Incognito: The Secret Lives of the Brain Study Guide

Incognito: The Secret Lives of the Brain by David Eagleman

BOOKRAGS

Contents

Plot Summary

In Incognito, David Eagleman, a neuroscientist, presents his argument that the American criminal justice system should integrate current research in brain science into sentencing guidelines. Assigning blame for criminal acts is complicated by the fact that our actions are dictated to a great extent by our unconscious minds, Eagleman claims. He proposes that rather than sentencing criminals based on how culpable they appear to a judge or jury, sentencing should be based on a person's potential for reforming their behavior based on neurological factors.

The conscious mind represents only a small part of our brain activity and function, Eagleman argues, and he presents the results of a large number of experiments and studies that support his assertion. Many of these experiments illustrate what happens to a person's perception or behavior when the brain is altered, either by damage or drugs. These changes in the brain sometimes result in a person acting contrary to their previous personality, revealing, Eagleman claims, that who we "are" is largely a function of unconscious processes of our minds.

Eagleman proposes a model of the brain he calls a "team of rivals." In this model, the brain is really several separate functions that sometimes incline toward opposing behaviors. Eagleman gives as an example a person's possible reaction when offered a sweet dessert. The person may have conflicting impulses to eat the dessert and to avoid eating the dessert because of health concerns. These competing impulses come from the unconscious mind, he argues, and our conscious mind acts as a kind of chief executive that makes the ultimate decision on whether to eat the dessert or not.

The conscious mind can be affected by many factors, however, Eagleman explains, and he provides several examples to support this. Our senses can be affected in many ways, altering our perception of reality. There is evidence that we do not always understand our own motivations, and that we are not capable of consciously knowing where they come from even though we think we may.

The American criminal justice system uses motivation as part of its criteria for punishment, Eagleman explains. A person who kills another to steal their money is deemed more "blameworthy" than someone who kills another while sleepwalking. Eagleman proposes that the actions of both such people can be better understood through neuroscience and that assigning punishment based on "blame" is not an effective way to prevent a person from committing the same crime again. Instead, he proposes, punishment should be based on a person's ability to be rehabilitated through behavioral or medical treatment according to the neurological reasons for their actions.

Chapter 1 There's Someone In My Head, But It's Not Me

Chapter 1 There's Someone In My Head, But It's Not Me Summary and Analysis

In the opening chapter, Eagleman describes the almost unfathomable complexity of the human brain, which contains hundreds of billions of neurons each of which forms thousands of connections with other neurons. Scientists are continually studying how the brain works, but much of what happens inside the brain is still a mystery, he explains.

This mystery is deepened by the fact that we are limited by our conscious minds from fully understanding what goes on in the unconscious, Eagleman argues. He presents the example of an experiment where men were shown photographs of the faces of several women and asked to rate their attractiveness. Photographs where the women's eyes had been dilated were consistently ranked as more attractive. When asked why they had chosen some women as more attractive than others, the subjects did not mention the dilated eyes as a factor, yet they clearly were. Eagleman adds that dilated pupils in a woman indicate a state of sexual arousal, suggesting that the subjects who found these photos more attractive were acting on a natural impulse of their unconscious minds. More importantly to his argument, however, is that they could not articulate exactly why they found dilated eyes more attractive.

This illustrates the disconnected relationship that Eagleman argues exists between the conscious and unconscious mind. Our conscious minds represent only a small part of the activity of our brains. As evidence, Eagleman refers to the common experience of reacting to something before a person is fully aware of what is happening, such as when a car backs out in front of a driver and the driver has already stepped on the brakes before he fully "sees" the other car. Major league baseball players are able to hit 100-mph fastballs even though they must begin their swing before their brains have had time to visually process the image of the approaching ball.

Fully appreciating the small role of the unconscious means making a giant shift in the way we perceive ourselves, Eagleman claims, similar to the shift in thinking that took place when it was shown the Earth revolved around the sun and not the other way around. We naturally think of our conscious selves as the center of our own small universes, but the conscious mind is really just "revolving" around the unconscious.

Some scientists, such as the psychoanalyst Sigmund Freud, understood this arrangement between the conscious and unconscious mind, Eagleman explains, but advances in neurological science since Freud's time have provided us with greater insight into the mechanical workings of the mind which have illustrated how and to what extent our behavior is dictated by our unconscious selves.

Chapter 2 The Testimony of the Senses: What Is Experience Really Like?

Chapter 2 The Testimony of the Senses: What Is Experience Really Like? Summary and Analysis

Our intuition tells us that we experience the world as it actually exists, Eagleman explains in chapter two. But we are actually unaware of most of what is happening. We can move an arm and be aware that it has moved, but we are unconscious of the flurry of neural impulses that caused the arm to move. Eagleman proposes an analogy that consciousness is like a newspaper, where complicated processes have been compressed into headlines. We read these "headlines" with our conscious minds while remaining unaware of the full "story."

Eagleman first turns to vision. About one-third of the brain is devoted to vision, he explains, indicating the extremely complex nature of the process. While seeing seems natural to most people, it is something that actually must be learned by the brain. Blind people who recover their sight are not immediately able to discern things like depth and movement in the same way as someone who has had vision since birth. While their eyes may work in exactly the same way, their brains must learn to make sense of the visual input.

Even after we learn to see, our vision can be fooled, Eagleman adds. He presents several illustrations of optical illusions that demonstrate phenomena such as depth being simulated on the flat page, apparent motion of stationary images, and the apparent change in size of images when their backgrounds are changed.

