

Charles Darwin (1809-1882)

«You care for nothing but shooting, dogs and rat-catching, and you will be a disgrace to yourself and your family», said Dr. Robert Darwin, of Shrewsbury, to his son Charles, about 110 years ago. Certainly Charles showed little interest in Latin and Greek, the only subjects taught him at school. He did not do much better as a medical student at Edinburgh. His lectures bored him, but he began to find things out for himself. His first scientific paper, read when he was 16 years old, contained the discovery that had previously been called the eggs of *Flustra*, an animal which forms incrustations on seaweed, could swim about, and were really larvae.

He had no liking for a medical career, and when 19 years old was sent to Cambridge to become a clergyman. Once again he did not care for lectures, but showed great zeal in collecting beetles. At 22 he left with a pass degree, and soon afterwards accepted an unpaid post as naturalist on H. M. S. *Beagle*, whose voyage round the world lasted for five years. He was, however, able to get ashore for weeks at a time, especially in South America. He interested himself in geology and in collecting and describing hitherto unknown animals.

And what he saw started him thinking. He visited islands whose geological structure showed that their rocks had once formed part of the sea bottom, and yet were inhabited by animals found nowhere else, though resembling those on the neighbouring continent. On the prevailing theories these animals must have been specially created. At that time most biologists thought that every species of animal had been created by God in its existing form, and many believed that all animals were descended from ancestors in Noah's ark. Darwin found these ideas difficult.

«It is strange», he wrote from St. Helena in 1836, «that this little centre of a distinct creation should, as is asserted, bear marks of recent elevation». He did not yet see how to explain such facts. But on some human affairs he had certainly made up his mind. His letters are full of attacks on slavery, which was only abolished in the British Empire in 1838.

«I was told before leaving England (he wrote from South America) that after living in slave countries all my opinions would be altered; the only alteration I am aware of is forming a much higher opinion of the negro character. It is impossible to see a negro and not feel kindly towards him».

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He returned to England in 1836, and never left it again, partly because of persistent bad health. In 1837 he started his first notebook on the transformation of species, that is to say, the theory that existing species of plants and animals, including men, were descended from ancestors very unlike themselves, and that the change, or evolution, had been mainly due to the survival of the fittest in each generation. His great book, *The Origin of Species*, was published twenty-two years later. During the whole interval he went on collecting facts for and against the theory which he gradually built up. In doing so, he says:

«I followed a golden rule, namely that whenever a published fact, a new observation or thought came across me, which was opposed to my general results, to make a memorandum of it without fail and at once; for I had found by experience that such facts and thoughts were far more apt to escape from the memory than favourable ones».

What other good qualities had he? Again to quote from his own words, «I think that I am superior to the common run of men in noticing things which easily escape attention, and in observing them carefully». We are apt to forget that if Darwin had never written a word on evolution, he would still have been among the world's great biologists.

He wrote a number of books on the fertilization of flowers. They described both observation and experiment. It is characteristic of Darwin that his experiments were always very simple. When one reads them one is inclined not so much to say «how clever Darwin was to think of that», but «how stupid the rest of humanity was not to think of that before». For example, he noticed that there are two kinds of primrose and cowslip, one with long styles, and the other with short. He fertilized numbers of flowers with the pollen of others, and found that pollen from long-styled plants produced plenty of seed on short-styled plants, and similarly pollen from short on long-styled plants. But when he crossed long with long, or short with short, he got very few seeds.

His last book, published when he was 72 years old, was devoted to earthworms, but he had been studying them for at least 42 years. He points out that they are constantly raising earth from below the surface, and may bring up a layer a foot deep in 60 years. This process serves to bury large stones and even buildings in the course of time. Among other experiments he did a large number of intelligence tests on worms, finding, for example, that they pulled triangular pieces of paper into their burrows by the sharpest angle, but pairs of pine needles by the blunt end. He was convinced that worms had intelligence.

In his scientific work he was guided by two principles. He never forgot that everything has a history. For example, the soil of England has been

made by earthworms, and men have been evolved from animals. And he was always trying to break down barriers between groups of living beings which in our ordinary thought regard as totally distinct. He devoted two books to the movements of climbing plants, and the even quicker movements of those which catch insects. In these he points out that many plants have properties which are usually thought to be peculiar to animals. In consequence he was not ashamed of making what he called «fool's experiments», as when, after noticing that a plant responded to vibrations of the table, he made his son play a bassoon to it!

But if most of his work was unorthodox he was fully conversant with the ordinary theory and practice of zoology and botany. He was out to show that the existing classification was artificial, in the sense that there were no unchangeable lines between species, and indeed that varieties, such as the bulldog or the Manx cat, were species in the making. But as a preliminary to this attack on accepted ideas, he devoted much of eight years to describing and classifying, in six volumes, all the known species of living and fossil barnacles. It is no use attacking a theory till you really understand it, and your attack is most successful if you appreciate its good points from actual experience, and so far as possible preserve them when framing a new theory.

