Thinking, Fast and Slow

INTRODUCTION

BRIEF BIOGRAPHY OF DANIEL KAHNEMAN

Kahneman was born in Tel Aviv in 1934 and spent his childhood years in Paris, France. He and his family lived in Paris when it was occupied by Nazi Germany in 1940, and they spent most of the war attempting to avoid internment. With the exception of his father, who died due to diabetes in 1944, his family survived. The family then moved to British Palestine in 1948, just before the creation of the state of Israel. Kahneman attended the Hebrew University of Jerusalem in 1954 for psychology and then served in the psychology department of the Israeli Defense forces. In 1958, he traveled to the United States to earn his PhD in Psychology from the University of California, Berkeley. Kahneman then became a lecturer in psychology and collaborated with Amos Tversky to study judgment, decision-making, and prospect theory. Kahneman was ultimately awarded the Nobel Prize in Economics in 2002 for his work on prospect theory.

HISTORICAL CONTEXT

Kahneman's work on prospect theory is built on the history of behavioral economics, particularly the work of Swiss scientist Daniel Bernoulli, who created utility theory. This theory, which stood the test of time for nearly 300 years, argued that the value of money (its utility) is proportional to the amount of money someone already has. Therefore, a gift of 10 ducats has the same utility to someone who already has 100 ducats as a gift of 20 ducats has to someone who already has 200 ducats. But in the book, Kahneman shows how Bernoulli's theory is flawed: it doesn't always take into account the difference in utility between a gain and a loss. This crucial error becomes the basis of Kahneman's own theory, prospect theory, which argues that people value losses more than they value gains.

RELATED LITERARY WORKS

Kahneman's book follows a tradition of contemporary creative works meant to help the public understand scientific and statistical topics. His work is styled similarly to Malcolm Gladwell's books, such as *Outliers* and *The Tipping Point*, which analyze the factors that contribute to success and popularity, respectively. *Thinking, Fast and Slow* bears similar themes to another of Gladwell's works, *Blink*, which emphasizes the strength of intuition. Kahneman has actually criticized some of the ideas in *Blink*, arguing as he does in *Thinking, Fast and Slow* that rationality is more advantageous than intuition because intuition often has severe flaws. Kahneman also elaborates on some of the ideas presented in Richard Thaler's *Nudge*, which coined the two systems of thinking that Kahneman defines in the first part of his book. The book's discussion of relying on statistics rather than stereotypes also bears comparison with Michael Lewis's *Moneyball*.

KEY FACTS

- **Full Title:** Thinking, Fast and Slow
- **When Written:** Based on Kahneman's scientific research between 1969 and 1996; expanded into a book in 2011
- **Where Written:** Berkeley, California
- **When Published:** 2011
- **Literary Period:** Contemporary
- **Genre:** Nonfiction
- **Setting:** N/A
- **Climax:** N/A
- **Antagonist:** N/A
- **Point of View:** First person, from Kahneman's perspective

EXTRA CREDIT

A New Title. Despite the fact that Kahneman believes himself to be a psychologist and not an economist, in 2015, *The Economist* listed him as the seventh most influential economist in the world.

A Presidential Prize. In addition to the 2002 Nobel Prize in Economics, Kahneman received the Presidential Medal of Freedom in August 2013 for his work.

PLOT SUMMARY

Daniel Kahneman begins by laying out his idea of the two major cognitive systems that comprise the brain, which he calls System 1 and System 2. System 1 operates automatically, intuitively, and involuntarily. We use it to calculate simple math problems, read simple sentences, or recognize objects as belonging to a category. System 2 is responsible for thoughts and actions that require attention and deliberation: solving problems, reasoning, and concentrating. System 2 requires more effort, and thus we tend to be lazy and rely on System 1. But this causes errors, particularly because System 1 has biases and can be easily affected by various environmental stimuli (called priming).

Kahneman elaborates on System 1's biases: sentences that are easier to compute and more familiar seem truer than sentences

that require additional thought (a feeling called cognitive ease). System 1 also tends to search for examples that confirm our previously held beliefs (the confirmation bias). This in turn causes us to like (or dislike) everything about a person, place or thing (the halo effect). System 1 also causes us to substitute easier questions for hard ones, like "What is my mood right now?" for the question "How happy am I these days?"

The second part of the book focuses on biases in calculations. Our brains have a difficult time with statistics, and we often don't understand that small samples are inherently more extreme than large samples. This leads us to make decisions on insufficient data. Our brains also have the tendency to construct stories about statistical data, even if there is no true cause to explain certain statistical information.

If we are asked to estimate a number and are given a number to anchor us (like asking if Gandhi was over 35 when he died, and then asking how old Gandhi was when he died), that anchor will have a large effect on our estimation. If asked to estimate the frequency of a thing or event (like people who divorce over the age of 60), it is rare that we will try to calculate the basic statistical rate and instead we will overestimate if we can think of vivid examples of that thing, or have personal experience with that thing or event.

We overlook statistics in other ways: if we are given descriptions about a fictional person who fits the stereotype of a computer science student (Kahneman names him Tom W), we will overestimate the probability that he actually belongs to that group, as the number of computer science students is actually quite small relative to other fields. In the same vein, if a fictional person fits the stereotype of a feminist (Kahneman calls her Linda), people will be more likely to say that she is a feminist bank teller than just a bank teller—despite the fact that this violates the logic of probability because every feminist bank teller is, by default, a bank teller.

When trying to make predictions, we often overestimate the role of qualities like talent, stupidity, and intention, and underestimate the role of luck and randomness—like the fact that a golfer who has a good first day in a tournament is statistically likely to have a worse second day in the tournament, and no other causal explanation is necessary. In this continuous attempt to make more coherent sense of the world, we also create flawed explanations of the past and believe that we understand the future to a greater degree than we actually do. We have a tendency to overestimate our predictive abilities in hindsight, called the hindsight illusion.

Kahneman next focuses on overconfidence: that we sometimes confidently believe our intuitions, predictions, and point of view are valid even in the face of evidence that those predictions are completely useless. Kahneman gives an example in which he and a peer observed group exercises with soldiers and tried to identify good candidates for officer training. Despite the fact that their forecasts proved to be completely inaccurate, they did not change their forecasting methods or behavior. People also often overlook statistical information in favor of gut feelings, but it is more important to rely on checklists, statistics, and numerical records over subjective feelings. An example of this can be found in the development of the Apgar tests in delivery rooms. This helped standardize assessments of newborn infants to identify which babies might be in distress, and greatly reduced infant mortality.

Kahneman spends a good deal of time discrediting people like financial analysts and newscasters, whom he believes are treated like experts even though, statistically, they have no demonstrable predictive skills. He works with Gary Klein to identify when "expert" intuition can be trusted, and discovers that some environments lend themselves to developing expertise. To develop expertise, people must be exposed to environments that are sufficiently regular so as to be predictable, and must have the opportunity to learn these regularities through practice. Firefighters and chess masters are good examples of true experts.

Kahneman elaborates on other ways in which we are overconfident: we often take on risky projects because we assume the best-case scenario for ourselves. We are ignorant of others' failures and believe that we will fare better than other people when we consider ventures like starting small businesses, or as Kahneman himself experienced, designing curricula.

Kahneman then moves on to writing about the theory he and Amos Tversky developed, called prospect theory. He first introduces Daniel Bernoulli's utility theory, which argues that money's value is not strictly fixed: $10 dollars means the same thing to someone with $100 as $100 has to someone with $1,000. But Kahneman highlights a flaw in Bernoulli's theory: it does not consider a person's reference point. If one person had $1 million yesterday and another had $9 million, and today they both have $4 million, they are not equally happy—their wealth does not have the same utility to each of them.