Eagleman presents the story of Mike May, a man who lost his vision at the age of three and then regained through surgery when he was forty-six. While May's eyes worked once more, he was unable to make sense of what he saw. When he learned to navigate a hallway as a blind person, for example, he learned that the walls usually remained parallel along the whole length of the hallway. When he could see once again, the walls appeared to converge with distance, clashing with how he had learned to "see" them as a blind person. The sudden shift of objects in his visual field when he turned his head was disorienting. He had to learn how to make sense of these confusing images, and was able to after some time.

The brain is also adaptable to "see" without eyes, Eagleman explains. He describes devices that take visual input through a camera and translate it into impulses that can be felt on another part of the body. One device used a series of electrodes on the back that pulsed in different ways according to the person's proximity to objects. Another device, used by an expert rock climber, translated visual images into impulses that were transmitted through a device around his tongue allowing him to sense edges and cracks in the rock. After using these devices for some time, the users internalized the feedback

to the point that it was effortless to translate the incoming impulses into accurate and meaningful representations of the real world. Their brains had successfully substituted one sense for another.

"Seeing," Eagleman argues, is really a complex series of lower and higher mental processes. The actual mechanics of interpreting light signals into brain impulses is in a way the least important part of vision. It is what the unconscious brain does with the information that is important. Eagleman presents some examples that suggest that one way the brain may work is by establishing a model of the outside world and then comparing these sensory inputs with the model for any deviations from it. This would explain why we remain apparently consciously unaware of much of what is around us, Eagleman suggests, only noticing when something is out of the ordinary.

Other senses are similarly disconnected from our consciousness, Eagleman explains. He offers the example of a person snapping his fingers and perceiving the sound of the snap as being simultaneous with the action of snapping. Processing the auditory signals of the snap takes time in the brain, however, and by the time the actual sound has been processed the action of snapping has completed. The unconscious brain puts the various elements together into something that makes sense to the conscious mind.

This time that it takes for us to process sensory input is not sensed by us, Eagleman claims. We imagine we are living and perceiving the outside world in the present, but because of this delay required to make sense of what we experience we are actually living a few milliseconds in the past. Time, like vision and the other senses, he argues, is a construct of the brain. It is a "rich illusion" (p. 54) that we cannot completely uncover.

In these first two chapters, Eagleman lays the groundwork of his argument by presenting anecdotal and scientific evidence that suggests our conscious mind is only a small part of our overall brain function. In the following chapter he explains that he intends to show that this gap in what we think we are perceiving with our senses also exists in other brain functions.

Chapter 3 Mind: The Gap

Chapter 3 Mind: The Gap Summary and Analysis

In chapter three, Eagleman further explores the gap between "what your brain knows and what your mind is capable of accessing." (p. 55) He asks the reader to try a simple experiment by making the motions of steering a car while changing lanes to the right. He explains that most people who try this exercise turn the wheel slightly to the right, then straighten it out again. This is not correct, he points out. Steering this way would actually send the car off the road. Instead, the correct way is to steer to the right, then straighten the wheel, then turn to the left.

The point of the exercise is to demonstrate that something we can do easily without thinking can be difficult to explain or recreate with the conscious mind. This is actually an advantage, Eagleman argues, as consciousness of our every action can get in the way of our efficiency. He gives the example of the difficult task of telling apart male and female chickens when they are just chicks. Chicken sexers, as those with this occupation are called, learn the task not by studying the anatomical differences, which are very hard to discern in young chicks, but by having an expert chicken sexer stand over them and correct them when they get it wrong. They internalize the task to the point that it becomes automatic and part of their unconscious capabilities.

There are ways to measure how our unconscious minds affect our conscious thinking even without our knowing it, Eagleman explains. For example, a person may consciously profess to have no prejudicial feelings about people of a certain race, but experiments that ask them to associate certain words such as "like" or "dislike" with photographs or words describing different races or creeds can reveal that they may move slightly toward the "dislike" option before choosing "like". This reveals a conflict between the unconscious and unconscious minds, Eagleman claims.

What we like is also determined largely by unconscious thinking and a natural tendency to like ourselves, Eagleman claims. This is called "implicit egotism," and is a well-established phenomenon, he explains. It is illustrated by the fact, for example, that people marry others with first names that start with the same letter more often than would be expected by chance. Eagleman claims this is because we implicitly prefer others that are like ourselves in some way.

Our brains are wired to move things like complicated tasks into our unconscious minds, Eagleman argues. This makes it possible to perform tasks efficiently without requiring our conscious attention. The conscious mind can actually get in the way of this efficiency, but is useful in deciding which tasks to learn and in actively training the unconscious mind in the desired task.

Chapter 4 The Kinds of Thoughts That Are Thinkable

Chapter 4 The Kinds of Thoughts That Are Thinkable Summary and Analysis

Chapter four explores the limits of our conscious thinking. Eagleman begins by talking about the senses once again and explaining the ways in which they are limited. We only sense a small portion of all the wavelengths of light, for example, and are incapable of seeing outside this range. Other animals, such as insects, can see wavelengths we cannot. With the sense of smell, a bloodhound is capable of sensing a whole range of odors that humans cannot sense.

Eagleman claims that our conscious mind is similar to our senses in that it has natural limits. There are thoughts that we cannot think, just as there are wavelengths of light we cannot see. Furthermore, just as we do not "miss" these imperceptible wavelengths of light, we do not know ourselves what the limits of our conscious knowledge are.

Much of what motivates us and drives our behavior is hard wired into our brains, Eagleman claims, and he provides several examples to support his argument. Experiments on babies indicate they show a tendency to look at faces. Humans seem to be predisposed, without any prior experience or learning, to be attracted to faces. Newborns also show evidence of recognizing and being attracted to the smell of their mother.

Eagleman cites several studies that look at what people seem to find attractive in others. In one study, men rated women they had only seen briefly as more attractive than the same women they were then given more time to look at. This attraction has little to do with the actual appearance of the women, just the time of exposure. Eagleman suggests that this tendency has been deeply ingrained in men by evolution from a time when pursuing a briefly-glimpsed female was advantageous.

