Evolution of populations answer key

Initially, the newly discovered particle nature of genes made it difficult for biologists to understand how gradual evolution could happen. But over the next few decades, genetics and evolution were intethemized by a consistent understanding of the relationship between natural selection and genetics, known as modern synthesis- that took shape in the 1940s and is generally accepted today. What is the difference between micro and macroevity? Microevlun explains the evolution of small organisms such as insects, while macroevlun explains the evolution of large organisms such as humans and elephants. Microevlievary describes the evolution of microscopic beings such as molecules and proteins, while macroevism explains the evolution of all organisms. Microevicon explains the evolution of organisms in populations, while macroevym explains the evolution of species over long period of time. Microevicon explains the evolution of organisms throughout their lives, while macroevism explains the evolution of organisms over multiple generations. Population genetics is a study: how selective forces change allial frequencies in a population over time A population of 12 homozygous resesive individuals (yy), 8 homozygous dominant individuals (YY) and 4 heterozygous individuals (Yy), a population whose allel frequencies did not change over time p2 + 2pq + q2 = 1 naturally selected population has risen from a colonial ship from Europe. The captain of the ship, which was polidaktily a rare dominant feature, was one of the original colonists. Today, we see a much higher polydactic frequency in the Amish population. This is an example: the constituent effect of genetic drift in natural selection is to dissolve for the genetic structure of a population with 12 homozygous resesive individuals (yy), 8 homozygous dominant individuals (YY) and 4 heterozygous individuals (Yy). p = (8*2 + 4)/48 = 0.42; q = (12*2 + 4)/48 = 0.58; p2 = 0.17; 2pq = 0.48; q2 = .34 Explain the Hardy-Weinberg principle of equilibrium theory. The Hardy-Weinberg balance principle is used to describe the genetic structure of a population. The theory is that the allel and genotic frequencies of a population are inherally constant: unless some kind of evolutionary force moves on the population, the population will carry the same genes from generation to generation, and individuals will look the same as a whole. Imagine trying to test if a flower population has evolved. You suspect there is selection pressure on the color of the flower: bees Blue flowers are more often clustered around red flowers. In a separate experiment, discover that blue flower color is dominant in red flower color. You count 600 blue flowers and 200 red flowers in one field. What do you expect the genetic structure of flowers to be? Red is shy, i.e. q2 = 200/800 = 0.25; q = 0.5; p = 1-q = 0.5; p2 = 0.25; 2pq = 0.5. You can expect 200 homozygous blue flowers, 400 heterozygous blue flowers and 200 red flowers. Individuals of a population often show different phenophys or express different allures of a particular amp called polymorphism. Populations with two or more variations of specific characteristics are called polymorphic. The distribution of phenophysies among individuals is influenced by a number of factors, including the genetic structure of the population and the environment, known as population change. When male lions reach sexual maturity, they leave their group in search of new pride. Which of the following mechanisms can this change the allel frequencies of the population? Which of the following evolutionary forces can bring new genetic variation to a population by randomly miating the genetic drift gene flow of natural selection? What is natural selection and genetic drift mutation and gene flow natural selection and non-random mutation and genetic drift diversifier miyat? When individuals mate with people who are similar to them, individuals mate with those most suitable for the population, individuals mate with those least suited to the population, closely related individuals mate with each other or do not breed, while offspring are often not as suitable as the offspring of two unrelated individuals. Why? Close relatives are genetically incompatible. The DNA of close relatives reacts negatively to the offspring. Inbreeding can bring together rare, harmful mutations that can lead to harmful phenophysies. Inbreeding normally causes silent allels to be expressed. What is Cline? The slope of a mountain, where a population, a mutation, helps an individual recover from gradual geographical change in an ecological gradient, defines a situation in which a population will be bottlenecked, explaining its impact on the population's gene pool. A tornado kills a large percentage of crustaceans living in the sand-only a few people survive. Allels carried by surviving individuals represent the gene pool of the entire population. If the surviving individuals do not represent the original population, the post-hurricane gene pool will be different from the original gene pool. Define natural selection and define the natural selection instance in a population. The theory of natural selection is due to the observation that some individuals in one population survive longer and have more offspring than others: so that most of their genes are transferred to the next generation. For example, a large, strong male gorilla is much more likely than the smaller and weaker to be the silverback of the population: the leader of the herd, which has mated far more than any other male in the group. Therefore, the herd leader will have