Prospect theory has three distinct features from utility theory: 1) Prospects are considered with regard to a reference point—a person's current state of wealth. 2) A principle of diminishing sensitivity applies to wealth—the difference between $900 and $1,000 is smaller than the difference between $100 and $200. 3) Losses loom larger than gains: in a gamble in which we have equal chances to win $150 or lose $100, most people do not take the gamble because they fear losing more than they want to win. Loss aversion applies to goods as well—the endowment effect demonstrates that a good is worth more to us when we own it because it is more painful to lose the good than it is pleasant to gain the good.

Standard economic theory holds that people are rational, and will weigh the outcomes of a decision in accordance with the probabilities of those outcomes. But prospect theory demonstrates that sometimes people do not weigh outcomes

strictly by probability. For example, in a scenario in which people have 95% chance to win $10,000, people overweight the probability that they may not win the money. They become risk averse, and will often take a smaller, guaranteed amount. If there is a 5% chance of winning $10,000, people overweight the probability of winning and hope for a large gain (this explains why people buy lottery tickets).

Prospect theory explains why we overestimate the likelihood of rare events, and also why in certain scenarios we become so risk-averse that we avoid all gambles, even though not all gambles are bad. Our loss aversion also explains certain biases we have: we hesitate to cut our losses, and so we often double down on the money or resources that we have invested in a project, despite the fact that that money might be better spent on something else.

Our brains can lack rationality in other ways: for instance, we sometimes make decisions differently when we consider two scenarios in isolation versus if we consider them together. For example, people will on average contribute more to an environmental cause that aids dolphins than a fund that helps farmers get check-ups for skin cancer if the two scenarios are presented separately. But when viewed together, people will contribute more to the farmers because they generally value humans more than animals.

How a problem is framed can also affect our decisions: we are more likely to undergo surgery if it has a one month survival rate of 90% than if the outcome is framed as a 10% mortality rate. Frames are difficult to combat because we are not often presented with the alternative frame, and thus we often don't realize how the frame we see affects our decisions.

Kahneman also worked on studies that evaluated measures of happiness and experiences. He found that we have an experiencing self and a remembering self, and that often the remembering self determines our actions more than the experiencing self. For example, how an experience ends seems to hold greater weight in our mind than the full experience. We also ignore the duration of experiences in favor of the memory of how painful or pleasurable something was. This causes us to evaluate our lives in ways that prioritize our global memories rather than the day-to-day experience of living.

Kahneman concludes by arguing for the importance of understanding the biases of our minds, so that we can recognize situations in which we are likely to make mistakes and mobilize more mental effort to avoid them.

CHARACTERS

MAJOR CHARACTERS

Daniel Kahneman – The author and narrator of *Thinking, Fast and Slow*. In the book, Kahneman synthesizes much of the research he has completed over the course of his career. To illustrate some of the ideas he researched, he also uses anecdotes from his time attending the Hebrew University of Jerusalem, as well as serving in the psychology department of the Israeli Army. After his time in the army, Kahneman became a lecturer in psychology and collaborated with Amos Tversky to study judgment, decision-making, and prospect theory (for which Kahneman won a Nobel Prize in 2002). The different parts of the book cover different phases of Kahneman's own research—cognitive biases, prospect theory, and his later work on happiness. Kahneman's desire in writing *Thinking, Fast and Slow* is to help people who do not have experience in cognitive science and psychology understand the way their minds work: their intuitions, their biases, their decision-making processes, and ultimately how they evaluate their own experiences. Kahneman's goals are to help people identify when they are prone to make mistakes, how those mistakes have real-life consequences, and even how societies and governments can influence public policy to help people avoid those mistakes.

Amos Tversky – A psychologist and Kahneman's primary collaborator. Kahneman and Tversky's partnership began in the early 1970s at the Hebrew University of Jerusalem, when Kahneman asked Tversky to lecture in one of his classes. Their discussion then led to their collaboration on many subjects, including intuition, forecasting, estimating, and assessing hypotheses. Their work culminated in the late 1970s in prospect theory, which addressed how human choices often deviate from the rules of rational economic theory. This collaboration led to the Nobel Prize Kahneman received in 2002, which Tversky would have shared had he not died in 1996 at age 59.

Richard Thaler – A behavioral economist and collaborator of Kahneman and Tversky's. Thaler coined the different classifications of Econs and Humans, which draw a distinction between the way economists view people and the way psychologists view people. As a graduate student, Thaler discovered people's behavior was often inconsistent with accepted economic theory, and was attracted by Kahneman and Tversky's work on prospect theory to help explain some of those inconsistencies. Together, the three men explored different behavioral economics principles like the endowment effect and broad framing, significantly advancing and defining the field.

Daniel Bernoulli – A Swiss mathematician remembered most for his pioneering work in probability and statistics. Bernoulli developed utility theory in 1738, which demonstrated that the utility of money and the state of one's wealth is more important than its intrinsic value (i.e., a gift of 10 ducats has the same utility to someone with 100 ducats as 20 ducats has to someone with 200 ducats). Kahneman and Tversky adapted utility theory and addressed some of its flaws in creating prospect theory.

Gary Klein – A psychologist and colleague of Kahneman's who

did not agree with his work on experts. Klein took the view that experienced professionals develop accurate intuitive skills—a view that was informed by his work with firefighters—in contrast with Kahneman's view that experts were often overconfident in their abilities, which were in reality based mostly on luck. They published a joint paper asserting that there are different kinds of experts, and one can discern which types of experts have truly acquired the expertise they claim to have.

Cass Sunstein – A psychologist who collaborated with Richard Thaler and also took the opposite perspective on risk as Paul Slovic. Sunstein believes that the system of regulation in the United States caters too much to public pressure. Risk, in his view, should only be calculated by lives and dollars lost, rather than public fear. Sunstein also served in the Obama administration and helped to change regulations concerning common framing devices. This work included the way in which a car's fuel economy should be presented to the public: listing the much more informative gallons-per-mile statistic than the more common miles-per-gallon information.

Paul Slovic – A psychologist who proposed the affect heuristic, in which people let their likes and dislikes determine their beliefs about the world. Slovic also explored topics of risk, asserting that expert opinions should not be the only ones considered in evaluations of risk. He believes that the average citizen's concerns should be taken into account when creating public policy—in contrast with the ideas of Cass Sunstein.

MINOR CHARACTERS

Paul Meehl – A psychologist whose work focused primarily on experts and predictive ability. He caused a scandal when reporting that his own statistical formulas outperformed experts a majority of the time.

TERMS

Heuristic – Any simple, efficient rule that people use to form judgments and make decisions. Heuristics are mental shortcuts that usually involve focusing on one aspect of a complex problem and ignoring others. In *Thinking, Fast and Slow*, **Daniel Kahneman** discusses common heuristics that people use, which often expose them to making mistakes. Examples of different heuristics that Kahneman mentions include the halo effect, the planning fallacy, and the hindsight illusion.

What You See Is All There Is (WYSIATI) – A phrase that **Kahneman** uses, often in acronym form, to discuss the principle that people are often biased by information that is presented to them, because they assume that this information is all that is needed to make a decision. It is a flaw in our thinking, because it fails to allow for the possibility that necessary evidence might be missing when we are making a judgment.

Humans – A term created by behavioral economist **Richard Thaler,** which describes the way that psychologists view people. Humans are not always rational, not always selfish, and are often very unstable in their likes and dislikes. This term is often used in opposition with Econs—the way that economists view people. **Kahneman** spends a majority of Part 4, which discusses prospect theory, arguing that people generally act more like Humans and less like Econs.

