

Zoology Subsidiary - BSc Part 1

Darwin's theory of natural selection

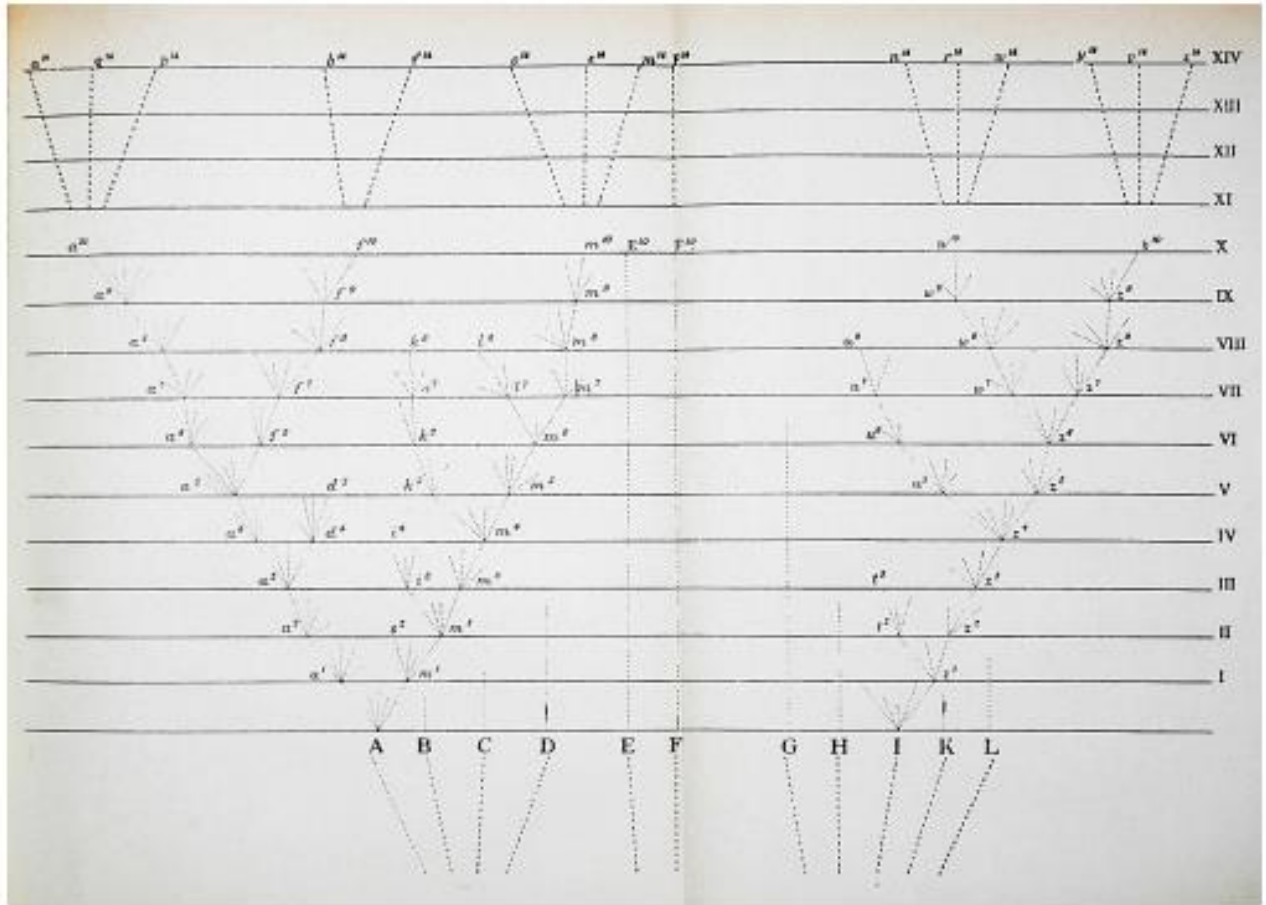
Darwin explains the core of his theory:

1. Nature varies, randomly.
2. Some of variations are more advantageous than others.
3. Because there is a struggle for existence, any advantage will be important, however slight.
4. In the long run, those organisms that have a slight innate advantage will survive more often than those that do not, passing on their advantages to their offspring.

Through this mechanism, Darwin argued that a population will change by the accumulation of small, but favorable advantages, over vast periods of time. Again, he referred to artificial selection, calling natural selection "unconscious artificial selection." But notice that nature does not chose preferred traits in the way that a breeder does.

