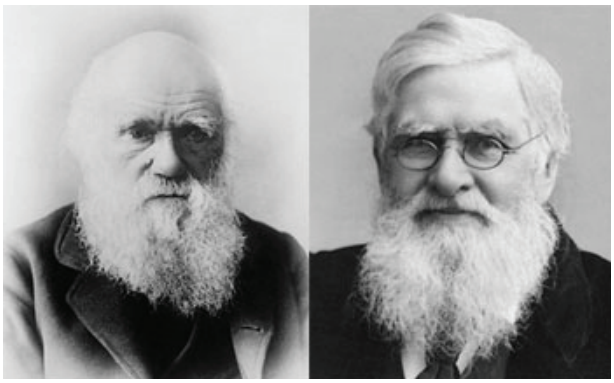
DARWIN AND WALLACE

Our understanding of evolution and natural selection can be directly attributed to two men, Charles Darwin and Alfred Russel Wallace.



Charles Darwin (left) and Alfred Russel Wallace

Although we now have access to scientific resources not even heard of in the time of Darwin and Wallace - such as DNA - we own our current understanding of the living world to these two men.

So who were they?

CHARLES DARWIN

On February 12, 1809, Charles Robert Darwin was born in Shrewsbury, England. Even as a young child, Darwin was very interested in all living things. He was an avid reader of nature books and devoted his spare time to exploring the fields around his home, collecting plants and insects.

In 1825 he became a medical student at the University of Edinburgh but gave up his studies after becoming traumatised by witnessing an operation performed on a child without anaesthetic. He then went to Cambridge University to study theology and graduated four years later; however, he was in no hurry to take holy orders. Instead, he set off on a journey that was to change his life, and affect the way we understand all life on Earth.

Charles Darwin

In 1831 Darwin set out on a five-year voyage aboard a ship called the Beagle. The ship sailed to South America to carry out surveying work, and Darwin - who had been recommended by one of his Cambridge professors - had a joint role as naturalist and companion to the captain, Robert FitzRoy.

On this journey Darwin marvelled at the remote regions they visited, finding animals of all shapes sizes and colours, and amassing plants, animals and fossils, along with copious notes.

On September 15, 1835, the Beagle arrived in the Galapagos Islands. These volcanic islands are located west of Ecuador, along the Equator in the Pacific Ocean. Darwin collected and documented a huge array of species in the Galapagos. On his return home he studied these species, eventually focusing on his collection of finches. Darwin noted that although the finches were very similar in size and appearance, there were distinct differences in the sizes and shapes of their beaks. Darwin theorised that the beaks were adaptations that helped each species of finch eat a different type of food, such as seeds, fruits, or insects. Some finches had stout beaks for eating seeds; others were insect specialists. Darwin realised that they were descendants of a single ancestor, and as they dispersed to different islands, the birds had adapted to eat the various foods available on these island, resulting in 13 different species.

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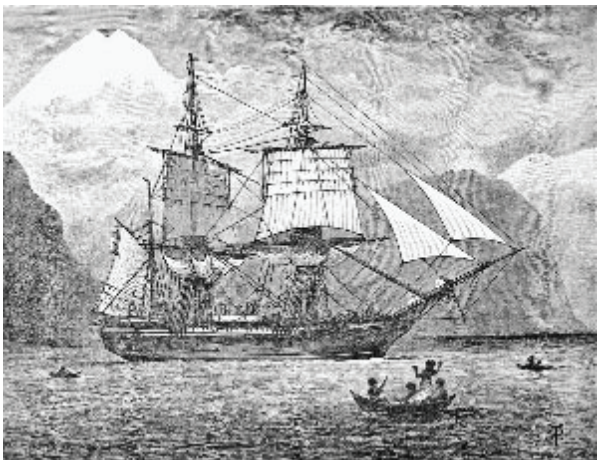
Aided by his study of the Galapagos finches, Darwin developed his theory of natural selection, a part of the larger process of evolution. The 'fittest' animals or plants – those with the characteristics best suited to their environment – are more likely to survive and reproduce. They pass on these desirable characteristics to their offspring. Gradually those features become more common, causing the species to change over time. If the changes are great enough, they could produce a new species altogether.



