

Speciation #1

The fundamental unit of categorization for living things is the species. Life is so powerfully shaped by breeding behavior, and species are the fundamental units within which breeding occurs. Will an elephant breed with a zebra? Of course not. But will an eastern bluebird from New York mate with an eastern bluebird from Ohio? Almost certainly, because they are members of the same species (*Sialia sialis*). Members of a species breed with each other but do not breed with members of other species. A species, by definition, is a group of actually or potentially interbreeding natural populations which are reproductively isolated from other such groups. So how do new species arise? Speciation is the development of new species through evolution. Now imagine two populations of a single species of bird, with one being separated from the other – say, by one of them having flown to a nearby location. If the two populations can still fly over and breed with one another, their genetic combinations will remain similar. In other words, they will evolve together remaining a single species. Now imagine that the migration stops between the two populations. Each population continues to evolve but they evolve separately from one another and their genetic combinations become increasingly different. If these two populations happen to reunite in the future, they may no longer interbreed because they are separate species. Speciation has occurred.



← Eastern Bluebird New York

Eastern Bluebird Ohio →



Speciation #2

Allopatric speciation is just a fancy name for speciation by geographic isolation. Allopatric literally means of other countries. In this mode of speciation, something extrinsic to the organisms prevents two or more groups from mating with each other regularly, eventually causing that lineage to speciate (become two new separate species). Isolation might occur because of the great distance or a physical barrier.

The following is an example of allopatric speciation. The Kaibab Squirrel (*Sciurus aberti kaibabensis*) is a tassel-eared squirrel that lives in the Kaibab Plateau in the Southwest United States, in an area of 20 by 40 miles (30 x 60 km). The squirrel 's habitat is confined entirely to ponderosa pine forests of the North Rim of the Grand Canyon National Park and the northern section of the Kaibab National Forest. The Kaibab squirrel has a black belly, white tail, and tufted ears. The tufts on the ears grow longer with age and may extend 1 to 2 inches (25 to 50 mm) above the ears in the winter, but may not be visible in summer.

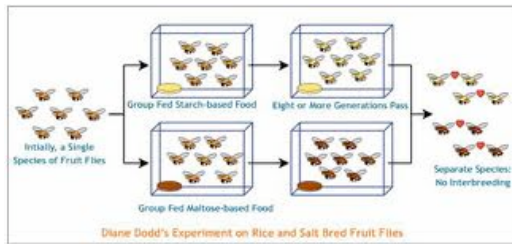
The Kaibab squirrel became geographically isolated from the common ancestor with its closest relative, the Albert squirrel (*Sciurus aberti aberti*, right) in the North Rim of the Grand Canyon about 10,000 years ago. Since then, several distinguishing features, such as the black belly and forelimbs have gradually evolved. The evolution of these new traits is consistent with the model of allopatric speciation.



← Kaibab squirrel

Abert squirrel →





Speciation #3

The first steps of speciation have been produced in several laboratory experiments involving “geographic” isolation. For example, Diane Dodd took fruit flies from a single population and divided them into separate populations living in different cages to simulate geographic isolation. Half of the population lived on maltose-based food, and the other populations lived on starch-based foods. After many generations, the flies were tested to see which flies they preferred to mate with. Dodd found that some reproductive isolation had occurred as a result of the geographic isolation and selection in the different environments: “maltose flies” preferred other “maltose flies,” and “starch flies” preferred other “starch flies.” Although, we can’t be sure, these preference differences probably existed because selection for using different food sources also affected certain genes involved in reproductive behavior. This is the sort of result we’d expect, if allopatric speciation were a typical mode of speciation.

Diane Dodd’s fruit fly experiment suggests that isolating populations in different environments (e.g., with different food sources) can lead to the beginning of reproductive isolation. These results are consistent with the idea that geographic isolation is an important step of some speciation events.

DODD, Diane M.B. 1989 Reproductive isolation as a consequence of adaptive divergence in *Drosophila melanogaster*. Evolution

Speciation #4

Mechanisms that reproductively isolates a species or a closely related species are central to speciation. Many outside factors, such as geographic isolation, can cause a species to separate. Additionally organisms have internal factors that also control the interbreeding between two separate species. Some major factors are listed below.

1. Ecological isolation – Even if they live in the same place, they can’t mate if they don’t come in contact with each other. Example: Lions and Tigers can breed but their ranges do not overlap
2. Temporal isolation – Even if they come in contact, they can’t mate if they breed at different times
3. Behavioral isolation – Even if they breed at the same time, they will not mate if they are not attracted to one another.
4. Mechanical isolation – Even if they attract one another, they can’t mate if they are not physically compatible
5. Gametic isolation – Even if they are physically compatible, an embryo will not form if the egg and sperm do not fuse properly.
6. Hybrid infertility – Even if fertilization occurs successfully, the offspring may not survive, or if it survives, may not reproduce (e.g., When a female horse and a male donkey mate, they produce an infertile mule).



← Goliath the liger

Baby mule →