more baby fathers who share half of their genes and will grow bigger and stronger like their father. Over time, genes for larger size will increase in frequency in the population, and the average body size, as a result, grows larger on average. Explain what Cline is and provide examples. Cline is a type of geographical variation seen in populations of a particular species that gradually changes on an ecological gradient. For example, warm-blooded animals tend to have larger bodies in cooler climates near the world's poles, saving better heat. This is considered a latitude cline. Flowering plants tend to bloom at different times depending on where they are along the slope of a mountain. This is known as altitudinal cline. Fitness is often measurable and measured by scientists in the field. However, it is not the absolute fitness of the individual that matters, but how it is compared to other organisms in the population. This concept, called relative conformity, allows researchers to determine which individuals contribute additional offspring to the next group, and thus how a population can evolve. What kind of selection results in more genetic varience in a population? The selection is called _________ when males and females in a population look or behave differently by diversification of the selection direction selection. Good genes hypothesis of a cline by diversifying the selection of sexual dimorphism sexual selection is a theory that explains what? Giving useful traits or behaviors explains why some harmful mutations are preserved in the population, giving aleller an example of a trait that may have evolved as a result of the handicap principle that improves the impressive ornamental characteristics of individuals of a gender, and explains why more suitable individuals are more likely to have offspring. The peacock's tail is a good example of the handicap principle. The tail, which makes men more visible to predators and less able to escape, is clearly a disadvantage to the bird's survival. But because this is a disadvantage, only the most suitable men need to survive with it. Thus, the quality of the tail population to women serves as an honest signal; therefore, men will earn more farms and more Success. List how evolution can affect population change and explain how they affect allial frequencies. Evolution has several ways to influence population change: balancing choice, direction selection, diversification of choice, frequency-based selection, and sexual selection. Because these affect allel frequencies in a population, individuals can either become more or less related, and the phenophysies displayed may become more similar or more different. All life on Earth is connected. According to the theory of evolution, humans, insects, plants and bacteria share a common edi, but millions of years of evolution turn each of these organisms into forms seen today. Scientists see evolution as an important concept for understanding life. Natural selection is one of the most dominant evolutionary forces. Natural selection eliminates these characteristics and behaviors to the desed of the organism as it moves to promote properties and behaviors that increase the organism's chances of survival and reproduction. But natural selection can't just be selected—as its name suggests. The introduction of new traits and behaviors falls on the shoulders of another evolutionary force - mutation. Mutation and other sources of change between individuals, as well as evolutionary forces acting accordingly, change populations and species. The combination of these processes has led to the world of life we see today. Learning Goals Describe how population genetics are used in the evolution of populations Define the Hardy-Weinberg principle and discuss its importance Describe the different types of variations in a population Describe in different ways that natural selection can shape populations Remember that for a particular character, a gene can have several allels or variants for different characteristics associated with that character. For example, in the ABO blood type system in humans, three allel red blood cells determine certain blood type proteins on the surface. In a population of diploid organisms each individual can carry two allals for only a specific gene, but it can be present in individuals who make up more than two populations. Mendel followed the allals from parent to cub. In the early twentieth century, in a field of study known as population genetics, biologists began researching how selective forces changed a population through changes in cell and genotypic frequencies. Allel frequency (or gene frequency) is the rate at which a particular allial is seen within the population. So far we have discussed evolution as a change in the characteristics of an organism population, but behind this change in science is genetic change. In population genetics, the term evolution is defined as a change in the frequency of an alllealy. For example, using the ABO blood type system, the frequency of one of the allals, IA, is the number of copies of the allel divided into all copies of the ABO gene in the population. For example, a jordan study found that the frequency of IA was 26.1 percent. IBand I0 allals make up 13.4 percent and 60.5 percent of all allials, respectively, and all frequencies are added up to 100 percent. Over time, a change in this frequency will create evolution in the population. The frequency of allials in a particular population may vary depending on environmental factors; therefore, some allels become more common in the natural selection process than others. Natural