

## The Reception of Darwin's Theory in the English-Speaking World

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Immediately following publication of his *Origin of Species*, Darwin was deeply anxious about the response of the scientists whose opinion he valued most. A few years earlier he had written to his friend Joseph Hooker to say that the most he hoped to achieve was to persuade sound naturalists that there were two sides to the species question. Now, in 1859, he wondered how many would be converted from belief in the fixity of species to his view that, given enough time, one species could gradually change into another. Darwin knew that his views were bound to be controversial: "God knows what the public will think", he wrote shortly before publication.

Within the scientific community it was widely held that the succession of species appearing in the fossil record had been introduced independently of each other. Darwin's mentor in geology, Charles Lyell, had argued that new species were introduced whenever the Earth's physical history created an environment in which they could flourish. Where they came from was the great mystery. Lyell had imagined that there would be a natural process involved, but he did not know what it was. There were evolutionary theories in the air; but they were not convincing. In his *Principles of Geology*, Lyell had specifically attacked the evolutionary theory of the Frenchman Jean-Baptiste Lamarck. When a Scotsman, Robert Chambers, had published a popular, anonymous text on evolution in 1844, it had been savagely attacked by the scientific experts of the day. These included Thomas Henry Huxley who was to play a crucial role in promoting Darwin's ideas. But in November 1859 Darwin didn't yet know how Huxley would react to *his* book. We find him writing to Alfred Russel Wallace: "If I can convert Huxley I shall be content." He must have succeeded because a month later he was reporting that Huxley "says he has nailed his colours to the mast, and I would sooner die than give up, so that we are in as fine a frame of mind ... as any two religionists."

That reference to religion is interesting. Darwin undoubtedly saw himself on a mission to convert his readers. Could he persuade them that new species were not introduced *independently* but were simply derived from pre-existing species? He had good reason to be apprehensive because he admitted that he had faced many difficulties in the development of his theory. What about the scarcity of intermediate forms in the fossil record? How could a caste system among neuter insects have come about when neuters could not pass on their characteristics to the next generation? Darwin believed he had come up with the necessary answers but he was not sure how his rhetoric would work with sceptics. We find him begging his readers to read his book straight through in its entirety, in order to appreciate what he described as "one long argument." No small request! In the early days, whenever he gained a convert he reported his success. As early as December 1859 he told one correspondent that, in addition to Huxley, Lyell was an "entire convert", as were Joseph Hooker the botanist and William Carpenter an eminent physiologist.

As we shall see in a moment, Darwin's description "an *entire* convert" might have contained a little wishful thinking; but there is no doubt that he was soon enjoying a sympathetic hearing from the men whose approval he most valued. One sour note was sounded by his old Cambridge professor, Adam Sedgwick, who complained that

Darwin's concept of natural selection dispensed with the category of final cause, or purpose, in nature. Sedgwick lamented this rupture of a traditional link between the physical and the moral order.

Those who were converted were of course impressed by Darwin's achievement in explaining so many facets of the natural world that would otherwise remain disconnected: fossil sequences, the extent of extinction, the geographical distribution of species, similarities between the embryonic forms of very different creatures, and the difficulty of drawing a firm line between varieties and species. On Darwin's theory varieties were incipient species. In the *Origin of Species*, he pointed to the plasticity of living forms. Referring to the many varieties of pigeon produced by breeders, Darwin noted that even a well-trained ornithologist would be tempted to regard them as separate species if he didn't know they were all derived from the common rock pigeon. If the test of a good theory was that it unified a wide range of disparate data, Darwin's theory certainly met that criterion. We can understand why Huxley and other competent naturalists regarded his work as having inaugurated a "new epoch in natural history." [Huxley *Darwiniana* 23].

In North America, as well as Britain, Darwin soon found advocates. The Harvard botanist Asa Gray was particularly supportive. Unlike some commentators, Gray really understood what Darwin meant by natural selection. Darwin was especially grateful for the fact that Gray, a devout Presbyterian Christian, assured his readers that the new theory was perfectly compatible with belief in a Creator God. Gray even suggested that Darwin's theory could be helpful to Christian theologians by underlining the unity of nature and the unity of humankind. This was in sharp contrast to the reaction of *some* religious leaders who felt that to share an ancestor with the apes was offensive to human dignity.

