The Red Queen: Sex and the Evolution of Human Nature Study Guide

The Red Queen: Sex and the Evolution of Human Nature by Matt Ridley

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Plot Summary

The Red Queen is an investigation into how sexual selection and the arms race for reproductive advantage between males and females is responsible for many cultural and biological facts that are characteristic of humans. In the book, the author explains both the biology and how that biological facts translate into culture differences. Fashion, beauty, monogamy, intelligence, and many other aspects of human psychology are explained through biological evolution by way of sexual selection.

The Red Queen begins with a defense of the concept of "human nature." The author argues that there is a definitive human nature that we can productively study through the evolutionary method. He then goes on to lay out the concept of the Red Queen and to explain sexual selection. A problem is posed as to how sexual reproduction can ever compete with the seemingly more effective method of asexual reproduction. The solution is found by looking at the effects of parasites and diseases on organisms. A disease that infects an asexual organism will be able to infect all of the clones that are descended from and genetically identical to the original organism. Sexual reproduction causes a reshuffling of the "genetic deck" every generation allowing organisms to avoid debilitation by parasites and diseases. Two genders, rather than hermaphrodites, develop as the result of an arms race and a competition between different kinds of genes. Once the genders have developed, all the pieces are in place for the Red Queen and sexual selection. The rest of the book explains the different human characteristics that are the result of sexual selection.

Next we find an explanation of the importance of sexual selection. Certain traits such as the Peacock's tail, are detrimental to a creature's survival because they alert predators to the presence of the creature but are also nevertheless selected for. The only viable explanation for this lies in the preference of the organism's reproductive partners for those traits. However, both men and women have different reproductive interests. Males prefer to have multiple reproductive partners to maximize the transmission of their genes. Females, on the other hand, must carry the young and raise them. They prefer the quality of reproductive mates to the quantity of reproductive mates. These different interests lead to different preferred social institutions. High status males thus prefer polygamy whereas females prefer monogamy. The result is a system of monogamy characterized by considerable adultery. Women are willing to settle for acceptable husbands while still seeking exceptional reproductive partners on the side. These different interests have led to different propensities in the human mind and different mental specialization between females and males.

In the final chapters, the author uses the edifice of sexual selection and gender differences in psychology to explain various culture norms. The peculiar standards or male and female attractiveness as well as fashion are explained by way of sexual selection. Ultimately, the development of human intelligence itself is explained by way of sexual selection.

Chapter 1

Chapter 1 Summary and Analysis

The Red Queen begins with a discussion of human nature. In the same way that a surgeon who cuts into a human stomach expects all human stomachs to basically be the same, a psychiatrist can expect to find roughly similar traits among people. Although different in particular aspects, their emotions and behavior are considered similar for all people. All humans can be expected to love, envy, hate, and be motivated by similar types of things. Even New Guinea tribes that are cut off from other civilizations for centuries and live as hunter-gatherers, will smile and respond emotionally in similar ways to Westerners. To understand human nature however, we need to understand where and how it comes from. We need to understand the evolution of human nature. Evolution, at least in humans, relies on sexual reproduction. Hence to understand human nature, we will ultimately need to understand the nature of sexual reproduction.

Ever since Charles Darwin in the late 19th century, scientist understood that all life forms are the product of biological evolution. Until recently, that process has not been well understood. Pre-Darwinian thinkers such as Jean-Baptiste Lamarck believed that evolution was a process of individual adaptations that were later passed down to ancestors. The giraffe has a long neck because its neck grew while trying to reach taller and taller leaves on trees. The giraffe then passes his long neck to his children. Similarly, by the same argument, people who have become muscular through weight-lifting should pass their muscles to their children. This theory, though plausible enough, is based on a misunderstanding of the basis of biological evolution or the gene. In fact, it was not until the 1970s that evolution was suitably explained in terms of the gene. In the 1970s, Richard Dawkins argued persuasively that the organism or the individual, is merely a container for genes. Genes seek replication through the actions of the bodies that contain them. Evolutionary theory then becomes a study of the functions of bodies and organisms understood as gene vehicles.

Although human beings share a common nature, they are also individuals. The human genome is like a deck of cards. All humans share the same cards in common but any particular person, like any particular hand of cards will be different in its combination. Through sexual reproduction, we are "dealt" a hand of genes from our parents, who were dealt a different hand by their respective parents and so on, back to the beginning of time. Furthermore, sexual reproduction requires two different sexes, male and female, who are different in many aspects. When scientists are trying to understand "why" human beings are the way they are, they should really ask instead "how" they got to be the way they are. We need to understand the history of an organism, and the twists and turns of its evolutionary story, to understand why it is the way it is.

The history of evolution is the history of a never-ending arms race. Each organism competes with every other to pass down more genes for the next generation. This is similar to the case of the Red Queen from Alice in Wonderland who keeps running but

makes no progress because as she runs, the landscape around her moves at the same pace she does. Progress in evolution or reproductive advantage is not absolute but rather relative to those other organisms that are competing for reproductive advantage. Predators evolve to be fast enough to catch prey while their prey evolve to be fast enough to evade the predators. Due to this evolutionary arms race, traits that increase reproductive success will spread and traits that do not will expire. Not all selection however, is based on reproductive success in terms of survival. Sexual selection is the selection of traits based on how appealing they are to potential mates. Determining the parts of human nature that are products of sexual rather than natural selection is the main project of this book.

Chapter 2

Chapter 2 Summary and Analysis

Chapter 2 begins with a fictional account of a Martian visitor who has been studying humans for several years but has not returned to give his report to his superiors on Mars. After hearing his report on how humans reproduce, the Martian's superior asks him why humans have sex. The Martian scientist responds that no one on earth has any idea why they have sex and not some other form of reproduction. The question of "why sex" and not some other form of reproduction is important for human scientists as well as Martian ones. There are many ways for an organism to reproduce. Many organisms reproduce asexually or in some other way. Why has sexual reproduction based on two and exactly two parents of different sexes become the norm for humans and many other species though?