HMS Beagle

Darwin's theory changed the way we look at life on Earth. Before his time, the world and the things in it were viewed as static, always having been the way they are now. His theory opened people up to the idea that plants and animals had changed in the past, and will continue to change in the future.

Despite this (or perhaps because of this) Darwin knew his radical ideas would be met with strong opposition from the scientific community. He delayed publishing them for many years while he assembled a mountain of evidence. He sought the advice of a wide range of people, including Cambridge professors, pig breeders and pigeon fanciers.

While Darwin was amassing his evidence he learnt that a young naturalist, Alfred Russel Wallace, had developed a theory very similar to his own. Being an honest man, Darwin offered to send Wallace's ideas to a journal for immediate publication. However, his friends advised that the fairest solution would be a joint announcement. This announcement was made to the Linnean Society in 1858.

The following year saw the publication of Darwin's contentious yet celebrated book, *The Origin of Species*. The book provoked outrage from some members of the Church of England as it contradicted the belief in divine creation. He was accused of blasphemy, but by then the book was fast becoming a bestseller.

"THERE IS GRANDEUR IN THIS VIEW OF LIFE, WITH ITS SEVERAL POWERS, HAVING BEEN ORIGINALLY BREATHED INTO A FEW FORMS OR INTO ONE; AND THAT, WHILST THIS PLANET HAS GONE CYCLING ON ACCORDING TO THE FIXED LAW OF GRAVITY, FROM SO SIMPLE A BEGINNING ENDLESS FORMS MOST BEAUTIFUL AND WONDERFUL HAVE BEEN, AND ARE BEING, EVOLVED." – CHARLES DARWIN, THE ORIGIN OF SPECIES.

A follow-up book, *The Descent of Man*, published in 1871, was even more controversial as it suggested that humans descended from apes. So great was the upset that it is said that the Bishop of Oxford asked Thomas Huxley, one of Darwin's biggest supporters, whether it was through his grandfather or grandmother that he claimed descent from a monkey.

Despite these attacks, Darwin's conviction in his theory remained unshaken. And although Darwin's theory has been modified over time, it remains fundamental to the study of life sciences. It must be noted however, that some controversy remains. There are some who believe that Darwin's theory should be kept out of school biology classes, even though the theory of evolution is accepted by the scientific community as the best, evidence-based explanation for the diversity and complexity of life on Earth.

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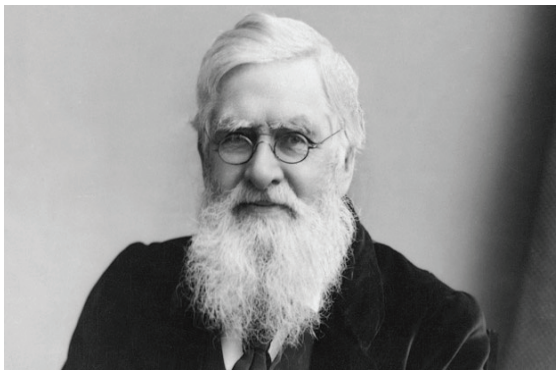
ALFRED RUSSEL WALLACE



Alfred Russel Wallace

Wallace was born in Usk (now in Monmouthshire) in 1823. After leaving school he worked at his brother's surveying firm until being hired as a teacher in 1844. In the same year a he formed a friendship with another keen naturalist, Henry Walter Bates, which was to bring unexpected opportunities.

Bates introduced Wallace to the methods and delights of collecting beetles. Four years later, Bates and Wallace decided to visit South America. Both had read Darwin's account of the voyage of the Beagle and the tales of the explorer Alexander von Humboldt's time there and both were keen to have their own adventures there.

