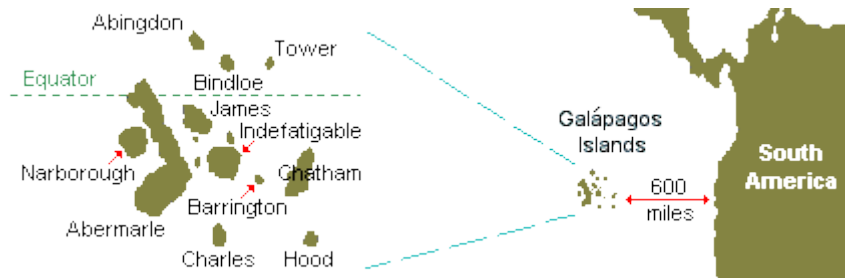


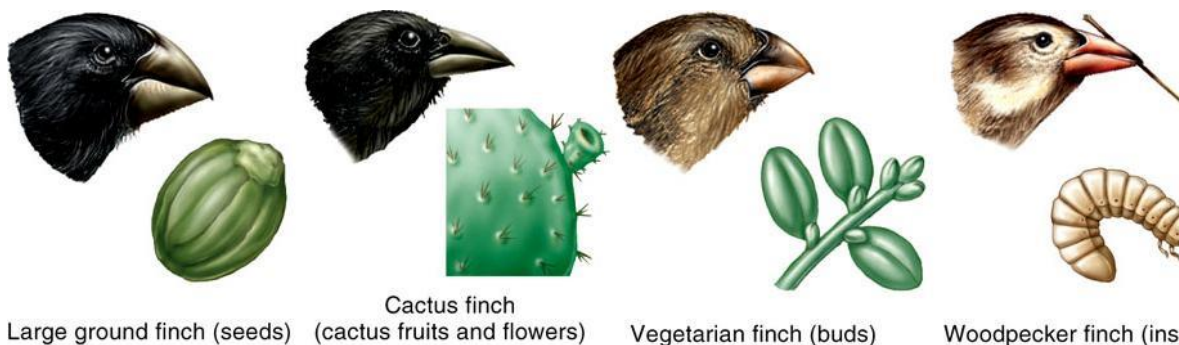
Darwin Finches

The Galápagos Islands have species found in no other part of the world, though similar ones exist on the west coast of South America. Darwin was struck by the fact that the birds were slightly different from one island to another. He realized that the key to why this difference existed was connected with the fact that the various species live in different kinds of environments.



On returning to England, Darwin and an ornithologist associate identified 13 species of finches that he had collected on the Galápagos Islands. This was puzzling since he knew of only one species of this bird on the mainland of South America, nearly 600 miles to the east, where they had all presumably originated. He observed that the Galápagos species differed from each other in beak size and shape. He also noted that the beak varieties were associated with diets based on different foods. He concluded that when the original South American finches reached the islands, they dispersed to different environments where they had to adapt to different conditions. Over many generations, they changed anatomically in ways that allowed them to get enough food and survive to reproduce. This observation was verified by intensive field research in the last quarter of the 20th century.

Finches from the Galápagos Islands



Large ground finch (seeds)

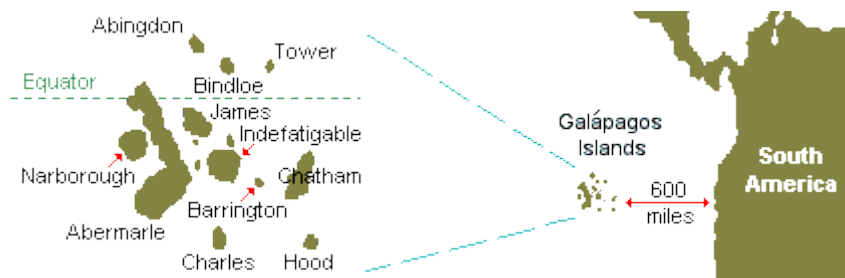
Cactus finch (cactus fruits and flowers)

Vegetarian finch (buds)

Woodpecker finch (insects)

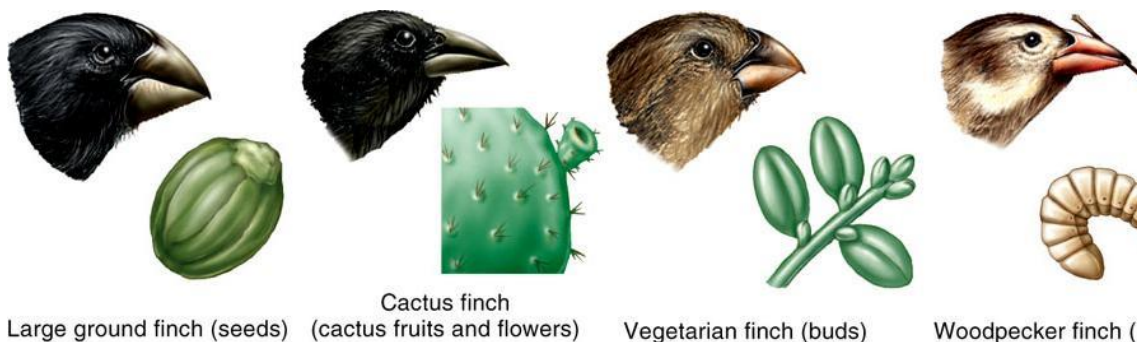
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Finches from the Galápagos Islands



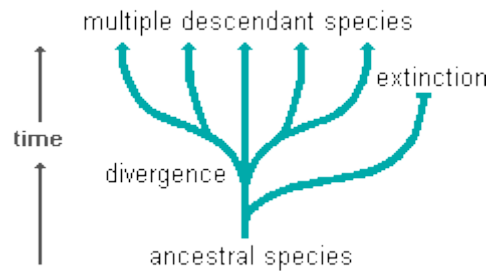
Large ground finch (seeds)

Cactus finch (cactus fruits and flowers)

Vegetarian finch (buds)

Woodpecker finch (worms)

Today we use the term **adaptive radiation** to refer to this sort of branching evolution in which different populations of a species become reproductively isolated from each other by adapting to different **ecological niches** and eventually become separate species.



Darwin came to understand that any population consists of individuals that are all slightly different from one another. Those individuals having a variation that gives them an advantage in staying alive long enough to successfully reproduce are the ones that pass on their traits more frequently to the next generation. Subsequently, their traits become more common and the population evolves. Darwin called this "descent with modification."

The Galápagos finches provide an excellent example of this process. Among the birds that ended up in arid environments, the ones with beaks better suited for eating cactus got more food. As a result, they were in better condition to mate. Similarly, those with beak shapes that were better suited to getting nectar from flowers or eating hard seeds in other environments were at an advantage there. In a very real sense, nature selected the best adapted varieties to survive and to reproduce.



Thomas Malthus
(1766-1834)

Darwin did not believe that the environment was producing the variation within the finch populations. He correctly thought that the variation already existed and that nature just selected for the most suitable beak shape and against less useful ones. By the late 1860's, Darwin came to describe this process as the "survival of the fittest." This is very different from Lamarck's incorrect idea that the environment altered the shape of individuals and that these acquired changes were then inherited.

Nineteenth century critics of Darwin thought that he had misinterpreted the Galápagos finch data. They said that God had created the 13 different species as they are and that no evolution in beak shape has ever occurred. It was difficult to conclusively refute such counter arguments at that time. However, extensive field research since the early 1970's has proven Darwin to be correct.