selection can change the genetic structure of the population; for example, if a particular allel gives a phenolyip that allows the individual to survive better or have more offspring. Because most of these offspring will also carry useful allel, and often the corresponding phenolycoip, they will also have more offspring of their own carrying allel, thus sustaining the cycle. In time, the allel population will so ayel. Some allels will be fixed in this way quickly, which means that each individual of the population will carry allure, harmful mutations can be quickly eliminated if derived from the dominant allel from the gene pool. A gene pool is the sum of all allala in a population. Sometimes, allel frequencies within a population change randomly with no advantage over the current allel frequencies. This phenomenon is called genetic drift. Natural selection and genetic drift usually occur simultaneously in populations and are not isolated events. Since it is often almost impossible to determine the cause of the change in allel frequencies in each formation, it is difficult to determine which process prevails. A non-typical event of the original population, which initiated the change in allel frequency in an is is isal frequency section of the population, is called its constituent effect. Natural selection, random drift, and its constituent effects can lead to significant changes in a population's genome. Hardy-Weinberg Equilibrium Principle In the early twentieth century, British mathematician Godfrey Hardy and German physician Wilhelm Weinberg set out the principle of equilibrium to describe the genetic structure of a population. The theory, later known as the Hardy-Weinberg balance principle, states that the allel and genotic frequencies of a population are inherally stable – unless some kind of evolutionary force moves on the population, neither allel nor genotypic frequencies change. The Hardy-Weinberg principle emits selective pressure for genotic or genotic, plus conditions that do not have mutation, migration, migration or selective pressure for an infinite population; While no population can satisfy this principle offers a useful model for comparing actual population changes. Population geneticists working under this theory represent different allels as different variables in their mathematical models. Variable p, for example, usually represents the frequency of a particular allel, say Y for Mendel's pea yellow property, while variable q color represents the frequency of green confer y allals. If these are only two possible allels for a particular locus in the population, p + q = 1. In other words, all p allals and all q allals constitute all all allals for this locus found in the population. But ultimately what concerns most biologists is not the frequencies of different allals, but the frequencies of genophyps, known as the genetic structure of the population, where scientists can predict the distribution of phenomedicies. If phenophylysis is observed, only the genotic of homozygous receptude can be known; calculations provide an estimate of the remaining genotics. Because each individual carries two allels per gene, if allel frequencies (p and q) are known, predicting the frequencies of these genoips is a simple mathematical calculation to determine the likelihood of taking these genophyses if two allels are randomly drawn from the gene pool. So in the above scenario, an individual pea plant can pp (YY), and thus produce yellow peas; pq (Yy), also yellow; or qq (yy) and thus producing green peas (Figure 1). In other words, the frequency of pp individuals is only p2; the frequency of pq individuals is 2pq; and the frequency of qq individuals is q2. And again, if p and q are only two possible allels for a particular property in the population, these genotic frequencies are one-to-one: p2+ 2pq + q2 = 1. Figure 1. When populations are in the Hardy-Weinberg balance, the allelic frequency is constant from generation to generation, and allel distribution can be determined from the Hardy-Weinberg equation. If the allelic frequency measured in the field is different from the predicted value, scientists can inquend on the speed at which evolutionary forces are. In plants, violet is dominant on flower color (V) white (v). If p = 0.8 and q = 0.2 in a population of 500 plants, how many people do you expect: homozygous dominant (VV), heterozygous (Vv) and homozygous resesif (vv)? How many plants would you expect for violet blossoms, and how many would be white flowers? In theory, if a population is in balance, i.e., there are no evolutionary forces that will have the same gene pool and genetic structure from generation to generation, and these equations will always apply. Of course, even Hardy and Weinberg realized that no natural population was immune to evolution. Constant drift in nature, mutation, possibly changing genetic makeup due to migration and choice. As a result, the only way to determine the exact distribution of phenophysies in a population is to go out and count them. But the Hardy-Weinberg principle gives scientists the mathematical basis of a population that is not in evolution, which can understand what role evolutionary forces play. If the frequencies of allals or genophys are deviing from the expected value from the Hardy-Weinberg equation, the population is evolving. Genetic Variation and Drift Figure 2. The distribution of phenophysies in these kittens shows population change. (Credit: Pieter Lanser) Individuals of a population often show different phenophys or express different allures of a particular amp called polymorphism. Populations