DOWNLOAD PDF NATURAL SELECTION AND HUMAN NATURE

Chapter 1 : Are humans still evolving by Darwin's natural selection? - BBC News

Darwin's natural selection is the process by which nature rewards those individuals better adapted to their environments with survival and reproductive success. It works at the level of genes.

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.

Chapter 2 : Evolutionary views of human nature | Darwin Correspondence Project

Image caption Could technological advances stop the human species enough to remove themselves from the grip of natural selection. likely to be driven as much by us as by nature. It may be.

I fully agree with all that you say on the advantages of H. This however had not occurred to me till reading your letter. It is, however, a great objection to this term that it cannot be used as a substantive governing a verb". Had he received the letter two months earlier, he would have worked the phrase into the fourth edition of the Origin which was then being printed, and he would use it in his "next book on Domestic Animals etc. Herbert Spencer has well expressed the same idea by the Survival of the Fittest. The term "natural selection" is in some respects a bad one, as it seems to imply conscious choice; but this will be disregarded after a little familiarity". He defended his analogy as similar to language used in chemistry, and to astronomers depicting the "attraction of gravity as ruling the movements of the planets", or the way in which "agriculturists speak of man making domestic races by his power of selection". He had "often personified the word Nature; for I have found it difficult to avoid this ambiguity; but I mean by nature only the aggregate action and product of many natural laws,â€”and by laws only the ascertained sequence of events. But the expression often used by Mr. Herbert Spencer of the Survival of the Fittest is more accurate, and is sometimes equally convenient. He uses the term in the context of societies at war, and the form of his reference suggests that he is applying a general principle. The phrase "survival of the fittest" has become widely used in popular literature as a catchphrase for any topic related or analogous to evolution and natural selection. It has thus been applied to principles of unrestrained competition, and it has been used extensively by both proponents and opponents of Social Darwinism. The phrase also does not help in conveying the complex nature of natural selection, so modern biologists prefer and almost exclusively use the term natural selection. The biological concept of fitness refers to reproductive success , as opposed to survival, and is not explicit in the specific ways in which organisms can be more "fit" increase reproductive success as having phenotypic characteristics that enhance survival and reproduction which was the meaning that Spencer had in mind. Interpretations of the phrase as expressing a theory are in danger of being tautological , meaning roughly "those with a propensity to survive have a propensity to survive"; to have content the theory must use a concept of fitness that is independent of that of survival. Instead, these groups have evolved by expanding into empty ecological niches. The main land dwelling animals to survive the K-Pg impact 66 million years ago had the ability to live in underground tunnels, for example. In Sahney et al. Instead, they cited extrinsic, abiotic factors such as expansion as the driving factor on a large evolutionary scale. The rise of dominant groups such as amphibians, reptiles, mammals and birds occurred by opportunistic expansion into empty ecological niches and the extinction of groups happened due to large shifts in the abiotic environment. Describing how things are does not imply that things ought to be that way. In his book Mutual Aid: A Factor of Evolution he set out his analysis leading to the conclusion that the fittest was not necessarily the best at competing individually, but often the community made up of those best at working together. He concluded that In the animal world we have seen that the vast majority of species live in societies, and that they find in association the best arms for the struggle for life: The animal species, in which individual struggle has been reduced to its narrowest limits, and the practice of mutual aid has attained the greatest development, are invariably the most numerous, the most prosperous, and the most open to further progress. Applying this concept to human society, Kropotkin presented mutual aid as one of the dominant factors of evolution, the other being self-assertion, and concluded that In the practice of mutual aid, which we can retrace to the earliest beginnings of evolution, we thus find the positive and undoubted origin of our ethical conceptions; and we can affirm that in the ethical progress of man, mutual support not mutual struggle â€” has had the leading part. In its wide extension, even at the present time, we also see the best guarantee of a still loftier evolution of our race. Tautology[edit] "Survival of the fittest" is sometimes claimed to be a tautology. Furthermore, the expression does become a tautology if one uses the most widely accepted definition of "fitness" in modern biology, namely reproductive success itself rather than any set of characters conducive to this reproductive success. The reason is that it does not mention a key

