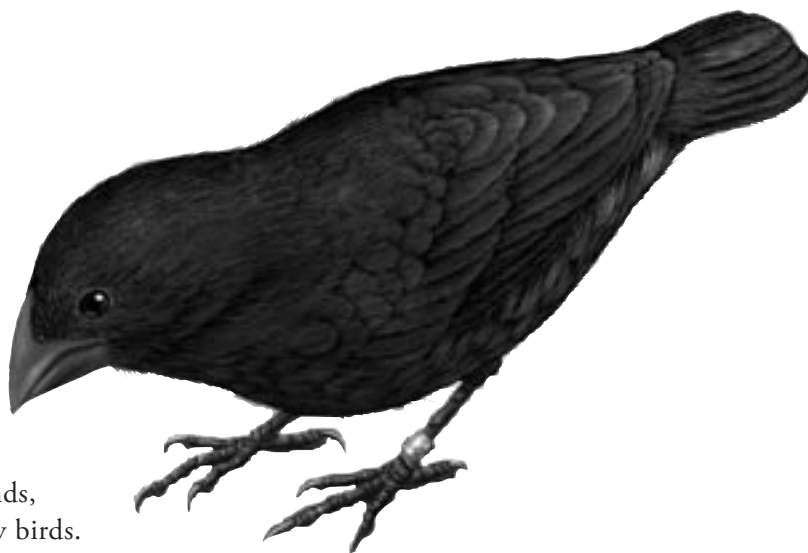


GALÁPAGOS FINCHES: Famous Beaks

Why would anyone travel halfway around the world to a hot, rocky island to measure bird beaks? Year after year, for more than 30 years, biologists Rosemary and Peter Grant have returned to the Galápagos Islands to do just that. These aren't just any islands, and the birds aren't just any birds.



The Galápagos Islands are a cluster of active volcanic islands in the Pacific Ocean. The island chain is extremely remote. It lies hundreds of miles from the nearest landmass, South America. The plants and animals that colonized the islands evolved in unique ways. The islands, and especially a group of dull little birds known as Darwin's finches, helped inspire Charles Darwin's ideas about evolution. The finches are named in his honor.

The Galápagos Islands are home to 13 species of finches. The birds vary in size and shape, and they are about as drab looking as a sparrow—until you consider their beaks. Each species is distinguished by a different beak. The 13 beaks are often compared to a toolbox containing 13 kinds of pliers, each one suited for a different task. The cactus finch has a long thin beak that works well for crushing cactus seeds. The woodpecker finch uses its beak to dig out insects from dead wood. The sharp-beaked ground finch feeds on nectar from flowers and catches insects, but sometimes it also pecks through the skin of seabirds called boobies and feeds on their blood. While the finches on the Galápagos feed on many kinds of foods, each bird has a beak suited to certain eating habits.

When Darwin first saw the finches on his visit to the Galápagos in 1835, he didn't know how important they would be to him. Darwin was 26 years old and employed as a naturalist on a five-year voyage around the globe. One of his jobs was



Rosemary and Peter Grant study the evolution of finches on the Galápagos Islands. They are professors at Princeton University.

Photos courtesy Rosemary and Peter Grant.

to collect samples of unknown plants and animals. Darwin captured some of the Galápagos finches for his collection, but at the time, he was more interested in plants and rocks and in the islands' stranger inhabitants. In his diary he mentioned the "hideous" lizards that gathered seaweed in the ocean and giant tortoises that were big enough to ride on.

Years later, however, it was the collection of little finches that puzzled and inspired him most. Darwin wondered why there were so many species of finches on the Galápagos Islands, and why they were as different and as similar as they were. Finches don't migrate, so the birds he collected must have evolved on the islands. He speculated that the first birds blew to the Galápagos from the coast of South America, evolving in a dozen directions on different islands.

The finches' beaks gave Darwin a clue about how a species could evolve. The size and shape of a bird's beak determine the kinds of food the bird can eat and the kinds it can't. A slight difference might give one bird an advantage over another in surviving and reproducing, and the advantaged offspring, in turn, would be more likely than others to survive and reproduce. Darwin called this process natural selection. Others described it as "survival of the fittest." Darwin thought that natural selection worked too slowly to be seen in one's lifetime.

More than a hundred years after Darwin's visit, Rosemary and Peter Grant traveled to the Galápagos Islands to take a closer look at the finches. The Grants wondered: If they took careful measurements of the finches and the foods they ate, would they be able to see the changes that Darwin imagined?

The Grants and their students set up a research camp on Daphne Major, an island in the center of the Galápagos. Daphne Major is a biologist's dream because

of its small size, isolation, and harsh weather. The island is like a giant petri dish, a science experiment set up by nature.