This kind of social hard-wiring affects our thinking in some interesting ways, Eagleman claims. He gives an example of a difficult logic puzzle involving colors and numbers and asks the reader to solve it. He then presents a different puzzle that has the same underlying logical solution but has been rephrased to make it about people and their ages. He claims that most people find the second puzzle easier to solve than the first, even though they are essentially the same puzzle. The reason, he argues, is that we can more easily process information if we can frame it in a social context.

Understanding and accepting that much of our minds is inaccessible to our conscious selves is difficult, Eagleman writes, but it is a fundamental part of the argument he intends to proceed with int he next chapter, in which he further characterizes the unconscious mind and the role the conscious mind plays.

Chapter 5 The Brain Is a Team of Rivals

Chapter 5 The Brain Is a Team of Rivals Summary and Analysis

Eagleman opens chapter five with a description of an incident involving the actor Mel Gibson. In July 2006, Gibson was pulled over in his car and arrested for driving while intoxicated. During the incident, he made several insulting remarks about Jewish people, asking the arresting officer if he was Jewish and refusing to get into the police car. A celebrity gossip website obtained a record of the incident, which included a handwritten account of Gibson's remarks, and made them public. Gibson then issued a written apology and offered to take steps to repair the harm he had caused.

Eagleman poses the question of which person is the "real" Mel Gibson, the one who vehemently professes a hatred for Jews or the one who seems genuinely sorry for his actions. Some commentators after the incident claimed that Gibson was truly an anti-semite and that this was revealed when he was drunk. Others dismissed the incident as meaningless because saying and doing stupid things while drunk is a common occurrence. Eagleman suggests that the nature of these comments illustrate that we want to think of ourselves and others as being one way or another. We want to think that Mel Gibson is either an anti-semite or he is not. The question is more complex than this, Eagleman suggests. One part of the brain may be racist, for example, while another part is not.

As an illustration of how the mind may be divided, Eagleman describes an early problem in the development of artificial intelligence. Programming robots to do what seemed like simple tasks such as picking up blocks and stacking them proved to be very difficult. A breakthrough was made when programmers broke the task into several smaller routines, with one routine in charge of finding the block, one in charge of picking it up and so on. Some brain scientists proposed that the brain might be assembled in a similar way, with many small actions that can be performed without conscious thinking coming together to form what we call intelligence.

This concept was called "society of mind." Eagleman agrees that the framework is a good model for how the brain works, but adds his own opinion that these many small sub-routines of our mind are actually competing with one another. He offers the example of the person being offered a slice of cake for dessert and having conflicting motivations to accept it because he likes cake and to reject it because he is concerned about his weight.

Ultimately a person can make a decision one way or the other in a situation like this, Eagleman explains, but when a rat is presented with a similar dilemma it becomes incapable of action. He describes an experiment where food is placed at the end of a passage which also contains an electrical shock. The rat is simultaneously drawn to the

food and wants to avoid the shock, but it cannot decide what to do and ultimately goes nowhere.

Eagleman characterizes this model of the brain as a "team of rivals," after a phrase used by the historian Doris Kearns Goodwin to describe Abraham Lincoln's presidential cabinet. It is a framework where several different parts of the brain compete with one another to control the actions of the conscious mind. Consciousness, Eagleman argues, is essentially an animal's ability to choose a course from among these competing options and act accordingly. Our conscious mind is like the CEO of an organization, receiving advice from several sources and making the final decision on what action to take.

While there are many competing aspects of the brain Eagleman argues, he focuses on two which he labels the "rational" and "emotional." The rational mind is focused on analyzing the outside world while the emotional mind looks inward. He presents the results of an experiment that pits these two rivals against one another. Subjects are presented with a fictional situation where allowing one person to die would save the lives of five others. In one version of the situation, the person would have to pull a lever to move a runaway train onto a track where it would kill one person but miss killing five. In this version, most people agree they would pull the lever, as the loss of one life is preferable to the loss of five. In another version, however, the situation is presented so that the person would actually have to push one person from an overhanging bridge to stop the train that would otherwise kill five people. Subjects found this version more difficult. The experimenters concluded that the emotional aspect of actually touching a person and pushing them to their deaths overrode the rational computation that it was better to lose one life than five lives.

Another set of conflicting motivations in the human mind is the rivalry between short term and long term desires, Eagleman argues. He presents several examples of people acting in ways that serve a long-term interest and protect them from the their short-term tendencies. A Christmas club is one such example, where people put money aside each month and then have it returned at Christmas time for purchasing gifts. These kinds of self-bargains are called "Ulysses contracts" after the classical figure Ulysses who had himself lashed to the mast of his boat so he would not be persuaded by the beautiful song of the sirens to steer his boat into the rocks. Sometimes the short-term motivation wins the rivalry, however. Eagleman cites the collapse of the subprime mortgage industry when many people took on loans they could not afford to pay.

There is a physical division in the brain, as well, Eagleman explains, between the left and right hemispheres. In some severe cases of epilepsy, an operation that severs the two halves is sometimes used as treatment. Patients can live normally, but the severing of the two halves sometimes produces some interesting behaviors that illustrate how the hemispheres are almost like two separate brains. Patients may receive conflicting sensory information on the separate sides of their brains and be unable to reconcile them, for example. Other brain conditions appear to unmask conflicting processes in the brain. one woman described by Eagleman was blind in one eye, but when asked to guess the number of fingers being held up in front of that eye, could guess correctly.

Her eye was perceiving the image and her unconscious brain was even somehow processing it, but not passing the information to her conscious mind.

