MODERN THEORY OF POPULATION pdf

1: Demographic transition - Wikipedia

Modern economists have rejected the Malthusian theory of maximum population, which, if exceeded, will spell misery in the country. Instead of the maximum population, the modern economists have substituted the idea of the optimum population.

Populations Back to Top Without variation which arises from mutations of DNA molecules to produce new alleles natural selection would have nothing on which to act. A population is a group of individuals living in the same geographical area and sharing a common gene pool. The gene pool is the sum of all genetic information carried by the members of a population. All genetic variation in a population is generated by mutation. Mutation is any heritable change in DNA. Mutations can be changes of a single nucleotide base or may involve changes in chromosome number. Whether a mutation is good, neutral, or harmful depends on how it affects survival and reproductive success. Population Genetics Back to Top A population is a group of potentially interbreeding organisms of the same species occupying a certain area. Members of a population vary from one another. This variation is the raw material on which natural selection operates. There are several types of mutations, both at the gene-level and the chromosome-level. Gene mutations provide new alleles, making these mutations the ultimate source of variation. A gene mutation is an alteration in the DNA nucleotide sequence , producing an alternate sequence, termed an allele. Mutations occur at random, and can be beneficial, neutral, or harmful. Some chromosomal mutations are changes in the number of chromosomes inherited, while others are alterations in arrangement of alleles on chromosomes due to inversions and translocations. In sexually reproducing organisms, genetic recombination is the realloc ation of alleles and chromosomes. Recombination results from crossing-over during meiosis , the random segregation of chromosomes to gametes during meiotic division, and the random combination of gametes during fertilization. The entire genotype is subject to natural selection since new combinations of alleles may have improve the reproductive success of the organism. For polygenic traits, the most favorable combination may occur when the right alleles group by recombination. Not only are variations created, they are also preserved and passed on from one generation to the next. The gene pool is the total of all the alleles in a population, in the context of gene frequencies. Neither dominance nor sexual reproduction will change allele frequencies. These conditions of the Hardy-Weinberg law are rarely met, so allele frequencies in the gene pool of a population do change from one generation to the next, resulting in evolution. We can now consider that any change of allele frequencies in a gene pool indicates that evolution has occurred. The Hardy-Weinberg law proposes those factors that violate the conditions listed cause evolution. A Hardy-Weinberg equilibrium provides a baseline by which to judge whether evolution has occurred. Hardy-Weinberg equilibrium is a constancy of gene pool frequencies that remains across generations, and might best be found among stable populations with no natural selection or where selection is stabilizing. Microevolution is the accumulation of small changes in a gene pool over a relatively short period. Mutation Rate Back to Top Gene mutations result in new alleles, and are the source of variation within populations. Gene mutations are ultimately behind the other mechanisms that provide variation. Due to DNA replication and DNA repair mechanisms, mutation rates of individual genes are low, but since each organism has many genes, and a population has many individuals, new mutations arise in populations all the time. Thus, mutations are relatively common, and the mutation rate is an adequate source of new alleles. High levels of molecular variation are common in natural populations, although many mutations usually recessive are hidden. The mutation rate varies greatly among species and even among genes of an individual. Mutations are caused by errors in DNA replication, chemicals, or radiation. Large scale effects of mutation result only when mutation is combined with other factors that reshuffle the gene pool. Selection acts on individuals, not their individual genes. Sexual reproduction increases variation by reshuffling the genetic information from parents into new combinations in their offspring. Mutations produce new alleles. Additional Sources of Variation Back to Top Gene flow moves alleles among populations through interbreeding as well as by migration of breeding individuals. Gene flow increases variation within a population by introducing new alleles produced in another population. Continued gene flow tends to decrease the diversity among populations, causing gene pools to become similar. Reduction or restriction of gene flow between populations is essential for the development of new species. The frequency of alleles can change from generation to generation as a result of chance alone in a small gene pool. This phenomenon is known as genetic drift. Random mating involves individuals pairing by chance, not according to their genotypes or phenotypes. Nonrandom mating involves individuals inbreeding and assortative mating. Inbreeding is mating between relatives to a greater extent than by chance; inbreeding can occur if dispersal is so low that mates are likely to be related and does not change allele frequencies, but it does decrease the proportion of heterozygotes and increase the proportions of both homozygotes at all gene loci. Assortative mating occurs when individuals tend to mate with those that have the same phenotype. Assortative mating divides a population into two phenotypic classes with reduced gene exchange. Genetic drift is changes in allele frequencies of a gene pool due to chance or random events. This can occur in large or small populations. Genetic drift causes gene pools of two isolated populations to become dissimilar as some alleles are lost and other are fixed. Genetic drift occurs when founders or colonizers establish a new population, or after a genetic bottleneck and resultant interbreeding. The founder effect is a case of genetic drift in which rare alleles, or combinations of alleles, occur in higher frequency in a population isolated from the general population. Founding individuals contain a fraction of the total genetic diversity of original gene pool. The alleles carried by founders is determined by chance alone. Consider the Pilgrim colonists in New England. By no means did they represent all the genetic variation of the human species or even genetic variations among Europeans. When a population is started by one or a few individuals who randomly separate from a larger population, chance may dictate that allele frequencies in the new population may be very different from those of the original population. They had fewer types of organisms than the South American mainland. The island species varied from the mainland species, and from island-to-island. Each island had a variation of tortoise that correlated with different vegetation and environmental conditions on that island. Galapagos tortoises, note the difference in the height of the shell between the top and bottom images. Top image from Lycos, photo by Bill Everit; bottom image from http: One unusual finch used a twig or thorn to pry out insects, a job normally done by a woodpecker. The finches posed questions to Darwin: Divergence of the Galapagos finches from ancestral colonizers from the South American mainland. Images from Purves et al. Drastic short-term reductions of population size caused by natural disasters, disease, or predators may result in by chance the survivors representing only a small portion of the original gene pool. Even when the population increases to its original size, a portion of its original genetic diversity remains lost. This feature, termed a bottleneck , is a problem with many endangered species. A bottleneck effect is genetic drift in which a severe reduction in population size results from natural disaster, predation, or habitat reduction. This results in a severe reduction of the total genetic diversity of the original gene pool. The cheetah bottleneck causes relative infertility because of the intense inbreeding. Similarly, the Hawaiian silversword has passed recently through its pwn bottleneck. Recent studies on humans suggest that there may have been one or more instances of severe genetic bottlenecks in our own prehistory. The bottleneck effect prevents most genotypes from participating in production of next generation. Migration into or out of a population can breakdown genetic differences between populations. Mutations developing in one population may be spread to other populations by migration. This serves, like mutation, to introduce new alleles into populations. Natural Selection Back to Top Not all members of a population necessarily have an equal chance of surviving and reproducing due to competition for resources and mates. By virtue of small phenotypic variations, some individuals are better adapted to their environment than are others. The better adapted individuals are more "fit" and tend to survive and reproduce, passing on their adaptations to the next generation in greater frequency than those adaptations of the less "fit" members of the population. Fitness is a measure of an individuals ability to survive and reproduce. Those with the highest fitness are more likely to survive and reproduce. Thus, they make a greater contribution to the gene pool, of the next generation than do those less "fit". Natural selection is the process of differential survival and reproduction that inevitably leads to changes in allele frequencies over time as those individuals who are the most "fit" survive and leave more offspring. There are three patterns, or types, of natural selection. Stabilizing Selection Stabilizing selection favors the intermediate phenotype out of a range of phenotypes. The extremes in variation are selected against.

