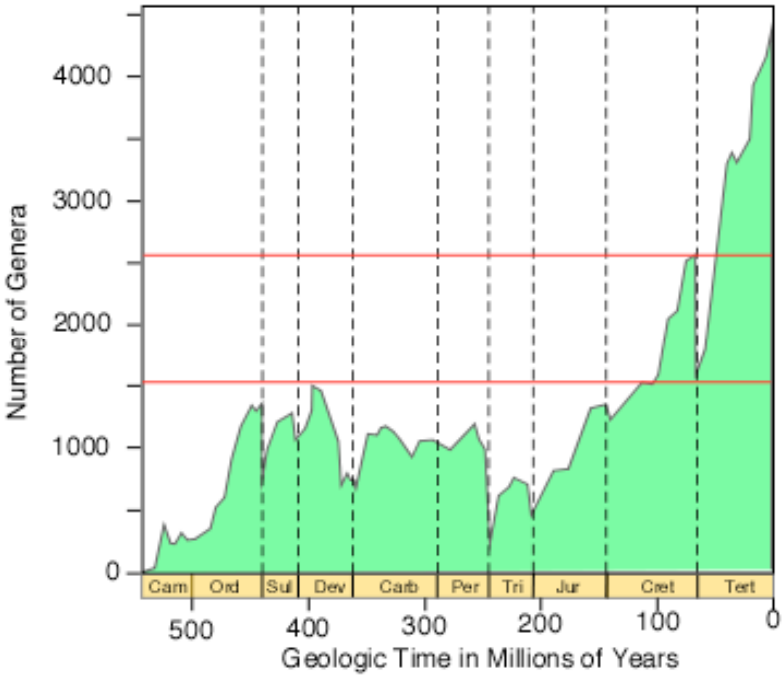
PROBLEMS AT THE KT BOUNDARY

The KT boundary is an event that occurred between the Cretaceous and the Tertiary periods. Geologists have divided the last 540 million years into 10 periods of varying length; the Cambrian, Ordovician, Silurian, Devonian, Carboniferous, Permian, Triassic, Jurassic, Cretaceous and Tertiary. They use the occurrence of a mass extinction to set the boundaries between eight of these periods as shown in figure 1, which is modified from a similar figure in a text on geologic history.[1] The KT boundary refers to the boundary between the Cretaceous (K, C is the Cambrian) and the Tertiary (T). The significance of this mass extinction is that it was the most recent. Notice that only about 1000 out of 2500 genera were affected and although one gets the impression that the extinction was rapid, in reality it lasted over 2 million years.



A recent theory blames the extinction of the dinosaurs and most of the other life on the impact of a large meteor with the earth 65 ± million years ago. According to this theory, the impact caused a large cloud of dust that filled the atmosphere and allowed little sunlight to reach the surface. The result was mass starvation of the dinosaurs and most of the other life on the planet. One wonders if this theory was first published in a classic comic book. It does make more sense than the theory that space people landed on earth and ate all of the dinosaurs. While it appeals to those who like catastrophes, it still lacks considerable credibility. Starvation takes less than two months to occur. Rapid occurrence of this event is not measured in days but in millions of years. The probability of a cloud blocking all the sun for a million of years is remote. If it did, why didn't the other 1500 genera (below the lower red line) die as well?

The major evidence for this theory is the presence of an iridium laden clay layer at the KT Boundary. This layer is unique in two ways, its global extent and its thickness. The global extent certainly indicates at major event. The thickness of the layer however is quite small. This layer of debris was most likely produced by the impact of a large meteor with the earth some time near the end of the Cretaceous period. This event may have been caused by a huge asteroid (presumed to be over 10 kilometers in diameter), which threw dense clouds of dust and debris into the atmosphere. The evidence for this

[1] Levin, Harold L; The Earth through Time, John Wiley & Sons, 2003, page 376

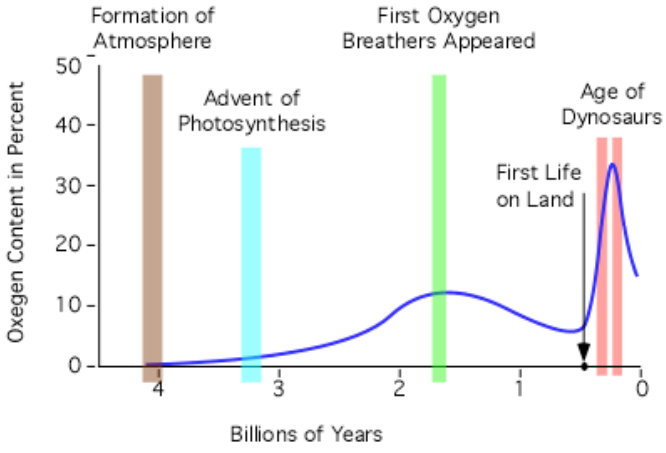
part of the theory is reasonable. This debris mixed and distributed by atmospheric circulation, supposedly blocked the sun from reaching the earths surface.[2] The blocking of the sun was supposed to have killed all the marine and land plants on which all other forms of life depends and they immediately followed suit. That is not supported by fact. Fifteen thousand of the 2500 genera were not affected.