The mind is full of competing systems such as these, which Eagleman calls "alien" and "zombie" routines. Sometimes they overlap, and different routines will dominate at different times, Eagleman argues. This assembly of competing routines is what makes up most of the activity of our brains, and our conscious mind, as is demonstrated in brains where these competing processes have been interrupted or disconnected, is mostly at the mercy of our unconscious processes. Eagleman presents the results of experiments that suggest that our conscious mind will even fabricate reasons for our actions after the fact when we cannot tell what our true motivations are.

This raises some serious questions, Eagleman claims. If we are really mostly a collection of "alien" subroutines, then what does it mean to say that a person is responsible for his actions? If our senses can be fooled, even by our own minds, can we truly be held accountable for what we do? This is the question at the center of his book, and one which will address in chapter six.

Chapter 6 Why Blameworthiness Is the Wrong Question

Chapter 6 Why Blameworthiness Is the Wrong Question Summary and Analysis

Eagleman opens chapter six with a description of an incident in Austin, Texas in 1966. Charles Whitman, a twenty-five-year-old man, shot forty-six people from the top of a tower on the University of Texas campus, killing thirteen of them. Police climbed the tower and killed Whitman. His body was examined afterward and it was found that he had a small tumor in his brain that impacted a part of the brain called the amygdala, which is involved in the regulation of emotions such as aggression and fear.

In writings he left behind, Whitman indicated that he suspected he had something wrong with his brain, hoping that his body might be studied. People who knew him had noticed that his behavior had changed in the months leading up to his shooting spree. In Eagleman's analogy, Whitman's aggressive "zombie" programs were winning the battle for control of his behavior. "His cooler, rational parties were battling his reactive, violent parties, but damage from the tumor tipped the vote so it was no longer a fair fight," Eagleman writes. (p. 153)

Eagleman asks the reader to consider what might have happened if Whitman had survived and been put to trial for his behavior. On one hand, he suggests, there seemed to be a definite biological cause for his behavior. He suggests that most people might agree that Whitman was not truly responsible for his actions. On the other hand, it would not seem proper to completely absolve him for his actions because of his tumor.

Eagleman provides other examples similar to Whitman's. In one case, a man he calls Alex started exhibiting a significant change in his sexual preferences, which were noticed by his wife. At the same time, Alex was suffering from serious headaches. When he was examined by a doctor to find the cause of the headaches, it was discovered that he had a brain tumor. Once the tumor was removed, his sexual behavior returned to normal.

The part of Alex's brain that was affected is called the orbitofrontal cortex. Eagleman describes several examples of "frontal cortex dementia" that is caused when the frontal cortex is damaged. Common behavior from this condition includes inappropriate social behavior. Appetites and desires that might normally be kept in check in a healthy brain come to the forefront when this part of the brain is damaged.

Not everyone has these competing parts of the brains balanced in the same way, however, Eagleman argues. He dismisses the assumption that all people are equally equipped to make sound and rational decisions. We are all at the mercy of the unconscious workings of our minds, and our ultimate behavior is a result of the

biological balance within our brain. As an example, he points out that the overwhelming number of criminals are male. This suggests that there is a genetic component to the balance among the various rival parts of the brain.

Eagleman argues that there are genetic components to behavior, but also that a person's upbringing and environment plays a role in how genetic tendencies might be expressed. Which factor plays the greater role is not important to Eagleman's argument because in neither case does an individual have any choice in the matter. We cannot choose our genes or who raises us.

Eagleman suggests that his argument to this point may appear as though he is arguing that nobody is truly responsible for their actions. He asserts that he does not mean to make this argument. To elucidate this statement, he turns to the subject of free will.

The question of whether humans truly possess free will has been addressed by philosophers for ages, Eagleman explains. The American legal system assumes that people do have free will. This assumption is at the core of the system, Eagleman argues. He gives the example of a circus elephant who broke free and trampled several people to death. We do not blame the elephant for its actions because we do not assume it was acting by deliberate choice. We do not believe it had free will.

Humans do have a choice in how they behave, the legal system assumes, but Eagleman challenges this. He has shown that human senses can misrepresent reality, and how biological factors can influence the unconscious mind in ways a person is not and cannot be aware of. We treat every person as if they hve a choice in their behavior, but Eagleman argues that not everyone truly does. He writes, "We've reached the crux of the issue. How exactly should we assign culpability to people for their varied behavior, when it is difficult to argue that the choice was ever really available?" (p. 162)

Eagleman offers the example of Tourette's syndrome, which is a condition in which people have involuntary muscle tics or make involuntary vocalizations. There are several other conditions of the brain that have similar symptoms, and sometimes the involuntary behaviors can be very complex. Eagleman presents the case of a man named Kenneth Parks who, while sleepwalking, drove fourteen miles to the home of his in-laws, stabbed his mother-in-law to death and assaulted his father-in-law. He then drove himself to a police station. Parks remembered nothing of the incident. He underwent repeated questioning and continuously maintained that he had no recollection of the event. Furthermore, he apparently had no motive for the killings, having had a good relationship with his in-laws. An expert testified in Parks' court case that someone sleepwalking could in fact have committed murder without any memory and without understanding the consequences. Parks was found not guilty.

Parks' case, as well as the brain conditions that have similar symptoms, demonstrate that the unconscious mind is capable of taking over our behavior, Eagleman argues. The next question, he asserts, is whether there is a part of the brain that is truly free to choose how to behave. Eagleman believes there is not. "As far as we can tell, all activity in the brain is driven by other activity in the brain," he writes. (p. 166) He concludes that

since there is no part of the brain that is truly independent from the rest of the brain, there is no such thing as free will. The interconnected nature of the brain and the incalculably complex processes that take place within it mean that we may never be able to map out exactly how we will behave in a certain situation, but nonetheless, Eagleman claims, that behavior is ultimately the result of a series of involuntary biological processes, even though it may appear to others and to ourselves that we are acting by our own choice.