Infants weighing significantly less or more than 7. Selection works against both extremes. Stabilizing selection, selection against the extremes in variation. Image from Purves et al. Living fossils, like the coelacanth, ginkgo, and horseshoe crab, are examples of organisms that are relatively unchanged from their distant ancestors. A specimen of the living fossil fish, a coelacanth. Exterior of a horseshoe crab, an example of a living fossil. Directional Selection Directional selection tends to favor phenotypes at one extreme of the range of variation.

MODERN THEORY OF POPULATION pdf

2: How does population genetics support the modern theory of evolution? | Yahoo Answers

The neoâ€•Darwin view of evolution incorporates modern understanding of population genetics, developmental biology, and paleontology, to which is being added knowledge of the molecular sequencing of DNA and the insights it provides concerning the phylogeny of life.

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.

3: 8 Examples of Evolution in Action - Listverse

The Optimum Theory of Population appeared as a reaction to the Malthusian theory. Criticizing the approach of the Malthusian Theory of Population, modern economists Edwin Cannan and Carr Saunders of London School of Economics have developed a new theory known as Optimum Theory of Population.

Modern Theory of Population: Modern economists have rejected the Malthusian theory of maximum population, which, if exceeded, will spell misery in the country. Instead of the maximum population, the modern economists have substituted the idea of the optimum population. Meaning of Optimum Population: By optimum population is meant the ideal number of the population that a country should have, considering its resources. It is the right number. Given a certain amount of resources, state of technical knowledge and a certain stock of capital, there will be a definite size of the population at which real income of goods and services per capita will be the highest. This is the optimum size. The optimum number can, therefore, be defined as the one at which per capita income is the highest. If the population of a country is below the optimum, i. The number of the people is insufficient to take the fullest possible advantage of the natural and capital resources of the country. This is what happens in a new country. The resources are vast; much can be produced; but there are not men enough to carry on the work of production efficiently. Under such conditions, increase in population will be followed by an increase in the per capita income. But this increase cannot go on indefinitely. When the shortage of man-power has been made up, the per capita income will reach the maximum, and we shall say that the optimum has been reached. If, however, the population still goes on increasing and the optimum is exceeded, then we shall have a state of over-population. There will be too many people in the land. The resources will not be sufficient to provide gainful employment to all. They will be thinly spread over the teeming millions. Per capita income will diminish; the standard of living will fall; war, famine and disease will be constant companions of such a people. These are the symptoms of over-population. Movement towards the Optimum: Let us suppose that the stock of natural resources, capital equipment and state of technology remain fixed in a country. Now assume that population, which is initially very small relative to these other resources, begins to increase. With the increase in population, the labour force of the country will also increase. As more and more labour is combined with the fixed amount of these other resources, output per capita or real income per head will rise. The output per capita will increase, because the increase in the quantity of labour will make possible. With a very small population or labour force, there is only a limited scope for specialisation, for each labourer is required to do all sorts of jobs. But as population, and, therefore, the number of workers increase, specialisation becomes possible. Each man then need not do all the jobs or make all parts of a good. Everybody can concentrate on the job for which he is best suited. Division of labour among the different workers, which is made possible by the increase in population, greatly increases the efficiency and productivity of labour. An increase in population will also permit a fuller utilisation of the natural resources and capital equipment. If the number of workers is small relative to the natural resources, then even the resources actually available will remain under-utilised. Moreover, the capital equipment is not fully and effectively utilized if there is shortage of labour. If the population increases and more labourers become available to be combined with the given stock of the natural resources and capital equipment, output per capita will no doubt rise. There is another related factor due to which production greatly increases as population expands in the initial stages. When population of a country is small, market for the products of industry is-also small. With this limited market for goods, producers are forced to produce on a small scale. They are thus unable to take advantage of the economies of large-scale production. As population increases, the market for goods expands; large-scale production becomes possible which adds greatly to the productivity of the economy. For all these reasons, output per capita, will rise for a time as pupation increases. As the population continues to increase, a point will finally be reached when capital and natural resources are fully utilized and, therefore, output per capita will be the highest. The level of population at which per capita output or real income is the maximum is called the optimum population. Movement Away From the Optimum: If, however, population still goes on increasing, that is, crosses the optimum point, output per capita will start declining. The economy would then become over-populated. Why does the output per capita fall when optimum point is exceeded? This is because there are now more men in the economy than are needed by it. A given amount of capital and natural resources have to be shared among a larger number of workers with the result that each of them has a smaller amount of equipment, materials and natural resources to work with. For this reason, the average productivity declines. It is very likely that many people may not get employment and, therefore, add nothing to production. Pressure of population on land increases. But the additional men, who get employment in agriculture, add nothing to total production. In other words, marginal productivity of these extra men in agriculture is zero or nearly zero. This is what is commonly known as the phenomenon of disguised unemployment. Disguised unemployment exist s in over-populated agricultural economics from where even if some workers are withdrawn, total production does not fall. Thus, low standard of living, open and disguised unemployment, and food problem are all signs of over-population. In both cases, the per capita income is lower than it would be in the case of optimum population. It is the optimum population with the highest per capita output which is the best for a country to aim at. The concepts of optimum population, under-population and over-population are represented in the figure given below: In this figure, size of population is measured on X-axis and output per capita on Y-axis. It is evident from this figure that in the beginning as copulation increases, output per capita also increases. Output per capita goes on increasing with every increase in population till OM is reached. At OM level of population, output per capita is the highest and is equal to MP. If population now increases beyond OM, output per capita falls. Therefore, OM is the optimum population. If the actual population of a country is less than OM, it will be under-populated and if the actual population is more than OM, it will be a case of over-population. But it may be noted that optimum population is not a fixed and rigid number but is a moving figure. As explained above, optimum population is relative to resources and technology. Given the amount of capital and natural resources and the state of technology, there will be a definite size of population at which the output per capita is maximum. But the quantity of capital and natural resources and the state of technology are subject to changes. In fact, changes in them often take place. When there is any change in them, the optimum level of population will also change. For instance, when either there is increase in the quantity of capital equipment and available natural resources or the country makes. Progress in technology, per capita output curve will shift upward and to the right, with the result that the optimum level of population will increase. The changes in the per capita output curve, as a result of increase in resources or progress in technology and their effect on optimum population, are shown in the Fig. With certain given resources and technology, per capita output curve is AR and the level of optimum population is OM at which output per capita is MP, which is the highest under the given circumstances. Thus, we see that with different resources or different technology, there will be a different level of optimum population. Dalton has given a formula by which we can judge the extent to which the actual population of a country deviates from the optimum population. The extent of the deviation is called maladjustment. The formula seeks to measure the degree of this maladjustment. O stands for optimum population. If M is negative, the country is under-populated and if M is positive, the country is over-populated. The following are the main differences between the Malthusian Theory and the Optimum Theory: According to the optimum theory, there is no rigidly fixed maximum. But the optimum theory tells us that, even in the absence of such distressing phenomena, there can be over-population, provided it can be shown that per capita income has gone down, or that with a decrease in population, per capita income will go up. Malthus was haunted by the fear that population would outstrip food supply. The modern economists do not suffer from any such apprehensions. There is a mutual and close relation between the growth of population and the economic development of a country. One affects the other and is, in turn, affected by the other. This is brought out by the Theory of Demographic Transition. Effect of Growing Population on Economic Development: Rapid growth of population promotes rapid economic growth, on the one hand, and retards it, on the other. Large population produces an urge for economic development as an escape from poverty and low standard of living. It offers a big market for goods and as such attracts prospective industrialists. It compels the fullest possible use of the available resources by means of better techniques. In this way, a growing population may accelerate economic growth.

4: Natural selection - Wikipedia

example, the theory of harmonic oscillators, or the theory of population aging). These models typically are small in the sense that they contain a small number of variables.