The question may seem silly, but from the biologist's point of view, sex is expensive in a way that asexual reproduction is not. Species that produce what are effectively clones of them do not need to seek mates or expend resources on sexual reproduction. Asexual reproduction should out compete with sexual reproduction in terms of its evolutionary advantage. Although many organisms do reproduce asexually, many others such as human beings, do not. The author concludes that there must be some advantage to sexual reproduction.

Sexual reproduction primarily involves a recombination and "outcrossing" of genes. In both the male and female, an individual's chromosomes are mixed with those of his father and mother in addition to their grandparents. This set, a mix of genes from one parent, is then paired with a set from the other parent, in what is called outcrossing. The primary outcome and purpose of sexual reproduction is this process of recombination and outcrossing. Scientist want to discover why all of this genetic mixing is better than just cloning one's own genes.

One hypothesis is called the "Vicar of Bray" hypothesis, which is named after a 16th century cleric who switched quickly form Catholic to Protestant and back again depending on the moods of the ruling government. According to this theory, the primary advantage of sexual reproduction is the speed of evolutionary change that it allows. This hypothesis, although compelling, is flawed because it sees evolution as a goal of an organism. Evolutionary change is what organism do to meet certain environmental challenges, although it is not a goal in itself. Hence the argument that the purpose of sexual reproduction is to accelerate evolutionary change must be mistaken.

Later scientists try to show that sexual reproduction gives a competitive advantage over asexual reproduction because sexual reproduction allows individuals to spread their genes with different individuals that are common in larger populations. Organisms that reproduce sexually can thus compete against organisms that evolve asexually. This theory however is also flawed because it fails to understand that organisms compete

against themselves for survival and not with other organisms. For example, gazelles compete against other gazelles by being faster than the cheetah because the slower gazelle is eaten by the cheetah while the faster one gets away. Hence, being fast enables the gazelle to survive and to reproduce, thus spreadings its genes more effectively.

Scientists need to show why sexual reproduction will benefit one member of the same organism versus another. However the perplexing dilemma that arises is that sex seems to benefit the species at the expense of the individual. How does sex end up benefiting the individual in a way that prevents a sexual individual from reproducing less than an asexual and individual member of the same species? Molecular biologists and geneticists have proposed solutions to this question. They argue that sex increases randomness of the genome and "shuffles the cards" in such a way that any errors in the genome or maladaptive changes will not be spread throughout the system. Another way of explaining this is saying that all of the genetics eggs for a species are not in the same basket. These theories do not adequately solve the problem however. We are forced to look to the science of ecology for a solution.

Chapter 3

Chapter 3 Summary and Analysis

Chapter 3 begins with a description of the bdelloid rotifer, a microscopic animal that can live in any kind of water, ranging from the extremely salty Dead Sea to the frozen water of the Antarctic. This organism presents a mystery because it apparently gave up sexual reproduction around 40 million years ago. Why? The question remains unanswered. In the previous chapter, George Williams argues that sexual reproduction in the 1906s requires individual organism to forget about their own reproductive success for the benefit of the species. However, we also see that group selection models are not satisfactory explanations of the importance of sexual reproduction. To explain sex, scientists need to find a reason for an individual organism to prefer sexual over asexual reproduction. They need to find a reason that sexual reproduction will benefit an individual organism's genes over another competitor of the same species.

One explanation that Williams proposes is the "lottery theory." The idea here is that asexual reproduction is like having a bunch of lottery tickets but all with the same number, while sexual reproduction is like having a lot of lottery tickets with different numbers. Asexual reproduction produces a large number of "average" offspring while sexual reproduction allows for the creation of a small number of very exceptional offspring. This theory makes sense if the "prize" for winning the genetic lottery is huge. Otherwise, asexual competitors will beat out the sexual reproducers. This theory also predicts that sexual reproduction should be popular among small creatures in changing environments, but that is exactly the opposite of what we actually find. Another theory developed by Graham Bell is the "tangled bank" theory that argues different organisms in an environment saturated with similar organisms have a greater likelihood of survival. This theory derives its plausibility from the idea that diversity through sexual reproduction allows organisms to stand out. As Williams points out at the time, this theory relies on the fallacy that evolution favors change and progress. However, this is not true. If it is true, then we would be right back at the "Vicar of Bray" theory. The chief competitor to all of these theories is the Red Queen theory.

Developed by Leigh Van Valen, the Red Queen theory states that chances of species extinction are not related to how long a species has existed. Species do not get better at surviving over time. If one species prospers, another competitor species will naturally be harmed. Evolution works by different adaptations that attempt to give one individual a reproductive edge over another. Once an advantage is gained however, the loser will adapt to negate the advantage. A kind of continuous arms race goes on between organisms and their causes of death such as parasites and diseases. Parasites and diseases account for far more deaths than other predators or environmental occurrences. In an attempt to "outwit" these killers, organisms engage in sexual reproduction. When a disease attacks an organism, the organism finds a defense. However, the disease adapts to the defense and the organism finds a new defense. Sexual reproduction is an attempt to keep the parasites and diseases off guard by

creating new variations through each generation. If a virus infects an asexual population of clones, it will quickly wipe them out because they are all the same. On the other hand, organisms that reproduce sexually will pass immunity or defenses down to their descende=ants.

William Hamilton supports this theory with computer simulations. In the simulations, sexual reproducers always lose out in reproductive fecundity to asexual reproducers until parasites are introduced into the simulation. At this point, sexual reproducers thrive better than asexual reproducers. Sex then functions as a defense against diseases and parasites in a never-ending war to avoid the ill effects of those tiny killers. Sex is necessary to avoid parasites but the question remains why sex works the way it does. For example, why are there two distinct sexes such as male and female instead of hermaphroditic or multi-sexed variations? That question is explored in the next chapter.