Having concluded that free will is a myth, Eagleman next asks what this means for the criminal justice system. He argues that the question of free will does not really matter, because it is linked to the concept of culpability. In turn, culpability is not the proper basis for punishing criminal activity, he argues, because the behavior of criminals is the result of their unconscious minds. Criminals should be treated as if they could not have acted any other way, he argues.

Eagleman therefore dismisses the concept of culpability and asks what should be done going forward to change the way in which criminals are treated and sentenced. He concludes that rather than base sentencing on the seriousness of their crime, that criminals instead be sentenced based on their potential to change their behavior. Eagleman calls this a "forward-looking, brain-compatible legal system." (p. 178) Such a system would treat criminal behavior like other biological diseases and provide specialized treatment customized to rehabilitate a criminal based on his particular brain abnormality. This treatment may be medical or may take the form of conditioning exercises.

This proposal is the central theme of Eagleman's book, and he argues that it is necessary because of the present unfairness of the criminal sentencing process. He envisions a system that will embrace neuroscience as a central part of understanding and reforming criminal behavior. In the following chapter, Eagleman expands his argument to general terms to ask what the implications might be of formally recognizing that free will is a myth and that our behavior is not a matter of choice.

Chapter 7 Life After the Monarchy

Chapter 7 Life After the Monarchy Summary and Analysis

Eagleman likens the discoveries of neuroscience that indicate the extent to which our unconscious minds control our behavior to the revolutionary discoveries of Galileo and Charles Darwin. Galileo's discovery of the moons of Jupiter demonstrated that the Earth was not the center of the solar system. Charles Darwin's theory of natural selection suggested that humans were simply one more species among many that had evolved on the planet. In each case, what was once thought to be central was shown to be less so. He calls the resulting shifts in thinking "dethronements."

Eagleman argues that our understanding of our conscious minds and the source of our behavior must undergo a similar shift. We imagine that our conscious minds are at the center of our identity and self-image, but Eagleman hopes to have demonstrated that this is not the case. Like the other "dethronements" caused by scientific advances, the realization that our conscious minds are not as central as we once thought seems to diminish our humanity and importance.

Eagleman argues that rather than diminish our opinion of ourselves, these dethronements should encourage us to explore ourselves at a new level. Just as the microscope opened up new levels of understanding by revealing what was once mysterious, advances in neuroscience will allow us to delve even deeper into our minds, he predicts, as well as shed light on social issues.

Eagleman asks the question of whether there is such a thing as a soul that exists independently of the biological parts of the brain, or whether the essence of our being is only the result of a string of very complex biological processes. He concludes that the question cannot be answered with certainty, but offers the example of a man named Phineas Gage, who survived a railroad construction accident in which a portion of his brain was completely destroyed. While Gage was known before the accident as a level-headed man and a hard worker, after the accident his personality changed significantly. He became irritable and impatient and began using vulgar language that he had not used before. The case illustrates again that who we are is largely a result of the processes of our brains. In Eagleman's view, this lends evidence to the interpretation of the "soul" as being only biological. "Who you are depends on the sum total of your neurobiology," he writes. (p. 205)

This is not only revealed by damaged brains, he continues, but by the study of how various substances affect the mind. Cocaine is a simple molecule, but it acts on receptors in the brain that are linked to the positive feelings of receiving rewards. Dopamine, a chemical found naturally in the brain, greatly affects moods and motivation depending on how much is present. Drugs that treat the uptake of dopamine are effective in treating depression and other brain conditions.

Other conditions, such as epilepsy, can alter perception and behavior, causing not only seizures but hallucinations. The causes of these conditions can sometimes be traced to genes, but there may also be a social component. Eagleman notes that immigrants are more likely to develop schizophrenia, possibly from the added stress of leaving a home country and being in a new environment.

Eagleman expands on this notion of genetic and social components playing a role in behavior. He describes an experiment that tracked the development of the personalities of monkeys. Among the monkeys in the study, five percent showed overly aggressive personalities. These monkeys were found to be more likely to have a certain form of a particular gene. The presence of the gene itself did not alway result in aggressive behavior, however. Only among monkeys that were raised away from their mothers did the aggressive gene result in an aggressive personality. Monkeys who carried the gene but were raised with their mothers did not become overly aggressive.

Eagleman shares a similar finding in adults who exhibit depression. While some genes seem to predispose a person to developing depression, not everyone with the gene shows symptoms. One study suggests that stressful life events contribute to the development of depression among those who are already predisposed to it. The conclusion Eagleman makes is that our personalities are the result of a combination of our "nature," meaning our genetic predispositions, and our "nurture," meaning our social environment, particularly as children.

The author warns against taking a "reductionist" view of the mind, however, that reduces everything to the simple biological processes. Complex systems, he explains, also have what is called "emergent" properties that only exist in the presence of all the smaller parts. Examining how these emergent properties are related to the underlying biological process is the important role of neuroscience.

Characters

Charles Whitman

Charles Whitman was a twenty-five-year-old man from Austin, Texas, who shot forty-six people in August, 1966, killing thirteen of them. Whitman had gone with several guns to the observation deck of an office tower on the University of Texas campus, where he indiscriminately shot at people below. Prior to going to the tower, Whitman had also stabbed his wife and his mother and composed a suicide note. In the note, he wrote that he had begun to feel "overwhelming violent impulses" (p. 152) and suggested that an autopsy be done on his brain after his death to determine the cause.

