DOWNLOAD PDF CHARLES DARWIN THEORY OF NATURAL SELECTION

Chapter 1 : Natural selection - Wikipedia

Darwin's Theory of Evolution - Natural Selection While Darwin's Theory of Evolution is a relatively young archetype, the evolutionary worldview itself is as old as antiquity. Ancient Greek philosophers such as Anaximander postulated the development of life from non-life and the evolutionary descent of man from animal.

Darwin believed all plants and animals had evolved from a few common ancestors by means of natural selection. Plants and animals produce many offspring, but some of the young die before they can become parents. All living things must compete for a limited supply of food, water, space, and other necessities. The individual plants and animals whose variations are best adapted to conditions have an advantage in this struggle. These organisms, on average, tend to leave a larger number of offspring than other members of their group. As a result, the proportion of the group sharing the traits of the best-adapted organisms increases from generation to generation. Scientists use the term fitness to refer to the ability of an organism to reproduce. For this reason, natural selection is often called the "survival of the fittest. First, the individuals of a population must differ in their hereditary characteristics. Human beings, for example, vary in almost every aspect of their appearance, including height, weight, and eye colour. People also differ in less-obvious features, such as brain size, thickness of bones, and amount of fat in the blood. These differences have some genetic basis. The second requirement for natural selection is that some of the inherited differences must affect chances for survival and reproduction. When this occurs, the fittest individuals will pass on more copies of their genes to future generations than will other individuals. Over time, a species accumulates genes that increase its ability to survive and reproduce in its environment. There are several types of natural selection. They include 1 directional selection, 2 stabilizing selection, and 3 sexual selection. Directional selection produces new features that help a species adapt to its environment. This type of selection is what most people think of as natural selection. Stabilizing selection occurs if a species is already well adapted to its environment. In such cases, the individuals with average characteristics leave the most offspring, and individuals that differ most from the average leave fewest. Unlike directional selection, stabilizing selection eliminates extreme characteristics, reducing the amount of variation in a population. Stabilizing selection may actually be the most common type of natural selection. Sexual selection occurs primarily among animals. Adults of many species prefer mates who display certain behaviors or have certain external features. Sexual selection explains, for example, why males of many bird species have more colorful feathers than the females. Have a great time! Survival of the Fittest is a misnomer, a very misleading misnomer at that. This term fails to adequately describe what happens in nature. There is not always a "fittest" type. There may be several different organisms that are equally fit for different reasons. They may be suited to different facets of the environment. One is not going to replace the other becasue each has its proper place in the environment. It is not just a matter of survival. The very idea of survival of the fittest is unfortunate becasue it has been viewed as some universal unconditioned truth, but it is an empty statement for those who say that the fittest are those who survive and there is no real predictive content to the notion of natural selection. That is simply false.

Chapter 2 : Darwin's Theory of Evolution: Definition & Evidence

These are the basic tenets of evolution by natural selection as defined by Darwin. The following is a quote from Darwin. "Variation is a feature of natural populations and every population produces more progeny than its environment can manage.

Darwin and Wallace rewrite the theory of evolution Darwin and Wallace presented their accounts of evolution at the same meeting Darwin finally went public with his groundbreaking theory of evolution by natural selection, while making sure that Wallace received some credit. Wallace, on his return, accepted that Darwin had treated him fairly. But Darwin missed the presentation. A private tragedy struck: I am quite prostrated, and can do nothing I hardly care about it. It would become one of the most important books ever written. He dreaded losing his reputation, as his grandfather Erasmus had. Charles did draw fierce criticism from the Church, and from some parts of the press. However, some were now willing to listen to evidence for evolution â€" especially from a leading figure like Darwin. One general law, leading to the advancement of all organic beings, namely, multiply, vary, let the strongest live and the weakest die. Andrew Marr re-enacts key moments from the Oxford Debate. It was left to others â€" notably a young biologist named Thomas Huxley â€" to take up the fight. In the 19th Century, scientific talks were popular entertainment and any debate about evolution was sure to draw crowds. In what many saw as a key battle between science and God, Huxley went head to head with Bishop Samuel Wilberforce and his Biblical account of creation. Both sides claimed victory. The debate has become part of the Darwin legend and shows how his ideas shook Victorian society. A witness recalls the Oxford University debate A worrying inheritance Charles Darwin and his son William, taken in Darwin wrote a warning about close relatives having children, buried in an obscure botanical textbook. He was already worried about his own marriage. Darwin and his cousin Emma had ten children and Charles was a devoted father. Yet the couple had now lost a son and two daughters, and nursed others through illness. Darwin knew that orchids were less healthy when they self-fertilised and worried that inbreeding within his own family may have caused problems. Yet when Darwin lobbied to add questions on cousin-marriage to the census he was refused. Queen Victoria had married her cousin, and Darwin was challenging another taboo. Nature thus tells us, in the most emphatic manner, that she abhors perpetual self-fertilisation. Each has adapted to its environment. Origin of Species was a bestseller worldwide and went into multiple editions. With each new edition, Darwin strengthened his arguments. By responding to critics, he was able to build a more robust case. The book was another challenge to Christian orthodoxy. Yet in the decade since Darwin had gone public, his ideas had gained acceptance. I have little strength and feel very old. Darwin describes his final book: He died a virtual recluse, surrounded by his wife and a few devoted friends. In his final months Darwin was tended by Emma, who had stood by him despite their differences in religious belief. Yet his followers, including the indomitable Huxley, had grander plans. He was buried at Westminster Abbey. A man who dares to waste one hour of time has not discovered the value of life.