Econs – A term created by behavioral economist **Richard Thaler** which describes the way that economists view people. Econs are always rational, always selfish, and unchanging in their tastes. **Kahneman** argues throughout the book that people generally do not operate like Econs. This term is often used in opposition with Humans—the way that psychologists view people.

THEMES

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INTUITION, DELIBERATION, AND LAZINESS

Daniel Kahneman's primary aim in *Thinking, Fast and Slow* is to explain human problem-solving, decision-making, and behavioral economics for those without psychology degrees. In order to do that, Kahneman first introduces readers to two ways in which people think, which he calls "System 1" and "System 2." System 1 handles involuntary, automatic processing, and is often associated with intuition. Peoples' intuitions are often right, but in certain circumstances, System 1 makes key judgmental errors or is easily manipulated. System 2, on the other hand, is used in scenarios that require more deliberate effort (such as calculating 17 x 24). While System 2 can be more accurate than System 1, it too can sometimes be fooled by simple manipulations because the human brain tries to use the least amount of energy possible when confronted with something that cannot be calculated or solved automatically. Kahneman argues that the brain is lazy by nature, and people should work to recognize situations in which mistakes or manipulations are likely and attempt to avoid those missteps.

Kahneman demonstrates that the brain naturally tends towards System 1 because it requires less effort, but that system is prone to make mistakes because it processes things extremely quickly and automatically. Thinking fast takes little energy, unlike thinking slow (for example, people will naturally stop walking if they are asked to complete a difficult mental

task). Because of this, people naturally tend towards allowing System 1 to take over. As an example, Kahneman describes a common puzzle: A bat and ball cost $1.10. The bat costs one dollar more than the ball. How much does the ball cost? The intuitive answer is 10 cents, but using System 2, one can determine that the correct answer is 5 cents. People could easily calculate this, but they tend to let their automatic thinking handle the work and therefore make mistakes. Like visual illusions, Kahneman brings up these kinds of cognitive illusions so that people can recognize the value of putting in just slightly more cognitive effort.

System 1 is a way of learning patterns. It separates things into categories and examples to help complete certain tasks, like being able to immediately recognize that two towers are the same height, or being able to determine the approximate average of a set of lines. However, although System 1 does well with comparisons, it doesn't do well with sums. Participants in a study were asked about their willingness to pay to help save birds after an oil spill. Different groups of participants stated their willingness to pay to save 2,000 birds, 20,000 birds, or 200,000 birds; though the number of birds was vastly different, the answers from the different groups were nearly identical. The emotional attachment to birds does not depend on the number of them. Thus, fast thinking can sometimes lead to judgements that don't make sense in comparison to other responses. The goal, then, is to broaden the context in which people make decisions. System 1 is also easily manipulated by outside factors. Kahneman describes this as "priming." For example, people who read words associated with money, or who are exposed to the idea of money in other ways, unconsciously become more selfish and less altruistic. People's automatic associations, then, can change their behavior and actions in ways that they do not realize. They do not intentionally choose to be less altruistic—their System 1 makes that choice for them. Primes can be found in many places, but Kahneman's point is to ensure that people are not intentionally manipulated.

While System 1 has its blind spots due to its being automatic, System 2 also has issues even when people try to put more deliberate effort into making decisions. System 2 is devoted to tasks that require attention and effort, like trying to count the instances of the letter "a" on a page, or picking out a relative in a crowd. However, in instances of more complicated questions and decisions, System 2 can be easily fooled because it can sometimes be preoccupied with other thoughts and is often lazy. For example, participants in a study were asked to watch a video of a basketball game and count the number of passes made by the team wearing white. The participants were so focused on the task that they rarely noticed a woman dressed in a gorilla costume walk into the game, pound on her chest, and then walk out of the game. This illuminates the blind spots that people might have if they are concentrated on something else. System 2 also makes people prone to simplify complicated questions in order to work less hard. When people are asked how successful a candidate might be in politics, they often substitute far simpler questions, like whether that candidate looks like a political winner. The issue with these simplifications, we need to recognize, is that sometimes the actual question asked requires a lot more information and analysis, yet people instead formulate important opinions, decisions, and financial contributions based on easier questions. Another way that System 2 tries to simplify its thought process is by using any available information as a guide, even though the information may not actually be useful. If a person is asked whether Gandhi was more than 114 years old when he died, they will give a much higher estimate of his age at death than if the first question had asked if he was more than 35. System 2 is still activated, but it relies on available information to make its decisions. But it is important for us to recognize when that information is obviously uninformative, and not to be swayed by it.

System 1 and System 2 are both modes of thinking that help people answer questions and make assumptions. In *Thinking, Fast and Slow*, Kahneman demonstrates that people cannot always rely on their automatic responses, but also that even when people put in extra effort, they are prone to errors because they rely on faulty reasoning. The goal, then, is to recognize those methods of faulty reasoning (which Kahneman refers to as heuristics) and attempt to avoid them in order to be more rational and accurate thinkers.

HUMAN FALLIBILITY AND OVERCONFIDENCE

After introducing the two modes of thinking he calls "System 1" and "System 2," Kahneman illuminates some of the underlying fallacies people rely on as they process information. In addition to humans' natural tendency towards laziness, people also tend to be overconfident in their abilities to correctly answer questions and make calculations. This overconfidence leads not only to biased conclusions based on a person's subjective experiences, but often leads to outright error.

In order to make their lives easier, people tend to streamline their thoughts and feelings when answering questions, often ignoring relevant outside data. This makes them extremely confident in their answers, but only because they have simplified their mental processes. Kahneman describes how people tend to commit "confirmation bias": believing themselves to be generally right, people look for evidence that confirms a belief they already hold rather than looking for evidence that disproves it. For example, if people are asked, "Is Sam friendly?" they look for evidence to confirm that Sam is, in fact, friendly, rather than finding examples that disprove it. Therefore, they are biased to agree with the question.

Similarly, the "halo effect" is another facet of confirmation bias, in which people's positive predispositions toward people, places, or things make them want to like everything about that person, place, or thing; the same is true of things people harbor negative feelings about. Kahneman uses a principle, "What you see is all there is" (WYSIATI) to explain how people only use information presented to them in their consideration of facts and calculations. This also makes them overconfident in their predictive abilities. For example, when Kahneman worked in the Israeli Army, he evaluated soldiers for officer training by watching a team-building exercise for a few hours. He would then make predictions about who might be the best candidate for the training. Ultimately, his predictions were only slightly better than blind guesses. He only used what he was able to see, assumed that a few hours would be representative of soldiers' performances more generally, and had great confidence in his ability to predict. People also place too much confidence in what they know from their own experiences and ignore potential outside data, because they inherently feel more secure in their own knowledge and experiences than those of others.

People tend to overestimate statistics when they can readily relate to them—for example, people will give a higher estimate for the rate of car crashes if they have personally been in one or witnessed one recently. Kahneman gives another example in which two partners each estimate that they do 70 percent of the housework, because they usually only remember the instances in which *they* do the chores. This also happens with news stories: people fear terrorism because it dominates the news cycles, yet fatal car crashes are far more common. As Kahneman writes, "Emotion and vividness influence fluency, availability and judgments of probability—and thus account for our excessive response to the few rare events that we do not ignore." The more readily people can think of examples, the more they overestimate frequency and probability.

