

“On the Origin of Species” By Charles Darwin

Chapter 3: Struggle for Existence

Darwin begins the bulk of his argument here, explaining how different species are created. Two concepts dominate this explanation: the struggle for existence and natural selection. Darwin suggests that an organism's struggle for existence is part of what determines why some species' characteristics survive and others become extinct. The great number of variations in species have allowed plants and animals to become beautifully adapted to their environments. Darwin provides examples of these adaptations. He mentions the beak of a woodpecker, which allows it to gather insects for food; the structure of a parasite, which allows it to attach to and feed off of another organism; and the ability of a beetle to dive into the water to gather food. These adaptations illustrate how unique characteristics of particular organisms have developed, allowing them to thrive in their specific environments. The most advantageous characteristics are preserved and passed on to offspring. Darwin explains that the presence of these useful adaptations in organisms is the result of natural selection.

Two other concepts, the struggle for life and the limits of population increase, frame the idea of an organism's drive to exist. Although nature can provide an abundance of food and shelter to its inhabitants, it can also be destructive, causing a struggle for life. Natural disasters, epidemics, and shifts in climate can limit the availability of food and shelter, and animals prey on other plants and animals. Nature inherently disallows the survival of some organisms. Darwin's principle of the limits of population increase, borrowed from economist Thomas Malthus, is based on the notion that each successive generation of species exponentially increases its population, growing the world population on a constant basis. If each generation continues to reproduce in greater numbers than the one before, and the rate of death remains the same, the earth will eventually run out of room and will be unable to support all of its inhabitants. Therefore, nature limits the number of possible inhabitants of the world. As a result, each individual organism must compete to continue existing, and because there must be a limit on population for every species, one individual organism's survival inherently threatens the survival of another.

The constant competition for existence compels all organisms and species to strive to outlive others and successfully leave offspring for the survival of the species. Most important to Darwin's theory is the survival of progeny, because future generations are both dependent on and essential to the perpetuation of advantageous traits and the progress of their race. While much of the competition for existence takes place between members of different species, the most important struggle is between members of the same species. Those individual members who hold advantageous variations that allow them to avoid predators, withstand climate changes, and survive natural disasters have the best chance of surviving. An

advantageous variation, combined with successful reproduction, can result in a change in the species, creating a subspecies better equipped to handle its environment. Survival does not occur by chance. Rather, it is the result of advantageous variations.

Finally, Darwin indicates different ways in which the struggle for existence can occur in the natural world. Most cases of survival involve one organism or group possessing an advantage over another one and beating it out. Generally, a species with a larger population has a greater chance of survival than a species with a smaller population, as its larger population makes it less likely to be wiped out by prey and better able to maintain its great numbers through reproduction. In some cases, however, relationships between species govern the chances of survival. Darwin points out that a single tree planted in any area allows further vegetation to grow there and that the fencing off of a section of land to keep cattle away allows seedlings to flourish. In these cases, the survival of a tree or removal of cattle allows the growth of an entirely different species. Struggles for survival are dependent on others, whether those struggles end up being competitive or cooperative in nature.

Chapter 4: Natural Selection

Darwin now focuses on natural selection, returning to his discussion of a breeder selecting desired characteristics for animals. If breeders can select characteristics they wish to breed in their animals and perpetuate these characteristics in their domestic populations, is it possible for nature to act in the same way? Darwin believes it is. Variations that give one species an advantage, no matter how slight, over another species, allow organisms a better chance of surviving and therefore of leaving more offspring. While breeders can select variations that are beneficial for them, omniscient nature has the power to develop and select variations that are imperceptible to man and beneficial to species in ways that man might never have considered. Nature can make any slight advantage increase an organism's likelihood of surviving over another, and since these advantageous variations are heritable, they can be perpetuated in future generations. Conversely, nature can also limit species by *not* bestowing advantageous characteristics on them, therefore making the species less likely to survive and putting them at risk of extinction.

Darwin gives a number of examples of variations that could be advantageous to an individual organism, passed along to subsequent generations, and preserved in the future of the species. For instance, a wolf with slimmer features might be able to run faster and therefore to escape from its predators. A bear might be born with the instinct to pursue a more abundant type of prey, which will be easier to obtain than less abundant types. In a more complex case, a plant might contain a sweet nectar or colorful petals that

attract more insects than other plants attract, which will spread the plant's pollen more frequently. Similarly, an insect might inherit a smaller body type, allowing it to obtain food more easily from a plant.

Adding to the concept of natural selection, Darwin briefly outlines the concept of sexual selection, which is another factor in species evolution. Because having offspring is key to species' survival, male individuals with variations that allow them to successfully attract females are more likely to reproduce and therefore to produce more offspring than others. These advantageous sexual characteristics are also variations that would be passed on to offspring. Darwin gives examples of tactics that species of male birds use to attract females: singing to their potential mates, displaying various brightly colored feathers, and performing antics to attract attention. If any variation in these characteristics were to give male birds a better chance of mating, that variation would likely spread to the birds' offspring and, as a result, would become predominant in the population in subsequent generations. Variations of this sort, such as color, aptitude for singing, or ornamentation, may have no direct impact on the ability of an individual organism to survive in nature; rather, the variations' utility in helping an organism reproduce is what allows these variations to be selected and perpetuated in a species.

Darwin goes on to explain the geographical requirements for the propagation of advantageous traits, noting that isolation is key to natural selection, as it creates a situation in which few individuals live in a specific area in which no new organisms will be introduced. In isolated areas, variations that allow organisms to survive in that particular environment win out over disadvantageous ones. In time, these variations spread throughout the species, making the organisms appear perfectly adapted to their environment. The workings of natural selection in geographical isolation explain why floral and animal life is unique in island environments. On the other hand, large geographical areas in which plant and animal populations are not isolated allow species to spread and propagate widely, increasing the species' numbers and its overall chances of survival in a range of environments.

Finally, Darwin relates the concept of natural selection to divergences of character and the gradual creation of new species, thus explaining the origin of species. As particular variations are selected over others, these variations lead to a divergence in characteristics from the parent species. Additional variations then lead to more divergences, and as some variations propagate and expand, others die out as a result of the struggle for existence and the limits of population growth. Darwin provides a chart to illustrate this process, demonstrating how these divergences create "branches" of related species. Some branches end as species become extinct, while other branches multiply as more subspecies develop and

a new species becomes a parent species. Eventually the divergences become so great that new species come about. Darwin says this process can take tens of thousands of years.