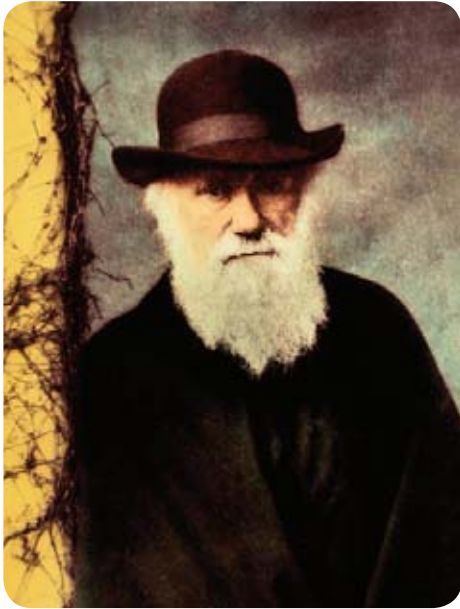


# Charles Darwin – still changing the way we think about our world

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Charles Darwin

One hundred and fifty years ago Charles Darwin published the theory of evolution by natural selection in 'On the Origin of Species'. From its first publication the theory stirred controversy, perhaps not surprisingly for a theory that not only revolutionised biology, but had far-reaching implications for many aspects of our lives.

Today, Darwin's theory influences many areas, from language and engineering to medicine and economics. Darwinian thinking has opened up new lines of research and exciting approaches to making new products.

The evidence for evolution by natural selection is overwhelming, but debate about the theory continues, especially about its wider application (for example in studies of societies and cultures) and what it means for our understanding of ourselves.

## Understanding how evolution works

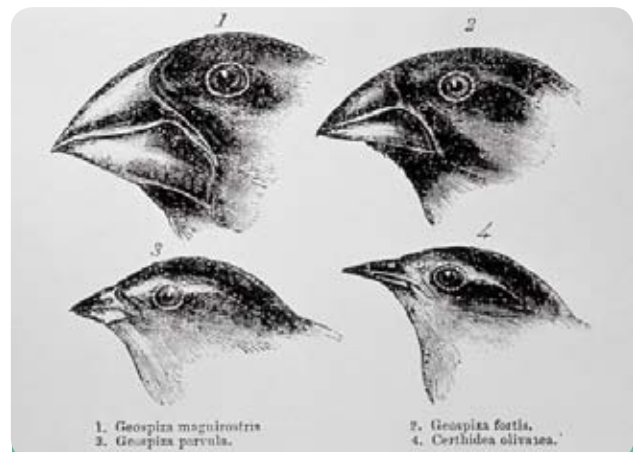
Darwin described how evolution – the change, over generations, in the characteristics of individuals in a population – is driven by 'natural selection'.

The idea of evolution – or changes to organisms – was not new in Darwin's day. It was Darwin's theory of natural selection, explaining how it happened, that was revolutionary. This new idea has found applications far beyond Darwin's original description of its role in biological evolution.

Darwin knew, from his extensive studies of animals and plants, that there were differences between the individuals in a population. He recognised that these variations meant some individuals would be less likely to survive in a particular environment than others. These less well adapted individuals would be less likely to reproduce and less likely to pass on their characteristics to future generations.

Darwin's insight was that if variations that affected survival (and hence reproductive success) were inherited, then over time the environment would eliminate (select out)

the individuals who were least successful in reproducing. This 'natural selection' or differential survival would ensure the 'survival of the fittest'; those best adapted to their environment. A changing environment would select for individuals with characteristics that increased their chance of survival in the new conditions.



A classic illustration of evolutionary theory, made by Charles Darwin in his book "A Naturalist's Voyage", London 1889. The drawing shows the beaks of four species of finches found in the Galapagos Islands. Darwin drew the conclusion that they all probably came from a common ancestor, but had diversified and evolved to adapt to local food supplies on the different islands.

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He realised that, given enough time, this process could result in large changes and that populations could eventually evolve into new species.