In addition to being overconfident about their own knowledge and experiences, people are overconfident about their own personal attributes and abilities. Kahneman writes how CFOs (chief financial officers) are shown to be grossly overconfident about their abilities to predict the market. Likewise, medical experts who were asked about their diagnoses and were "completely certain" about them were actually wrong 40 percent of the time. The issue is that overconfident people are rewarded, as they are more easily able to gain the trust of clients. People also become more confident in hindsight. People think they understand the past, which implies that they should understand the future. In reality, however, they understand the past less than they think they do. A survey was conducted in 1972, just before President Nixon travelled to China to meet with Mao Zedong. Respondents assigned probabilities to fifteen different possible outcomes of the meeting. After Nixon's return, respondents were asked to recall the probability they assigned to different outcomes. If the event had actually occurred, they exaggerated what they had thought the probability was. This hindsight bias leads people to evaluate decision-making processes in a faulty way—by the outcome, not by whether the decision was sound at the time. Kahneman explains, "We are prone to blame decision makers for good decisions that worked out badly and to give them too little credit for successful moves that appear obvious only after the fact."

People also assume that statistical rules do not apply to them; they assume the best-case scenario for themselves and rarely consider the worst-case scenario. Kahneman experiences this himself when he tries to draft a textbook for the Israeli Ministry of Education. The team he assembles works quickly together, and he asks them to estimate how long it might take to complete their job. The team members' average answer is around two years. When he asks his colleague, Seymour, to estimate based on his knowledge of other teams, Seymour realizes that only about 40 percent of teams finish the job, and it usually takes seven or eight years. Kahneman realizes in hindsight that they should have abandoned their project, but they assumed that they might be the exception—even though they were not.

It makes sense that people rely on their own experiences to determine answers to questions—after all, their personal experiences are the only ones they have access to. However, this method is ultimately problematic because people rely too heavily on that experiential knowledge without understanding fully how their experiences fit into bigger patterns. People often fail to account for the fact that they simplify their thought processes and exaggerate their responses. If Kahneman's primary goal is to allow people to recognize how they make mistakes, revealing the situations in which people are typically overconfident is the first step in raising that awareness.

STORIES AND SUBJECTIVITY VS. STATISTICS AND OBJECTIVITY

Humans are natural storytellers; they attempt to make sense of the world by attaching stories to events that occur. Because of this, Kahneman explains, humans have a difficult time reckoning with purely statistical or numerical information and they underestimate the randomness in the world. One of the biggest difficulties that people face in making decisions or analyzing data is when they are presented with statistical information in conjunction with a narrative about the same principle. Even though the statistical information should hold as much weight—if not more—than the narrative, people generally prefer the narrative.

Humans will readily violate the laws of probability when they are presented with details that play into their impulse to automatically construct stories in their minds. After hearing

priming details about a fictional person named Linda—including the facts that she is single, outspoken, concerned with discrimination and social justice—people said that it was more probable that Linda was a feminist bank teller than a bank teller, even though this violates the law of probability because any feminist bank teller is, by default, a bank teller (so simply saying "bank teller" would be the better guess). In another example, Kahneman describes a scenario: a cab was involved in a hit and run accident at night. 85 percent of the cabs in the city are green and 15 percent are blue. A witness identified the cab as blue; witnesses under these circumstances correctly identify cab colors 80 percent of the time. What is the probability that the cab was green? Kahneman finds that people usually ignore the base rates of the number of cabs, and instead favor the witness's accuracy, guessing about 80 percent. However, if the first sentence had said that green cabs are involved in 85 percent of accidents, people give more weight to that information because they construct a story assuming that the green cabs are more reckless. Thus, the narrative assumptions cloud the statistical information and make people less accurate.

People often place more weight in causality (the fact that an event directly leads to another event) because it helps them make sense of the world. However, this leads to errors in judgment because the world is often more random than people believe it to be. Kahneman worked with the Israeli Air Force, and he describes how one of the instructors emphasized punishment over reward. The instructor stated that when he praised flight cadets for a good maneuver, they usually did worse. Screaming into a cadet's ear for bad execution generally led to better performance. However, this discredits the fact that a particularly good execution of a certain maneuver will more likely than not be followed by a less well-executed maneuver, and vice-versa with a particularly bad execution. Thus, while the instructor may appear to be correct, he is inappropriately attaching causality between his actions and the cadets' performances. In general, people will assign greater significance to talent, stupidity, and intentions than to luck. Entire industries are built on expert analysts explaining what is often just due to laws of probability and chance. Kahneman points to analysis of the Olympic ski jump, in which athletes jump twice. If athletes have a good first jump, commentators say they will have a worse second jump because they will feel pressure; if athletes have a bad first jump, commentators say that they have nothing to lose and will have a better second jump. The analyst has detected a principle of luck and chance and has assigned a causal story to it. But Kahneman points out that, like the cadets, the athletes are simply more likely to have a worse jump if they had a better jump just prior, and vice versa.

The previous examples demonstrate how people lack objectivity when looking at statistics, but people also lack objectivity when they are forced to evaluate their own experiences. How an experience ends seems to hold greater weight in people's memory than how it was as a whole. A record scratch at the end of an enjoyable concert "ruins" the experience. Even though the past is fixed, memory is mutable, and the story of how a person experienced the concert is changed in retrospect. Similarly, when people have a bad experience, the duration of that experience is less important than the memory of it. In an experiment, people are exposed to two experiences: first, sixty seconds of putting their hand in a cold water bath; second, sixty seconds of putting their hand in a cold water bath followed by thirty additional seconds with slightly less cold water. People prefer to repeat the second experience rather than the first, even though the second experience encompasses the first experience. Subjectively, people believe the second option is slightly less painful because it ends in a better way. This is another way in which people's perceptions do not match statistical data and therefore cause them to act or respond in unexpected ways.

Constructing stories about the world is a useful way to make sense of it, but it also becomes one of the primary ways in which people commit errors in thinking and judgment. Using these examples, Kahneman tries to impress on his readers that things like intentions, talent, and stupidity only tell part of the story, and that luck and randomness should be just as critical in our understanding of how the world works.

CHOICES, LOSSES, AND GAINS

In 2002, Kahneman won the Nobel Prize in Economics for his work in behavioral economics, namely his development of prospect theory with Amos Tversky. Prior to prospect theory, economic theorists believed that the value of money was the sole determinant in explaining why people buy, spend, and gamble in the way that they do. Prospect theory (explained over the course of several chapters of *Thinking, Fast and Slow*) argues that people's choices are determined less by the intrinsic value of money, and more by the way in which people feel that their wealth or general circumstances have changed.

Prospect theory reveals that people are "loss averse"—they dislike losing more than they like winning—because they care more about maintaining their current state of wealth than improving it. Kahneman sets up a gamble: if a coin shows tails, the person will lose 100 dollars, but if the coin shows heads, they will win 150 dollars. Even though they stand to gain more than they would lose, most people dislike this gamble because losses loom larger than gains. In another experiment, people are told that they have been given 1,000 dollars. They are then told that they have a 50 percent chance to win 1,000 dollars or they can get 500 dollars for sure. In this scenario, they will usually choose the second option. However, if they are told that they have been given 2,000 dollars and are given a 50 percent chance to lose 1,000 dollars or to lose 500 dollars for sure, they will usually choose the first option. Even though the two

scenarios contain the same outcomes, people are risk averse in the first and risk seeking in the second because they intrinsically care more about avoiding a sure loss and are more willing to take a risk. Loss aversion also explains some investors' behavior: people are more likely to sell stocks that have gained money rather than stocks that have lost money, because they consider the buying price to be a reference point, and they don't like to add losses to their record. Yet Kahneman points out that the primary consideration when buying stocks is to consider how well a stock might do in the future, not its previous value.