Share5 Shares 26K Evolution is one of the greatest scientific discoveries of all time. Armed with the knowledge of the interconnectedness of all life on earth, biologists have made startling discoveries. There is so much evidence in favor of evolution, that arguing against it is like denying that there is a moon in the sky. Yet people do still actively deny evolution occurs. Speciation, the formation of a new species from an ancestor species, takes a very long time yet there are evolutionary steps which can be observed. Here are eight examples, amongst many, of evolution in action. Originally, the vast majority of peppered moths Biston betularia had a light, mottled coloring which was a good camouflage against predators. The best explanation as to why this change in the species occurred is that the light moths lost their advantage of camouflage as light surfaces were darkened by pollution, and so light moths were eaten more frequently by birds. The peppered moth as an example of evolution has been attacked recently, usually as to the cause of the shift in coloration, but the example still stands as a major shift in a species caused by mutations leading to variation and natural selection. Speciation involves many mutations leading to significant changes. The yellow bellied three-toed skink Saiphos equalis is a lizard of New South Wales, in Australia, that appears to be undergoing the change from laying eggs to live birth. Since these skinks can either lay eggs or give birth, it gives scientists the chance to study the adaptations necessary for live birth. Skink embryos encased in an egg have an extra source of calcium that the live born skinks lack. It turns out that this nutritional difference is made up by the mother secreting extra calcium for the young held inside her. This looks like the first step on the road to developing a system like the mammalian placenta. Skinks living on the coast tend to lay eggs, probably because the warm weather is predictable and sufficient for embryonic development. It is to be predicted that these two populations will at some point separate into different species as each population becomes fixed in its reproductive strategy. This brings up a common question in creationists â€” If man evolved from apes, why are there still apes? Well, with the skinks we would see two species formed, an egg laying and a live birthing species. Each would be best suited for their habitat. If live birthing skinks evolved from egg layers, why are there still egg layers? Because each is adapted for its niche. We do not have to wait for a predator to evolve to observe this, however; modern humans have been transporting species around the world, and thus we can observe new species interactions. The Asian shore crab Hemigrapsus sanguineus is an invasive species in New England which feeds on the native blue mussels. It has recently been observed that mussels, when they detect Asian shore crabs, develop thicker shells to stop the crabs eating them. This shell thickening behavior is costly to the mussels, and so is heavily regulated. The evolutionary factor here is that only mussels from regions where Asian shore crabs are endemic will thicken their walls when exposed to the crabs. Those mussels from other regions do not detect the crabs as a threat. Here we observe the starting shots in an evolutionary arms race. The lizards were left for decades, and compared to the colony from which they were taken. They were found to have shifted from a mainly insectivorous diet to one heavy in vegetation. This diet change seems to have driven dramatic changes in the lizards. These are key adaptations for dealing with chewing leaves. The most exciting sign of evolution is the development of cecal valves, muscles used to separate portions of the intestine. These serve to slow the passage of food through the intestine and give time for the bacteria in the gut to breakdown the plant matter for absorption. This is an entirely novel development in the Italian wall lizard, and a major adaptation. It does immense harm to agriculture and native species. Those toads at the front of the invasion wave are likely those best adapted for spreading fastest. Of course, these fast-spreading toads will breed with each other as only other fast toads will be at the front. When toads at the front of the invasion wave were studied, they were found to be bigger, hardier, had longer legs allowing for greater speed, and were more active. As a result of these sorts of adaptations the rate at which cane toads spread has been increasing ever since they were introduced. These finches are still helping evolution be understood. Peter and Rosemary Grant studied the finches on one of the Galapagos Islands, and have observed evolutionary change caused by direct competition of two rival species. The medium ground finch was well established on the isle of Daphne, and had been studied in depth. Its beak was suited perfectly for cracking large nuts. In , the large ground finch from a neighboring island arrived. These larger finches could drive away the native medium ground finches and would eat all the large nuts. Over the period of study, the medium ground finches of Daphne island were found to have developed smaller beaks more suited to the smaller nuts, ignored by the invading larger finches. This is a classic study in evolutionary biology. The Blue Moon Butterfly Hypolimnas bolina of the Samoan islands was being attacked by a parasite which destroyed male embryos. This is not because the parasite has disappeared, it is still present, but it is no longer deadly to male embryos. This case shows how a mutation giving an advantage can rapidly spread throughout a population. Any male with the ability to survive infection would be able to mate with a great many females, due to the paucity of other males, and spread his immunity through the gene pool. Since , in the lab of Richard Lenski, the evolution of twelve E. Since then, over 50, generations of E. With samples of each population taken regularly the accumulated genetic changes can be followed with ease. Over time the bacteria have become far more efficient at growing under the conditions used. This study has provided evidence of how evolution actually occurs. One of the populations developed the ability to utilize citrate as a nutrient, something otherwise unknown in E. The series of letters can be found here.

5: Malthus vs Boserup | Big Picture

From this, he developed the Malthusian theory of population growth in which he wrote that population growth occurs exponentially, so many scholars take caution when providing modern examples.

One of those resources is food. In high-income countries food supply is relatively secure; Britain has not experienced a widespread food shortage since the Second World War. But as demand for food increases, supplies come under greater pressure. In a drought in the USA caused a drop in the global production of maize, and the effects were felt around the world as the prices of staple foods such as bread increased. In the future will we be able to produce enough food to support the ever-increasing human population? While this seems like a 21st-century problem, it is actually a question that has concerned economists for hundreds of years and farmers since the first days of agriculture. Malthus thought that if the human population continued to grow, food production would not be able to keep up with demand and there would not be enough food to go around. The result, he warned, would be a terrible famine that would kill many people. There are examples of this happening to particular populations of animals and insects, such as the reindeer on St Matthew Island. Malthus reasoned that this disastrous outcome could only be avoided if the population stopped growing. This, Malthus thought, was what would save us from large-scale starvation. But the population has not stopped growing. Where did he go wrong? At the time when he was writing the Industrial Revolution had not yet arrived, and without developments such as pesticides and fertilisers the amount of food that could be produced per acre of land was much smaller than it is today. Malthus did not account for these advances in his population theory, but another economist, Ester Boserup, did. She worked for the United Nations and her experience working in low- and middle-income countries such as India helped to shape her theory of the relationship between human population growth and food production. She suggested that food production can, and will, increase to match the needs of the population. Drawing on her knowledge of farming in the developing world, where populations were growing quickly, Boserup argued that the threat of starvation and the challenge of feeding more mouths motivates people to improve their farming methods and invent new technologies in order to produce more food. For example, a farmer who has four fields to produce food for his family might grow crops in three of the fields, but leave the fourth field empty as the ground is dry and his crop will not grow there. However if the farmer has two more children, the pressure to produce more food might drive him to build irrigation canals to bring water to the fourth field or to buy a different type of seed that will grow in drier ground. He would change the way he farms to make sure that he has enough food to support a larger family. Is there a limit? Print this resource Questions for discussion Can you find an example of an individual or a group that thinks Malthus was right? What are their arguments? Food is not the only resource that we need to survive. Can you think of other resources that humans compete for? What would happen if they ran out?

6: Evolution - News and Scientific Articles on Live Science

The Development of Modern Population Theory The Development of Modern Population Theory Robinson, Warren C. ^ Thomas Robert Maltfaus, An Essay on the Principle of Population {London: I7S8).