They arrived in Brazil in 1848 with the aim of investigating the origin of species. They planned to finance the trip by collecting specimens and selling them. Wanting to cover more ground, the two men split up, Wallace heading north by river. Here he collected specimens in areas previously unexplored by European naturalists, amassing thousands of unique animal specimens.

Wallace spent more than four years collecting, after which he sailed back to England. However, on this voyage the ship caught fire and sank along with virtually all his specimens and diaries. Fortunately a passing ship rescued the crew and passengers.

Undaunted by this disaster, Wallace started planning his next expedition almost immediately, and within a year he had left England again, setting sail for the Far East.

In 1854 he began traveling through the Malay Archipelago (now Malaysia and Indonesia). Throughout his eight years there, he collected a total of 125,660 specimens, including more than 5,000 species new to science! He also noticed a distinct pattern in the distribution of animals throughout the archipelago. He proposed an imaginary line dividing the region in two major parts, with Borneo, Bali and Java to the West of the line and Sulawesi and Lombok to the East. Later known as Wallace's line, this marked the boundary between the animal life of the Australian region and those of Asia.

The Malay Archipelago

'IN THIS ARCHIPELAGO THERE ARE TWO DISTINCT FAUNAS; YET THERE IS NOTHING ON THE MAP OR ON THE FACE OF THE ISLANDS TO MARK THEIR LIMITS' – FROM A LETTER IN WHICH WALLACE DESCRIBES THE LINE THAT WOULD EVENTUALLY BE NAMED AFTER HIM.

One day in 1858 while feverish and confined to his hut, Wallace had a flash of inspiration: he suddenly understood how species evolved! He saw that species changed because the fittest individuals survived and reproduced, passing their advantageous characteristics on to their offspring.

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Wallace immediately wrote to Charles Darwin, knowing he was also interested in this subject. And although Darwin had been working on the very same theory for twenty years, he was yet to publish. Darwin was understandably surprised, and although he had the means to claim the theory as his own, he invited Wallace to present their theories together at a Linnean Society meeting.

'HE COULD NOT HAVE MADE A BETTER SHORT ABSTRACT! EVEN HIS TERMS NOW STAND AS HEADS OF MY CHAPTERS!' – DARWIN ABOUT WALLACE'S WORK

Even though the two men presented their ideas together, Darwin overshadowed Wallace and since that time it has usually been his name alone associated with the theory of evolution by natural selection. Wallace expressed no resentment at this: in fact, he was Darwin's greatest fan! Wallace was also aware that without Darwin's support, he would never have gained entry to the highest ranks of the scientific establishment.

However, Wallace and Darwin did not agree on everything. Wallace was a spiritualist, believing that natural selection could not explain the human intellect. He was a tireless thinker, writing widely on this and other diverse topics including land ownership, workers' rights, law, economics and museums.

By the time of his death, Wallace had written more than 20 books and over 1,000 articles and published letters. Although not a household name like Darwin, the important work of Wallace is increasingly being recognised and his outstanding achievements are receiving the acclaim they deserve.

KEY POINTS

- Charles Darwin travelled to the Galapagos Islands on the Beagle.
- The study of Galapagos Island finches helped Darwin develop his theory of natural selection, a part of the larger process of evolution.
- Natural selection is based on the idea that he 'fittest' animals or plants – those with the characteristics best suited to their environment – are more likely to survive and reproduce. They pass on these desirable characteristics to their offspring. Gradually those features become more common, causing the species to change over time. If the changes are great enough, they could produce a new species altogether.
- Alfred Russel Wallace travelled to the Malay Archipelago. While in a feverish state he refined his theory of evolution, one being very similar to the theory
- developed by Darwin.
- Darwin and Wallace agreed to present their theories of evolution together at a Linnean Society meeting in 1858.
- Darwin published *The Origin of the Species* in 1859.
- The theory of evolution by natural selection changed the way we look at life on Earth. Before this time, the world and the things in it were viewed as static, always having been the way they are now. This theory opened people up to the idea that plants and animals had changed in the past, and will continue to change in the future.