Chapter 4

Chapter 4 Summary and Analysis

Chapter 4 explains why there are two sexes, male and female, rather than some other number and why the ratio, at least among humans, of male to female is around 1:1. Part of the reason involves logic similar to the familiar notion of a "tragedy of the commons." A tragedy of the commons occurs when what is individually rational leads to outcomes that are collectively irrational. For instance, it would be better for everyone if a certain stretch of ocean is not fished excessively. However, for an individual fisherman, assuming that his neighbors will fish as much as they can, it is in his best interest to get as much fish as he can before there are no more left. If everyone fishes the right amount, the fisherman will not have an incentive to overfish. However, since there is not reason for any individual to believe that his neighbors will fish the correct amount, it is rational to take as much as possible in the short-term. Genes behave the same way and gender seems to be a solution to the problem.

Genes only exist because they are the descendants of some previous gene that is successful in replicating. Genes use different strategies to replicate and those strategies, if successful, are passed down to their descendants. Sex is one strategy of replication. One kind of gene called transposons, nicknamed "outlaw genes," acts like a virus and hijacks chromosomes to spread copies of itself at the expense of other genes. Another similar effect is the exclusion of the sperms cellular material, except its genetic nucleus from the egg. One reason that this occurs is that material from the sperm cell can cause diseases that were once latent to appear and kill the egg. To prevent the destruction that ensues from "outlaw genes" and other problems associated with a genetic "free for all," two genders emerge. These are the female that contains all of the cytoplamsmic genes and the male that contains none. Furthermore, because of the existence of genes that emerge to kill off maleness or femaleness in mutation, hermaphrodites are unstable and cannot compete with males. Hence, two genders emerge in a stable equilibrium.

This theory is not entirely true. Many species will continue to have virgin births or to produce only females in certain situations. Males are not always needed. Species have different ways of determining gender from environmental factors like temperature and decisions made by the mother or in some cases, where species change gender constantly depending on breeding opportunities. There is some evidence that human hormones can affect the gender of children with upper class and high status individuals tending to have more male children while lower status humans tend to have females. However, this research is still in its infancy. Maleness can be a reproductive advantage in polygamous species like monkeys where a male can impregnate multiple females. Whatever the reason, there does seem to be a strong preference for male children over females in many human cultures. In China and India for instance, the sex ratio skews towards the male because males are so prized. Sex-selective abortions are used to abort female fetuses for males. Despite the preference in many cultures for male

children, the Red Queen will eventually reassert herself. If there are too many males, it will pay to be a female. Furthermore, males are good at harming themselves through uneasy violence and status games. While technology may make it even easier to determine the sex of a child, the 1:1 gender ratio is strong as an evolutionary pressure in humans. There is no doubt that whatever we do, an equal division of males and females will eventually reassert itself.

Chapter 5

Chapter 5 Summary and Analysis

Chapter 5 begins with a description of the mating behavior of Australian brush Turkeys. The male of the species spends a great deal of time amassing tons of leaves and other material to make large mounds for the female's eggs. Interestingly, though, the male does not know if he is the father of the eggs and is often not the father. Why then does the male turkey spend so much time making a safe home for eggs that are not his own? The answer lies in the fact that the price he extracts from any female who wants to use his mound is that he be able to mate with her. Female turkeys prefer well-built mounds to mounds of poor construction. Male turkeys that are skilled mound makers will attract more females and hence reproduce more. Here we have a good example at sexual rather than natural selection at work. Mound-building skills are of reproductive benefit rather than for purely survival reasons.

To understand the nature of sexual selection it is important to understand the asymmetry of interests between the sexes. Since one male can typically impregnate many females, males tend to have an interest in finding as many wives and sexual partners as possible. They also want to find sexual partners who will tend to be good mothers. Females, on the other hand, are looking for good genes from a sexual partner as well as characteristics that will make the male a good husband and father. In species where females carry their young for a long time before birth or that requires considerable attention after birth, there is an even higher premium for women to find high quality mates. Males are interested in increasing the number of sexual partners whereas women are interested in increasing the quality of sexual partners. Of course, with any discussion of evolution or sexual selection, it is important to remember that individuals involved may or may not be directly motivated or aware of these motivations. Still these factors are important because individuals that have motivations in line with the environmental and natural incentives will reproduce at a greater rate and pass down their genes more successfully.

In most species, males compete for females and females will often pick which males they are going to mate with based on external factors, such as male beauty. In many species, especially birds like peacocks, females prefer males with ornate and sometimes extravagant ornamentation. Many species of birds and other creatures engage in "lekking" or a kind of sexual market where males congregate in a certain location. Females wander through this area and select the most appealing males to reproduce with. Scientists have developed two theories to explain why females chose one male over another. One theory is called the "Fisher" or "sexy-sons" theory and it claims that females seek out the most attractive males so that the female's children will also be attractive and be able to pass their genes down. The other theory, "good-genes" argues that females seek out attractive males because attractiveness is a good signal that the males also possess good genes. One scientist called Zahavi, argues that male attractiveness signals to the female that since the male is handicapped with extravagant

plumage that can easily be seen by predators for instance, he is better at surviving. Both accounts seem to be right. In situations where it is difficult or costly for females to chose males, females tend to choose males based on ornamentation that signals good genes. Where selection is plentiful, for instance in "lekking" situations, females will tend to choose on attractiveness alone. Of course, both males and females have a incentive to deceive the other sex to promote their own attractiveness. Much of the later chapters will show how sexual selection shapes human society and culture.