requirement for natural selection, namely the requirement of heritability. It is true that the phrase "survival of the fittest", in and by itself, is a tautology if fitness is defined by survival and reproduction. Natural selection is the portion of variation in reproductive success that is caused by heritable characters see the article on natural selection. This is precisely what is called " evolution by natural selection. In other words, natural selection does not simply state that "survivors survive" or "reproducers reproduce"; rather, it states that "survivors survive, reproduce and therefore propagate any heritable characters which have affected their survival and reproductive success". This statement is not tautological: However, much care would be needed to disentangle tautological from testable aspects. Moreover, an "implicit shifting between a testable and an untestable interpretation can be an illicit tactic to immunize natural selection [Shermer points out, as an example, that population genetics accurately demonstrate when natural selection will and will not effect change on a population. Shermer hypothesizes that if hominid fossils were found in the same geological strata as trilobites , it would be evidence against natural selection.

Chapter 3 : Natural selection and infectious disease in human populations

Darwinian Theories of Human Nature (This is my summary of a section of a book I often used in university classes: Thirteen Theories of Human Nature, by Stevenson, Haberman, and Wright, Oxford Univ. Press.

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 4 : The role of natural selection in human evolution â€“ insights from Latin America

By Elizabeth Pennisi, ScienceNOW In a world where we've tamed our environment and largely protected ourselves from the vagaries of nature, we may think we're immune to the forces of natural selection.

In this lesson, we wish to ask: How did observations in nature lead to the formulation of the theory of evolution? How does the process of natural selection work? What evidence do we have for local adaptation? How can natural selection affect the frequency of traits over successive generations? The R Evolution of Theory The theory of evolution is one of the great intellectual revolutions of human history, drastically changing our perception of the world and of our place in it. Charles Darwin put forth a coherent theory of evolution and amassed a great body of evidence in support of this theory. In other words, all of the similarities and dissimilarities among groups of organisms that are the result of the branching process creating the great tree of life see Figure 1 , were viewed by early 19th century philosophers and scientists as a consequence of omnipotent design. A phylogenetic "tree of life" constructed by computer analysis of cyochrome c molecules in the organisms shown; there are as many different trees of life as there are methods of analysis for constructing them. However, by the 19th Century, a number of natural historians were beginning to think of evolutionary change as an explanation for patterns observed in nature. No one knew how old the earth was, but geologists were beginning to make estimates that the earth was considerably older than explained by biblical creation. Geologists were learning more about strata, or layers formed by successive periods of the deposition of sediments. This suggested a time sequence, with younger strata overlying older strata. A concept called uniformitarianism , due largely to the influential geologist Charles Lyell, undertook to decipher earth history under the working hypothesis that present conditions and processes are the key to the past, by investigating ongoing, observable processes such as erosion and the deposition of sediments. Discoveries of fossils were accumulating during the 18th and 19th centuries. At first naturalists thought they were finding remains of unknown but still living species. As fossil finds continued, however, it became apparent that nothing like giant dinosaurs was known from anywhere on the planet. Furthermore, as early as , Cuvier pointed out that the deeper the strata, the less similar fossils were to existing species. Similarities among groups of organisms were considered evidence of relatedness, which in turn suggested evolutionary change. Lamarck is the most famous of these. In , he proposed organic evolution as the explanation for the physical similarity among groups of organisms, and proposed a mechanism for adaptive change based on the inheritance of acquired characteristics. He wrote of the giraffe: This habit sustained for long, has had the result in all members of its race that the forelegs have grown longer than the hind legs and that its neck has become so stretched, that the giraffe, without standing on its hind legs, lifts its head to a height of six meters. Darwin was influenced by observations made during his youthful voyage as naturalist on the survey ship Beagle. On the Galapagos Islands he noticed the slight variations that made tortoises from different islands recognizably distinct. In addition, they all appeared to resemble, but differ from, the common finch on the mainland of Ecuador, miles to the east. In , Darwin published his famous On the Origin of Species by Means of Natural Selection, a tome of over pages that marshalled extensive evidence for his theory. Publication of the book caused a furor - every copy of the book was sold the day that it was released. Origins for an ongoing dialogue. What does this theory of evolution say? He also provided thoughtful explanations of the consequences of evolution for our understanding of the history of life and modern biological diversity. Species populations of interbreeding organisms change over time and space. The representatives of species living today differ from those that lived in the recent past, and populations in different geographic regions today differ slightly in form or behavior. These differences extend into the fossil record, which provides ample support for this claim. All organisms share common ancestors with other organisms. Over time, populations may divide into different species, which share a common ancestral population. Far enough back in time, any pair of organisms shares a common ancestor. For example, humans shared a common ancestor with chimpanzees about eight million years ago, with whales about 60 million years ago, and with kangaroos over million years ago. Shared ancestry explains the similarities of organisms that are classified together: Since then, biologists and

