

Speciation: allopatric, sympatric and aparapatric with examples

Speciation is the formation of new species from the pre-existing ones. However, no one has yet observed the development from beginning to end of a new plant or animal species in nature. The fossil record, so useful in painting a broad picture of long-term evolutionary trends, lacks the temporal and biological sensitivity to dissect the multitude of processes involved in speciation. Population genetics, the extreme opposite of paleontology in its ability to measure and model gene frequency changes and stability, has also failed to provide much insight into the genetics of speciation.

Speciation is an adaptive process that involves establishment of intrinsic barriers to gene flow between closely related populations by development of reproductive isolating mechanisms. A study of speciation is a study of the genetics and evolution of reproductive isolating mechanisms. Most evolutionists therefore generally accept as a working definition the biological species concept: species represent groups of interbreeding natural populations reproductively isolated from other such groups. Selection for reproductive isolation between closely related populations is fundamentally different from the process involved in local adaptation. The latter entails only minor genetic adjustments, whereas speciation frequently involves a reorganization of some crucial component in the genetic system that results in a quantum step toward the origin of interspecific differences.

Speciation is the changing of individuals within a population so they are no longer part of the same species. This most often occurs due to geographic isolation or reproductive isolation of individuals within the population. As the species evolve and branch off, they cannot interbreed with members of the original species any longer. There are four types of speciation that can occur based on reproductive or geographic isolation, among other reasons and environmental factors.

Types of Speciation:

1. **Allopatric Speciation:** The prefix *allo-* means "other". When paired with the suffix *-patric*, meaning "place", it becomes clear that allopatric is a type of speciation caused by geographic isolation. The individuals that are isolated are

literally in an "other place". The most common mechanism for geographic isolation is an actual physical barrier that gets between members of a population. This can be something like as small as a fallen tree for small organisms or as large as being split by oceans.

Allopatric speciation does not necessarily mean the two distinct populations cannot interact or even breed at first. If the barrier causing the geographic isolation can be overcome, some members of the different populations may travel back and forth. However, a majority of the populations will stay isolated from each other and as a result, they will diverge into different species.

Speciation of antelope squirrels on opposite rim of the Grand Canyon exemplifies allopatric speciation; Harris's antelope squirrel inhabits the Canyon's south rim while the white-tailed antelope squirrel lives on the north rim of the canyon.

2. **Parapatric Speciation:** The suffix *-patric* still means "place" and when the prefix *para-*, or "beside", is attached, it implies that this time the populations are not isolated by a physical barrier and are instead "beside" each other. Even though there is nothing stopping the individuals in the entire population from mixing and mating, that does not happen in parapatric speciation. For some reason, individuals within the population only mate with individuals in their immediate area.

Some factors that could influence parapatric speciation include pollution or an inability to spread seeds for plants. However, in order for it to be classified as parapatric speciation, the population must be continuous with no physical barriers. If there are any physical barriers present, it needs to be classified as either peripatric or allopatric isolation.

Gulls of the genus *Larus* (*L. argentatus* and *L. fuscus*) is the result of parapatric speciation.

3. **Sympatric Speciation:** Speciation in the same geographic region is called as sympatric speciation. Putting the prefix *sym-*, meaning "same" with the suffix

-*patric* which means "place" gives the idea behind this type of speciation. Amazingly enough, the individuals in the population are not separated at all and all live in the "same place". The most common cause for sympatric speciation is reproductive isolation. Reproductive isolation may be due to individuals coming into their mating seasons at different times or preference of where to find a mate. In many species, choice of mates may be based on their rearing. Many species return to where they were born to mate. Therefore, they would only be able to mate with others who were born in the same place, no matter where they move and live as adults. Speciation of cichlid fishes (*Pundamilia pundamilia* and *P. nyererei*) is the result of sympatric speciation.