Chapter 6

Chapter 6 Summary and Analysis

As we have seen in the previous chapters, evolution ultimately cares more about sexual rather than survival success. Of course, one needs to be alive to reproduce and hence natural selection is a perquisite of sexual selection. A large number of traits arise as a result of the two sexes influencing the evolution of the other by selecting certain characteristics in their reproductive partners. This chapter explores some of the ways that females and the environment have shaped human males.

In the beginning, the author argues against two positions that hold that evolution has no effect on human behavior and culture. The first is that all of human behavior is learned and hence, biological evolution will have little effect on the next generation. The author responds that we are not attracted to one person or another and we do not crave the taste of food because we were taught it. This is part of our nature. The second argument is that human being are flexible and can resist the dictates of their nature. This is true but still our natures derived from biological evolution will constrain and contextualize our choices in important ways.

The question then becomes what are the biological incentives passed down to males. It turns out that the answer to that question depends on facts about the nature of the reproductive process of a specific species. In animals with large asymmetries in size between the male and female such as a Gorilla, males tend to keep large and exclusive harems. The gibbon, on the other hand, is adapted to be more asocial and interested in exclusive fidelity with one partner. The human is a little of both, where human beings are adapted for monogamy with a little bit of adultery included and in some situations, polygamy. Women need men to help raise and provide for their children as well as to protect and provide for the woman during her long gestation period. Women therefore favor men who can command enough resources and power to provide effectively. Men prefer to have as many mates as possible, although it is expensive and difficult to provide for a lot of females.

Polygamy seems to be the natural human situation in most early societies. For females, marriage to a rich man as a third or fourth wife is preferable in most cases to marriage to a poor man as a first wife. Women can thus potentially, benefit from polygamy. As the ubiquitous existence of harems throughout history attest, men have an almost insatiable desire for sex and to increase reproductive potential. Men will thus prefer to have more women rather than less. There is a strong incentive towards polygamy because of these reasons. Almost all tribal societies are polygamous and most major religions either directly advocate polygamy, as in fundamentalist forms of Mormonism and early Judaism. They may also allow this practice in disguised form as in Middle Ages Europe. Polygamy was only stamped out when democracy created a legal system to regulate the institution of marriage. Still, prostitution and adultery are rampant as males attempt to satisfy their insatiable sexual appetites.

Furthermore, as research into tribal societies shows, almost all male-on-male violence is in some way related to a battle for women. In one tribe, two-thirds of the members of the tribe have lost a relative to murder by the age of forty. The tribe also engages in constant warfare with neighboring tribes for the purpose of stealing their women. The Trojan war is also started because of a dispute over a woman. One of the most coveted and key rewards of power throughout most of human history has been a supply of women for the ruler to reproduce with.

Given that polygamy seems natural and that the male sex drive prefers any kind of polyandrous situation to monogamy, why are most modern human societies monogamous? To answer this question it is important to remember that males evolved simultaneously with females who have interests of their own. We look at females interests in the next chapter.

Chapter 7

Chapter 7 Summary and Analysis

In the previous chapter, the author describes how men have an overwhelming desire for multiple reproductive and sexual partners. Men prefer to be polygamists. The question that naturally arises is, why is there so much monogamy? The reasons have to do with Man's competitor in the sexual arms race, i.e. woman. Woman, although preferring polygamy to celibacy, much prefer monogamy. Yet despite a preference for monogamy, many women do engage in adulterous affairs. Why would women who prefer monogamy ever be unfaithful to their male counterparts? The answer lies, as the author suggests, in an analysis of the evolutionary interests of females.

In our primate cousins, infanticide is common. After a male primate finds a female primate to mate with, he will tend to kill the children that she already has. Males do this to reduce genetic competitors that they will have to support and to end female lactation so that the female can begin breeding once again. In chimpanzees who have large social groups, females are extremely promiscuous. Part of the reason for this is presumably to create reproductive "coalitions" with multiple males. If the males are not sure whose child belongs to whom, they will protect all of the children.

Humans on the other hand, are different. The life of a human being can vary in complex social structures, but tend to be monogamous. Furthermore, unlike other primates, humans do not publicly display their fertility. Humans can mate at any time and often, women are not even sure when they are fertile.

Furthermore, male testicles belie a tendency towards sperm competition. Human beings have testicles outside of their bodies, unlike gorillas but similar to chimpanzees. This enables large amounts of sperm to be stored for future use. Male human beings expect to have their sperm compete with the sperm of other males. This suggests widespread adultery in human beings. The female's interest seems to be to find a satisfactory if not ideal husband to reproduce with and to raise her children, while trying to find better reproductive partners on the sly.

Female physiology supports this hypothesis. Sperm retention or the amount of sperm that a woman keeps in her vagina, is related to whether or not and how she has an orgasm. Females are 70 percent more likely to have the right kind of orgasm and to become impregnated when unfaithful. Furthermore, women tend to have affairs at times when they are more fertile. Men on the other hand excrete far more sperm when they suspect their wives are unfaithful or have been absent for a considerable amount of time. All of this suggests that men and women have evolved to be monogamous with a considerable amount of adultery. Some even go so far as to suggest that the development of language is the by-product of a need to gossip by men and women to spread information about who has been unfaithful to whom. It is no surprise then, given

the social interest in the topic, that sex primarily occurs in private. Everyone has an incentive to hide what they are doing.

Anthropologists also find that jealousy is a universal characteristic of humans across different cultures. One strange idea to come out of this analysis is the view that the Catholic church in the Middle Ages may have developed rules to prevent rulers from creating legitimate heirs. The church created tons of rules to prevent sex and divorce among the upper class. This in turn, reduced the amount of breeding that could go on in that class. At that time, the clergy was primarily composed of dispossessed second and third sons of noble families. Is it possible that these rules were devised to prevent legitimate heirs from being born? The conflict between Henry the VIII and the church over divorce may have been a more frequent phenomenon than is commonly thought.