Note the vertical axis is logarithmic and represents millions of people. The original Demographic Transition model has just four stages, but additional stages have been proposed. Both more-fertile and less-fertile futures have been claimed as a Stage Five. Some countries have sub-replacement fertility that is, below 2. Replacement fertility is generally slightly higher than 2 the level which replaces the two parents both because boys are born more often than girls about 1. Many European and East Asian countries now have higher death rates than birth rates. Population aging and population decline may eventually occur, assuming that the fertility rate does not change and sustained mass immigration does not occur. The HDI is a composite of life expectancy, income, and level of education. Development promotes fertility decline at HDI levels below 0. From the point of view of evolutionary biology , wealthier people having fewer children is unexpected, as natural selection would be expected to favor individuals who are willing and able to convert plentiful resources into plentiful fertile descendants. This may be the result of a departure from the environment of evolutionary adaptedness. There will be a negative population growth rate which will affect the country. This will take a generation or two before the population grows back up. The decline in death rate and birth rate that occurs during the demographic transition may transform the age structure. When the death rate declines during the second stage of the transition, the result is primarily an increase in the child population. The reason being that when the death rate is high stage one , the infant mortality rate is very high, often above deaths per children born. When the death rate falls or improves, this may include lower infant mortality rate and increased child survival. Over time, as individuals with increased survival rates age, there may also be an increase in the number of older children, teenagers, and young adults. This implies that there is an increase in the fertile population proportion which, with constant fertility rates, may lead to an increase in the number of children born. This will further increase the growth of the child population. The second stage of the demographic transition, therefore, implies a rise in child dependency and creates a youth bulge in the population structure. This stage of the transition is often referred to as the golden age, and is typically when populations see the greatest advancements in living standards and economic development. An increase of the aged dependency ratio often indicates that a population has reached below replacement levels of fertility, and as result does not have enough people in the working ages to support the economy, and the growing dependent population. A major factor was the sharp decline in the death rate due to infectious diseases, which has fallen from about 11 per 1, to less than 1 per 1, By contrast, the death rate from other causes was 12 per 1, in and has not declined markedly. The agricultural revolution and the development of transport, initiated by the construction of canals, led to greater availability of food and coal, and enabled the Industrial Revolution to improve the standard of living. Scientific discoveries and medical breakthroughs did not, in general, contribute importantly to the early major decline in infectious disease mortality. Ireland[edit] In the s and early s, the Irish demographic status converged to the European norm. Mortality rose above the European Community average, and in Irish fertility fell to replacement level. The recent changes have mirrored inward changes in Irish society, with respect to family planning, women in the work force, the sharply declining power of the Catholic Church, and the emigration factor. The uniqueness of the French case arises from its specific demographic history, its historic cultural values, and its internal regional dynamics. More than two-thirds of that growth can be ascribed to a natural increase resulting from high fertility and birthrates. In contrast, France is one of the developed nations whose migratory balance is rather weak, which is an original feature at the European level. Several interrelated reasons account for such singularities, in particular the impact of pro-family policies accompanied by greater unmarried households and out-of-wedlock births. These general demographic trends parallel equally important changes in regional demographics. Since the same significant tendencies have occurred throughout mainland France: Shifts in population between regions account for most of the differences in growth. The varying demographic evolution regions can be analyzed though the filter of several parameters, including residential facilities, economic growth, and urban dynamism, which yield several distinct regional profiles. The distribution of the French population therefore seems increasingly defined not only by interregional mobility but also by the residential preferences of individual households. These challenges, linked to configurations of population and the dynamics of distribution, inevitably raise the issue of town and country planning. The most recent census figures show that an outpouring of the urban population means that fewer rural areas are continuing to register a negative migratory flow â€” two-thirds of rural communities have shown some since The spatial demographic expansion of large cities amplifies the process of peri-urbanization yet is also accompanied by movement of selective residential flow, social selection, and sociospatial segregation based on income. Taiwan and South Korea "tiger" economies , Thailand, Malaysia, and Indonesia "second wave" countries , and China and Vietnam "market-Leninist" economies. Demographic change can be seen as a byproduct of social and economic development together with, in some cases, strong governmental pressures. The transition sequence entailed the establishment of an effective, typically authoritarian, system of local administration, providing a framework for promotion and service delivery in health, education, and family planning. Subsequent economic liberalization offered new opportunities for upward mobility â€” and risks of backsliding â€”, accompanied by the erosion of social capital and the breakdown or privatization of service programs. The present demographic transition stage of India along with its higher population base will yield a rich demographic dividend in future decades. Income growth and public investment in health caused mortality to fall, which suppressed fertility and promoted education. Industrialization, skill premium, and closing gender wage gap further induced parents to opt for child quality. Expanding demand for education was accommodated by an active public school building program. The interwar agricultural