Kahneman then expands his argument to show that the tendency towards loss aversion is true not only with money, but also with objects and goods. A friend of Kahneman's—whom he calls Professor R—will only buy wines below 35 dollars, but will not sell those same wines for under 100 dollars. Thus, owning the good appears to increase its value because the professor has a higher selling point for the wine than buying it (he dislikes losing the wine more than he likes gaining it). This concept is also true of a person who buys a concert ticket for 200 dollars and is unlikely to sell their ticket, even for a much greater price. Thus, loss aversion appears to be particularly true of goods like tickets (and the wine in the previous example) that are meant to be "for use"—experiences for the person who bought them. Owning the good increases its value.

Loss aversion is then shown not only to be true of money and goods, but also of general psychological experiences. Kahneman asks readers to imagine a company that has already spent 50 million dollars on a project that is behind schedule and is now less likely to bring in money than initially thought. Furthermore, the project now requires an additional investment of 60 million dollars to reach completion. The company is still unlikely to abandon the project because it has already invested money and is averse to taking a sure loss on the project as a whole, when the primary consideration should be the future prospects of that project and whether that money might be better invested somewhere else. In another example, Kahneman reveals that golfers who putt to avoid a bogey (a loss of one stroke over par) putt with more accuracy than golfers who putt to achieve a birdie (a gain of one stroke under par) because they are more averse to taking a loss than to achieving a gain. Kahneman explains that this principle of loss aversion is what keeps people in poor jobs, unhappy marriages, and unpromising research projects for too long.

Kahneman uses prospect theory to demonstrate how our choices about money, goods, and gambles are not always based in monetary value, but in value that is based how a person feels about a prospect, how and when they acquired that prospect, and how much time and effort they have already invested in it. Kahneman admits that the theory is not perfect, but he argues that it allows people to understand their own decisions more concretely and enables them to take a more holistic view of how they buy, sell, and gamble.

SYMBOLS

Symbols appear in **teal text** throughout the Summary and Analysis sections of this LitChart.

MÜLLER-LYER ILLUSION

The Müller-Lyer illusion symbolizes people's inability to change how they process information, even when they know they are wrong. The Müller-Lyer illusion is an image: on the top is a horizontal line with arrows or fins attached to it that point outward, away from the line. On the bottom is another horizontal line with arrows or fins that point inward, towards the line. Measuring would reveal that the two horizontal lines are the same, but the horizontal line in the bottom figure always appears longer. Even though we learn that the two lines are equally long, that is not our automatic intuition about them.

This illusion then becomes a good stand-in for what Kahneman calls "cognitive illusions." Like the Müller-Lyer illusion, there are cognitive illusions in which, even though people learn what the real answer to a puzzle might be, their intuition will still tell them that a different answer is the correct one. Kahneman's purpose in writing the book, then, is to help people learn the illusions—like Müller-Lyer—in which they might make a mistake, and to remind them to expend a little more effort in calculating their answers and making decisions.

QUOTES

Note: all page numbers for the quotes below refer to the Farrar, Straus and Giroux edition of *Thinking, Fast and Slow* published in 2011.

Part 1, Chapter 1 Quotes

The gorilla study illustrates two important facts about our minds: we can be blind to the obvious, and we are also blind to our blindness.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 24

Explanation and Analysis

One of the earliest experiments that Kahneman introduces

involves participants watching a short film of two teams—one wearing white and one wearing black—passing basketballs. The viewers are so preoccupied with a task in which they must count the number of passes that they do not notice a woman wearing a gorilla suit walk through the game. The gorilla experiment, as Kahneman suggests, illustrates some of the mistakes that our brains fall victim to. This example in particular illustrates the limits of System 2—the system involved with deliberate effort and calculation. Counting the number of basketball passes is not something that comes naturally to us, and thus it takes a serious amount of mental effort to do so. In this scenario, we don't see the gorilla not because System 2 is lazy, but because it is busy and does not have the same amount of mental effort to devote to that task.

Additionally, Kahneman points out here that we are "blind to our blindness." This is, in effect, pointing out our overconfidence in our abilities, or at least our surprise in our shortcomings. This blindness demonstrates how our confidence leads not only to error, but even afterwards to our disbelief in those errors.

❝ Constantly questioning our own thinking would be impossibly tedious, and System 2 is much too slow and inefficient to serve as a substitute for System I in making routine decisions. The best we can do is a compromise: learn to recognize situations in which mistakes are likely and try harder to avoid significant mistakes when the stakes are high.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 28

Explanation and Analysis

This statement makes up the crux of the book's argument. Kahneman first introduces the two modes of thought (System 1 and System 2) by enumerating their different purposes and strengths: System 1 is automatic and often prone to mistakes based on the heuristics that we use to simplify calculations and thought processes. System 2 is mobilized when it is necessary to put more deliberate effort into certain calculations.

In this passage, Kahneman plainly states one of the primary goals of the book. His aim is not to force us to use our System 2 processing for everything (which would not only make us much slower thinkers but also much more mentally exhausted thinkers), but instead to recognize where our primary errors arise and to try to avoid those errors. The chapters in Part 1, then, primarily focus on the different biases and errors that commonly result from the misuse of System 1 and System 2, in the hopes that we can recognize these situations in our own lives and avoid our inherent laziness should they come up.

Part 1, Chapter 3 Quotes

❝ The bat-and-ball problem is our first encounter with an observation that will be a recurrent theme of this book: many people are overconfident, prone to place too much faith in their intuitions.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 45

Explanation and Analysis

In order to demonstrate our inherent laziness, Kahneman introduces a common puzzle that references a bat and a ball, in which the intuitive answer to the problem is an incorrect answer. With a simple check, he explains, one could easily identify that the intuitive answer as being wrong, but very few people actually do this check. This is a perfect demonstration of the principle that our System 2 processing is lazy. Instead of investing this slight amount of extra effort that it would take to verify the intuitive answer that System 1 has put forth, people choose simply rely on System 1's automatic intuition.

Even though this isn't one of Kahneman's examples of an overconfident heuristic that leads to mistakes, there is still an element of overconfidence here, as he points out. People decide to trust their instincts over more accurate calculation methods, and place too much faith in their own abilities to make those calculations. His goal, then, is to demonstrate some of the common problems and illuminate for us when it is prudent to invest more effort.

Part 1, Chapter 4 Quotes

❝ The results are not made up, nor are they statistical flukes. You have no choice but to accept that the major conclusions of these studies are true. More important, you must accept that they are true about you.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 57

Explanation and Analysis

In Chapter 4, Kahneman discusses the concept of priming, in which various external stimuli can subconsciously and imperceptibly change our behavior. These changes in behavior come as a result of System 1's automatic associations and the network of patterns that it has developed over time. Thus, for example, if people are primed for money, they are shown to be less altruistic and more individualistic. Even though many people don't believe that these subconscious effects are true of them, this exposes people to another kind of bias.

Kahneman makes the point that it is important for people not to be overconfident about their ability to be affected by these stimuli, as this overconfidence will affect their ability to draw lessons from the rest of the book. Many of Kahneman's stories reference studies that are representative of the general population. But, if people choose not to believe that these studies apply to them as individuals as well, they will fail to learn lessons from the book and they will subsequently fall victim to many of the biases that Kahneman describes.