Chapter 3 : BBC - iWonder - Charles Darwin: Evolution and the story of our species

In , Charles Darwin set out his theory of evolution by natural selection as an explanation for adaptation and speciation. He defined natural selection as the "principle by which each slight variation [of a trait], if useful, is preserved". [17].

Check new design of our homepage! Natural selection is a key to the origin of new species from the existing ones. The following article provides information about this theory. Prior to Charles Darwin, there were many scientists who claimed that a species is evolved from another species or ancestor. However, in those times there were no scientific evidence to prove the concept of evolution. It was in the 19th century that Charles Darwin put forth the theory of Natural Selection that is widely accepted by scientists and the general public. He noticed that birds inhabiting different islands had slight difference in their features. In the study, he identified varied species of Finches that differed in their beak shape and size. This difference in the beak was related to the foods available in that particular region. Contrary to this, he observed only one species of Finches in South America. According to him, the original species of Finches, after arriving at the islands were dispersed in varied environmental conditions. In due course of time, the anatomy of the birds were modified naturally as an adaptation to the prevailing conditions. In simpler terms, they were modified for better access to food, thus increasing their survival rate for reproduction. For example, a species that possessed beak was best-suited for consuming thorny plants and had better chances of surviving in the arid areas than others. This particular bird survived and reproduced, while those that could not adapt to the environment, died. This modification or adaptive feature might have developed after many generations. As the birds were anatomically different from each other, they were reproductively isolated, thus giving rise to separate species. In this way, a new species of Finches evolved from the original one. Applying the concept of evolution to every living thing, Darwin claimed that individuals belonging to the same species showed some sort of variation between them. Those individuals who possess features that are favorable for living, survive and reproduce, thus passing the genetic material from one generation to another. Eventually, after many generations, the genetic traits or features become more common. Thus, a population evolves which consists of only the favorable traits. Natural selection can be explained in the same way as the breeding procedure practiced by human breeders for domestic animals. In case of cattle breeding, the best productive cows are used for breeding. This process gradually discards the undesirable traits. Similarly, natural selection excludes inferior species over a period of time, while favoring superior adaptable species. Natural selection is an important aspect in the process of evolution. It helps in accumulating and preserving beneficial mutations that increase an organisms chance of survival.

Chapter 4 : Darwin's Theory Of Evolution

Darwin's theory of natural selection is an important landmark in the evolutionary process and the origin of species. Prior to Charles Darwin, there were many scientists who claimed that a species is evolved from another species or ancestor.