with two or more variations of specific characteristics are called polymorphic. The distribution of phenophylysies among individuals is influenced by a number of factors known as population change, such as the genetic structure of the population and the environment (Figure 2). Understanding the sources of gender change in a population is important for determining how a population develops in response to different evolutionary pressures. Genetic Variation Natural selection and some other evolutionary forces can only act on hereditary properties, namely the genetic code of an organism. Because allels pass from parent to offspring, they can be selected with beneficial characteristics or behaviors, while harmful allels can be selected. Acquired properties, for the most part, are not hereditary. For example, when an athlete works out in the gym every day, building up muscle strength, the athlete's offspring won't necessarily grow up to be a body builder. If there is a genetic basis for fast running, on the other hand, it can be transmitted to a child. Before Darwinist evolution became the dominant theory of the field, French naturalist Jean-Baptiste Lamarck had the theory that acquired traits could actually be hereditary; While this hypothesis is largely uns supported, scientists have recently edgy to realize that Lamarck is not entirely wrong. For more information, visit this site. Heritability can be anoinked genetic differences in the fraction of phenothyme variation, or genetic variability, among individuals in a population. As the hereditary ness of the phenotypical variation of a population increases, the more sensitive it is to evolutionary forces that act according to hereditary variation. The diversity of allel and genotics in the population is called genetic varience. When scientists participated in the breeding of a species, such as animals and nature guards in zoos, a population's genetic to maintain as much phenotypical diversity as possible. This also helps reduce the risks associated with inbreeding, mating of closely related individuals, which can have unintended effect by bringing together abnormalities and harmful resesive mutations that can cause susceptibility to the disease. For example, a rare, shy allel-in caused disease can be found in a population, but only when an individual carries two copies of the allale. Because Allel is rare in a normal, healthy population with unlimited habitat, the chances of two carriers mating are low, and even then only 25 percent of their offspring inherit the disease allel from both parents. While it is likely to happen at some point, it will not be frequent enough for natural selection to rapidly eliminate allals in the population, and as a result will be kept at low levels in the allel gene pool. However, if a surrogate family starts mating with each other, this will significantly increase the likelihood of mating in two carriers and eventually producing diseased offspring, a phenomenon known as inbreeding depression. Changes to allel frequencies defined in a population can illuminate how it develops. In addition to natural selection, there are other evolutionary forces that may be in play: genetic drift, gene flow, mutation, non-random mutations and environmental variences. Genetic Drift Natural selection theory is due to the observation that some individuals in a population are more likely to survive longer and have more offspring than others; so they'll transfer more of their genes to the next generation. For example, a large and powerful male gorilla is much more likely than a smaller, weaker gorilla to be the leader of the herd, which has mated far more than any other male in the group, and is likely to be the silverback of the population. The herd leader will be a father to more puppies who share half of their genes, and will be bigger and stronger like their father. Over time, genes for larger size will increase in frequency in the population, and the population, as a result, will grow larger than the average. So, this would occur if this particular election pressure, or selective force driving, were the only one acting on the population. In other examples, better camouflage or stronger resistance to drought can create a choice pressure. Another way in which the allel and genotic frequencies of a population can change is genetic drift (Figure 3), which is just the effect of luck. Luckily, some individuals will have more offspring than others-not because of an advantage given by some genetically encoded trait, not just because one male was in the right place at the right time (the receiving woman walked) or because the other was in the wrong place at the wrong time (when hunting a fox). Figure 3. Click for a larger picture. Genetic drift in a population can lead to the chance destruction of an alleline from a population. In this example, rabbits with brown coat-colored alleli (B) are dominant on rabbits with white coat color alleli (b). In the first generation, two allels occur equally frequently in the population, and the p and q values are 0.5. Only half of individuals multiply, resulting in a second generation with values of 0.7 and 0.3 p and q respectively. In the second generation, only two individuals resurge, and by chance these individuals are homozygote dominant for brown coat color. As a result, the third generation resesif b allel disappears. Do you think genetic drift will be faster on an island or on the mainland? Small populations are more susceptible to genetic drifting forces. Large populations, on the other hand, are buffered against the effects of chance. If one in 10 people dies young