

ScienceTalk

# The book that changed the world

## Darwin convinced the scientific world that evolution is a fact

John van Wyhe

Charles Darwin's *On The Origin Of Species* was published 158 years ago on Nov 24, 1859. It was one of the most revolutionary books in the history of science, indeed it became one of the most influential books ever written. In it Darwin argued that species change over time, they evolve. Where do species come from? They are descended from earlier ones. Everything that has ever lived is related on a complex ever-branching tree of life.

The research of historians of science has shown there was no great clash of science versus religion when Darwin's book appeared. It was not banned by the Pope and it was not burned in the streets.

Not only has this been forgotten, but it sounds counter intuitive. The world was, on average, much more religious and conservative back then. And yet, within 10 to 15 years of the publication of *On The Origin Of Species* the scientific debate over evolution was over.

Darwin had convinced the international scientific community that evolution is a fact. And thus it has remained for over 150 years of continuing research and discoveries, most notably DNA and genetics.

But how could one book convince an unwilling world that a deeply unpalatable view was true? The answer lies in two basic facts from the history of science.

### WHAT PEOPLE KNEW AT THE TIME

Contrary to legend, when Darwin's book appeared, the world was no longer thought to be only 6,000 years old. Nor were all living species thought to have been created at the same time. An earlier scientific revolution had already, unwittingly, paved the way for Darwin.

By detailed study of the rocks



A page from Charles Darwin's *On The Origin Of Species*, with a finch, a mockingbird and a pigeon skeleton that he studied when formulating his theory. PHOTO: NATURAL HISTORY MUSEUM, LONDON

themselves, generations of Christian geologists had already discovered that the world was immeasurably ancient, on a scale that the human mind could not comprehend.

And there had never been a global flood.

Secondly, they had uncovered millions of fossils of extinct creatures, unlike anything alive today. As geology developed, it became clear that life on earth had appeared in a generally progressive order. In the most ancient rocks only very primitive creatures like clams and crabs were found. In a later era the first bony fish had appeared. Much later, primitive reptiles first appeared on earth. Dinosaurs were discovered. Later still, the first mammals appeared. And all of this had happened long before the appearance of humans. As these discoveries were made by religious

men, there was no taint of evolution or irreligion. For example, one possible explanation for the long series of previous worlds of life (like the age of reptiles) was that each had been a separate creation.

So even before Darwin came on the scene, it was universally accepted that the world was immeasurably ancient, and species had appeared and disappeared millions of times, with gradually more advanced species appearing through time.

### THE ORIGIN OF SPECIES ITSELF

Darwin's book distilled an unprecedented 20-year scientific research programme into one volume. And he had found a beautiful analogy to explain his theory – farmers and breeders are changing plants and animals through selective breeding all the time.

Essentially the same process happens in nature.

The natural world is inevitably a struggle to survive. Only those with the right characteristics will manage. Darwin showed that all living things vary. These little differences may make the difference between what survives and what dies. It is as if the survivors are naturally selected. Over time, successful differences accumulate and a species will look different than it had before. This is evolution. And this is how living things come to be adapted naturally and in a way that looks like, but is not, design.

The *Origin Of Species* could explain why one finds fossils of extinct creatures in the same places where, exclusively, members of that family live today. For example, extinct kangaroo fossils have been found in Australia. Why? Be-

## About the writer

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cause species evolve. The way embryos in all animals grow reveals unmistakable clues to their ancient ancestry. Humans start their embryological development with a tail. And vestigial organs, which had always puzzled naturalists, were now explained. They are leftovers from ancient ancestors, for example the wings on flightless birds. Why do sea turtles have to risk their lives to come ashore and lay their eggs? Because their ancestors were land-living turtles.

In addition to all of his evidence Darwin's *Origin Of Species* was also admirably inoffensive in its tone. Darwin knew his readers would be sceptical, as he had once been. And, contrary to legend, Darwin was not atheist.

New research at the National University of Singapore is still uncovering more of the true story.