Part 1, Chapter 7 Quotes

❝ Contrary to the rules of philosophers of science, who advise testing hypotheses by trying to refute them, people (and scientists, quite often) seek data that are likely to be compatible with the beliefs they currently hold.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 81

Explanation and Analysis

Kahneman discusses how people form conclusions: when they are asked a question like "Is Sam friendly?" they will call up a different set of data than if they are asked "Is Sam unfriendly?" The difference between these two sets of data that people will seek demonstrates that people have a "confirmation bias": they tend to look for examples that will confirm the beliefs they already hold, rather than try to test hypotheses that will prove them wrong. The presence of confirmation bias illustrates two of the book's themes. First, it demonstrates that our cognitive processes are biased towards laziness—it is easier for us to come up with examples of the thing that we have been asked, than to realize that it is more prudent to come up with examples for the thing that we have not been asked.

Second, confirmation bias is an element of our overconfidence. Not only do we like to be right, as a rule, but we also tend to assume that we are right, and that the beliefs we already hold will prove to be true. Thus, when we come up with examples, we tend to recall only those examples that will support our intuitions.

❝ We often fail to allow for the possibility that evidence that should be critical to our judgment is missing—what we see is all there is.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 87

Explanation and Analysis

In a chapter devoted to demonstrating how our minds automatically jump to conclusions, Kahneman refers to a study in which people who only heard one side of a court case believed that side of the court case and were far more confident in their judgment than those who had heard both sides. This is due to a phenomenon that Kahneman calls "What you see is all there is" (WYSIATI). This means that the evidence that is in front of us is the sole evidence that we use to make judgments, without considering the possibility that we might need outside information. This is both because our mental processes are inherently lazy, and because we are overconfident in the information that we already believe and have access to. This can lead to errors in various kinds of calculations, however, and by using the example of a court case, Kahneman demonstrates that these biases can have serious consequences.

Part 2, Chapter 10 Quotes

❝ We are far too willing to reject the belief that much of what we see in life is random.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 117

Explanation and Analysis

Kahneman explains that often we see patterns where none exist, as when we assume that there is a "hot hand" in basketball (in which a player gains a temporarily increased propensity to score) or we assume that in a sequence of six births in a hospital, the births being all girls is less likely than having a mix of boys and girls. In each case, we start to assume that there might be an underlying cause for what we see as a pattern, even though in fact these events are random. The example of the hospital births is particularly indisputable for being random, because there is exactly equal chance of a parent having a boy as a girl, and these events are independent of each other. Yet the fact that we still assume some kind of pattern plays into a broader fact about our minds: we have a difficult time assessing statistics that have no underlying cause, and so instead our System 1 processing starts to assume that there must be a cause.

Part 2, Chapter 12 Quotes

❝ The explanation is a simple availability bias: both spouses remember their own individual efforts and contributions much more clearly than those of the other, and the difference in availability leads to a difference in judged frequency.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 131

Explanation and Analysis

Kahneman explores the availability bias here, which reasons that when people try to estimate the frequency of a given category or event, they will rely much more on events that attract attention, that gain lots of media coverage, or that are personal and vivid in order to come up with their estimates (as opposed to trying to formulate some kind of statistical calculation or even relying on information that they know). This example, of two spouses who are asked to estimate the percentage of housework they do, falls into that third category. They both estimate that they do over half the work, because they are not privy to all of the effort and time that the other person spends on the housework and additionally are very aware of their own work. This is due to the fact that people are overconfident in what they personally have experienced—particularly when that information is easy to retrieve from memory—and thus they overestimate the frequency of their doing the work.

Part 2, Chapter 13 Quotes

❝ The lesson is clear: estimates of causes of death are warped by media coverage. The coverage is itself biased toward novelty and poignancy.

Related Characters: Daniel Kahneman (speaker), Paul Slovic

Related Themes:

Page Number: 138

Explanation and Analysis

Kahneman speaks about the availability bias—which reasons that we estimate frequency of an event based on our ability to come up with examples of that thing—in terms of risk and judgment. A team led by Paul Slovic asked people to estimate various causes of death, and often people would overestimate causes of death that were, as Kahneman explains here, covered more often by the media—which itself bases its coverage on different, interesting, and poignant events. Thus, we are readily influenced by the media because we are overconfident in the things that we have personally seen or heard about (this also has to do with the WYSIATI concept). Hearing about someone struck by lightning on the news, for example, makes the idea of death by lightning more available to us, and thus we tend to overestimate the frequency of that event. This has real-world consequences in that we are very affected by events like acts of terrorism (and that fear or worry can drive public policies), even though vehicle accidents are many times more frequent, for example.

Part 2, Chapter 14 Quotes

❝ People without training in statistics are quite capable of using base rates in predictions under some conditions. [...] However, concern for base rates evidently disappears as soon as Tom W's personality is described.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 152

Explanation and Analysis

In this chapter, Kahneman introduces the character of Tom W, a graduate student. People are asked to estimate the probability that he studies in nine different fields. At first, people simply try to estimate the base rate—the proportion

of all graduate students in a given field (for example, say, 11% of students study computer science). But when given a description of Tom W that makes him sound more like a computer science or engineering student, people immediately disregard base rates and are much more likely to estimate the probability that he studies in a given field based on the description of him. This is another example of the way in which our brains are ill-equipped to handle statistics. Due to our automatic processing, we much more readily latch on to features and stories that give us hints as to what the answer might be, rather than asking our deliberate processing to put effort into making those calculations—even though those calculations will prove to be much more accurate.

Part 2, Chapter 15 Quotes

❝ The set of feminist bank tellers is wholly included in the set of bank tellers, as every feminist bank teller is a bank teller. Therefore the probability that Linda is a feminist bank teller must be lower than the probability of her being a bank teller. […] The problem therefore sets up a conflict between the intuition of representativeness and the logic of probability.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Related Symbols:

Page Number: 157

Explanation and Analysis

Kahneman introduces the example of Linda, a fictional woman who is described as being single, outspoken, very bright, and concerned with social justice. People are then asked to determine whether it is more likely that she is a bank teller or a feminist bank teller, and most people will respond that she is a feminist bank teller—even though it is, by all logical rules, not true. This recalls the example with Tom W, in which representativeness is deemed more important than the statistical base rate in trying to determine what subject Tom studies. Thus, not only do we prefer stories and narrative information over statistics, but we also prefer them so much that we will violate the laws of probability. This example is even so potent that, like the visual example of Müller-Lyer illusion, when we find out the correct answer we are still drawn toward our incorrect intuition.

Part 2, Chapter 16 Quotes

❝ Nisbett and Borgida found that when they presented their students with a surprising statistical fact, the students managed to learn nothing at all. But when the students were surprised by individual cases—two nice people who had not helped—they immediately made the generalization and inferred that helping is more difficult than they had thought.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 173-174

Explanation and Analysis

Nisbett and Borgida had tried an exercise with their psychology students. First, they presented them with the results of an experiment: that the majority of people (78%) had not helped a person in need when they thought that someone else would be able to help. Yet when they showed interviews with two individuals that had been a part of the experiment, the students assumed that both of those individuals had rushed to help—preferring to rely on the fact that the two individuals seemed like decent people rather than relying on the statistical information that they had been given.

This exercise with the students serves as another example that demonstrates how people prefer to rely on stories than statistics. This is further proven when Nisbett and Borgida try an exercise in which they tell the students that the two individuals did not help and ask them to estimate the overall helping rate of the participants. These estimates were much more accurate, because a surprising story carries more weight than a surprising statistic.

