

Which evolved first—the bee or the orchid?

Chapter: Evolution

LS4.C: Adaptation

Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a populations and (2) variation in the expression of that genetic information – that is, trait variation—that leads to differences in performance among the individuals.



Mandy Schaller/Alamy

Opening Teacher Activity/Strategy

Orchids and orchid bees have a dependent relationship. The orchid depends on the bee to pollinate it, while the bee receives a fragrance that it uses to attract female bees. For a long time, scientists thought that these two species evolved at the same time, or coevolved. But recently scientists discovered that the bees evolved about 12 million years before the orchids. The orchids needed the bees more than the bees needed the orchids. Therefore, the orchids change as the bees' needs change.

Have students examine the chapter opener image. Ask them to discuss the relationship of the orchid bee and the orchid. Ask them for their opinion on which evolved a dependency on the other first. Then share the information about the evolution process with students.

Use with Section: Evidence of Evolution

The first orchids appeared about 112 million years ago. Then about 64-million-years ago, orchid populations began to make sticky balls out of their pollen. These clumps of pollen, called pollinia, stuck to pollinators very well, so pollinators didn't lose any pollen grains before getting to the next flower. One-third of orchid species have developed a way to attract pollinators by smelling or looking like food or by looking like a nesting site or a mate.

Point out that many species are dependent upon each other, such as the bee and the orchid in the chapter opener image. In small groups, have students research some of the amazing orchid species that are adapted to attract pollinators.

Ask:

- How are the orchid and orchid bee an example of adaptation?
- What are other adaptations have orchids developed over time?
- How did these adaptations improve the orchid's reproductive success?
- How do scientists study extinct orchids?

Use with Section: Shaping Evolutionary Theory

Have students re-examine the chapter opener image. Explain that the bee orchid has adapted its blooming period to better match the active periods of pollinators, such as bees and wasps. If a real female wasp is placed next to an orchid that mimics a female wasp, a male wasp will be able to spot the difference. For this reason, natural selection has favored flowers that bloom when male wasps are flying but the female wasps are not yet out of the nest. Thus, males will not have the option of choosing a real female wasp, and it will choose the orchid, which will result in pollination. With more than 27,000 species, orchids are one of the most successful flowering plant species in the world.

As a class, discuss how and why orchids became so successful.

Ask:

- How do orchids benefit from tricking pollinators?
- Do you think tricking pollinators led to new species?
- Why do you think orchids are so diverse?

[Sources:]

http://www.pbs.org/wgbh/evolution/library/01/1/l_011_02.html

<https://www.wnps.org/blog/coevolution-and-pollination/>

<http://www.sciencemag.org/news/2015/08/orchids-dazzling-diversity-explained>