Chapter 8

Chapter 8 Summary and Analysis

Studies on the pine mole show that there are significant differences between the abilities, especially in terms of spatial judgments, between male and female pine moles. Male pine moles are polygamous and live in networks of tunnels underground. The male needs to have a keen ability to remember locations in the tunnels to find and protect his many wives. Given the impact of sexual selection on other cultural and biological processes as well as our polygamous past, is it possible that human beings are similar to pine roles in this regard? The rest of the chapter makes a case that male and female brains are different in significant ways as a result of the effects of sexual selection and the sexual arms race for reproduction between males and females.

This conclusion, that males and females have different minds, is often seen as unequal and discriminatory. It is not entirely clear why this conclusion is made. It seems perfectly acceptable to note that males and females, although mostly similar, are very different in many respects in their physical appearances. Men and women have evolved over millennia in different evolutionary situations. In fact, it strains credulity to think that male and female mind shave not adapted to their different environmental and sexual niches differently. Also, there is considerable evidence that male and female minds are different. Girls, especially at an early age, show a propensity to be better than boys at verbal tasks. Boys, however, tend to be better at mathematics and some kinds of spatial tasks. Boys tend to be better at reasoning abstractly, whereas women excel at reasoning in terms of particulars. Boys are very good at reading maps and in visualizing complex geometrical objects, whereas women excel at remembering and recalling the locations of particular objects and in spotting important objects in a landscape. When given pictures of landscapes cluttered with people and objects, the boys tend to pick out the objects and the girls tend to pick out the people as being significant. When given the choice of toys, even among identical twins, boys tend to prefer objects and machines while girls tend to prefer dolls and things that look like people.

The explanation of these differences is that in the womb, the brain responds exposure by hormones, specifically testosterone. Men need a Y chromosome but in the womb, their brains develop the same as females until they receive a dose of testosterone. If the child misses this testosterone exposure in the womb, the brain remains more feminine. This original physical conditioning is almost impossible to change. Studies have found that on Israeli communes where the participants attempt to redefine gender roles, the original gender of the children eventually reasserts itself into the more commonplace form.

These differences express themselves in different sexual interests as well. Men tend to prefer younger and healthier mates to reproduce with while women prefer wealthier males of higher status. Sexual desires and fantasies are also consistently different. Males fantasize about multiple females and concentrate on the sexual act itself, while

women tend to focus on a smaller number of men to fantasize about and typically the fantasies are less overtly sexual. This difference is reflected in the pornography and romance novel industries respectively. Pornography caters mostly to men while romance novels cater to women. Homosexual men tend to be like heterosexual men and lesbians tend to be more like heterosexual women.

Still, even with the differences between men and women, it is important to remember that the differences hold universally, regardless of race, ethnicity, or culture. Also, the differences are still outweighed by the similarities between men and women. Culture is a powerful force that is influenced by and influences evolution but it is not strong enough to override the effects of sexual and natural selection on the brains and minds of men and women. Men and women behave and perform certain roles in every culture and society from hunter-gatherer societies to modern Western democracies. From this evidence, it seems clear that men and women really do have different minds that are the result of evolution.

Chapter 9

Chapter 9 Summary and Analysis

Chapter 9 begins with a discussion of the, potential genetic basis of homosexuality. There is some evidence that a human being who has a particular gene on the X chromosome may, when it encounters the right kinds of environmental conditions, create a preference for sexual partners of the same sex. Whether or not this account of homosexuality is correct, it raises the question of whether or not and to what extent our reactions to those we find sexually attractive is the product of evolution. Our ideas of attractiveness and our sexual inclinations seem to be widespread, if not universal, and hence appear to be designed by evolution. This should lead us to believe that our notions of beauty, what we find attractive, is not arbitrary, but is rather the result of a long evolutionary process.

Men, for instance, universally prefer younger women and particularly women in their early twenties as the most attractive. Furthermore, men tend to find thinner women more attractive than plumper women. o understand why, it is important to first understand incest norms in human beings. Some people, including Freud, have speculated that there is an inherent tendency towards incest among humans, which is why there needs to be very strong injunctions against incest. Factual evidence however, seems to contradict this assertion. Children that are raised together, whether related or not, are almost never sexually attracted to one another. This suggest that there is a strong built-in aversion to incest, at least to those in the nuclear family unit. Furthermore, incest is most prevalent between fathers and daughters. Fathers, of course, are not raised with their daughters and may not have the aversion that a daughter may have. Cousins are commonly attracted to one another and in some parts of the world cousin marriage is common. There is evidence to suggest that places where anti-cousin marriage norms are strong, there is a concentration of wealth by land. This concentration is often made worse when land is kept in the family by intermarriage by cousins. Hence cousin marriage is strongly opposed. This suggests that injunctions against cousin marriage may be more about power and wealth than genetic problems.

All of this suggests that sexual aversion to one's close family is "imprinted" during an important period in youth. Similarly, some have suggested that beauty is also imprinted in this way. Women that are thin are considerably more attractive to most men, but this attractiveness is strange given that thin women are less attractive, from a genetic point of view, as mothers. Low body fat imperils pregnant woman and small hips make childbirth dangerous. Some have suggested that being thin is a status symbol in modern women. Since food is so cheap and readily available, it is difficult to be thin and a woman that remains thin shows her wealth and status accordingly. This is unconvincing however. There is no reason that men should prefer higher status to more fertile women. New research however shows that it is not the slenderness of a woman that men are attracted to, but rather the waist to hip ratio of women. Thin waists give the illusion of a more exaggerated hip to waist ratio and hence, being thin as a beauty norm

most likely evolved via sexual selection between women for men. Another theory is that being thin as well as many other markers of female beauty are related to youth. Men prefer younger rather than older mates for breeding. There is evidence for this. However it is most likely a combination of youth, fertility, and facial symmetry that men find attractive.