The reception of Darwin's theory varied considerably within both scientific and religious communities. Initially there was opposition from some of the finest scientific minds – from physicists who felt that Darwin's hypotheses were too speculative and from experts in geology and zoology, such as Asa Gray's Harvard colleague Louis Agassiz.

Agassiz had no time for theories of evolution that involved material connections between species. Rather, in the fossil record he saw evidence of progressive creation as epoch succeeded epoch. Living things were the representation of ideas in the mind of the Creator. As he once put it: "There will be no scientific *evidence* of God's working in nature until naturalists have shown that the whole creation is the *expression of thought* and not the *product of physical agents*."

Agassiz was not alone in that view. In England, Richard Owen also ascribed the common bone structures of the vertebrates to an archetypal idea in the mind of God. Owen had risen to fame through his expertise in anatomy and paleontology; and it was he who invented the word 'dinosaur'. Owen was willing to see the emergence of new species as the result of natural causes but, at the same time, the whole process was an unfolding of a divine plan. The many different vertebrates looked to him to be instantiations of a common skeletal structure – an archetypal idea in the mind of the Creator. There was a sense in which 'creation' was continuous.

In simple terms we could say there was a clash between Darwin's theory and a Platonist philosophy of nature. Whereas Agassiz (Roberts 1988, 34) wrote that "the intervention of a Creator is displayed in the most striking manner, in every stage of the history of the world," Darwin's mechanism of natural selection required no such intervention. Agassiz communicated his verdict to Asa Gray: Darwin's work he thought was "poor – very poor".

But just a few years later, a scientific meeting was held in Boston at which both Agassiz and the British physicist John Tyndall were present. Tyndall left a poignant account of a scene that marks the passing of an age:

Rising from luncheon, we all halted as if by common consent, in front of a window, and continued there a discussion which had been started at table. The maple was in its autumn glory, and the exquisite beauty of the scene outside seemed, in my case, to interpenetrate without disturbance the intellectual action. Earnestly, almost sadly, Agassiz turned, and said to the gentlemen standing round, "I confess that I was not prepared to see [Darwin's] theory received as it has been by the best intellects of our time. Its success is greater than I could have thought possible."

Within fifteen years of Darwin's publication, the success of his theory was greater than his critics thought possible. This is an important marker because it means that after about fifteen years the theory was so well respected among fellow scientists that it could not be ignored by the public. But there was a problem. There is a difference between accepting the reality of evolution and accepting that natural selection provided an adequate understanding of the process. Darwin did more than anyone to convince the English-speaking world that evolution had really occurred. But the mechanism was to remain controversial during the rest of his life and many historians would say until the 1930s. Even Darwin himself declared in his book *The Descent of Man*, that he had probably given too much weight to natural selection in the first edition of his *Origin*.

The concept of natural selection did prove useful to other scientists - and quite quickly. For example the British naturalist Henry Bates soon showed that the phenomenon of mimicry could be elegantly explained by natural selection. Bates made a special study of butterflies along the river Amazon. Why, for example, among *Leptalis* butterflies were there some that, in their markings, resembled species of the *Heliconidae* family that were known to be distasteful to birds? Their disguise could now be explained without appealing to thoughts of a designer. Variants of *Leptalis* species having markings that approximated to those of the *Heliconidae* would have had an advantage over those in which the markings were less pronounced – for the simple reason that birds would tend to avoid them. In due course what had once been a rudimentary copy would become a remarkable imitation – but merely through further variation and the selective predation of birds.

Such applications of Darwinian principles were scientifically fruitful and impressive. To experience the switch from the designed universe of William Paley to the seemingly undirected universe of Darwin was like a *gestalt* switch that could be similar to a conversion experience. As the naturalist Alfred Newton put it: "all personal feeling apart, it came to me like the direct revelation of a higher power; and I awoke next morning with the consciousness that there was an end of all the mystery

in the simple phrase, ‘Natural Selection’”. But many questions remained. What were the causes of variation in the first place? Was there enough time for natural selection, working on small variations, to do its work? Ironically perhaps, Darwin’s most famous disciple, Huxley, thought the answer was “no”.