before releasing their offspring to the next gene, all of the population's genes, which are 1/10 of the gene pool, suddenly disappear. In a population of 100 people, this is only 1 percent of the total gene pool; therefore, it is much less effective on the genetic structure of the population. Follow this animation of random sampling and genetic drift action: Bottleneck Effect Figure 4. A chance event or disaster can reduce genetic variability within a population. Genetic drift can also be magnified by natural events, such as a natural disaster that kills-random-a large part of the population. Causes the sudden anething of a large part of the genome known as the bottleneck effect (Figure 4). In one move, the genetic structure of the survivors becomes the genetic structure of the entire population, which may be very different from the pre-catastrophic population. Founding Effect Another scenario in which populations may experience a strong impact on genetic drift is that part of the population is separated to start a new population in a new place, or a population is divided by some kind of physical barrier. In this case, these individuals are unlikely to be representative of the entire population resulting in constituent influence. The constituent effect occurs when the genetic structure varies according to the founding parents of the new population. The constituent effect is believed to be a major factor in the genetic history of the Afrikaner population of Dutch settlers in South Africa, as evidenced by rare mutations in many other populations that are common in Afrikaners. This is most likely because a higher than normal portion of the founding colonists carry these mutations. After all Huntington's disease (HD) and Fanconi anemia (FA) are known to cause blood marrow and congenital anomalies-- even an unusually high insliness of cancer. Watch this short video to learn more about constructing and bottleneck effects. Note that the video is not audio. Question: How do natural disasters affect the genetic structure of a population? Objective: When a large part of a population is suddenly destroyed by an earthquake or hurricane, individuals who survived the event are often a random sampling of the original group. As a result, the genetic structure of the population can vary significantly. This phenomenon is known as the bottleneck effect. Hypothesis: Repeated natural disasters will give different population genetic structures; therefore, if this experiment is run each time, the results change. Test hypothesis: Count the original population using different colored beads. For example, red, blue, and yellow beads can represent red, blue, and yellow individuals. After registering the number of each individual in the original population, place them all in a bottle with a narrow neck that will only allow you to out a few beads at a time. Then pour 1/3 of the contents of the bottle into a bowl. It represents individuals who survive after a natural disaster kills the majority of the population. Count and save the number of different colored beads in the bowl. Then, place all the beads back in the bottle and repeat the experiment four more times. Analyze data: Compare the five populations resulting from the experiment. Do the populations all contain the same number of different colored beads, or are they changing? Remember, these populations all come from the same main population. Form one conclusion: Most likely, the resulting five populations will be quite significantly different. This is because natural disasters are not selective-they kill and spare random individuals. Now think about how this is going to affect a real population. What happens to the hurricane that hit the Mississippi Gulf Coast? How do seabirds that live on the beach get by? Gene Flow Figure 5. Gene flow can occur when you travel from one geographic location to another. Another important evolutionary power is gene flow: the flow of allels to a population due to the migration of individuals or gametes, and outward (Figure 5). While some populations are fairly stable, others experience more whites. Many plants, for example, send pollen far and wide, by wind or bird, some distance to pollination in other populations of the same species. While developing men leave their mothers to seek new pride with genetically unrelated women, even a population that initially seems stable can take its share of migration and migration, like the pride of lions. This variable flow of individuals and just as the group not only changes the gene structure of the population, but also can bring new genetic variations to populations in different geological locations and habitats. Mutation mutations are changes in an organism's DNA and are an important driving force of diversity in populations. Species develop due to the accumulation of mutations that occur over time. The emergence of new mutations is the most common way to introduce new genotynic and phenotypical varience. Some mutations are unaltenable or harmful and are rapidly removed from the population by natural selection. Others are useful and will take the population. Whether a mutation is beneficial or harmful is determined by whether it helps an organism reach and reproduce sexual maturity. Some mutations do nothing and can edible in the genome without being affected by natural selection. Some may have a dramatic effect on a gene and the resulting phenothy. Non-Random Mating If individuals mate with their random peers, the result may be a changing population. There are many reasons why a non-random mutation occurs. One reason is the choice of simple mate; for example, female