87
CHARLES DARWIN

One of the most fundamental concepts of biology is that species change with time. The process by which this occurs was discovered by Charles Darwin and Alfred Wallace. They announced their results together (in 1858), but each made the discovery independently, and Darwin is given the greater credit, not only because he made the actual discovery first but also because he spent 28 years meticulously collecting, reviewing, and organizing a vast array of data and wrote a lengthy book explaining it all (*The Origin of Species,* published in 1859).

Darwin was born in England in 1809. His father and grandfather were wealthy physicians, and Charles himself studied medicine for several years but quit because he hated the sight of blood. He then studied for the clergy, but after completing those studies he decided that a career as a clergyman wasn't for him either. By a remarkable stroke of good luck there was a position open for a ship's naturalist on a voyage of exploration, and through the influence of one of his professors, who had noticed that he was a keen and ardent observer of nature, Darwin obtained that position. He sailed in 1831 on a ship called the *Beagle* and spent five years observing animals, plants, geologic formations, and fossils, primarily on the two coasts of South America.

Color title A and color over the the associated line tracing Darwin's voyage on the *Beagle.*

When Darwin departed on that voyage, he was convinced, like most people of his time, that species were fixed and unchanging. But the science of geology had been advancing rapidly. Many fossils had been found, and the science of paleontology had gotten its start. Although the fossil record was obviously incomplete, some groups of fossils clearly displayed a gradual change of some species over time. On the voyage, Darwin read a new book by his friend Charles Lyell, *Principles of Geology,* which presented convincing evidence that the earth was much older than people had thought, that it had been slowly changing over immense periods of time, and that it was still changing. At the same time, Darwin was discovering many fossils himself and seeing in the geology of South America more evidence to support Lyell's views. He was struck by the fact that many fossils resembled living forms, yet were different enough that they had to be regarded as different species.

Of all the areas visited by Darwin, it was the Galápagos Islands, 600 miles off the west coast of Ecuador, which had the most profound influence on his thinking. These almost barren islands had so much exposed volcanic rock that Darwin reasoned they must have been thrust up from the ocean floor quite recently, as geologic changes go. Darwin was struck by the fact that only a few of the species he had seen on the South American mainland were represented here. In particular, all the small birds present were finches, but they had differentiated into 14 species with remarkably different beaks, each especially well adapted to a particular food source.

Color the heading "Galápagos Finches" and the heading "Food Source."

Darwin knew that small land birds are often blown far to sea by storms and that plants are sometimes carried great distances by ocean currents, frequently with small animals as passengers. He theorized that the finches arrived soon after the islands were formed and, over a period that could have been several thousand years, gradually differentiated into 14 separate species, each adapted to a different "niche" in the environment. Biologists today call this process "adaptive radiation."

Color titles B through G and the remainder of the plate as each finch is discussed.

Geospiza fortis is a ground finch and feeds on *seeds.* Its beak is somewhat short and stoutly built to enable it to break those seeds open. *Geospiza scandens* is sometimes called the cactus finch because its principal food is the prickly pear cactus. Its beak is long and nearly straight for reaching into the *flowers of the cactus* to feed on nectar and the soft tissues. *Camarhynchus crassirostris* lives high in the trees in dense forests. It feeds primarily on buds, flowers, and *fruit* but does eat some seeds as well, so it has a strong beak for crushing. *Certhidea olivacea* is often called the warbler finch because it so greatly resembles a warbler that even Darwin was fooled at first. It eats *insects* and has a thin, sharp beak for capturing them. *Camarhynchus pallidus* is the most unusual of all. It has a spadelike beak, much like a woodpecker's, and feeds as a woodpecker does on insects and grubs it digs out from under bark. But it lacks the woodpecker's long tongue, so it uses a cactus spine or a twig as a *tool* to dig out its prey—the only known case of a tool-using bird.

87 Charles Darwin (from older coloring book)

a. When & where was Darwin born?

b. In what profession did his father & grandfather work, which Darwin also tried?

c. What second career did Darwin try?

d. Job Darwin attained since he was a keen & ardent observer of nature:

e. Name of the boat on which Darwin sailed:

e. Darwin read this book along his journey, written by his friend Charles Lyell:

f. This book presented convincing evidence that:

g. Island which had profound influence on Darwin's thinking:

h. Process by which birds were scattered & adapted into different niches:

CHARLES DARWIN

VOYAGE OF THE *BEAGLE*A

GALÁPAGOS FINCHES★
BEAKB
FOOD SOURCE★
SEEDSC
CACTUSD
FRUITE
INSECTF
TOOLG