Female find taller as well as more intelligent and wittier men more attractive. It is clear that women are seeking high status men and men that have the ability to rise in the status hierarchy, hence they are selecting skills that correlate with status. Whatever the sign of beauty or fashion, it is clear that the Red Queen is at work. Attractiveness, like thinness is a kind of arms race or treadmill. The faster one goes the faster others go as well.

Chapter 10

Chapter 10 Summary and Analysis

The question of this chapter is, "why did humans develop intelligence?" Several common hypotheses are suggested and sexual selection is finally posited as a solution. On common suggestion is that humans need their intelligence for learning. Animals have instincts that prepare them for familiar situations but which do not allow them to learn new information easily. Human minds easily acquire new information, which is an advantage. New evidence suggests, however, that much of human learning is developed through instincts. Chomsky has suggested the idea that language acquisition is party the result of an innate or genetically acquired ability to learn grammar. Modern psychology and linguistics supports this claim. Our ability to distinguish easily between objects and to see certain objects as whole also looks to be partially that result of genetics. Our instincts require certain environmental factors to work. Children that do not hear language early will lose their ability to learn language at all. Still, it is clear that much of our language and other aspects of our intelligence is the product of our genetic inheritance.

This leads to a further point about nature and nurture, namely that they need not be opposites but rather complementary. Genes provide the basis for the limits and the capabilities of humans. Nurturing or exposure to the environment will provide the actual context of those capabilities. Genes provide the ability to learn language. For example, being raised in an English-speaking rather than a French-speaking home determines whether we speak English or French. Still, social science rebels against the idea that nature and nurture can work together. The work of Cosmides and Tooby among others has been changing this. They argue that the mind is made up of many different "modules" that have evolved over time such as "fear snakes" and various cheater detection mechanisms. Humans living in groups need to be able to tell when one group member is cheating or breaking the rules. This could involve stealing, adultery, or something more minor. Human society and intelligence is built around gossip, which is the transmission of information about other people, especially their propensities to cheat. Some argue that larger brains evolved as a mechanism to deal with cheater detection. Of course, as we know from the Red Queen, once cheater detection improves, cheaters will improve. This will therefore lead to an arms race in intelligence. Humans are apparently natural psychologists who are able to predict and read the intentions of other people fairly easily. This hypothesis develops into the "Machiavellian" hypothesis where humans need greater and greater intelligence to overtake and to scheme better than their neighbors and rivals. Tests suggest that humans are much better at picking out cheaters in a social context than performing the same logical task in a non-social context. This suggests that their mental processes are developed to pick out cheaters.

Another theory is that women just prefer more intelligent men. One reason may be that intelligence is correlated with neotony or the tendency that humans share with most

dogs to look more like children later into life. Since men prefer younger-looking women, the neotony gene is selected as well as the intelligence gene. Women may just prefer intelligent men however because they are less boring. Apes and humans prefer to be entertained rather than bored and intelligence may have accomplished that goal. None of these explanations can be the whole story but all suggest plausible explanations of human intelligence.

In the Epilogue titled "The Self-Domesticated Ape," the author here concedes that the study of human nature via evolution is still at an early and incomplete stage. He argues that the progress of science is in error however. Science advances by sticking a theoretical neck out only to have it chopped off, in his opinion. Much of what has been advanced as the product and process of the Red Queen is proven to be incorrect, but in disproving one theory, we necessarily provide evidence for a competitor. Through trial and error, we will eventually get closer and closer to the truth.

Characters

Red Queen

The Red Queen is an allusion to a character in Alice In Wonderland. In the story, Alice comes upon a queen running along who implores Alice to run fast. Despite how fast Alice runs, she stays in the same place however because the landscape moves at the same pace that she is. The metaphor is meant to suggest a kind of treadmill where no matter how fast one runs, they stay in the same place.

The application to biology and evolution suggests an arms race between organisms of a given species for reproductive advantage. The effect is a kind of co-evolution whereby if one gains an advantage, it is eventually compensated through the advantages possessed by reproductive foes. One example of this is apparent in the co-evolution of disease and host. The host's immune system develops defenses against a disease, which forces the disease, through evolutionary pressures, to develop new methods of attacking the host in a never-ending battle to assert supremacy. Sexual selection in many species, including human beings, is postulated to be a kind of Red Queen process. Females evolve to get a certain reproductive advantage, which forces male to develop a corresponding advantage and so on. While this kind of competition may appear futile, it is ultimately a kind of internal motivation and mechanism for mutual co-evolution between competitors. This is a useful addition to evolutionary theory because it allows us to better understand seemingly inexplicable facts of evolution such as human evolution.

Charles Darwin

Charles Darwin was an English scientist and writer who fully developed a theory of evolution by natural selection in his book called The Origin of the Species published in 1859. Some of his predecessors including his grandfather Erasmus Darwin and even thinkers as far back as some pre-Socratic Greek philosophers had suggested the idea of evolution, it was not until Darwin developed the idea of natural selection over long periods of time that a plausible explanation of the process of evolution was articulated.

Darwin developed his idea on a voyage as a ship naturalist on the Beagle and its trip to the Galapagos Islands. Natural selection argues that traits are passed down because the holders of those traits are able to survive. Through this "survival of the fittest," traits more conducive to the survival of the species in natural environments would be passed down over time. Darwin also proposed another engine of evolution that he worked out less completely than natural selection, namely sexual selection. Sexual selection involves traits being passed down because they contribute to reproductive advantage instead of survival value. In fact some traits like the peacock's ostentatious tail, which are selected through sexual selection, may actually be detrimental to survival. Now it is

well known that sexual selection is extremely important and has a huge effect on which traits ultimately are passed down.