peacocks may prefer peacocks with larger, brighter tails. Properties that lead to more mibirs for an individual are selected by natural selection. A common form of peer selection, called various mating, is the individual's preference for mating with partners similar to their phenotypical. Another reason for the non-random placement is the physical location. This is especially true in large populations spread over large geographical distances where not all individuals have equal access to each other. Some can live along forests or in rugged terrain for miles, while others can live just around the world. Environmental Varience Figure 6. The sex of the American crocodile (Crocodile mississippiensis) is determined by the temperature at which the eggs are incubated. Eggs hatched at 30°C produce females, and eggs hatched at 33°C produce males. (credit: Steve Hillebrand, USFWS) Genes are not the only player that determines population change. Phenophysies are also affected by other factors, such as the environment (Figure 6). A beachgoer is likely to have darker skin than lisa in a city, for example, because of regular exposure to the sun, an environmental factor. Some important features, such as sex, are determined by the environment for some species. For example, some turtles and other reptiles have heat-related sex determination (TSD). TSD means that if their eggs are incubated within a certain temperature range, or in females within a different temperature range, individuals become males. Geographical separation between populations can lead to differences in sexism between these populations. Such geographical differences occur among most populations it can be important. A type of geographical variation, called cline, can be seen as populations of a particular species gradually vary between an ecological gradient. For example, warm-blooded animal species tend to have larger bodies closer to earth's poles in cooler climates, which allows them to better protect the heat. This is considered a latitude cline. Alternatively, flowering plants tend to bloom at different times depending on where along the slope of a mountain known as an altitudinal cline. If there is gene flow between populations, individuals will likely show gradual differences in phenothy along the cline. Limited gene flow, on the other hand, can lead to sudden differences, even de species. Adaptive Evolution Natural selection only moves according to the hereditary characteristics of the population: making choice for beneficial allels, thereby increasing their frequency in the population, while selecting against harmful allels and thereby reducing their frequency - a process known as adaptive evolution. Natural selection is not based on individual allals, but on all organisms. An individual, for example, increases the ability to reproduce (fecundity) a result can carry a very useful genotic with phenotoip, but if the same individual carries an allel resulting in a fatal childhood disease, this fecundity phenothy will not be passed on to the next generation because the individual does not live to reach reproductive age. Natural selection moves at the individual level; for individuals who contribute more to the gene pool of the next generation, known as the evolutionary (Darwinist) fitness of an organism. Fitness is often measurable and measured by scientists in the field. However, it is not the absolute fitness of the individual that matters, but how it is compared to other organisms in the population. This concept, called relative conformity, allows researchers to determine which individuals contribute additional offspring to the next group, and thus how a population can evolve. There are several ways in which selection can affect population change: balancing selection, direction selection, selection diversification, frequency-based selection, and sexual selection. Because natural selection affects allel frequencies in a population, individuals can either become more or less genetically similar, and the phenophyps displayed may be more similar or more different. Balancing Selection If natural selection prefers an average phenolyip, the choice against extreme variations will pass through the population stabilization selection (Figure 7). For example, in the population of mice living in the forest, natural selection prefers individuals who best adapt to the forest floor and are less likely to be noticed by predators. Assuming A fairly consistent shade of brown, fur most closely matched with this color will be passing genes to their brown coat, most likely to survive and reproduce in mice. Mice carrying allures that make them a little lighter or a little darker will stand out against the ground and are more likely to be victims of predation. As a result of this selection, the genetic varience of the population will decrease. Figure 7. An average phenolyip is preferred in the balancing selection. Direction Selection When the environment changes, populations often go through the direction selection (Figure 8), which selects phenophysies at one end of the spectrum of existing variation. A generic example of this kind of choice is the evolution of peppery moths in eighteenth and nineteenth century England. Before the Industrial Revolution, moths were predominantly light-colored, which would have made them fit in with the light-colored trees and lichens around them. But as soot began to gush from factories, the trees blacked out, and light-colored moths made it easier for birds of prey to notice. Over time, mothmenic destenance increased because they had a higher survival rate in habitats affected by air