depression aggravated traditional income inequality, raising fertility and impeding the spread of mass schooling. Landlordism collapsed in the wake of de-colonization, and the consequent reduction in inequality accelerated human and physical capital accumulation, hence leading to growth in South Korea. Both supporters and critics of the theory hold to an intrinsic opposition between human and "natural" factors, such as climate, famine, and disease, influencing demography. They also suppose a sharp chronological divide between the precolonial and colonial eras, arguing that whereas "natural" demographic influences were of greater importance in the former period, human factors predominated thereafter. Campbell argues that in 19th-century Madagascar the human factor, in the form of the Merina state , was the predominant demographic influence. However, the impact of the state was felt through natural forces, and it varied over time. In the late 18th and early 19th centuries Merina state policies stimulated agricultural production, which helped to create a larger and healthier population and laid the foundation for Merina military and economic expansion within Madagascar. From , the cost of such expansionism led the state to increase its exploitation of forced labor at the expense of agricultural production and thus transformed it into a negative demographic force. Infertility and infant mortality, which were probably more significant influences on overall population levels than the adult mortality rate, increased from due to disease, malnutrition, and stress, all of which stemmed from state forced labor policies. Available estimates indicate little if any population growth for Madagascar between and The demographic "crisis" in Africa, ascribed by critics of the demographic transition theory to the colonial era, stemmed in Madagascar from the policies of the imperial Merina regime, which in this sense formed a link to the French regime of the colonial era. Campbell thus questions the underlying assumptions governing the debate about historical demography in Africa and suggests that the demographic impact of political forces be reevaluated in terms of their changing interaction with "natural" demographic influences. Demographics of Russia Russian male and female life expectancy since [33] [34] Russia entered stage two of the transition in the 18th century, simultaneously with the rest of Europe, though the effect of transition remained limited to a modest decline in death rates and steady population growth. The population of Russia nearly quadrupled during the 19th century, from 30 million to million, and continued to grow until the First World War and the turmoil that followed. In the s and s, Russia underwent a unique demographic transition; observers call it a "demographic catastrophe": This shift resulted from technological progress. A sixfold increase in real wages made children more expensive in terms of forgone opportunities to work and increases in agricultural productivity reduced rural demand for labor, a substantial portion of which traditionally had been performed by children in farm families. The changing demographics of the U. Beginning around , there was a sharp fertility decline; at this time, an average woman usually produced seven births per lifetime, but by this number had dropped to nearly four. A mortality decline was not observed in the U. However, this late decline occurred from a very low initial level. During the 17th and 18th centuries, crude death rates in much of colonial North America ranged from 15 to 25 deaths per residents per year [38] [39] levels of up to 40 per being typical during stages one and two. Life expectancy at birth was on the order of 40 and, in some places, reached 50, and a resident of 18th century Philadelphia who reached age 20 could have expected, on average, additional 40 years of life. This phenomenon is explained by the pattern of colonization of the United States. Sparsely populated interior of the country allowed ample room to accommodate all the "excess" people, counteracting mechanisms spread of communicable diseases due to overcrowding, low real wages and insufficient calories per capita due to the limited amount of available agricultural land which led to high mortality in the Old World. With low mortality but stage 1 birth rates, the United States necessarily experienced exponential population growth from less than 4 million people in , to 23 million in , to 76 million in The only area where this pattern did not hold was the American South. High prevalence of deadly endemic diseases such as malaria kept mortality as high as 45â€"50 per residents per year in 18th century North Carolina. In New Orleans , mortality remained so high mainly due to yellow fever that the city was characterized as the "death capital of the United States" â€" at the level of 50 per population or higher â€" well into the second half of the 19th century. Specifically, birth rates stand at 14 per per year and death rates at 8 per per year. It must be remembered that the DTM is only a model and cannot necessarily predict the future. It does however give an indication of what the future birth and death rates may be for an underdeveloped country, together with the total population size. Most particularly, of course, the DTM makes no comment on change in population due to migration. It is not applicable for high levels of development, as it has been shown that after a HDI of 0. Some trends in waterborne bacterial infant mortality are also disturbing in countries like Malawi , Sudan and Nigeria ; for example, progress in the DTM clearly arrested and reversed between and In recent decades more work has been done on developing the social mechanisms behind it. Nevertheless, demographers maintain that there is no historical evidence for society-wide fertility rates rising significantly after high mortality events. Notably, some historic populations have taken many years to replace lives after events such as the Black Death. Some have claimed that DTM does not explain the early fertility declines in much of Asia in the second half of the 20th century or the delays in fertility decline in parts of the Middle East. Nevertheless, the demographer John C Caldwell has suggested that the reason for the rapid decline in fertility in some developing countries compared to Western Europe, the United States, Canada, Australia and New Zealand is mainly due to government programs and a massive investment in education both by governments and parents. Combined with the sexual revolution and the increased role of women in society and the workforce the resulting changes have profoundly affected the demographics of industrialized countries resulting in a sub-replacement fertility level. Motivations have changed from traditional and economic ones to those of self-realization.