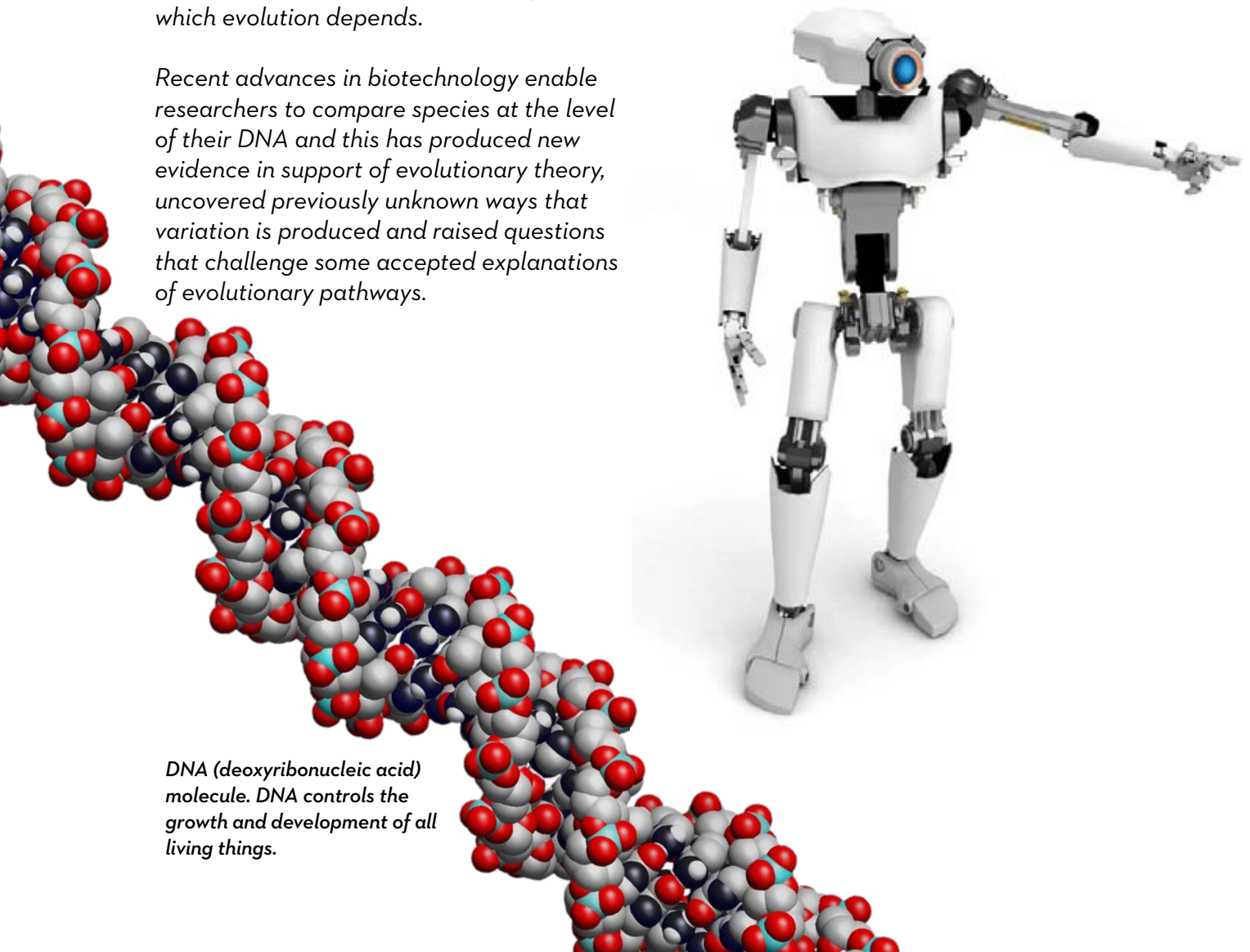
An explanation of how variations are inherited followed shortly (in 1850), when Gregor Mendel published his studies on inheritance of parental characteristics by their offspring. However, it was nearly a 100 years before DNA and genes were identified as the basis of inheritance, the physical carriers of the information that was passed from one generation to the next, and that DNA mutations, and other genetic changes, caused the variation between individual organisms on which evolution depends.

Recent advances in biotechnology enable researchers to compare species at the level of their DNA and this has produced new evidence in support of evolutionary theory, uncovered previously unknown ways that variation is produced and raised questions that challenge some accepted explanations of evolutionary pathways.

DNA (deoxyribonucleic acid) molecule. DNA controls the growth and development of all living things.

Evolution by natural selection is not restricted to living organisms. (Darwin may have realised this; he refers to parallels between the evidence for the development of languages and evolution by natural selection). Any population of 'things' that vary in ways that affects their ability to survive can be subject to selection by their 'environment', resulting in better adaption to that environment. Researchers are using this general application of evolution by natural selection in a wide range of social studies and to develop new computer software, robots and molecules.

Read more at <http://www.darwin.rcuk.ac.uk>



**Darwin Today** is raising awareness of the importance of Darwin's theory of evolution by natural selection, in current research and innovation across many disciplines. **Darwin Today** is targeting general audiences around the UK. It is led by the Biotechnology and Biological Sciences Research Council on behalf of the UK Research Councils.

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