pollution because their dark coloration was blended with so wet trees. Similarly, the hypothetical mouse population can evolve to capture a different coloration if something is going to cause the forest floor where they live to change color. The result of this type of selection is a shift towards new, appropriate phenolysips in the genetic varience of the population. Figure 8. In the direction selection, a change in the surrounding area changes the spectrum of observed phenophysies. In science, sometimes things are believed to be true, and then new information emerges that changes our understanding. The story of the peppery moth is an example: the facts behind the correct choice of dark moths have recently been called into question. Read this article to learn more. Diversify Selection Sometimes two or more different phenolyipes can each have advantages and can be selected by natural selection, while intermediate phenophysies are on average less in shape. Known as diversification selection (Figure 9), this occurs in many populations of animals with multiple male forms. Large, dominant alpha males match brute force, while small males can sneak in to secretly mate with females in the alpha male's territory. In this case, it will be chosen for both alpha males, but medium-sized males who cannot pass alpha males and are too large to be troubled by mating. Diversification of choice can also occur when environmental changes support individuals at both ends of the phenotic spectrum. Imagine a population of mice living on the beach. Light colored sand interspersed with patches of tall grass. In this scenario, light-colored mice that adapt to sand and dark mice that can be stored in the grass are preferred. Medium-colored mice, on the other hand, do not mix in the grass or the sand, making them more likely to be eaten by predators. As the population becomes more diverse, genetic variation increases as a result of such a choice. Figure 9. In diversification of selection, two or more extreme phenolyips are selected, while the average phenolycoip is selected against. Different types of natural selection can affect the distribution of phenotypes within a population (see Figure 7, 8, and 9). In recent years, factories have become cleaner and fewer soot are released into the environment. What effect do you think this has on the distribution of moth color in the population? Frequency-dependent Selection Another type of selection, called frequency-dependent selection, prefers phenophysies that are common (positive frequency-dependent selection) or rare (negative frequency-dependent selection). An interesting example of this type of selection is seen in a unique group of Pacific Northwest lizards. Male common side-stained lizards come in three throat color patterns: orange, blue, and yellow. Figure 10. The yellow-throated side-stained lizard is smaller than blue-throated or orange-throated males and looks like females of the species, which secretly allows mating. (credit: tinyfroglet/Flickr) Each of these forms has a different reproductive strategy: orange males are strong and can fight other males for access to their females; blue males are medium sized and form strong pairs of bonds with their wives; and yellow men (Figure 10) look a bit like the smallest, and the woman, who lets them sneak matings. Like a game of rock-paper-scissors, orange beats blue beats blue, blue beats yellow, and yellow beats orange to compete for women. So, large, strong orange males can fight off blue males to mate with females tied to blue pairs, blue males succeed in protecting their wives against males in yellow sneakers, and yellow males can secretly mat from large potential friends, monogamous orange males. In this scenario, orange men will be preferred by natural selection when the population is dominated by blue men, blue men thrive when the population is mostly yellow male, and yellow men will be chosen when orange men are the most populous. As a result, the cycle of side-stained lizard populations in the distribution of these phenophysies-a generation, orange may be dominant, and then the frequency of yellow males will begin to rise. Once yellow men make up the majority of the population, blue men will For. Finally, when blue men become common, orange men will once again be preferred. Selection due to negative frequency serves to increase the genetic variation of the population by selecting rare phenophysies, while positive frequency-related selection often reduces genetic variation by selecting for common phenophysies. Sexual Selection Some species of males and females are often quite different from each other in ways that are far from reproductive organs. Men are usually larger, for example, and display many elaborate colors and ornaments, such as peacock tails, that tend to be smaller and pale than women's decorations. These differences are known as sexual dimorphisms (Figure 11) caused by the fact that in many populations, especially in animal populations, males have more variance in reproductive success than females. In other cases, some men are usually larger, stronger or more fancy men - while others take the vast majority of total farms, while others don't get mating at all. This can occur because males are better at fighting other males, or because females choose to mat with larger or more ornate males. In both cases, this shift in reproductive success creates strong selection pressure among males to obtain these farms, which leads to the evolution of larger body size and elaborate ornaments to attract the attention of females. Females, on the other hand, tend to receive a handful of selected