7: Modern Theory of Evolution

theory of population growth In pre-modern societies, birth rates were very high by the standards of industrialized world today. Nonetheless, population growth quite was low until the 18 th century because there was a rough overall.

So main theories of evolution are: I Lamarckism or Theory of Inheritance of Acquired characters. This theory is based on the comparison between the contemporary species of his time to fossil records. His theory is based on the inheritance of acquired characters which are defined as the changes variations developed in the body of an organism from normal characters, in response to the changes in environment, or in the functioning use and disuse of organs, in their own life time, to fulfill their new needs. Thus Lamarck stressed on adaptation as means of evolutionary modification. Lamarckism is based on following four postulates: Every living organism is found in some kind of environment. The changes in the environmental factors like light, temperature, medium, food, air etc. To fulfill these new needs, the living organisms have to exert special efforts like the changes in habits or behaviour. Use and disuse of organs: The new habits involve the greater use of certain organs to meet new needs, and the disuse or lesser use of certain other organs which are of no use in new conditions. This use and disuse of organs greatly affect the form, structure and functioning of the organs. Continuous and extra use of organs make them more efficient while the continued disuse of some other organs lead to their degeneration and ultimate disappearance. Inheritance of acquired characters: Lamarck believed that acquired characters are inheritable and are transmitted to the offsprings so that these are born fit to face the changed environmental conditions and the chances of their survival are increased. Lamarck believed that in every generation, new characters are acquired and transmitted to next generation, so that new characters accumulate generation after generation. After a number of generations, a new species is formed. So according to Lamarck, an existing individual is the sum total of the characters acquired by a number of previous generations and the speciation is a gradual process. Summary of four postulates of Lamarckism: Living organisms or their component parts tend to increase in size. Production of new organ is resulted from a new need. Continued use of an organ makes it more developed, while disuse of an organ results in degeneration. Acquired characters or modifications developed by individuals during their own lifetime are inheritable and accumulate over a period of time resulting a new species. Evidences in favour of Lamarckism: Phylogenetic studies of horse, elephant and other animals show that all these increase in their evolution from simple to complex forms. Development of present day long-necked and long fore-necked giraffe from deer-like ancestor by the gradual elongation of neck and forelimbs in response to deficiency of food on the barren ground in dry deserts of Africa. These body parts were elongated so as to eat the leaves on the tree branches. This is an example of effect of extra use and elongation of certain organs. Development of present day limbless snakes with long slender body from the limbed ancestors due to continued disuse of limbs and stretching of their body to suit their creeping mode of locomotion and fossorial mode of living out of fear of larger and more powerful mammals. It is an example of disuse and degeneration of certain organs. Development of aquatic birds like ducks, geese etc. These changes were induced due to deficiency of food on land and severe competition. It is an example of both extra use skin between the toes and disuse wings of organs. Development of flightless birds like ostrich from flying ancestors due to continued disuse of wings as these were found in well protected areas with plenty of food. The ancestors of modem horse Equus caballus used to live in the areas with soft ground and were short legged with more number of functional digits e. These gradually took to live in areas with dry ground. This change in habit was accompanied by increase in length of legs and decrease in functional digits for fast running over hard ground. This theory states that environmental factors do affect only somatic cells and not the germ cells. As the link between the generations is only through the germ cells and the somatic cells are not transmitted to the next generation so the acquired characters must be lost with the death of an organism so these should have no role in evolution. Weismann mutilated the tails of mice for about 22 generations and allowed them to breed, but tailless mice were never born. Pavlov, a Russian physiologist, trained mice to come for food on hearing a bell. He reported that this training is not inherited and was necessary in every generation. Similarly, boring of pinna of external ear and nose in Indian women; tight waist, of European ladies circumcising removal of prepuce in certain people; small sized feet of Chinese women etc are not transmitted from one generation to another generator. Eyes which are being used continuously and constantly develop defects instead of being improved. Similarly, heart size does not increase generation after generation though it is used continuously. Presence of weak muscles in the son of a wrestler was also not explained by Lamarck. Finally, there are a number of examples in which there is reduction in the size of organs e. So, Lamarckism