He was the grandson of two prominent abolitionists: Painting of seven-year-old Charles Darwin in Both families were largely Unitarian , though the Wedgwoods were adopting Anglicanism. The eight-year-old Charles already had a taste for natural history and collecting when he joined the day school run by its preacher in That July, his mother died. From September , he joined his older brother Erasmus attending the nearby Anglican Shrewsbury School as a boarder. Darwin found lectures dull and surgery distressing, so he neglected his studies. He learned taxidermy in around 40 daily hour-long sessions from John Edmonstone , a freed black slave who had accompanied Charles Waterton in the South American rainforest. He learned the classification of plants, and assisted with work on the collections of the University Museum , one of the largest museums in Europe at the time. As Darwin was unqualified for the Tripos , he joined the ordinary degree course in January He became a close friend and follower of botany professor John Stevens Henslow and met other leading parson-naturalists who saw scientific work as religious natural theology , becoming known to these dons as "the man who walks with Henslow". In his final examination in January Darwin did well, coming tenth out of candidates for the ordinary degree. Inspired with "a burning zeal" to contribute, Darwin planned to visit Tenerife with some classmates after graduation to study natural history in the tropics. The ship was to leave in four weeks on an expedition to chart the coastline of South America. As FitzRoy had intended, Darwin spent most of that time on land investigating geology and making natural history collections, while HMS Beagle surveyed and charted coasts. Most of his zoology notes are about marine invertebrates, starting with plankton collected in a calm spell. He identified the little-known Megatherium by a tooth and its association with bony armour, which had at first seemed to him to be like a giant version of the armour on local armadillos. The finds brought great interest when they reached England. Three Fuegians on board had been seized during the first Beagle voyage , then during a year in England were educated as missionaries. Darwin found them friendly and civilised, yet at Tierra del Fuego he met "miserable, degraded savages", as different as wild from domesticated animals. Unlike his scientist friends, he now thought there was no unbridgeable gap between humans and animals. The Fuegian they had named Jemmy Button lived like the other natives, had a wife, and had no wish to return to England. High in the Andes he saw seashells, and several fossil trees that had grown on a sand beach. He theorised that as the land rose, oceanic islands sank, and coral reefs round them grew to form atolls. He heard that slight variations in the shape of tortoise shells showed which island they came from, but failed to collect them, even after eating tortoises taken on board as food. Zoologists had a huge backlog of work, and there was a danger of specimens just being left in storage. The armour fragments were actually from Glyptodon , a huge armadillo-like creature as Darwin had initially thought. On the same day, he presented his mammal and bird specimens to the Zoological Society. The ornithologist John Gould soon announced that the Galapagos birds that Darwin had thought a mixture of blackbirds , " gros-beaks " and finches , were, in fact, twelve separate species of finches. Darwin stayed with his freethinking brother Erasmus , part of this Whig circle and a close friend of the writer Harriet Martineau , who promoted Malthusianism underlying the controversial Whig Poor Law reforms to stop welfare from causing overpopulation and more poverty. As a Unitarian, she welcomed the radical implications of transmutation of species , promoted by Grant and younger surgeons influenced by Geoffroy. Darwin had not labelled the finches by island, but from the notes of others on the ship, including FitzRoy, he allocated species to islands. By mid-March, Darwin was speculating in his Red Notebook on the possibility that "one species does change into another" to explain the geographical distribution of living species such as the rheas, and extinct ones such as the strange Macrauchenia , which resembled a giant guanaco. On 20 September he had "an uncomfortable palpitation of the heart", so his doctors urged him to "knock off all work" and live in the country for a few weeks. After visiting Shrewsbury he joined his Wedgwood relatives at Maer Hall , Staffordshire, but found them too eager for tales of his travels to give him much rest. His charming, intelligent, and cultured cousin Emma Wedgwood , nine months older

