***Patterns of Evolution*** (TB ch. 17 - 4, p. 435)

Being a theory, there are many possibilities that could explain the diversity of life, as derived by evolution.

There are 6 current models of macroevolution (evolution of many populations and species over a long period of time).

1) Extinction
2) Adaptive Radiation
3) Convergent Evolution
4) Coevolution
5) Punctuated Equilibrium
6) Developmental Genes and Body Plans

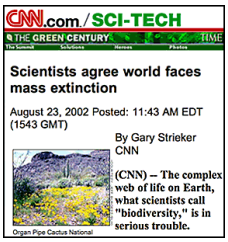
Dec 16-8:06 PM

***Extinction***

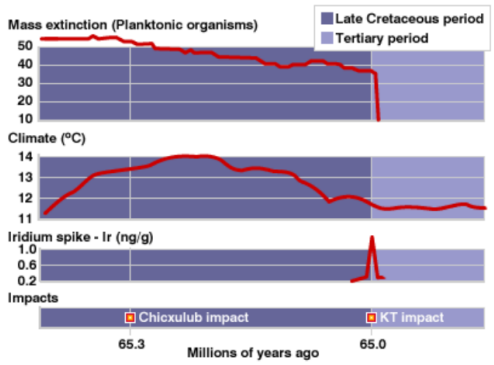
Most of the world's species extinctions happen slowly, and are the result of intense competition or changes in the environment.

Sometimes, however, mass extinctions happen over a relatively short period of time.


BBC NEWS
Tuesday, 21 May, 2002, 13:48 GMT 14:48 UK
Quarter of mammals 'face extinction'
Siberian tigers may vanish within three decades
By Corinne Podger
BBC science correspondent
Almost a quarter of the world's mammals face extinction within 30 years, according to a United Nations report on the state of the global environment.


CNN.com / SCI-TECH
THE GREEN CENTURY
Scientists agree world faces mass extinction
August 23, 2002 Posted: 11:43 AM EDT (1543 GMT)
By Gary Strieker
CNN
(CNN) -- The complex web of life on Earth, what scientists call "biodiversity," is in serious trouble.
Organ Pipe Cactus National

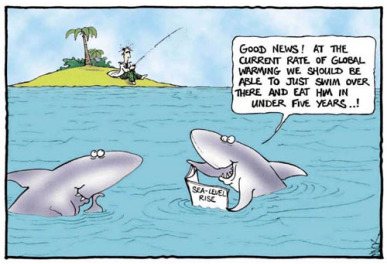
Nov 26-8:36 AM




Nov 26-8:39 AM

Mass extinctions are usually due to several interacting factors, instead of one major cataclysmic event (such as a meteor).

Factors can include:
- collapse of food webs
- disruption of energy flow through ecosystems
- volcano eruptions
- continents moving
- changing sea levels

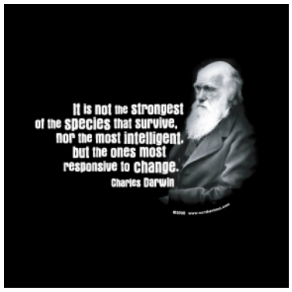



Nov 26-8:40 AM

The result of a mass extinction is the large amount of competition and predators wiped out.

The remaining species can take advantage of this opportunity and branch out quickly in many ways that were not possible a few generations ago.

ex: Once dinosaurs were extinct, mammals and birds quickly became a diverse group of organisms.




Nov 26-8:43 AM

***Adaptive Radiation***

Adaptive radiation takes place when one species branches out in many different ways, resulting in many organisms decendant from the same ancestor.

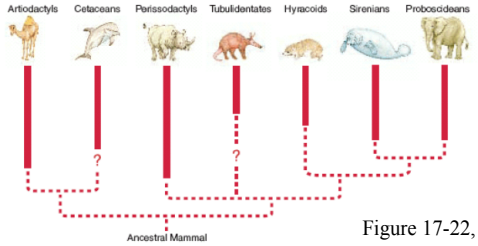



Figure 17-22, p. 436

Nov 26-8:47 AM

***Convergent Evolution***

If adaptive radiation takes place in ecologically similar environments (ex: grasslands of North America and South America), completely unrelated species may turn out to have very similar characteristics.

Similar environmental pressure may cause limbs or other features to evolve the same way.

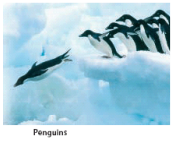




Figure 17-23, p. 437

Nov 26-8:50 AM

***Coevolution***

Many organisms are known as *specialists* - organisms that specialize in one particular habitat or food, etc...

In this case, it may be possible for one organism to evolve a protection mechanism against the other. In return, the second will evolve a new feature as a response to the first.

ex: a species of plant evolves to create a toxin that prevent insects from eating it.
In response, the insect species evolves a digestive chemical that neutralizes the toxin and allows it to continue eating the plant.

Nov 26-8:53 AM

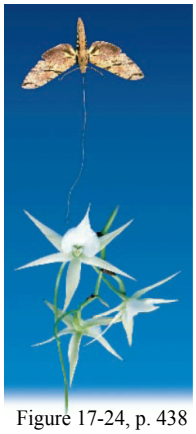


Figure 17-24, p. 438

*In this example, scientists can predict the existence of unknown species based on the features of known ones.*

*ex: Darwin discovered an orchid species where nectar was located 40cm into the flower. He predicted the existence of a species of pollinator with a 40cm long proboscis.*

*50 years later, a moth species was discovered that fit the predicted characteristics.*

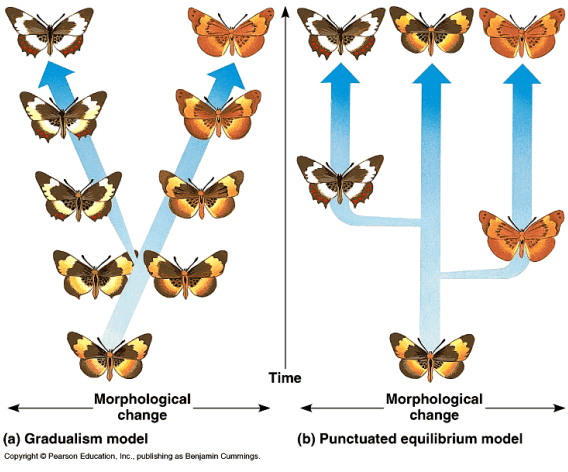
Nov 26-8:59 AM

***Punctuated Equilibrium***

This is a model of evolution that requires species to change quickly over short periods of time after long periods of equilibrium.

This could occur for many reasons:
- Small populations become isolated (genetic changes then take less time to spread through the population)
- Small group of organisms migrate to new areas and evolve quickly to fill new niches.
- Mass extinctions cause new niches to become available

Nov 26-9:02 AM




Nov 26-9:07 AM

***Developmental Genes and Body Plans***

In animal embryos, hox genes control the development of major body structures such as:
- which part becomes the front and the rear
- what will be the shape of size of the limbs, etc...

Small changes in these genes can result in large differences in adults!


Figure 17 - 26, p. 440

Nov 26-9:09 AM