Richard Dawkins

This individual is the evolutionary theorist responsible for the incredible influential "Selfish Gene" theory that puts the focus of evolution of the transmission of genes between generations.

John Maynard Smith

This individual was an evolutionary theorist instrumental in bringing mathematical approaches such as game theory to evolutionary biology. This person is a key developer of the evolutionary game theory.

Jean-Bapiste Lamark

This individual was a predecessor of Darwin who argued that traits that develop in an individual are passed down to the next generation. For instance, a giraffe develops a long neck by extending his neck to eat leaves on high branches. This trait of an elongated neck passes down to his descendants.

Stephen Jay Gould

This individual was a paleontologist influential in evolutionary theory. He opposed nature-based approaches to human sciences and developed the theory of Spandrels.

Bill Hamilton

A British evolutionary theorist, this individual was an early developer and advocate of the Red Queen theory in relation to a parasite theory of sexual reproduction.

George Williams

This individual is an American evolutionary theorist that was a critic of group selection models. This theorist argued that sexual reproduction was a process whereby the species benefited, although the individual did not necessarily benefit.

Robert Trivers

An American evolutionary theorist, this individual developed a theory of sex ratios based on hormone levels that argued that status could have a large effect on sex ratios.

Leda Cosmides

This individual is an American evolutionary psychologist credited along with John Tooby for developing the field of evolutionary psychology. This psychologist argues that the human mind is "massively modular" and made up of modules that are selected for based on reproductive and survival success.

John Tooby

American evolutionary psychologist and husband of Leda Cosmides, this individual advocates a theory whereby much of human intelligence Is the result of "cheater detection" modules that are selected for their greater reproductive benefits.

Objects/Places

Gene

A gene is a portion of human DNA that can be isolated as an individual instruction in the human genome. It is the portion of DNA that is passed down to descendants in reproduction.

DNA

DNA is a collection of nucleic acids that act as a kind of recipe for the creation of cells and cell structures. It is the basic unit of life, providing the instructions for the creation of an organism that is passed down through genes in reproduction.

Chromosome

A coil of DNA that contains many genes, a chromosome is also known as a "vector" of heredity since it is the unique organization of genes on chromosomes that are passed down through sexual reproduction.

genome

This provides complete genetic information of a particular organism, consisting of chromosomes and genes.

Meiosis

This process is a kind of asexual reproduction where the cell splits in half.

Asexual Reproduction

This process involves one organism "cloning" itself without requiring another organism to reproduce.

Spandrel

Spandrels, also known as exogamy, is a trait that has developed as the side effect of another trait but is useful in its own right.

Pseudogamy

This is the process whereby a sperm cell impregnates an egg cell, but no genetic information from the sperm cell is transmitted to the egg.

Automixis

This process is the formation of a diploid nucleus in asexual reproduction without the division of the nucleus itself.

Mutation

This is a mistake in DNA replication that can lead to the creation of a new trait.

Hermaphrodite

This is an organism that has components of both female and male traits.

Gamete

This is a reproductive cell that combines with another gamete to form the basis of a new organism.

Tragedy of the commons

This is a situation whereby individuals acting rationally in their own self-interest will ultimately undermine their welfare by the excessive consumption of a collective resource.

lekking

This is a gathering or marketplace of males for mating purposes where females will examine a collection of males in order to select the best mating specimen.

Polyandry

This is a situation where people have a variety of mates over long periods of time.

Themes

Nature versus Nurture

Since Rousseau, a debate has raged in social sciences over whether human nature is the product of heredity, nature, or nurture. After Charles Darwin's theories grew popular, it became accepted that nature was responsible for many human traits. The crimes of eugenicist and racists who used pseudo-biology in pursuit of their fascist aims provoked a backlash in the late 20th century. Scholars taking a cue from Durkheim and Marx, argued that almost nothing was the result of nature and that there were no real biologically-based differences between persons. It grew apparent that these scholars were intent on advocating egalitarianism through their work. Hence it was absolutely necessary that humans being not be different biologically. Biological equality was considered the basis oft political and economic equality. Although this approach only partially concurs with facts, several developments eventually completely undermined this approach. Examples include the cognitive revolution in psychology and linguistics as well as the development of "sociobiology" and the use of game theory in the social sciences and biology.

The Red Queen hypothesis holds that most human traits are the product of natural and sexual selection. Hence these traits are the product of nature rather than nurture. This approach does not completely rule out the importance of nurture though. For example, in the case of language, it is nurture that is necessary to develop the capacities that are possible because of nature. In this way, nature and nurture are complementary.

The Battle of the Sexes

According to the Red Queen hypothesis, many important human traits are the result of sexual selection. Sexual selection is the selection of traits because of their reproductive advantage. In a species like human beings, where the males compete for females, women have a huge control over which genes are selected for the next generation. If females prefer taller over shorter men, taller men will be more successful in reproduction and hence the trait for tallness will tend to be passed down. Males compete with other males for female approval and for reproductive advantage. Human males have developed "kamikaze" sperm that has no other purpose than to kill or immobilize the sperm of other males that may be competing with it inside the female. Similarly, females compete with each other for reproductive advantage. Males prefer women that have wide hips to aid in birthing and hence women have developed a tendency to make their hips appear bigger by creating an hourglass shape. They also have developed a trait to add fat to their breasts and hips to make them look bigger. This is a kind of deception however as fatter breasts do not have more milk-producing capacity. The male is fooled however and most males tends to prefer larger breasts. This is an example of Red Queen style co-evolution where one party, in this case the female, will develop a trait to gain an advantage over other women and also to deceive

the men into thinking they are better reproductive partners than they actually are. In sexual selection, this kind of battle between the sexes for advantage will be common.