was rejected. It was first comprehensive theory of biological evolution. It stressed on adaptation to the environment as a primary product of evolution. Long forgotten Lamarckism has been revived as Neo-Lamarckism, in the light of recent findings in the field of genetics which confirm that environment does affect the form, structure; colour, size etc. Main scientists who contributed in the evolution of Neo-Lamarckism are: French Giard, American Cope, T. Term neo-Lamarckism was coined by Alphaeus S. Germ cells may be formed from the somatic cells indicating similar nature of chromosomes and gene make up in two cell lines e. Effect of environment on germ cells through the somatic cells e. Heslop Harrison found that a pale variety of moth, Selenia bilunaria, when fed on manganese coated food, a true breeding melanic variety of moth is produced. Effect of environment directly on germ cells. Tower exposed the young ones of some potato beetles to temperature fluctuation and found that though beetles remained unaffected with no somatic change but next generation had marked changes in body colouration. Muller confirmed the mutagenic role of X-rays on Drosophila while C. Darwinism Theory of Natural Selection: He collected the observations on animal distribution and the relationship between living and extinct animals. He found that existing living forms share similarities to varying degrees not only among themselves but also with the life forms that existed millions of years ago, some of which have become extinct. He stated that every population has built in variations in their characters. So it is also called Darwin-Wallace theory. It was published on 24th Nov. In this theory, Charles Darwin proposed the concept of natural selection as the mechanism of evolution. Main postulates of Darwinism are: Limited food and space. Natural selection or Survival of the fittest. Inheritance of useful variations. According to Darwinism, the populations tend to multiply geometrically and the reproductive powers of living organisms biotic potential are much more than required to maintain their number e. At this rate, a Paramecium can produce a clone of about million Paramecia in just one month and in five years, can produce Paramecia having mass equal to 10, times than the size of the earth. Other rapidly multiplying organisms are: Cod one million eggs per year ; Oyster million eggs in one spawning ; Ascaris 70, 00, eggs in 24 hours ; housefly eggs in one laying and laying eggs six times in a summer season ; a rabbit produces 6 young ones in a litter and four litters in a year and young ones start breeding at the age of six months. Similarly, the plants also reproduce very rapidly e. Even slow breeding organisms reproduce at a rate which is much higher than required e. At this rate, if all elephants survive then a single pair of elephants can produce about 19 million elephants in years. These examples confirm that every species can increase manifold within a few generations and occupy all the available space on the earth, provided all survive and repeat the process. So the number of a species will be much more than can be supported on the earth. Limited food and space: Darwinism states that though a population tends to increase geometrically, the food increases only arithmetically. So two main limiting factors on the tremendous increase of a population are: These do not allow a population to grow indefinitely which are nearly stable in size except for seasonal fluctuation. Due to rapid multiplication of populations but limited food and space, there starts an everlasting competition between individuals having similar requirements. In this competition, every living organism desires to have an upper hand over others. This competition between living organisms for the basic needs of life like food, space, mate etc. Between the members of same species e. Between the members of different species e. Between living organisms and adverse environmental factors like heat, cold, drought, flood, earthquakes, light etc. Out of these three forms of struggle, the intraspecific struggle is the strongest type of struggle as the needs of the individuals of same species are most similar e. Similarly, cannabilism is another example of intraspecific competition as in this; individuals eat upon the members of same species. In this death and life struggle, the majority of individuals die before reaching the sexual maturity and only a few individuals survive and reach the reproductive stage. So struggle for existence acts as an effective check on an ever-increasing population of each species. Variation is the law of nature. According to this law of nature, no two individuals except identical monozygotic twins are identical. This everlasting competition among the organisms has compelled them to change according to the conditions to utilize the natural resources and can survive successfully. Darwin stated that the variations are generally of two typesâ€”continuous variations or fluctuations and discontinuous variations. On the basis of their effect on the survival chances of living organisms, the variations may be neutral, harmful and useful.

MODERN THEORY OF POPULATION pdf

8: Modern Theory of Population: The Optimum Theory (Explained With Diagram)

There were several key players involved in the Modern Synthesis. The theory relied on the population genetics work of R. A. Fisher and Sewall Wright. Theodosius Dobzhansky made extensive studies of natural populations of the fruitfly Drosophila that supported many aspects of the theory.