Huxley, unlike Darwin himself, resorted to sudden mutations to accelerate the pace of evolution. Why was Darwin so reluctant to admit mutations into his theory? Note that we are not talking here of genetic mutation, which later played such a crucial role in 20<sup>th</sup> century evolutionary theory. Darwin’s own genetics were pre-Mendelian. He favoured a blending theory of inheritance according to which offspring had characteristics that were a blend of parental features. And this was the problem. A sudden mutation affecting an individual member of a species would very quickly be swamped as the mutant form mated with normal members of the population. There were times when Darwin worried that this swamping problem might even apply to the minor variations on which his theory depended. The problem was of course minimised if a similar variation appeared in the majority of a population at the same time. But why would this happen, unless environmental factors could have a direct effect on organisms?

This is just one example of the scientific problems that Darwin had to face. For a historian there is another irony in the story. When the relevance of Mendel’s work to evolutionary theory began to be appreciated early in the 20<sup>th</sup> century, the importance of mutation was reintroduced. But William Bateson and others who emphasised *discontinuities* in the appearance of variation constructed theories of evolutionary change that were deliberately opposed to Darwinian natural selection. Mutation theories and the theory of natural selection did not always sit comfortably together.

Controversy over natural selection sometimes focused on the most sensitive issue of all – the evolution of humankind. When discussion centred on the unique capacities of the human mind, there was no scientific consensus. Opinions varied widely. Darwin clearly believed that human characteristics, including the ability to expression emotion, could be found in animals. He even thought that the behaviour of his dog might throw light on the origins of religion. One day it had barked at a canopy blown by the wind, as if it were detecting some invisible agent behind the appearances.

But, and it is a very *big* but, not all converts to the reality of evolution were satisfied that natural selection gave a sufficient explanation for the emergence of the human mind. Darwin, as we saw earlier, had once referred to Lyell as an “entire convert” to his views; but Lyell believed there were unique features of the human mind that natural selection alone could not explain. Even the co-founder of the theory of natural selection, Alfred Russel Wallace, made an exception of human beings. Wallace was actually more confident than Darwin that natural selection could explain the evolution of animal forms; but when it came to the origin and transmission of human culture he believed that more was involved. Wallace put the spotlight on mathematical ability, musical appreciation, and other aesthetic sensibilities. These were not universally distributed among humankind. Nor was it clear that they had survival value. Wallace was not a Christian, but he was drawn into spiritualism. This was to damage his reputation among hard-line Darwinians, but it means that he was willing to entertain some kind of spirit agency at work in the evolution of humanity.

This brings us finally to the question of religious responses to Darwin's theory. They are interesting and diverse. Many Christians were shocked by Darwin's ideas, but others, including clergymen, were among Darwin's earliest converts. Until the middle of the 19<sup>th</sup> century, science was hardly a profession in the modern sense. In England it was often practised by clergymen as an amateur pursuit. For most of Darwin's teachers, science was not only a religious duty. It also provided a way of illustrating God's power and wisdom. The appearance of design in the structure of living things reinforced a sense of design in the structure and purpose of the universe. One of the reasons why Darwin's theory was so culturally significant was that it did challenge simple inferences from nature to God. But neither Darwin nor Huxley, who fought so hard to elevate science as a profession, dismissed the possibility that there was design in the laws or in the original configuration of the universe that had made evolution possible. Darwin spoke of "designed laws with the details left to chance". Huxley, in his own account of the reception of Darwin's theory, thought there had been far too much fuss about the issue of design. Darwin's theory in his view posed no more threat to theistic religion than had the first book of Euclid.

The Christian thinkers in England and America who helped to promote Darwinian theory agreed with him. The Christian socialist Charles Kingsley, who spread evolutionary ideas in his novels, congratulated Darwin on a view of nature that led to a nobler view of creation, to a deity so wise that he could make all things *make themselves*. And another Christian defender of evolution, Frederick Temple, symbolised a favourable Christian response when he was appointed Archbishop of Canterbury just a few years after Darwin's death. By the end of the 19<sup>th</sup> century there were religious leaders in the United States, such as James McCosh at Princeton, who were happy to reinterpret their faith in the light of evolutionary theory. More conservative Christians have not followed that path, but that is another story.