paleontologists have documented a broad spectrum of slow to rapid rates of evolutionary change within lineages. The primary mechanism of change over time is natural selection, elaborated below. This mechanism causes changes in the properties traits of organisms within lineages from generation to generation. Organisms within populations exhibit individual variation in appearance and behavior. These variations may involve body size, hair color, facial markings, voice properties, or number of offspring. On the other hand, some traits show little to no variation among individualsâ€”for example, number of eyes in vertebrates. Some traits are consistently passed on from parent to offspring. Such traits are heritable, whereas other traits are strongly influenced by environmental conditions and show weak heritability. High rate of population growth. Most populations have more offspring each year than local resources can support leading to a struggle for resources. Each generation experiences substantial mortality. Differential survival and reproduction. Individuals possessing traits well suited for the struggle for local resources will contribute more offspring to the next generation. This process is natural selection. The traits that confer an advantage to those individuals who leave more offspring are called adaptations. In order for natural selection to operate on a trait, the trait must possess heritable variation and must confer an advantage in the competition for resources. If one of these requirements does not occur, then the trait does not experience natural selection. Natural selection operates by comparative advantage, not an absolute standard of design. Natural selection can only work on existing variation within a population. Such variations arise by mutation, a change in some part of the genetic code for a trait. Mutations arise by chance and without foresight for the potential advantage or disadvantage of the mutation. In other words, variations do not arise because they are needed. Industrial melanism is a phenomenon that affected over 70 species of moths in England. It has been best studied in the peppered moth, Biston betularia. Prior to , the typical moth of the species had a light pattern see Figure 2. Image of Peppered Moth During the Industrial Revolution, soot and other industrial wastes darkened tree trunks and killed off lichens. The light-colored morph of the moth became rare and the dark morph became abundant. In , the first melanic morph was seen; by , it was far more common -- illustrating rapid evolutionary change. Eventually light morphs were common in only a few locales, far from industrial areas. The cause of this change was thought to be selective predation by birds, which favored camouflage coloration in the moth. A brief summary of his results are shown below. By observing bird predation from blinds, he could confirm that conspicuousness of moth greatly influenced the chance it would be eaten.

Chapter 5 : Natural selection - Wikipedia

Natural selection is still influencing the evolution of a wide variety of human traits, from when people start having children to their body mass index, reports a study published Monday in the.

Chapter 6 : Darwin, evolution, & natural selection (article) | Khan Academy

Artificial selection, also called "selective breeding", is where humans select for desirable traits in agricultural products or animals, rather than leaving the species to evolve and change gradually without human interference, like in natural selection.

Chapter 7 : Evolution and Natural Selection

The picture around the s. In , Alfred Russel Wallace () who developed independently of Darwin the concept of the key role of natural selection in biological evolution, questioned its role in relation to our species.

Chapter 8 : Darwin's Theory of Evolution: Definition & Evidence

Capitalism and Human Nature. and it is already illuminating what we know about the possibilities of human social organization. How natural that has evolved through natural selection to.

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Chapter 9 : Evolution: Natural selection and human selection article (article) | Khan Academy

The process of natural selection can act on human culture as well as on genes, a new study finds. Scientists have shown for the first time that cultural traits affecting survival and reproduction.