Whitman was killed by a police officer and his body was examined afterward. It was found that he had a brain tumor that affected his amygdala, a part of the brain associated with the control of emotions, especially fear and aggression. After the incident, people who knew Whitman remarked that his behavior had changed significantly leading up to the shooting. It was if he was trying to control something inside himself, one person said.

Eagleman uses Whitman's case as an illustration of the extreme behavioral changes that can take place when the neural activity of the brain is affected. Whitman acted carefully and deliberately, planning his assault and writing about it, but his motivation was the result of a biological problem, Eagleman argues, that changed his perception of the world. In Eagleman's model, the aggressive and fearful part of Whitman's brain, normally kept in check by other parts of the brain such as the amygdala, was winning the constant battle between the rival sections of the mind. Eventually, because of the biological impairment caused by the tumor, the aggressive faction "won" control of Whitman's behavior.

Kenneth Parks

Kenneth Parks was a twenty-three-year-old man from Toronto who had a sleepwalking condition. He was married, with a young child, and had a good relationship with his in-laws. One night, while sleepwalking, Parks drove to the house of his inlaws and stabbed his mother-in-law to death and assaulted his father-in-law. He then drove himself to a police station, saying he thought he had killed some people and that he needed attention for some deep cuts on his hands.

Parks had no recollection of the events. Subsequent examinations showed that he had a condition where his brain tried to wake up directly from a deep sleep, instead of the normal activity that transitions from deep sleep to wakefulness. His brain was in a state where he acted as if he was awake, but was actually asleep and unaware of what he was doing. In the court case that followed the incident, an expert testified that Parks could indeed have driven to his inlaws and performed such an act while being

completely unaware of his actions or of the consequences. Parks was found not guilty of the murder and assault of his inlaws.

Eagleman uses Parks' case to introduce the complicated question of culpability. In this case, Parks had a biological condition that allowed him to act completely out of character without his knowledge or his control. Eagleman argues that most people would agree he was not responsible for his actions. Eagleman expands this example to conclude that all criminal behavior is similarly based on biological factors and is out of the control of the criminal.

Charles Darwin

Charles Darwin was a nineteenth century naturalist who published the influential book On the Origin of Species, which presented his theory of natural selection. The book has been widely recognized as revolutionary in the field of biology and as the cornerstone of the theory of evolution. Eagleman uses Darwin's theory as an example of how the progress of science has seemingly decreased the central importance of humankind in our understanding of the world around us.

Sigmund Freud

Sigmund Freud was an influential theorist and psychiatrist who developed a method of treatment for mental conditions that he called psychoanalysis. Freud had a theory of the mind that included distinct parts that were in constant rivalry with one another. Eagleman compares Freud's theory with his own neurologically based theory that comes to similar conclusion.

Marvin Minsky

Marvin Minsky was a computer scientist who worked on the development of artificial intelligence and robotics. He discovered that complex tasks for a robot could be handled more efficiently if broken down into separate subroutines. He later theorized that the human mind may operate on a similar structure, with many individual subroutines that operate without our conscious knowledge that can be used together to complete complex tasks.

Mel Gibson

Mel Gibson is a popular actor who was pulled over while driving drunk and arrested. During the arrest, he made several insulting remarks about Jews to the arresting officer, comments which were later made public. Gibson issued an apology and offered to take steps to make up for his behavior. Eagleman uses Gibson as an example of how drastically behavior can change in a single individual.

Ulysses

Ulysses is a character from classical Greek literature. In one story of Ulysses, he has himself lashed to the mast of his boat so that he might hear the song of the dangerous sea sirens without being lured by them onto the rocks. Eagleman explains that this kind of self-restraint has come to be known as a "Ulysses contract."

Phineas Gage

Phineas Gage was a railroad worker in the nineteenth century who had part of his brain destroyed in an explosion. Prior to the brain injury, Gage had been a hard working conservative man. After the injury his personality changed remarkably and he became irritable and boisterous. Eagleman uses Gage's example to illustrate how much the biology of our brain affects our personality.

Split-brain patients

Split brain patients are people who have had the left and right halves of their brains surgically separated. While they are able to function normally in most cases, the separation of the hemispheres sometimes causes behavior that makes it appear as if two separate brains are inhabiting the same person. A person may button up a shirt with one hand while unbuttoning it with the other, for example, and be unaware of it or unable to explain why they are doing it.

Synesthesics

Synesthesics are people who have a condition where their senses overlap in unusual ways. They may experience sounds and tastes as colors, or may associate a color with a certain day of the week. The condition illustrates the fluid nature of human perception, Eagleman argues.

Objects/Places

Neuroscience

The field of science that studies the physical makeup, properties and function of the brain.

Alien and Zombie Routines

Terms that Eagleman uses to describe the many automatic processes that take place in our minds without our conscious knowledge.

Frontal Cortex

The part of the brain that is associated with appetites and desires. Damage to this portion of the brain can cause a change in behaviors such as sexual preference.

Amygdala

A portion of the brain associated with control of the emotions. Damage to this part of the brain may cause aggressive behavior, as in the case of Charles Whitman.

Brain Hemispheres

The brain consists of two nearly identical parts, the left and right hemispheres, which are normally connected. Each side of the brain specializes in certain areas of control and processing, such as language, vision, and motor movement.

Dopamine

A neurotransmitter that is associated with both motor control and with the brain's reward system. Imbalances in dopamine levels can cause muscular disorders such as Parkinson's disease, or also lead to addictive behaviors such as drug use and gambling.

Serotonin

A neurotransmitter associated with cognition and emotion. Imbalances in serotonin are associated with depression.

Free Will

The concept that humans are completely free to choose their own actions. The concept has been debated by philosophers for ages, with varying opinions. Eagleman applies his neural-based theory to the question and concludes that since all actions are the result of interconnected and unconscious brain activity, there is no free will. He then concludes that since there is no free will, there is no such thing as culpability.