than Darwin, was nursing his invalid aunt. After initially declining the work, he accepted the post in March The strain took a toll, and by June he was being laid up for days on end with stomach problems, headaches and heart symptoms. For the rest of his life, he was repeatedly incapacitated with episodes of stomach pains, vomiting, severe boils , palpitations, trembling and other symptoms, particularly during times of stress, such as attending meetings or making social visits. He visited Glen Roy in glorious weather to see the parallel "roads" cut into the hillsides at three heights. He later published his view that these were marine raised beaches , but then had to accept that they were shorelines of a proglacial lake. Used to jotting down daily notes on animal breeding, he scrawled rambling thoughts about career and prospects on two scraps of paper, one with columns headed "Marry" and "Not Marry". Advantages included "constant companion and a friend in old age As species always breed beyond available resources, favourable variations would make organisms better at surviving and passing the variations on to their offspring, while unfavourable variations would be lost. In October , that is, fifteen months after I had begun my systematic enquiry, I happened to read for amusement Malthus on Population, and being well prepared to appreciate the struggle for existence which everywhere goes on from long-continued observation of the habits of animals and plants, it at once struck me that under these circumstances favourable variations would tend to be preserved, and unfavourable ones to be destroyed. The result of this would be the formation of new species. Here, then, I had at last got a theory by which to work She accepted, then in exchanges of loving letters she showed how she valued his openness in sharing their differences, also expressing her strong Unitarian beliefs and concerns that his honest doubts might separate them in the afterlife. I shall be delighted to hear how you think that this change may have taken place, as no presently conceived opinions satisfy me on the subject. Darwin scorned its amateurish geology and zoology, but carefully reviewed his own arguments. Controversy erupted, and it continued to sell well despite contemptuous dismissal by scientists. He now renewed a fascination and expertise in marine invertebrates , dating back to his student days with Grant , by dissecting and classifying the barnacles he had collected on the voyage, enjoying observing beautiful structures and thinking about comparisons with allied structures. He wrote to Hooker about this portrait, "if I really have as bad an expression, as my photograph gives me, how I can have one single friend is surprising. Hooker increasingly doubted the traditional view that species were fixed, but their young friend Thomas Henry Huxley was firmly against the transmutation of species. Though Darwin saw no threat, on 14 May he began writing a short paper. Finding answers to difficult questions held him up repeatedly, and he expanded his plans to a "big book on species" titled Natural Selection , which was to include his "note on Man". He continued his researches, obtaining information and specimens from naturalists worldwide including Wallace who was working in Borneo. In mid he added a section heading; "Theory applied to Races of Man", but did not add text on this topic. On 5 September , Darwin sent the American botanist Asa Gray a detailed outline of his ideas, including an abstract of Natural Selection, which omitted human origins and sexual selection. In December, Darwin received a letter from Wallace asking if the book would examine human origins. Shocked that he had been "forestalled", Darwin sent it on that day to Lyell, as requested by Wallace, [] [] and although Wallace had not asked for publication, Darwin suggested he would send it to any journal that Wallace chose. His family was in crisis with children in the village dying of scarlet fever , and he put matters in the hands of his friends. Lyell arranged to have it published by John Murray. As many more individuals of each species are born than can possibly survive; and as, consequently, there is a frequently recurring struggle for existence, it follows that any being, if it vary however slightly in any manner profitable to itself, under the complex and sometimes varying conditions of life, will have a better chance of surviving, and thus be naturally selected. From the strong principle of inheritance, any selected variety will tend to propagate its new and modified form. There is grandeur in this view of life, with its several powers, having been originally breathed into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved. An caricature following publication of The Descent of Man was typical of many showing Darwin with an ape body, identifying him in popular culture as the leading author of evolutionary theory. Reaction to On the Origin of Species The book aroused international interest, with less controversy than had greeted the popular Vestiges of the Natural History of Creation. Patrick

Matthew drew attention to his book which had a brief appendix suggesting a concept of natural selection leading to new species, but he had not developed the idea.

Chapter 5 : Darwinâ€™s Finches and Natural Selection in the Galapagos

Darwin and Natural Selection. Most educated people in Europe and the Americas during the 19th century had their first full exposure to the concept of evolution through the writings of Charles Darwin.

Coloration evidence for natural selection In , Charles Darwin set out his theory of evolution by natural selection as an explanation for adaptation and speciation. He defined natural selection as the "principle by which each slight variation [of a trait], if useful, is preserved". As long as there is some variation between them and that variation is heritable , there will be an inevitable selection of individuals with the most advantageous variations. If the variations are heritable, then differential reproductive success leads to a progressive evolution of particular populations of a species, and populations that evolve to be sufficiently different eventually become different species. It struck him that as population outgrew resources, "favourable variations would tend to be preserved, and unfavourable ones to be destroyed. The result of this would be the formation of new species. But if variations useful to any organic being do occur, assuredly individuals thus characterised will have the best chance of being preserved in the struggle for life; and from the strong principle of inheritance they will tend to produce offspring similarly characterised. This principle of preservation, I have called, for the sake of brevity, Natural Selection. He was in the process of writing his "big book" to present his research when the naturalist Alfred Russel Wallace independently conceived of the principle and described it in an essay he sent to Darwin to forward to Charles Lyell. Lyell and Joseph Dalton Hooker decided to present his essay together with unpublished writings that Darwin had sent to fellow naturalists, and On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection was read to the Linnean Society of London announcing co-discovery of the principle in July In the 3rd edition of Darwin acknowledged that othersâ€”like William Charles Wells in , and Patrick Matthew in â€”had proposed similar ideas, but had neither developed them nor presented them in notable scientific publications. Darwin thought of natural selection by analogy to how farmers select crops or livestock for breeding, which he called " artificial selection "; in his early manuscripts he referred to a "Nature" which would do the selection. At the time, other mechanisms of evolution such as evolution by genetic drift were not yet explicitly formulated, and Darwin believed that selection was likely only part of the story: After the publication of On the Origin of Species, [27] educated people generally accepted that evolution had occurred in some form. Herbert Spencer of the Survival of the Fittest is more accurate, and is sometimes equally convenient. Modern synthesis 20th century Natural selection relies crucially on the idea of heredity, but developed before the basic concepts of genetics. Haldane introduced the concept of the "cost" of natural selection. Hamilton conceived of kin selection in A second synthesis was brought about at the end of the 20th century by advances in molecular genetics , creating the field of evolutionary developmental biology "evo-devo" , which seeks to explain the evolution of form in terms of the genetic regulatory programs which control the development of the embryo at molecular level. Natural selection is here understood to act on embryonic development to change the morphology of the adult body. However, natural selection is "blind" in the sense that changes in phenotype can give a reproductive advantage regardless of whether or not the trait is heritable. A dark melanic morph of the peppered moth largely replaced the formerly usual light morph both shown here. Since the moths are subject to predation by birds hunting by sight, the colour change offers better camouflage against the changed background, suggesting natural selection at work. Genetic variation Natural variation occurs among the individuals of any population of organisms. If the traits that give these individuals a reproductive advantage are also heritable , that is, passed from parent to offspring, then there will be differential reproduction, that is, a slightly higher proportion of fast rabbits or efficient algae in the next generation. Even if the reproductive advantage is very slight, over many generations any advantageous heritable trait becomes dominant in the population. In this way the natural environment of an organism "selects for" traits that confer a reproductive advantage, causing evolutionary change, as Darwin described. Artificial selection is purposive where natural selection is not, though biologists often use teleological language to describe it. This gave dark-coloured moths a better chance of surviving to produce dark-coloured