Part 2, Chapter 17 Quotes

❝ Indeed, we pay people quite well to provide interesting explanations of regression effects. A business commentator who correctly announces that "the business did better this year because it had done poorly last year" is likely to have a short tenure on the air.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 182

Explanation and Analysis

Kahneman explains the principle of regression, whereby he

demonstrates that if someone or something does something statistically better (like golfers who are under par on the first day of a tournament), it is more likely—purely by statistical chance—that they will be worse the next time they try the same thing. This is because luck is always a factor in performance. But Kahneman shows that we often assign larger roles to individual talent (or stupidity, or any number of factors that are based on the qualities of a given individual) than to luck. Kahneman attributes this idea to the fact that we are constantly trying to make sense of the world and want to believe that it is more coherent and less random than it actually is. In evoking the example of the newscaster, he demonstrates that our desire for this coherence affects how we report and consume news; he is correct in saying that a person who explains events based purely on luck is likely to have a short tenure because we have a much larger propensity for wanting narrative explanations rather than statistical ones.

Part 3, Chapter 19 Quotes

❝ A general limitation of the human mind is its imperfect ability to reconstruct past states of knowledge, or beliefs that have changed. Once you adopt a new view of the world (or of any part of it), you immediately lose much of your ability to recall what you used to believe before your mind changed.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 202

Explanation and Analysis

This quote comes during Kahneman's discussion of hindsight bias, in which he explains that we have a tendency to overestimate how much we knew about the past (an experiment shows that people will exaggerate the probability they assigned to an event happening if that event did in fact end up happening). This bias is part of a larger tendency that humans have towards overconfidence—we generally have greater faith in our own abilities than is truly warranted. Because we believe we understand the past, we also overestimate our ability to predict the future.

These different factors, while they help us to make sense of the world and to see it as more coherent, can also lead to some serious mistakes. Hindsight bias in particular can affect the way we evaluate decisions. Even if a decision was arrived at by a sound process, if it turned out badly we blame the decision-maker. The same thing happens if someone makes a very risky decision, but it works out in their favor—that person is usually rewarded for being more astute, even though this reinforces even riskier behavior.

Part 3, Chapter 20 Quotes

❝ The illusion of skill is not only an individual aberration; it is deeply ingrained in the culture of the industry. Facts that challenge such basic assumptions—and thereby threaten people's livelihood and self-esteem—are simply not absorbed.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Related Symbols:

Page Number: 216

Explanation and Analysis

Part 3 is largely concerned with the theme of overconfidence, and Kahneman spends a good deal of time focusing on "experts" and people who have more confidence in their predictive abilities or skill than is statistically warranted. This chapter particularly focuses on professionals in the financial industry. Kahneman mathematically proves that financial investors' success on a year-by-year basis is largely due to luck, and that an average person could do as well as they do. Of course, this contradicts the financial investors' own experience of what they do—asserting that it requires a good deal of skill to find success in the industry. And not only are the financial investors overconfident in their own abilities, but financial firms are as well—rewarding luck as if it is skill with year-end bonuses based on yearly performance. But the illusion of skill is also upheld by a deep bias. Like the Müller-Lyer illusion, even when people realize the bias they hold or the information they have is incorrect, their intuition—that their field requires a high degree of skill—is nearly insurmountable.

Part 3, Chapter 21 Quotes

❝ Applying Apgar's score, the staff in delivery rooms finally had consistent standards for determining which babies were in trouble, and the formula is credited for an important contribution to reducing infant mortality.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 227

Explanation and Analysis

Kahneman describes the Apgar test as a prime example of why standardized scoring is more reliable than human intuition. Prior to the development of the Apgar test, obstetricians used different metrics to determine whether a newborn infant might be in distress and at risk for brain damage or death. In 1953, Virginia Apgar developed a set of five variables that people could score on a scale from one to three. The aggregate score served as a good indicator of whether a baby was healthy or not. This served as a very important development in delivery rooms. Instead of relying on fallible and often inconsistent humans, the test gave a formula that turned out to be much more reliable, and in fact, the test is credited with significantly reducing infant mortality. Even though the different obstetricians may have had valuable expertise that allowed them to develop good intuitions, an accurate algorithm provides an important means of eliminating bias and inconsistency.

Part 3, Chapter 23 Quotes

❝ In this view, people often (but not always) take on risky projects because they are overly optimistic about the odds they face. I will return to this idea several times in this book—it probably contributes to an explanation of why people litigate, why they start wars, and why they open small businesses.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 253

Explanation and Analysis

Kahneman describes an instance in which he himself fell victim to overconfidence. When creating a textbook, he and his team vastly underestimated the time and effort it would take to complete it. This is what he calls the planning fallacy, in which people assume the best-case scenario for themselves because they are confident in their own abilities to complete a task or project, despite a baseline assessment of how long something might take or how difficult it might be. This overconfidence leads to costly mistakes—while the group had estimated 1.5-2.5 years to complete the project, the curriculum had in fact taken eight years to complete, and in the meantime the enthusiasm for the project had waned and the curriculum was never used. Kahneman's goal, then, is to counsel people not to make the same mistake. If they had had a reasonable idea of how long the project might have taken, they might never have begun it in the first place, and therefore would not have wasted valuable time and energy.

Part 3, Chapter 24 Quotes

❝ Experts who acknowledge the full extent of their ignorance may expect to be replaced by more confident competitors, who are better able to gain the trust of clients.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 263

Explanation and Analysis

As Kahneman continues to explore what it means to be an "expert" and the overconfidence that they often exhibit, he considers a variety of fields in which confidence is rewarded. Even though overconfidence often comes with an increase in mistakes and biases, people prefer overconfident individuals in fields like financial investment, in television hosting, and in medicine. He cites statistics for each of these areas that demonstrate why being overconfident can actually be harmful, because people are too willing to rely on their own (flawed) intuitions. Kahneman also devotes a large portion of the book to demonstrating the sheer variety of biases that overconfident people can have, such as the hindsight illusion, the planning fallacy, and optimistic biases. Yet one of the issues with society is that overconfident individuals often find more success than their less confident colleagues, because clients generally prefer certainty over doubt. Thus, not only is overconfidence an issue that individuals must learn to combat, but society as a whole has to understand the issue with always viewing overconfidence favorably.

Part 4, Chapter 26 Quotes

❝ For most people, the fear of losing $100 is more intense than the hope of gaining $150. We concluded from many such observations that "losses loom larger than gains" and that people are loss averse.

Related Characters: Daniel Kahneman (speaker), Amos Tversky

Related Themes:

Page Number: 284

Explanation and Analysis

Kahneman reports the primary work that he did with Amos Tversky, which is called prospect theory. Prospect theory demonstrates that people's intrinsic idea of money is not fixed; it is often dependent on how gaining or losing wealth makes them feel that their situation has changed. A big finding of prospect theory is the concept that people are intuitively loss averse, which Kahneman demonstrates here. In this example he quotes, even in a favorable gamble people avoid risk because they fear losing more than they want to win. In terms of prospect theory, this concept is explained by the fact that people care more about maintaining their current state of wealth and general condition than they care about improving it.

Loss aversion takes on many forms, whether strictly through money (as shown here), or through goods or situations. And as with other intuitions, loss aversion can open people up to a series of biases that stem from it, like the sunk-cost fallacy, fear of regret, and overweighting unlikely situations. Overall, loss aversion can be helpful and help maintain the status quo, but Kahneman aims to make its negative effects apparent so that people can avoid costly mistakes.

