

## How Species Form... "Speciation" (page 708)

A species is a group of related creatures capable of breeding to produce fertile offspring.

New species may form by way of two main pathways....both due to natural selection working on a pop'n....

**Transformation** -  
the build up of small changes over time

**Divergence** -  
A new species forms from a parent species that continues to exist.

To remain a distinct species, a pop'n must have barriers to prevent interbreeding, like...

**Geographical barriers** -  
a topographic feature keeps pop'ns separate....like a river or canyon ( **allopatric speciation** )

**Biological barriers** -  
Keep reproduction separate, even when living in the same area, like...

**Behavioural isolation**, songs, dances, pheromones are species specific

**Habitat isolation**, even though they live together, habitat preferences mean different species encounter each other less often

Speciation Pathways :

**Adaptive radiation, or divergent evolution** -  
a species colonizes new areas different enough for N.S. to form a variety of species from a common ancestor. Ex. Galapagos finches

**Convergent evolution** -  
Two unrelated species eventually turn out similarly in similar environments. Ex. Bird and bat flight

**Coevolution** -  
Two species interact to control the evolution of the other, like plants and pollinators, predators and prey, parasites and hosts.

**The speed of evolution :**

2 theories : gradualism and punctuated equilibrium

**Gradualism** -  
slow accumulated changes, not supported as much in the fossil record.

**Punctuated equilibrium** -

**(Gould - Eldridge hypothesis)**

Sudden bursts of speciation ( < 50 000 yrs) interrupt long periods of time where species seem relatively unchanged.

**Theories on the Origins of Life :**

**Chemical Evolution -  
( the Haldane - Oparin hypothesis )**

Inorganic chemicals could, under the right atmospheric conditions, become rearranged to make organic chemicals.

**Tested by Stanley Miller in 1953**

methane, ammonia, hydrogen, and water inside a setup, sparks to mimic lightning...after a week, organic molecules present....including amino acids

This is not life, but more tests show nucleotides and RNA form too. Self replicating molecules must have existed before any life forms.

**The Panspermia theory :**

life originated elsewhere, and traveled to Earth, introduced by meteors, or by other beings.

**The Gaia Theory :**

chemical evolution first, then the Earth living as a large organism controlling populations and maintaining homeostasis....James Lovelock...1960's

**Intelligent Design Theory :**

A supernatural being created all life, since life and all of its processes are too complex to be the result of random chance over long periods of time. ( Creationism )

**Serial Endosymbiosis Theory ( SET ) :  
(The Lynn Margulis hypothesis)**

Eukaryotic cells included into their structure smaller free living bacteria like life forms, ( aerobic bacteria to mitochondria, photosynthetic bacteria to chloroplasts ), which allowed them to survive in more environments.