Nature/Nurture

An ongoing debate over whether our personalities are affected more by our nature, that is our genetic makeup, or our nurture, that is the way in which we are raised. Eagleman presents evidence that genetic makeup predisposes a person to certain types of behavior and personality traits, but that these tendencies can be enhanced or diminished by social factors.

Culpability

The notion that a person is responsible for his actions. Eagleman argues that there is really no such thing as culpability because humans do not really have free will to choose their actions. In his proposal to reform the criminal justice system, Eagleman suggests that all criminals should be treated as if they had no choice but to act in the way they did.

Themes

The Fallibility of the Senses.

Part of Eagleman's argument about the separation of the conscious and unconscious minds rests on the fallibility of the human senses. We simply cannot trust that our senses are representing to our conscious mind what is actually occurring in the outside world. Perception is much more than the mechanical translation of light or sound waves into vision and hearing. Our unconscious brain processes these bits of information and then releases the results to our conscious mind. Furthermore, our conscious minds will trust what the unconscious mind tells us over what we actually sense.

Eagleman gives several illustrative examples. He describes people who have a peculiar condition resulting from a stroke where they are blind but believe they can see. If one of these people is asked to describe the face of a person in the room they have not met, they will provide a description but it will not match. If asked to tell how many fingers a person is holding up they will give a definite answer which is really only a guess because they cannot actually see. Their brains seem to be providing them with rich visual images based on information from the other senses, which they cannot tell from actual vision.

Eagleman also presents the case of a person who had lost his sight at age three and then regained it through surgery as an adult. While his eyes functioned normally after the surgery, he was at first highly disoriented because the visual images he perceived did not match the perceptions of the world he had when he was blind. His brain had to re-learn how to perceive the world in a visual way.

Eagleman also describes the condition called synesthesia, where the senses are mingled in ways that seem unusual to normal people. Someone with synesthesia may experience certain sounds or days of the week as colors, for example.

The common factor in these deviations from normal perception, Eagleman argues, is that the people who have these conditions are not aware of any shortcoming in their perceptions. A blind person does not simply "see" nothing, he experiences the world using other senses. The blind stroke victims who believe they can see are not aware that they are actually blind. People with synesthesia do not themselves feel that their perceptions are unusual. In other words, there is a wide range of possibilities in how an individual perceives the world, and all of them feel very real and natural to that individual even when an outside observer can tell that the person's perceptions are faulty. None of us can truly trust what we perceive, and furthermore, Eagleman argues, because the conscious mind knows only what it is told by the unconscious mind, we do not have the ability to know ourselves whether we are truly perceiving something that is real or not.

The Brain Is a Team of Rivals

Eagleman borrows the phrase "team of rivals" from the historian Doris Kearns Goodwin which she applies to the group of advisors that Abraham Lincoln surrounded himself with during the Civil War. In Eagleman's model of the brain, our unconscious mind is made up of several separate processes each with the potential to pull us in its own direction. The conscious mind's role is to mediate among these rival factions of our unconscious mind and choose a course of behavior.

As an example, Eagleman asks the reader to imagine being offered a slice of chocolate cake. One part of our unconscious mind is attracted to the cake because of the nutritional value to our body, while another part of our unconscious mind might lead us to worry about our weight. We want the cake and do not want it at the same time.

Eagleman describes an experiment that puts a rat in a similar predicament. Food is placed at the end of a passage, but the rat also gets an electric shock at the end of the passage. The rat cannot decide whether to move toward the food or away from the potential shock. It becomes stuck by indecision.

This is a different reaction than a human deciding for or against eating a slice of cake, however. We have the ability to make a decision to accept or decline the cake. This, Eagleman argues, is actually the role of our conscious mind. Our conscious mind is like the CEO of a board of rivals, who makes the final decision on which recommended path to follow. Eagleman goes even farther and applies his theory to the question of whether animals besides humans have consciousness. He proposes that an animal that shows the ability to choose between competing impulses displays a level of consciousness.

All Criminals are Brain Damaged

In chapter six, Eagleman writes, "The bottom line of the argument is that criminals should always be treated as incapable of having acted otherwise. The criminal activity itself should be taken as evidence of brain abnormality, regardless of whether currently measurable problems can be pinpointed." (p. 177). He arrives at this conclusion after having shown that there is a gap between the conscious and unconscious minds that we as individuals are not able to bridge. We cannot trust our senses to accurately represent the outside world, and we cannot trust that we understand ourselves what motivates us to behave in certain ways.

Eagleman asks some provocative questions about how we define criminal responsibility. He gives the example of a man with a rare brain condition that caused him to sleepwalk. While sleepwalking, he drive his car to the home of his in-laws and stabbed them, killing his mother-in-law. He awoke with only a vague idea that something had happened but had no recollection of his actions.

In a case like this, Eagleman argues, we do not consider the man to be fully responsible for his actions. His brain condition changed his perception of reality and he acted almost

completely without being conscious of what he was doing. This was an extreme case, where the difference between the man's conscious and unconscious states was clear. It was also a case where the man's condition, and therefore his potential criminal behavior, could be controlled with medication.

Eagleman argues that all criminal behavior can be thought of in the same way as in the sleepwalker case. We should not really ask to what extent a person is to blame for his criminal behavior, he argues, but what imbalance in his brain is causing the behavior and whether or not something can be done to remedy it. He admits that the brain is so complex that determining all the factors that contribute to a person becoming a criminal is practically impossible. Determining whether they can be treated is not impossible, however, in many cases. The ability to treat such behavior will only improve in the future as brain science develops, Eagleman predicts.