Modern Synthesis The Modern Synthesis describes the fusion merger of Mendelian genetics with Darwinian evolution that resulted in a unified theory of evolution. It is sometimes referred to as the Neo-Darwinian theory. The Modern Synthesis was developed by a number of now-legendary evolutionary biologists in the s and s. The Modern Synthesis introduced several changes in how evolution and evolutionary processes were conceived. It proposed a new definition of evolution as "changes in allele frequencies within populations , " thus emphasizing the genetic basis of evolution. Alleles are alternate forms of the same gene, characterized by differences in DNA sequence that result in the construction of proteins that differ in amino acid composition. Four forces of evolution were identified as contributing to changes in allele frequencies. These are random genetic drift, gene flow, mutation pressure, and natural selection. Of these, natural selection â€”by which the best-adapted organisms have the highest survival rateâ€"is the only evolutionary force that makes organisms better adapted to their environments. Genetic drift describes random changes in allele frequencies in a population. It is particularly powerful in small populations. Gene flow describes allele frequency changes due to the immigration and emigration of individuals from a population. Mutation is a weak evolutionary force but is crucial because all genetic variation arises originally from mutation, alterations in the DNA sequences resulting from errors during replication or other factors. The Modern Synthesis recognized that the majority of mutations are deleterious have a harmful effect , and that mutations that are advantageous usually have a small phenotypic effect. Advantageous mutations may be incorporated into the population through the process of natural selection. Changes in species therefore occur gradually through the accumulation of small changes. The large differences that are observed between species involve gradual change over extensive time periods. Speciation the formation of new species results from the evolution of reproductive isolation, often during a period of allopatry , in which two populations are isolated from one another. There are several differences between the Modern Synthesis and the older Darwinian conception of evolution. First, mechanisms of evolution other than natural selection are recognized as playing important roles. Second, the Modern Synthesis succeeds in explaining the persistence of genetic variation, a problem that Charles Darwin struggled with. As Darwin correctly recognized, blending inheritance would result in the rapid end of genetic variation within a population, giving natural selection no material to work with. There were several key players involved in the Modern Synthesis. The theory relied on the population genetics work of R. Fisher and Sewall Wright. Theodosius Dobzhansky made extensive studies of natural populations of the fruitfly Drosophila that supported many aspects of the theory. Ernst Mayr developed the biological species concept and created models concerning how speciation occurs. George Gaylord Simpson helped integrate paleontological observations into the theory behind the Modern Synthesis. Ledyard Stebbins contributed tenets principles based on his botanical work. Since the s it has been recognized that the Modern Synthesis omits some biological disciplines that are also relevant to evolution. In particular, much attention has focused on patterns of ontogeny and development. Jennifer Yeh Futuyma, Douglas J. Evolutionary Biology, 3rd ed. Harper and Brothers, Systematics and the Origin of Species from the Viewpoint of a Zoologist. Columbia University Press, Tempo and Mode in Evolution. Cite this article Pick a style below, and copy the text for your bibliography.

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9: Population Genetics (Stanford Encyclopedia of Philosophy)

Another important small population effect is known as the founder principle or founder effect. This occurs when a small amount of people have many descendants surviving after a number of generations. This occurs when a small amount of people have many descendants surviving after a number of generations.

What is the Demographic Transition Model? All 6thth graders worldwide are eligible. Videos are being accepted now and the deadline for students to submit is February 28, This is post 1 of 6 in a series about the Demographic Transition Model â€" a fundamental concept in population education, which is covered in Social Studies courses, most notably AP Human Geography. Beginning in the late s, something remarkable happened: With new technologies in agriculture and production, and advancements in health and sanitation, a greater number of people lived through their adolescent years, increasing the average life expectancy and creating a new trajectory for population growth. This sudden change created a shift in understanding the correlation between birth and death rates, which up to that point had both been relatively equal, regardless of location. Over the past years, population demographics have continued to evolve as a result of the relationship between the birth and death rates within a country. The observation and documentation of this global phenomenon has produced a model, the Demographic Transition Model, which helps explain and make sense of changes in population demographics. Each stage is characterized by a specific relationship between birth rate number of annual births per one thousand people and death rate number of annual deaths per one thousand people. Within the model, a country will progress over time from one stage to the next as certain social and economic forces act upon the birth and death rates. Every country can be placed within the DTM, but not every stage of the model has a country that meets its specific definition. For example, there are currently no countries in Stage 1, nor are there any countries in Stage 5, but the potential is there for movement in the future. What are the stages of the Demographic Transition Model? In Stage 1, which applied to most of the world before the Industrial Revolution, both birth rates and death rates are high. As a result, population size remains fairly constant but can have major swings with events such as wars or pandemics. In Stage 2, the introduction of modern medicine lowers death rates, especially among children, while birth rates remain high; the result is rapid population growth. Many of the least developed countries today are in Stage 2. Population growth continues, but at a lower rate. Most developing countries are in Stage 3. In Stage 4, birth and death rates are both low, stabilizing the population. These countries tend to have stronger economies, higher levels of education, better healthcare, a higher proportion of working women, and a fertility rate hovering around two children per woman. Most developed countries are in Stage 4. A possible Stage 5 would include countries in which fertility rates have fallen significantly below replacement level 2 children and the elderly population is greater than the youthful population. Limitations of the Demographic Transition Model Like any model, there will be outliers and exceptions to the rule and the Demographic Transition Model is no different. Additionally, there are things the DTM cannot reveal: But even so, the relationship between birth rate and death rate is an important concept when discussing population and any patterns, such as those provided by the DTM, that aid in understanding are helpful. Demographic Transition Model Case Studies Over a series of five posts we will explain each stage of the Demographic Transition Model in depth and provide a case study for stages when there is a country that currently fits its parameters.

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