offspring, and in just fifty years from the first dark moth being caught, nearly all of the moths in industrial Manchester were dark. The balance was reversed by the effect of the Clean Air Act , and the dark moths became rare again, demonstrating the influence of natural selection on peppered moth evolution. Fitness biology The concept of fitness is central to natural selection. In broad terms, individuals that are more "fit" have better potential for survival, as in the well-known phrase " survival of the fittest ", but the precise meaning of the term is much more subtle. Modern evolutionary theory defines fitness not by how long an organism lives, but by how successful it is at reproducing. If an organism lives half as long as others of its species, but has twice as many offspring surviving to adulthood, its genes become more common in the adult population of the next generation. Though natural selection acts on individuals, the effects of chance mean that fitness can only really be defined "on average" for the individuals within a population. The fitness of a particular genotype corresponds to the average effect on all individuals with that genotype. A mathematical example of "survival of the fittest" is given by Haldane in his "The Cost of Natural Selection" paper [62]. Haldane called this process "substitution" or more commonly in biology, this is called "fixation". This is correctly described by the differential survival and reproduction of individuals due to differences in phenotype. On the other hand, "improvement in fitness" is not dependent on the differential survival and reproduction of individuals due to differences in phenotype, it is dependent on the absolute survival of the particular variant. The probability of a beneficial mutation occurring on some member of a population depends on the total number of replications of that variant. The mathematics of "improvement in fitness was described by Kleinman. Fixation or substitution is not required for this "improvement in fitness". On the other hand, "improvement in fitness" can occur in an environment where "survival of the fittest" is also acting. The classic Lenski "E. The probability of a beneficial mutation occurring on some member of the lineage to give improved fitness is slowed by the competition. The variant which is a candidate for a beneficial mutation in this limited carrying capacity environment must first out-compete the "less fit" variants in order to accumulate the requisite number of replications for there to be a reasonable probability of that beneficial mutation occurring. Competition biology In biology, competition is an interaction between organisms in which the fitness of one is lowered by the presence of another. This may be because both rely on a limited supply of a resource such as food, water, or territory.

Chapter 6 : Population and Evolutionary Genetics

The theory of evolution by natural selection, first formulated in Darwin's book "On the Origin of Species" in , is the process by which organisms change over time as a result of changes in.

