible for setting geologic names and dates) now wants Neogene (N) and Paleogene (E). An ICS recommendation "is almost always a good idea" says Walter Alvarez, however "I will feel some nostalgia for the K-T boundary, [it] being grandfathered in so to speak."[3] The same is now the E-K boundary or, more precisely, the Paleocene (E_1, the oldest epoch of the Paleogene) – Maastrichtian (K_6, the youngest epoch and stage of the Cretaceous) boundary. In the absence of, or in addition to, fossils, paleomagnetic (normal- and reversed-) polarity chronology can be used to locate the E-K boundary (***Figure h22.1***).[4]

To date, no unreworked dinosaur fossils have been found in Cenozoic strata, even in the oldest of these which accumulated in the Paleocene. However, dinosaurs fossils have been found to be varied and numerous in strata of Maastrichtian age. The final extinction of the dinosaurs was evidently at, or was very close to, the palynology-determined end of the Mesozoic Era [6] in the Ferris Fm, Hanna Basin, southern Wyoming[7] and the Hell Creek Fm, Williston Basin, Canada.[8] Until then, dinosaur species had been waxing and waning in variety and number [9] for 160 million years since they appeared in the Late Triassic Epoch of the Mesozoic Era. ❑