The Methods of Scientific Inquiry in the Introduction to *The Origin of Species*

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Charles Darwin's 1859 book, *The Origin of Species*, was the first to formulate the modern theory of how species of living things came to be. The introduction to the book not only states Darwin's theory, but also allows us to see how Darwin saw his work and the methods he used.

Darwin starts out by describing how he came to think of the solution to the question of the origin of species. He traces the main parts of the process that we now call the scientific method: observation, "patiently accumulating and reflecting on all sorts of facts" formulating a hypothesis, and experimentation.

The need for feedback from his peers in order to examine his theory more thoroughly was not neglected by Darwin. He discusses a major part of any scientific inquiry, the discussion and exchange of ideas with fellow researchers and the publication of scientific findings for public examination. Research done for its own sake, and kept only to oneself and not shared with the public and other scientists, was clearly as useless in Darwin's day as it is today.

Because his theory was so new, revolutionary, and controversial for its time (and still is today), Darwin is careful to alert readers to the mistakes he may have made in citing a great amount of earlier work; such glitches, as any researcher knows, will inevitably be found in a large work. He also elaborates on some incomplete processes in his scientific work, and predicts that future research and publications will make his hypothesis and the evidence leading to his conclusions more compelling. Darwin states his idea (already shared, in part by other naturalists) that species were not independently created, but evolved from earlier living things; this principle is simply known as "descent with modification." He cautions that this conclusion is not good enough until it can be shown just how one species evolved into another, which was later termed speciation. It is not enough to conclude that external factors, such as God or the weather, were the cause of the change.

For example, Darwin explains that many species depend on one another, in other words, they live symbiotically. Certain plants can reproduce only if a specific species of bird that is adapted to eating these plants will carry the plant's seeds. In order to attract animals and use the animals as carriers to distribute their

seeds, flowering plants evolved with their beautiful colors and sweet taste. The dependence of one species on another for its survival cannot be explained by spontaneous evolution of creation as is.

Finally, Darwin states his goal, to see the means by which different species have adapted to life and assumed the forms and lives that they have in our day. He proposes that domesticated animal breeding be seen as a lesson in natural selection. His methods depended on the two major tools of a researcher, careful observation and recording of the stages of any experiment.

Darwin's introduction describes the main sections of his book. In the first part of the book, Darwin wants to show how the purposeful breeding of domesticated animals allows humans to modify animals by accumulating otherwise small and unnoticeable variations. In nature too, he writes, there is much variation within species. Here Darwin summarizes his theory of Natural Selection. As there are many more animals born than can survive, those who have a variation that is advantageous will survive to eat and reproduce, and thus pass on their advantageous variations to their offspring. Darwin points to the need for a great amount of data, and advises the reader that the high degree of variability of species in nature becomes evident "only by giving long catalogues of facts."

Darwin promises that towards the end of the book he will discuss the most difficult parts of the theory of evolution that need to be reconciled, the actual mechanisms of change from simple to complex, instincts of animals, the role of hybridism, and finally the lack of clear proof in the geological record.

For future research, Darwin planned to study the interrelationships between species. He was convinced that the varied species were not individually and completely created, but evolved from other, older species in a "descent with modification." Darwin believed that when we understand how evolution works, human beings will come to understand our own relationship with the rest of the world.

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