Daphne Major has a resident population of finches commonly known as medium ground finches. Their scientific name is *Geospiza fortis* (geo-SPEEZA-fort-iss). They are distinguished from other finch species by their medium-sized bodies and their beaks. When the Grants started their research, they took a head count of the finches on Daphne Major. To do this, they put up mist nests to catch the birds, picking them out one by one with their hands and placing numbered bands on their legs. Sometimes the finches watched, perching on the researchers' wrists and arms as they worked.

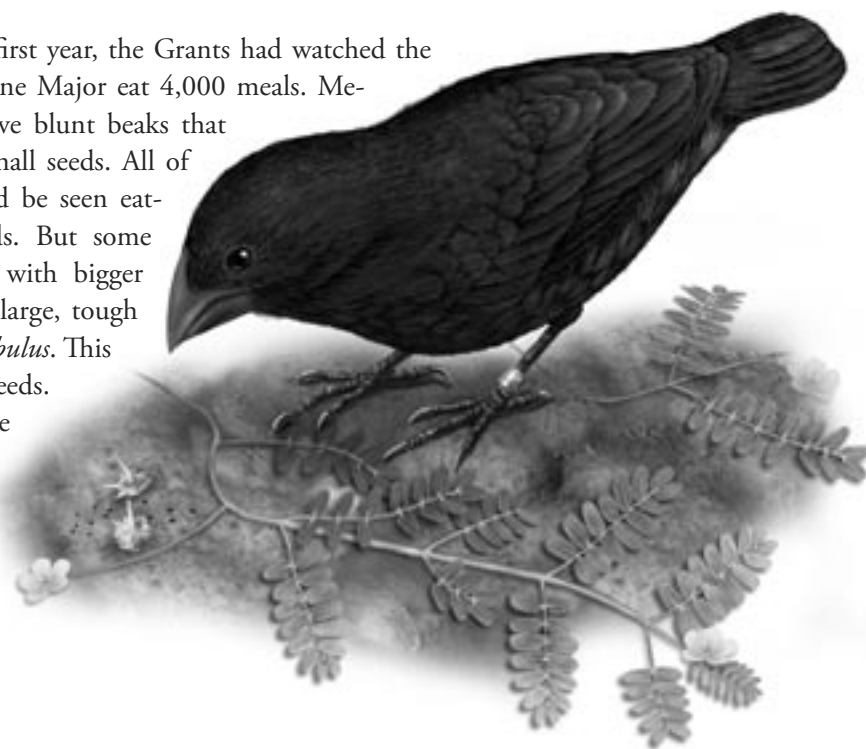
After banding the birds, the researchers took careful measurements. They weighed each bird with a spring balance and then measured it from head to hallux (big toe) with a set of calipers. They kept a record of the bird's wing length, leg length, toe length, and, most important of all, its beak size. The Grants were struck by the variation in beak sizes. To us, a fraction of an inch seems insignificant. But was it important to a finch? Did it make a difference in the food the finch ate? Did it matter to its survival?

To find out, the Grants and their students also measured finch food. Every morning they scoured the island with binoculars to see what the birds ate for breakfast. They got to know the food as well as they knew the birds, though it wasn't half as much fun. It required sifting through the dirt, counting the seeds, and measuring their size and hardness. They gave each seed a score based on how hard a bird had to struggle to crack it open.

By the end of their first year, the Grants had watched the ground finches on Daphne Major eat 4,000 meals. Medium ground finches have blunt beaks that are suited to crushing small seeds. All of the ground finches could be seen eating the small, soft seeds. But some of the birds—the ones with bigger beaks—could tackle the large, tough seeds of a plant called *Tribulus*. This plant is as tough as its seeds. It can withstand extreme conditions such as long droughts.

The Medium Ground Finch, *Geospiza fortis*

UNSM Angie Fox illustration.





These two male medium ground finches, *Geospiza fortis*, were on the same Galápagos Island at the same time. Notice the variation in beak depth.

Photo courtesy Peter Boag.

The Grants measure the size of finch beaks with great precision. Even small changes in beak size can influence the survival of the birds.

Photo courtesy Rosemary and Peter Grant.

The Grants and a graduate student, Peter Boag, returned to Daphne Major in the years following to measure the finches and their food. Nothing much changed. Then one year, a severe drought turned Daphne Major into the science experiment of a lifetime. The drought prevented many of the plants from producing seeds that year, so the finches were dependent on the seeds left over from the previous year. Once the finches ate all of the abundant small seeds that had been produced the year before, they were left with big tough seeds. Then a life-and-death struggle took place. When the Grants and Peter Boag returned to the island the next year, they were shocked by what they found.

Discover for yourselves whether variations in beak size can make a difference in finch survival and evolution. In this activity you'll meet some medium ground finches, measure their beaks, become a beak yourself and test your food-gathering skills, graph the finches and seeds on Daphne Major, and see whether changes in the environment can push the finches toward a different beak.