His book the Voyage of the Beagle is an account of his worldwide journey. When setting off from England in for a five-year voyage, Darwin had little ambitions for groundbreaking scientific research. After surveying the coasts of South America, the ship stopped over in the Galapagos Islands. Among those that struck Darwin so greatly were the finches that are now named in his honor. Darwin would later base some of his thought from the supposing that these finches were all descendents of the same lineage. Years later in , Darwin finally consolidated all of his observations into his famous book On The Origin of Species, drastically and controversially altering the scientific view on the biological origins of life. Who Charles Darwin was: Science in his family was a heritage starting with his grandfather Dr. Erasmus Darwin, a well-renowned botanist, and his father Dr. Darwin, who was a medical doctor Because of his wealthy childhood and youth, he was able to enjoy his time exploring the wonders of nature. I look forward with joy and interest to this, both as being somewhat nearer to England and for the sake of having a good look at an active volcano. Henslow, July 12, Darwin and the HMS Beagle were in Galapagos during September and October of , and through this time, he had the opportunity to explore a handful of islands, and collect several Galapagos species for use in his own research and that of his friends back in England. The Beagle itself was far too large to land, so it cruised around the islands and smaller boats would take Darwin and the other crew members ashore, where they could mingle with the endemic wildlife. While the crew captured several of the San Cristobal giant tortoises for food, Charles Darwin was intrigued by the them and plant specimens on the islands, as well as with the rocky island and the lava that formed it. Darwin diligently collected many animal and plant specimens and learned that it was possible to tell from which island a tortoise came judging by its shell. In his journal, Darwin remarked that the convicts regularly ate tortoises and that whaling ships and pirates often took them: By the race was extinct. Isabela Island Albemarle On this island , Darwin was amazed by the number of marine iguanas that forage underwater. His first thought was that the iguana fed of fish and little animals. However, and while on James Island , a dissection of a marine iguana led to the discovery that they feed off algae. October 4 â€” October 8 - Northern Islands: It did not anchor at any of these islands and instead decided to head for James Santiago Island, as they were running low on fresh water. They collected many specimens, including:

Chapter 7 : Darwin and His Theory of Evolution | Pew Research Center

Learn a bit about Charles Darwin's Theory of Natural Selection with this neato cartoon. There are giraffes and stuff!VOICES-Narrator - Rebecca Duenow.

Growing up a shy and unassuming member of a wealthy British family, he appeared, at least to his father, to be idle and directionless. But even as a child, Darwin expressed an interest in nature. Later, while studying botany at Cambridge University, he was offered a chance to work as an unpaid naturalist on the HMS Beagle, a naval vessel embarking on an exploratory voyage around the world. In the course of nearly five years at sea â€" during which time the Beagle surveyed the coast of South America and stopped in such places as Australia and, most famously, the Galapagos Islands â€" Darwin took advantage of countless opportunities to observe plant and animal life and to collect both living and fossilized specimens for later study. After the Beagle returned to England in October , Darwin began reflecting on his observations and experiences, and over the next two years developed the basic outline of his groundbreaking theory of evolution through natural selection. But beyond sharing his ideas with a close circle of scientist friends, Darwin told no one of his views on the origin and development of life. Indeed, he did not publish his now-famous volume, On the Origin of Species by Means of Natural Selection, until , more than 20 years after he had first formulated his theory. On the Origin of Species may never have been written, let alone published, if it had not been for Alfred Russel Wallace, another British naturalist who independently proposed a strikingly similar theory in This being the age of Victorian gentlemen, it was agreed that the two scientists would jointly publish their writings on the subject. The following year, Darwin published On the Origin of Species, a lengthy, fleshed-out treatment of his ideas on evolutionary theory. The book was an immediate bestseller and quickly set off a firestorm of controversy. Yet the concept of species adaptation was not so radical at the time. Scientists had been debating whether animals evolved decades before Darwin put forth his theory. All existing creatures, he argued, descended from a small number of original or progenitor species. Darwin compared the history of life to a great tree, its trunk representing these few common ancestors and an extensive system of branches and twigs symbolizing the great variety of life that has evolved from them. This evolution, Darwin wrote, is due to two factors. The first factor, Darwin argued, is that each individual animal is marked by subtle differences that distinguish it from its parents. The second factor, Darwin argued, is that although variations are random, some of them convey distinct advantages â€" superior camouflage, a heartier constitution or greater speed, for example â€" that better equip a creature to survive in its environment. A greater chance of survival allows for more opportunity to breed and pass on advantageous traits to a greater number of offspring. Over time, an advantage spreads throughout a species; in turn, the species is more likely to endure and reproduce. Thus, over the course of many generations, subtle changes occur and accumulate, eventually morphing into bigger changes and, possibly, even a new species. Yet evolution continued to be vigorously rejected by British and American churches because, religious leaders argued, the theory directly contradicted many of the core teachings of the Christian faith. Darwinian thinking also appeared to contradict the notion, central to Christianity and many other faiths, that man had a special, God-given place in the natural order. Instead, proponents of evolution pointed to signs in human anatomy â€" remnants of a tailbone, for instance â€" showing common ancestry with other mammals. There seems to be too much misery in the world. Regardless, it was around this time that the British scientific establishment gained the upper hand in the debate over evolution. And while the public disagreement between ecclesiastical and scientific authorities did not end in the s, religious thinkers became more wary of directly challenging evolution on scientific grounds. In the late 19th and early 20th centuries, churches instead focused much of their energy on resisting the idea that man had evolved from lower animal orders and hence had no special place in creation or, for that matter, a soul. Indeed, while some churches, including the Catholic Church, eventually accepted evolution as a God-directed mechanism of biological development, none questioned the role of God as the sole creator of man. By the time of his death, in , Darwin was considered the greatest scientist of his age. Moreover, the very church his theory had challenged accorded him a full state funeral and burial in Westminster Abbey, near the grave of Sir Isaac