Evolution as Explanation

Evolution is a scientific theory that explains the development of species and organisms over time. The key component of the theory of evolution is the understanding of the function of the gene and the methods that lead to gene replication. Evolution then is a scientific theory but also a powerful general method of explanation. Since we know that evolution is the only workable explanation for the development of organisms and traits, it is useful and warranted to presume that for any given trait, there is an evolutionary explanation or a biological history that explains the existence of the trait. This may not always be true. However, as an explanatory presumption, the idea is that evolution of some sort or other is the proper method of explanation unless it is proven otherwise.

This method, as we have already seen, rubs some people the wrong way. One reason is that the method seems to lack an appreciation for what many claim is most importantly human such as our free will and culture. This is mistaken, however. As the author argues, the existence of free will is a fact that must be explained by evolution and not something that evolution discredits. This argument also holds for cultural practices. As this book shows, the evolutionary method of explanation is extremely powerful and can provide compelling and interesting explanations for phenomena that previously could not be explained. It may not always be correct, but when it can provide explanations where other approaches cannot, it is preferable.

Style

Perspective

The perspective of The Red Queen is akin to an interested and intelligent layman who wants to understand and explain how important developments in evolutionary theory relate to common human practices. The author advocates a thesis called the Red Queen thesis in sexual selection as a method for understanding human nature. He presents opposing viewpoints but it is clear that the author is a partisan of the Red Queen. The author also clearly favors using the evolutionary method broadly in the social sciences.

Although he believes that nature and nurture work together, it is clear that he believes social science has, over the last 100 years, unnecessarily and unjustly favored explanation that is based on nurture and culture over ones based on nature and evolution. Part of the book presents a case for changing that approach. The author does a good job of making his case for nature over nurture and also of explaining the nature of the debate between the two camps. He is clearly an advocate of the evolutionary approach but takes pains to make sure he does not present the other side without validation. Science writing of this kind can always be challening but the author does a good job of balancing his approach and explaining his own position well. No reader can walk away form this book and claim that the author ignored valid arguments by his opponents. Some might even be swayed by his argument.

Tone

The tone of the book is somewhat casual, which is a surprise given the subject matter of the book. There is a danger in writing about science that the author will either make the work too technical and dull, filled with scientific detail or he will dumb down the material so much that it will lose its force.The author here avoids both extremes and keeps the book technically strong as well as easy to reach and conversational in tone. The text is copiously footnoted so if the reader is interested in following a particular thread to greater lengths, they can easily do so. The author does a good job translating complex scientific and mathematical concepts into everyday language. Nonetheless, a reader with very little science background may have some problems fully understanding the material, especially in the early chapters. There is a sense, given the author's conversational tone and the scientific subject matter that the author is glossing over important distinctions, although how much of this is going on is unclear. In certain places, the author is perhaps too quick in presenting a certain argument. A more deliberate and methodical tone would have helped in those places. Overall however, the author accomplishes creating a science book that does not sacrifice technical merit for clarity of presentation. This is a feat attempted by many but accomplished by only a few. Furthermore, the book is fun to read and engaging. The author has a clear sense of whimsy and of humor, which is a welcome addition in a book like this.

Structure

The structure of this book is one of the few places that could use clear improvement. As already mentioned, the tone and exposition of the book clearly communicates complex scientific ideas. If the structure was more clearly defined, the presentation would improve. Each chapter is arranged along a theme and those themes and concepts steadily build to make a strong overarching case. Within each chapter, the argument meanders rather than developing and stalls at points. Each chapter starts with an example and many examples are used throughout but it is not always where the main thrust of the argument lies. Some argumentative threads and examples seemingly go nowhere, whereas other important parts of the argument seem unsupported. One gets the sense that the author had so much to say and so many interesting cases to describe that that he put too much in without organizing the material particularly well. The reader may find themselves trying to retrace the thread of the argument or not remembering the point of the chapter midway through. Paradoxically, this strange organization makes the book highly readable because it is full of interesting cases and examples. However, the incoherent structure can be hard to follow logically. Some concentration on clear argumentative and narrative structure would have made the book a lot stronger. Part of the problem may also be that the book does not have a clearly defined argument. An open-ended investigation of an idea is an acceptable method but one that is somewhat unsatisfying.

Quotes

"Evolution is a treadmill, not a ladder" (Chapter 2, pg. 27.)

"Evolving is not a goal but a means to solving a problem" (Chapter 2, pg. 31.)

"It is stasis, not change, that is the hallmark of evolution" (Chapter 3, pg. 63.)

"The struggle for existence never gets easier" (Chapter 3, pg. 64.)

"When one gender is being choosey, all the consequences of sexual selection flow" (Chapter 5, pg. 169.)

"Evolution is more about reproduction of the fittest than survival of the fittest" (Chapter 6, pg. 174.)

"About three-quarters of all tribal cultures are polygamous" (Chapter 6, pg. 177.)

"Mankind is a polygamist and a monogamist, depending on the circumstances" (Chapter 6, pg.177.)

"Gossip was rife and a husband's best chance of deterring his wife's affairs was to let her know that he kept abreast of her affairs" (Chapter 7, pg. 229.)

"With concealed ovulation came continual sexual interest" (Chapter 7, pg. 230.)

"Difference is not inequality" (Chapter 8, pg. 249.)

"Gossip is one of the most universal human of human habits." (Chapter 10, pg. 332.)

Topics for Discussion

What is the difference between sexual and natural selection?

What is the best explanation for the popularity of sexual reproduction among species versus asexual reproduction?

Explain why humans are primarily monogamous instead of polygamous.

Explain the "Selfish gene" hypothesis.

What are the benefits of an evolutionary explanation of culture? What are the drawbacks?

Does it change your impression of attraction and beauty to learn that it is the result of sexual selection?

Does evolution have a goal?