In 1837 Darwin began to make notes on the transmutation of species. By 1844 he had written a sketch of his views, shown it to colleagues, and asked for it to be published if he died. In 1858, fourteen years later, Alfred Russel Wallace sent Darwin an essay containing many of the same views. Darwin proposed to publish it, and suppress his own book. However, Hooker, who had read Darwin's sketch, insisted that this would be serious loss to science, and finally Wallace's essay was read to the Linnaean Society in 1858 with extracts from Darwin's unpublished book, and from a letter written in 1857. Wallace, who was as magnanimous as Darwin, entirely agreed to this course, and there were none of the petty squabbles about priority which have occasionally disgraced scientists.

In 1859 *The Origin of Species* was published. Its argument falls into two parts. On the one hand evidence is brought forward from the study of fossils, of geographical distribution, of embryology, and of vestigial organs (such as man's ear muscles or the remains of a dog's thumb) that existing animals and plants are descended from very different forms in the past. On the other hand, the theory is put forward that the change has been mainly due to natural selection, or the preservation of favoured races in the struggle for life. For example, within a species some animals have thicker hair than others. Such differences are inherited. The thick-haired animals will survive better in a cold climate, so the species as a whole will tend to

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have thicker hair. The opposite will happen in a warm climate. Similarly, plants with an inherited tendency to produce flowers whose colour and smell attract bees will be more often fertilized by them than plants with unattractive flowers, and therefore flowers of many species have gradually developed so that they now attract bees.

Today ninety-nine biologists in a hundred believe in evolution, but a good many doubt whether it can be entirely explained by natural selection, though natural selection is pretty universally admitted to have been one of its causes.

Of course, Darwin's theory was violently attacked by many people. Bishop Wilberforce described it as an «utterly rotten fabric of guess and speculation», and others used still harsher language. But the majority of biologists, even when critical, could not cope with the incredible mass of facts which Darwin had collected in favour of his theory, and the detail in which he dealt with objections to it, especially in later editions of the book. Hence he carried conviction where earlier evolutionists such as Lamarck had failed to do so. Darwin himself objected to controversy, but he found a number of very vigorous champions, especially T. H. Huxley. He contended himself with bringing forward further evidence in his book on *The Variation of Animals and Plants under Domestication*, and in developing his theories, especially on sexual selection, further in *The Descent of Man*.

It was not till the end of the nineteenth century that the weakest points in the theory of natural selection were discovered. Particularly Darwin's theory of heredity was wrong. The germ-cells do not collect contributions from the various organs of the body, as he believed. And variation is not so continuous as he often suggested. Evolution has not always taken place in small steps. Thus the step from a coloured to a white flower may be taken in a single jump without intermediates. However, these criticisms do not disprove either evolution, or the importance of natural selection. To-day a good many of the other objections to Darwin's views have been met. Darwin's theories must, I think, be modified in many details, like those of Newton or Dalton, but I, at least, am one of those who regard them as one of the foundations on which biology must be built. As a result of accepting Darwinism, I think most biologists are now materialists, in the sense that they believe that matter existed before mind. Darwin, who was very cautious, did not go so far. He described himself as an agnostic.

As a result of Darwin's work many people have come to believe that our descendants will be much more perfect than ourselves, with less animal characteristics. Others, because they accepted Darwinism, have been much more ready to apply evolutionary theories to society, and to believe that the kind of organization which is best fitted for a people, for

example, that of England, changes with time. At one time, feudalism was the best possible system, later on capitalism. Darwin did not discuss the evolution of societies. But he made it easier for other to do so. In fact, he has had a very unsettling effect on thought, and made it much harder to take a great many current ideas for granted, or to believe a number of doctrines which were thought to be essential to religion.

To sum up, Darwin speculated in the most daring manner. He was extremely cautious in publishing his speculations and extremely honest in weighing the arguments against them. But his mind was dominated by an immense respect for facts, and it is this respect more than any other characteristic which has given him his lasting influence on human thought.

Questions

A

1. What have you learnt about Darwin as a school boy?
2. What was his first scientific paper?
3. Say a few words about Darwin's voyage on *Beagle*.
4. What did most biologists at that time think about the origin of species?
5. What were other scientific achievements of Darwin apart from this theory of evolution?
6. What is characteristic of Darwin's experiments?
7. What was Darwin's rule about attacking a theory?
8. What does the author mean by the expression «*fool's experiments*»?
9. Give the headlines to all the paragraphs found in the text.
10. Analyse the word «*cautious*» used in the text. Give synonyms to this word.
11. Find sentences where Passive Voice is used.

B

1. Do you know of any other famous men who showed little interest in the subjects they were taught at school?
2. Do you know of other scientists who made long voyages and collected many data during them?
3. What is your method of collecting facts and putting them down in your paper?
4. Did you have any interesting experiences with animals as the one Darwin had with squirrels?
5. What are the weak points of Darwin's theory?