Newton. Indeed, his interment in the abbey was seen by some contemporaries as symbolic of an uneasy truce between science and religion in Britain. Julia Margaret Cameron Report Materials.

Chapter 8 : Darwin's Theory Of Natural Selection

Darwin began formulating his theory of natural selection in the late s but he went on working quietly on it for twenty years. He wanted to amass a wealth of evidence before publicly presenting his idea.

Changes that allow an organism to better adapt to its environment will help it survive and have more offspring. Evolution by natural selection is one of the best substantiated theories in the history of science, supported by evidence from a wide variety of scientific disciplines, including paleontology, geology, genetics and developmental biology. More simply put, the theory can be described as "descent with modification," said Briana Pobiner, an anthropologist and educator at the Smithsonian Institution National Museum of Natural History in Washington, D. The theory is sometimes described as " survival of the fittest ," but that can be misleading, Pobiner said. For example, a study on human evolution on 1, students, published online in the journal Personality and Individual Differences in October , found that many people may have trouble finding a mate because of rapidly changing social technological advances that are evolving faster than humans. As a hypothetical example, Darwin used North American black bears, which were known to catch insects by swimming in the water with their mouths open: Darwin was so embarrassed by the ridicule he received that the swimming-bear passage was removed from later editions of the book. Scientists now know that Darwin had the right idea but the wrong animal. Instead of looking at bears, he should have instead been looking at cows and hippopotamuses. The last shore-dwelling ancestor of modern whales was Sinonyx, top left, a hyena-like animal. Over 60 million years, several transitional forms evolved: Natural selection can change a species in small ways, causing a population to change color or size over the course of several generations. This is called "microevolution. Given enough time and enough accumulated changes, natural selection can create entirely new species, known as "macroevolution. Take the example of whales â€” using evolution as their guide and knowing how natural selection works, biologists knew that the transition of early whales from land to water occurred in a series of predictable steps. The evolution of the blowhole, for example, might have happened in the following way: Random genetic changes resulted in at least one whale having its nostrils placed farther back on its head. Those animals with this adaptation would have been better suited to a marine lifestyle, since they would not have had to completely surface to breathe. Such animals would have been more successful and had more offspring. In later generations, more genetic changes occurred, moving the nose farther back on the head. Other body parts of early whales also changed. Front legs became flippers. Their bodies became more streamlined and they developed tail flukes to better propel themselves through water. The colorful plumage of peacocks and the antlers of male deer are both examples of traits that evolved under this type of selection. The French biologist Jean-Baptiste Lamarck came up with the idea that an organism could pass on traits to its offspring, though he was wrong about some of the details. Around the same time as Darwin, British biologist Alfred Russel Wallace independently came up with the theory of evolution by natural selection. Such changes are called mutations. Mutations can be caused by random errors in DNA replication or repair, or by chemical or radiation damage. Most times, mutations are either harmful or neutral, but in rare instances, a mutation might prove beneficial to the organism. If so, it will become more prevalent in the next generation and spread throughout the population. In this way, natural selection guides the evolutionary process, preserving and adding up the beneficial mutations and rejecting the bad ones. For example, genes can be transferred from one population to another when organisms migrate or immigrate, a process known as gene flow. And the frequency of certain genes can also change at random, which is called genetic drift. A wealth of evidence Even though scientists could predict what early whales should look like, they lacked the fossil evidence to back up their claim. They mocked the idea that there could have ever been such a thing as a walking whale. The critical piece of evidence came in , when paleontologists found the fossilized remains of Ambulocetus natans, an animal whose name literally means "swimming-walking whale. It was clearly adapted for swimming, but it was also capable of moving clumsily on land, much like a seal. When it swam, the ancient creature moved like an otter, pushing back with its hind feet and undulating its spine and tail. Modern whales propel themselves through the water with powerful beats of their horizontal tail