The Origin of Species, 1868 (5th edition), Introduction "Owing to this struggle ,variations, however slight and from whatever cause proceeding, if they be in any degree profitable to the individuals of a species, in their infinitely complex relations to other organic beings and to their physical conditions of life, will tend to the preservation of such individuals, and will generally be inherited by the offspring. The offspring, also, will thus have a better chance of surviving, for, of the many individuals of any species which are periodically born, but a small number can survive. I have called this principle, by which each slight variation, if useful, is preserved, by the term Natural Selection, in order to mark its relation to man's power of selection. But the expression often used by Mr. Herbert Spencer of the Survival of the Fittest is more accurate and is sometimes equally convenient."

Darwin's concept of divergence



The Initial Reaction

The Origin was a very popular book, and went through six editions from 1859 to 1872. Darwin tapped into the thinking of the time and pitched evolution as a form of progress similar to the progress of the English nation that his contemporaries perceived. England was no longer as conservative as it had been when he was young and a belief in social progress using science and industry fit well with the evolutionary idea of biological progress. Literal interpretations of the Bible were coming under increasing criticism and many were prepared to be convinced of the fact of biological evolution. Darwin's close supporters, such as Huxley, Hooker and Lyell, were influential and helped Darwin carry out the social aspect of the argument for evolution.

The Reaction to Natural Selection

Although the Origin convinced many naturalists of the fact of evolution, many people remained skeptical about the theory of natural selection. People raised the following objections: § It is random and open-ended. § Is not a goal directed process. § Where the goal was implicitly understood as white, Victorian, upper-class males. § It does not imply directed progress. § This was a challenge to the establishment and to the mercantile values of the rising middle class. § Is not an open system, as in Lamarck's theory. That is, individuals cannot improve themselves throughout the course of their lives and pass on these improvements. Most naturalists of the 1870s and 80s became evolutionists, and even called themselves "Darwinists," but did not accept natural selection, which was the core of Darwin's theory.

Darwinists without Natural Selection

Even many people who supported Darwin, did not accept, or understand, natural selection. For example, Herbert Spencer, used Darwin's ideas to explain human progress towards fitter individuals – a very progressivist view of evolution. Ernst Haeckel, an avid Darwinist, thought that evolution unfolded according to a plan, like embryonic development ("ontogeny recapitulates phylogeny").

The Religious Reaction

Darwin's ideas gave a profound shock to the religious establishment, and to the naturalists who supported it with the theory of natural theology. Darwin's theory was perceived as being much more difficult to reconcile with a creative, all powerful god, than those of Copernicus, Galileo or Newton. If we take natural selection seriously it is difficult to see how a god could have created us, and hence it is difficult to see how we could have any special place in a god's creation. There were a number of public disputes between religious authorities, older naturalists and the Darwinists. § Bishop Wilberforce and Huxley at the British Association for the Advancement of Science meeting. § There was an ongoing debate in newspapers and journals. A number of naturalists argued for "theistic evolution," and even many of Darwin's colleagues, such as Lyell and Wallace, could not fully accept the natural selection of human beings.

The Modern Synthesis

In the 1930s–40s, there was a revival of the theory of evolution through the mechanism of natural selection. It was argued that the new science of genetics made it clear that mutations in genes could be completely random and that these could then be adaptively selected for by purely environmental pressures. The modern synthesis brought together all the different branches of life sciences and viewed their findings through the light of natural selection. Dobzhansky, 1973: "Nothing in biology makes sense

except in the light of evolution.” There was a renewed interest in the evolution of the human race and in thinking about the implications of evolution through natural selection as a basis for understanding our social and moral place in the world.

Natural Selection and Human Nature

Some of the most serious implications of the theory of natural selection are on our understanding of human nature. If human beings evolved from a primate ancestor, it might mean that even our most “noble” traits – such as our ability to love, our feeling of the divine, our creativity, our love of knowledge, our concern for others, etc. – are not the gifts of a beneficent god, but are rather the chance results of natural processes. While it is easy to see that our base traits – such as greed, lust, selfishness, etc. – would have helped our ancestors to survive, it has been more difficult to see this with our noble traits. We are still in the process of developing models of behavior that show how these traits would have been advantageous to our ancestors. That is, scientists are currently still articulating the paradigm of natural selection to cover more and more phenomena.

Overview

Over the course of his life, Darwin went from being a devout Anglican, who had intended to become a minister and believed that the natural world was evidence of God’s providence, to being an agnostic who believed that human beings were the chance result of natural processes. The revolution in thought and worldview brought about by the theory of natural selection is one of the most profound to have effected us. Although almost all biologists now accept natural selection, it is still difficult for many lay people to accept. It is still disputed from the perspectives of both religion and “common sense.” From the perspective of worldviews, we should remember that it often takes a long time for a new worldview to take hold. A change in worldview involves many cultural and social factors that do not always follow a clear logic.

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