

Darwin graduated from Cambridge University in 1831, and would probably have gone right into the Church of England—except that Henslow recommended him to a British Navy captain, Capt. Robert FitzRoy, who was looking for a naturalist and companion for a surveying voyage to South America.



Capt. Robert FitzRoy



FitzRoy was captain of the ship *HMS Beagle*, a small ship (about 100 feet long) assigned to chart the treacherous coasts of South America and Tierra del Fuego.



The *Beagle* had gone out to chart the South American coastline on her first voyage (1826-1830), but that had ended badly when the *Beagle's* original captain committed suicide. FitzRoy was determined to go back and finish the job. Despite some trouble getting the approval of his father (who was going to have to pay his son's expenses), Darwin was finally allowed to go...



and HMS Beagle left England on December 27, 1831.





Charles Lyell (1797-1875)

The "Father of Modern Geology", Lyell devised new ways of thinking about Earth history and using geological evidence. He proposed *uniformitarianism* as an approach to reading the past in the rocks...

Lyell's uniformitarianism ("the present is the key to the past")

- *Uniformity of law:* the laws of science have not changed over time
- *Uniformity of process:* the natural processes going on on Earth today have always operated
 - Lyell also argued for *uniformity of rate* (the processes affecting the Earth have always operated at the same gradual rates and the same intensities) and *uniformity of state* (the Earth has not changed overall). These are no longer accepted.

A widely held theory at the time was *catastrophism:* the geological history of the Earth was dominated by short, rapid, powerful catastrophic events that wiped out most or all of the life on it and completely reshaped the planet. Lyell begged to differ. . .





You didn't need to assume that massive catastrophes, unlike anything in human experience, had altered the face of the Earth. All you needed, to explain geology, was (1) processes that can be observed today, and (2) lots and lots of time.

Let's look at the ruined Temple of Serapis, at Puzzuoli, near Naples on the island of Sicily. . .



The temple was built on land, and was in use at least up to 200 AD.

It's now right at the edge of the sea. The old floor is submerged at high tide.

The columns are riddled with holes, made by a type of marine clam that bores into solid rock.



CONCLUSION: Over less than 2000 years, the temple has sunk, and then been raised, a few tens of feet. If this can happen in a few thousand years... what could happen in millions of years? (We'll come back to this later...)





... with these cracks in 100 million-year-old rocks. We can explain the features of the ancient rocks, using a process that can be observed today. (Clayton Lake State Park, NM)



As Darwin was reading Lyell, the *Beagle* reached South America early in 1832—and spent the next three years traveling up and down the Atlantic and Antarctic coasts.

Darwin's Voyage...

- Darwin had the time and resources to take long trips inland (which was just as well, since he was usually seasick aboard ship)
- He was able to ship specimens and send letters and writings back to England—these gave him a good reputation among scientists before he even returned
- He later (1845) published a journal of his travels, now known as *Voyage of the Beagle*, and still a good read.





"The Gaucho is invariably most obliging, polite, and hospitable... but at the same time a bold, spirited fellow."— *Voyage of the Beagle*, 1845



When not enraptured by the scenery, or riding with the gauchos, Darwin collected South American fossils—including bones of this beast, the extinct *glyptodon*.



Though unusually large, the glyptodon was clearly very similar to a uniquely South American group of mammals: the armadillos.

This picture shows three of the eleven South American armadillo species. (Incidentally, the ninebanded armadillo, which you're familiar with, is a relatively recent migrant into North America—it didn't cross the Rio Grande until about 1850, and didn't enter Arkansas until about 1920.)



And this happened time and again!



Unique *fossil* vertebrates of South America turned out to be very similar to *living* vertebrates that were also unique to South America. This giant skeleton, *Mylodon*, turned out to be very much like that of the living tree sloths.



"This wonderful relationship in the same continent between the dead and the living, will, I do not doubt, throw more light on the appearance of organic beings on our earth, and their disappearance from it, than any other class of facts." — *Voyage of the Beagle*, chapter 8 Some of the fossils Darwin found were not like living animals—but *seemed* to combine features of what are now classified as separate classes of animals. Take *Toxodon platensis*, here...







Rounding Cape Horn at the southern tip of South America, the *Beagle* encountered the Fuegians (who called themselves Yaghan or Yámana), the southernmost of all Native Americans...

FitzRoy had captured four Fuegians on the *Beagle*'s first voyage, in 1830. He'd had them educated in England and was returning them, hoping to civilize the tribe.





Darwin befriended the Fuegians on the *Beagle*, including the one the sailors named "Jemmy Button" (real name: Orundellico). He later wrote: "Jemmy Button was a universal favourite. . . the expression of his face at once showed his nice disposition. He was merry and often laughed, and was remarkably sympathetic with any one in pain. . . ."



Years later, he wrote, "The Fuegians rank amongst the lowest barbarians; but I was continually struck with surprise how closely the three natives on board H. M. S. *Beagle*, who had lived some years in England, and could talk a little English, resembled us in disposition and in most of our mental faculties."