flukes, but Ambulocetus still had a whip-like tail and had to use its legs to provide most of the propulsive force needed to move through water. Fossil "links" have also been found to support human evolution. In early , a fossilized jaw and teeth found that are estimated to be up to , years old, making them at least 50, years older than modern human fossils previously found outside Africa. This finding provides another clue to how humans have evolved. Controversy Despite the wealth of evidence from the fossil record, genetics and other fields of science, some people still question its validity. Some politicians and religious leaders denounce the theory of evolution, invoking a higher being as a designer to explain the complex world of living things, especially humans. School boards debate whether the theory of evolution should be taught alongside other ideas, such as intelligent design or creationism. Mainstream scientists see no controversy. Additional resources The National Oceanic and Atmospheric Administration has a presentation on whale evolution. To understand the difference between a theory and fact , see this National Academy of Sciences website. Evolution â€" News and information on evolution and the battle with proponents of so-called creation science.

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Darwin Theory of natural selection was proposed by Charles Darwin in Darwin believed all plants and animals had evolved from a few common ancestors by means of natural selection.

If evolution was a car, the theory of natural selection would be the engine. The basic ideas of evolution were discussed long before there was any scientific research done to support them. The evolutionary concept was never able to gain any real steam because it lacked a mechanism. That is, scientists wanted to believe that species evolved from one form to another, but had no plausible process to make it happen. The theory of natural selection provides that reasonable method of evolution. Natural selection essentially states that "the strong survive. Those who are not ideally suited will not be able to compete. Charles Darwin proposed this principle after observing some population variations in birds. He noticed that animals within a species often had slightly varied traits, and that those traits made some more suited to certain conditions. The resulting population would be entirely made up of those animals with the "better" trait. Over time, he reasoned, this could result in a species changing enough traits to eventually become a totally different creature, like a fish becoming a frog. There have been some concerns expressed about the real meanings of the theory of natural selection. There is no doubt that variations within a single species make some members better suited to handle different circumstances. These moths lived in cities around the time of the industrial revolution and had to deal with increased pollution. Lighter-colored moths stood out on soot-stained buildings and trees, and thus, were easier targets for birds. The darker moths found it easier to survive, because they blended into the darkened environment. As a result, the population of light-colored moths dwindled over time, and the darker-colored moths increased. The dominance of the darker moths is used as an example of natural selection. There is an important point to be made about the theory of natural selection, however. Once conditions return to "normal," the balance of that species will return to "normal" as well. Birds with unusually heavy beaks may become dominant during dry years, since they can more easily break open nut shells and tree bark. The "normal" birds, with regular beaks, will struggle and diminish. Yet, once the drought is over, the population tends back to normal-beaked birds. The darker moths who were more suited to the polluted times made up most of the moth population, but when the pollution began to fade, the moth population returned to its "normal" state. Why does this happen? Species have shown to be genetically stable. In fact, genetic defects that change the form or function of creatures usually result in death. The examples of the moths and birds show that each species has some variations, and that those variations can favor different animals at different times. However, they also show that the same variations are possible generation after generation - which is why the populations can change right back to where they were. There are no new species or new variations being produced, just more or less of those that already existed. There has been no scientific observation of any permanent change in species. There are plenty of proven cases of adaptation, which involves non-genetic changes. There are examples of natural selection changing the balance of populations within a species. Yet there are no known instances of a natural population experiencing a permanent, meaningful change. Observed genetic mutations are, in the natural world, crippling and usually fatal. While there is no doubt about the short-term function of natural selection, its long-term effects are not fully understood. While scientists prefer to point to the examples of birds and moths as proof of the theory of natural selection, they often refuse to see the same examples as contradictory to evolution itself. Learn More about Origin of Species! God , the Father, sent His only Son to satisfy that judgment for those who believe in Him. Jesus , the creator and eternal Son of God, who lived a sinless life, loves us so much that He died for our sins, taking the punishment that we deserve, was buried , and rose from the dead according to the Bible. If you truly believe and trust this in your heart, receiving Jesus alone as your Savior , declaring, " Jesus is Lord ," you will be saved from judgment and spend eternity with God in heaven. What is your response?