myeness; therefore, they are more likely to choose desirable men. Sexual dimorphism differs greatly between species, of course, and some species are even reversing gender-role. In such cases, females tend to have a greater varience in reproductive success than males, and accordingly they are chosen for their larger body size and often characteristically detailed characteristics of males. Figure 11. Sexual dimorphism (a) peacock and peacock, (b) Argiope appensa spiders (female spiders are large) and (c) wood ducks. (credit spiders: Business change by Sanba38/Wikimedia Commons; credit duck: business modification by Kevin Cole) The pressures of choice on men and women to obtain the farm are known as sexual choice; it can cause the development of secondary sexual traits that do not benefit the individual's likelihood of survival but help maximize reproductive success. Sexual selection can be so powerful that it selects for traits that really harm an individual's survival. Think of the peacock's tail one more time. While men with the most beautiful and large, most colorful tail are more likely to win over women, they are not your most practical extension. In addition to being more visible to predators, it makes men slower in their attempts to escape. That risk, in fact, It's like big tails in the first place. Speculation is that large queues carry risks, and only the best men survive this risk: the bigger the tail, the more men are eligible. This idea is known as the handicap principle. The hypothesis of good genes states that men develop these impressive ornaments to show off their effective metabolism or ability to fight the disease. Females then select males with the most impressive characteristics because they report their genetic superiority, which passes on to their offspring. It can be said that females should not be selective, because this will likely reduce the number of offspring, which can be useful if better males are more suitable offspring. Fewer, healthier offspring can increase their chances of survival more than many weak offspring. In 1915, biologist Ronald Fisher proposed another model of sexual selection: the Fisherian runaway model suggests that the selection of some traits is the result of sexual preference. In both the handicap principle and good genhipotesis, this trait is said to be an honest sign of the quality of males, so that females are given a way to find the most suitable pairs - males transfer the best genes to their offspring. No Perfect Organism Natural selection is the driving force in evolution and can create populations that are better adapted to survive and reproduce successfully around them. But natural selection can't produce the perfect organism. Natural selection can only select existing variations in the population; it does not create anything from scratch. Therefore, it is limited to the current genetic varience of a population and any new allel that arises through mutation and gene flow. Natural selection is also limited because it works at the level of individuals, not allels, and some allels are connected because of their physical proximity in the genome, which conveys them together (connection imbalance). Any individual can carry some useful allel and some negative allel. The net effect of these allals, or the fitness of the organism, which can act naturally in selection. As a result, good allels can also be lost if carried by individuals with a few overwhelmingly bad allels; Likewise, bad allels can be kept in a general fitness benefit if carried by individuals who have enough good allels to cause. In addition, natural selection can be limited by relationships between different polymorphisms. One morph may give you a higher fitness than the other, but the frequency may not increase due to the fact that going less useful for a less useful feature will require you to undergo less useful phenothy. Think of the rats who live on the beach. Some light color and harmony with sand, others dark and fit with patches Dark mice, in general, may be more suitable than light-colored mice, and at first glance, one can expect that light-colored mice should be selected for darker coloring. But keep in mind that intermediate phenolyipin, a medium-sized jacket, is too bad for mice. As a result, light-colored mice are not selected for dark coloring, because individuals moving in this direction (who begin to be selected for a darker coat) would be less fit than those who were light-wearing. Finally, it is important to understand that not all evolution is adaptive. While natural selection chooses the most in-form individuals and often results in a generally fiter population, other forces of evolution, including genetic drift and gene flow, often do the opposite: introducing harmful allals to the population's gene pool. Evolution has no purpose - not to turn a population into a biased ideal. This is just the sum of the various forces described in this section and how it affects the genetic and henotypic varience of a population. Give an example of a trait that may have evolved as a result of the handicap principle and explain your reasoning. List how evolution can affect population change and explain how they affect allial frequencies. Check answer the question below to see how well you understand the topics discussed in the previous section. This short exam is not included in your grade in the class and you can get an unlimited number of res). Using this test, check your understanding and decide whether (1) the previous section is more or (2) to move on to the next section. Section.

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