Style

Perspective

Eagleman is making an argument in Incognito and he writes from the perspective of someone who wants to convince his reader of certain facts and then lead the reader to share the conclusions that he bases on those facts. He directs his prose at the reader, frequently asking the reader to "consider" various supporting examples and analogies he uses to illustrate his argument.

After presenting his supporting information, he makes his central argument about bringing neurological science into the practice of criminal justice, addressing what he feels are the important issues not being addressed and explaining how brain science might be applied to them. Here Eagleman broadens his perspective from simply convincing his reader to making a case for broader societal change to the criminal justice system. He anticipates what some of the objections to his proposal might be and attempts to counter them.

Finally, Eagleman adopts a perspective on an imaginary future where his ideas about the role of consciousness in human behavior have been accepted and integrated, making predictions about the implications to philosophy and other areas of thought.

Eagleman is an academic writing for a popular audience. Throughout the book he keeps his writing broad and accessible to the average reader. His general perspective is of an academic who wishes to make complex ideas accessible to the general public and convince them that a change is warranted by these ideas.

Tone

Eagleman strives to maintain an easy, conversational tone throughout the book. When he is presenting the results of academic research he provides just the broad outline of the experiments and studies that he feels support his thesis. He uses humor and makes references to popular culture throughout the book. Eagleman frequently addresses the reader directly, proposing thought experiments and making analogies to everyday activities like driving a car.

Eagleman's tone shifts somewhat in the final two chapters as he introduces the central argument of his book, which is that the American legal system should introduce current research on brain science into its criminal sentencing structure. Here Eagleman is addressing the sometimes violent and deviant behavior of people, many of whom showed evidence of brain disease or neurological imbalance, and asking serious questions about how our society determines culpability. He sometimes adopts a defensive tone, as he anticipates the potential objections to his proposal.

In the final chapter, Eagleman address some of the larger philosophical implications that he sees arising from his proposal. Here, the tone becomes more expansive and lofty. The author avoids delving too deeply, however, maintaining a light touch that does not overwhelm the reader with complicated philosophical discussion.

Structure

Incognito is divided into seven chapters, with endnotes and an index. Eagleman includes several illustrations and diagrams throughout. The book is structured like an essay, with the opening chapters providing background information that supports the author's conclusions in the later chapters.

The first four chapters supply the basis for the author's conclusions in the final three chapters. Chapter one introduces the concept of the unconscious mind and suggests that our unconscious has more influence over our actions than we suspect. Chapter two discusses sensation and describes some of the ways our senses can be fooled. Chapter three looks at the separation between the conscious and unconscious parts of our minds. Chapter four describes how our conscious thinking is limited by the extent of our senses.

In chapter five, the author presents his thesis that the mind is made up of several competing processes, a "team of rivals" that steer us in opposing directions with the conscious mind acting as the leader that makes the final decision on what action to take. In chapter six, the author extends his theory to propose that the present American legal system should use current research into the brain when sentencing criminals. In the final chapter, chapter seven, the author addresses some of the philosophical questions that might arise from diminishing the role of the conscious mind.

Quotes

"Brains are in the business of gathering information and steering behavior appropriately. It doesn't matter whether consciousness is involved in the decision making. And most of the time it's not."
Chap. 1, p. 5

"So the first lesson about trusting your senses is: don't. Just because you believe something to be true, just because you know it's true, that doesn't mean it is true."
Chap. 2, p. 53

"There is a looming chasm between what your brain knows and what your mind is capable of accessing."
Chap. 3, p. 55

"When the brain finds a task it needs to solve, it rewires its own circuitry until it can accomplish the task with maximum efficiency. The task becomes burned into the machinery."
Chap. 3, p. 71

"What you are able to experience is completely limited by your biology...As science marches forward with machines that can see what we can't, it has become clear that our brains sample just a small bit of the surrounding physical world."
Chap. 4, p. 77

"By analogy to your perception of the world, your mental life is built to range over a certain territory, and it is restricted from the rest. there are thoughts you cannot think."
Chap. 4, p. 82

"There is an ongoing conversation among the different factions in your brain, each competing to control the single output channel of your behavior. As a result, you can accomplish the strange feats of arguing with yourself, cursing at yourself, and cajoling yourself to do something - feats that modern computers simply do not do."
Chap. 5, p. 107

"I propose that a useful index of consciousness is the capacity to successfully mediate conflicting zombie systems."
Chap. 5, p. 144

"To what extent is someone at fault if his brain is damaged in ways about which he has no choice? after all, we are not independent of our biology, right?"
Chap. 6, p. 154

"When it comes to nature and nurture, the important point is that you choose neither one. We are each constructed from a genetic blueprint and born into a world of

circumstances about which we have no choice in our most formative years."
Chap. 6, p. 159

"The bottom line of the argument is that criminals should always be treated as incapable of having acted otherwise. The criminal activity itself should be taken as evidence of brain abnormality, regardless of whether currently measurable problems can be pinpointed."
Chap. 6, p. 177

"And over the past century, neuroscience has shown that the conscious mind is not the one driving the boat. A mere four hundred years after our fall from the center of universe, we have experienced the fall from the center of ourselves."
Chap. 7, p. 193

Topics for Discussion

Eagleman claims that there is no such thing as "free will." Is he right? Discuss his argument.

Eagleman proposes a legal system that offers customized rehabilitation to criminals based on brain science. Is this a practical proposal? What obstacles would have to be overcome?

What does Eagleman mean when he calls the brain a "team of rivals"? Is his argument persuasive?

Why does Eagleman conclude that we cannot trust our senses? What evidence does he offer?

How does Eagleman link his conclusion about free will with the concept of criminal culpability? Does he make a valid point?

What resistance does Eagleman anticipate to accepting his proposal about the mind? Does he sufficiently address these concerns?

Discuss Eagleman's description of the soul. Does he think the soul exists?