Where as the extinction of the dinosaurs was a rapid event, that is a rapid geologic event, which means 1,000,000 years at least. The loss of solar energy and the resulting catastrophe from a major meteor event would be on the order of months or maybe years. The probability of an extra solar object striking the earth large enough to cloud the atmosphere for 1,000,000 years would be several 1000 billion to one, and since the universe is only 14 billion years the probability, as Eliza Doolittle would say, "is not bloody likely."

Besides the probability, the geologic evidence does not support this conclusion. The geologic record shows the dinosaur fossils are found below the iridium layer not in it. If the iridium cloud caused the extinction, all the fossils from this extinction would be found in the iridium layer or above. The geologic record shows the dinosaurs fossils below the iridium layer, thus the extinctions took place before the meteor impact. The impact of the meteor is just a cosmic coincidence. A little like, having bad luck after a black cat passes in front of you.

A more probable cause of the extinction is that the dinosaurs, killed themselves. A super successful species is often its own worst enemy. There exists a strong notion in geologic literature that once the oxygen content reached present levels it remained that way. That is highly unlikely in any real dynamic situation. A recent study shows that notion to be false.[3] This article shows evidence that during the last 600 million years the oxygen content of the atmosphere may have varied between 12 and 35 percent.

If we expand that oxygen curve to 4 billion years, it may look something like figure 2. It is known that the early atmosphere was without oxygen. Aquatic microorganism that depended on photosynthesis began to flourish around 3 billion years ago and because O_2 is a waste product of photosynthesis the O_2 content of the air began to increase.



Around the 1.75 BYA respiration was developed as herbivores began to use the plants as food along with the O_2 to produce energy and generate CO_2 as a waste product. This slowed the oxygen production and eventually reversed it, and the O_2 content of the

[2] Levin, Harold L; The Earth through Time, John Wiley & Sons, 2003, page 455

[3] Berner R. A. et. al., Oxygen and Evolution, Science Vol 316, April 27, 2007, pg 557

air and water decreased. Around 425 MYA plants moved up on land to get away from the herbivore pressure and found an abundance of CO_2 and unfiltered sunlight. Photosynthesis flourished. Oxygen content of the air rose quickly. After 100 million years of pumping Oxygen into the atmosphere, the O_2 content roses sufficiently to allow that the amphibians aided by the abundant oxygen in the atmosphere to venture out of the water and feed on the vegetation near the waters edge. However, most of the land mass was covered by plants and free of herbivores.

The oxygen rich atmosphere increased the partial pressure of Oxygen helping the amphibians and then the early reptiles to the transition from extracting oxygen from water to extracting it from air. Freed from the need to be close to water, the reptiles foraged farther into the land. For the next 100 million years land plants prospered and the O_2 content continued to rise. The number of species using metabolism increased on the surface and eventually the oxygen levels stabilized maybe at a level twice its present level. By now, dinosaurs are dominating life on the planet. Research shows that an oxygen rich environment produces large body size.[4] The body size of the dinosaurs continued to increase. The result was that around 75 million years ago huge numbers of large dinosaur grazers were consuming tons of plants and exhaling tons of CO_2. The oxygen replenishment slowed and the O_2 content began to drop. Their voracious appetites consumed old growth forest without regard for tomorrow. Maybe even a spotted Archaeopteryx or two caught on its nest. Eventually the O_2 content was reduced below the level that the inefficient lungs of the dinosaurs, which had been developed when O_2 levels were 50% than the current level, could tolerate and they simple asphyxiated themselves by over breeding.

The small mammals had a more sophisticate lung and a smaller body mass which allowed them to survive along with a few small reptiles and the amphibians who could return to the water to oxygenate their blood.

Thus the disappearance of the dinosaurs would be far less dramatic, but far more realistic. It also foreshadows the possibility that any super successful species plays a major role in their extinction and will bring other genera down with them. The problem is not so much what the species does, but how many of the species are doing it. In the case of the dinosaurs, it was eating and breathing.

Humans are now a super abundant species and are likewise impacting the environment. Humans are consuming more that 20% of the biomass on the planet and exhaling 200% more CO_2 into the atmosphere than worldwide industry. Technology has save the human species for 10,000 years, but this time technology cannot do it alone. We must stop breeding or cease to exist like the dinosaurs.

Global climate change is not a problem it is a symptom. The problem is two many humans on the planet. Reducing population is the only viable solution to most of the

[4] Falkowski, et al. Science 309, Feb 22, 2005.

problems the world is currently facing. Cutting the human population by 50 percent will cut,

1. Industry and energy needs by 50%.
2. Cut the number of cars by 50%,
3. Increase the availability of food by 200%,
4. Reduce Poverty.
5. Reduce terrorism.
6. Reduce all human environmental impacts by 50% across the board.

Is there anything here not to like? Unfortunately, yes.

1. Military and political power balance will be affected.
2. Economics will need to be revised.
3. Religious doctrine will require change.

It will not be an easy transition. But breeding must stop, and a negative growth rate must be achieve until we can reach a sustainable population, (2.5 to 3 billion) and then growth rate can be increased to zero. This will require a hither to unknown amount of cooperation or brutal force. If not, -----

this is how the human world ends
not--with a bang, but a whimper.

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