Part 4, Chapter 30 Quotes

❝ You read that "a vaccine that protects children from a fatal disease carries a 0.001% risk of permanent disability." The risk appears small. Now consider another description of the same risk: "One of 100,000 vaccinated children will be permanently disabled." The second statement does something to your mind that the first does not.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 329

Explanation and Analysis

Kahneman displays the difficulty that many people have with statistics, and particularly with a concept he calls "denominator neglect." This bias ignores the base-rate in frequency and instead focuses on individuals, as in this example. When the statistic is communicated not in terms of percentages but instead in terms of concrete amounts, the 99,999 children who are unaffected by the vaccine become relatively unimportant: instead, people focus on the single child that is affected. The second example arouses our emotions much more than the first, because we find stories (and the images that our minds conjure) to be much more salient than statistics.

This example also exhibits the importance of framing. When shown these two different ways of referencing the same fact, we acknowledge that they are the same and can make a judgment with both references in mind. But if we are shown one over the other, we are likely to be influenced without being aware that an alternative method of presentation might have changed our opinion. This is an example of WYSIATI—we are confident that the information that has been presented to us is all that we need, and do not believe that there might be other information that could help us make decisions.

Part 4, Chapter 34 Quotes

❝ People will more readily forgo a discount than pay a surcharge. The two may be economically equivalent, but they are not emotionally equivalent.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 364

Explanation and Analysis

Late in the novel, Kahneman introduces the idea of frames. Frames imply that the way in which information is presented (usually as either positive or negative) can have a large impact on the decisions people make with that information. In this example, credit card companies argued that gas stations should frame fees associated with using a credit card as "cash discounts" rather than "credit surcharges." Kahneman clarifies the positive and negative associations we have with giving up a discount and paying a surcharge, even though logically they indicate the same thing.

This concept, and this particular example, plays on two earlier biases that Kahneman introduced: priming and loss aversion. Priming is an automatic response to different words and ideas, activating a network of other words and ideas. "Discount" will evoke much more positive words and feelings than "surcharge" will, which is why credit card want to frame it in this way. Additionally, people care more about

losses than they do about gains, and so psychologically paying a surcharge is more painful than giving up a discount. Kahneman uses this example to demonstrate how frames can be used to manipulate people's emotions and actions, and as such emphasizes that it is important to be aware of them.

❝ Saving lives with certainty is good, deaths are bad. Most people find that their System 2 has no moral intuitions of its own to answer the question.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 369

Explanation and Analysis

Kahneman's discussion of how frames affect people's decisions reveals some troubling facts about human nature and morality. When given a problem regarding how to combat a fatal disease affecting 600 people, respondents must choose between sure things or gambles. Their answers greatly change if the question is phrased in terms of the amount of people who are saved in each scenario versus the amount of people who will certainly die in each scenario. As expected in prospect theory, when the question is framed to say that 200 people will be saved for certain (a sure gain), they become risk averse and choose that option. But when the question is framed to say that 400 people will die (a sure loss), people become very risk-seeking in the hopes that nobody will die, because losses are more painful than gains.

In terms of moral implications, the framing reveals that our intuitions, even about important moral questions, are often reliant on descriptions of problems rather than their actual substance. When people are made aware of their inconsistencies, they often have no guide—revealing how biases can actually deprive us of true moral instincts.

Part 5, Chapter 35 Quotes

❝ Confusing experience with the memory of it is a compelling cognitive illusion—and it is the substitution that makes us believe a past experience can be ruined.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 381

Explanation and Analysis

Kahneman makes a distinction between the experiencing self, which reports pain and pleasure as one experiences it, and the remembering self, which reports afterward how an experience was on the whole. The distinction between these two selves demonstrates just how subjective and mutable our memories are. Kahneman describes a man who greatly enjoyed listening to a concert on a record, only for the concert to be "ruined" by a record scratch at the very end. Thus, even a past experience can be changed in our minds by a memory after the fact.

This hindsight experience of the concert is also affected by two other related biases: the peak-end rule, and duration neglect. The long pleasure of the full concert is completely unimportant: what is more important is the experience at the end. Thus, not only is our full experience of an event subjective, but we also give greater weights to parts of the experience over others.

Part 5, Chapter 37 Quotes

❝ The use of time is one of the areas of life over which people have some control. Few individuals can will themselves to have a sunnier disposition, but some may be able to arrange their lives to spend less of their day commuting, and more time doing things they enjoy with people they like.

Related Characters: Daniel Kahneman (speaker)

Related Themes:

Page Number: 395

Explanation and Analysis

In Kahneman's discussion of happiness, he argues that our emotional state can be greatly affected by what we choose to focus on (for example, we usually only take pleasure from eating if we notice that we are eating and focus on it). This causes Kahneman to assert here that our attention, and what we spend time doing, can be manipulated in ways that will make us happier—the more that we are able to surround ourselves with activities and people we like, the more they will demand our attention and the happier we will be.

This concept can also be restated in terms of the dynamic between System 1 and System 2. System 1 is the source of our emotions and it will automatically process what is happening around us. But, with a little more effort from

System 2, we can focus on the things that make us happier and have an overall better emotional state.

Conclusions Quotes

❝ The investment of attention improves performance in numerous activities—think of the risks of driving through a narrow space while your mind is wandering—and is essential to some tasks, including comparison, choice, and ordered reasoning. However, System 2 is not a paragon of rationality. Its abilities are limited and so is the knowledge to which it has access.

Related Characters: Daniel Kahneman (speaker)

Related Themes: 

Page Number: 415

Explanation and Analysis

As Kahneman wraps up his conclusions, he reiterates the contrast between System 1 and System 2—System 1 being based on intuitions, while System 2 is more deliberate and effortful. Much of the book has been devoted to the ways in which our intuitions can be based on unhelpful mental shortcuts, which in turn cause us to make mistakes. Yet this quote also reminds us that even when we invest more attention into activities or calculations, we can still make mistakes.

The key then, and what Kahneman aims to do in the book, is to make people aware of both kinds of mistakes: the intuitive ones, and the ones that we commit even when we try to exert more effort. His hope is that the more that we are exposed to these heuristics, the more that we can identify scenarios in which we might be prone to those mistakes and avoid them.

SUMMARY AND ANALYSIS

The color-coded icons under each analysis entry make it easy to track where the themes occur most prominently throughout the work. Each icon corresponds to one of the themes explained in the Themes section of this LitChart.

PART 1, CHAPTER 1

Kahneman opens by allowing us to observe our minds in two different processing modes. He first provides an image of an angry-looking woman, eyebrows furrowed and mouth agape. He tells readers to note how they automatically observe her to be angry, perhaps about to say something loud and unkind. He says that this is an instance of "fast thinking."

In order to demonstrate some of the faults in the way we think and process information, Kahneman must first introduce us to the two ways in which we do so. One of Kahneman's main strategies for this, which he carries out through the book, is by asking us to observe our own brains at work.

Next, Kahneman instructs us to solve the problem 17 x 24. He states that we know we could probably solve the problem with effort, and perhaps with paper and pencil. He notes that when we solve it, we proceed through a sequence of steps, burdened by holding information in our heads. This is an example of slow thinking.

Like the example of the angry woman, Kahneman allows us to observe the limits of our "fast thinking" and show how "slow thinking" takes a lot more deliberate effort, as when we try to solve a more complex math problem.

Kahneman adopts the terms used by psychologists Keith Stanovich and Richard West, who referred to these two processes as "System 1" and "System 2." System 1 operates automatically and quickly. System 2 allocates attention to complex and effortful mental activities.

By introducing the two systems, Kahneman builds a framework that will eventually allow us to understand the limits of each individual kind of processing.

Kahneman then lists some examples of System 1 and System 2 processing: System 1 detects distance, orients to sounds, allows us to drive a car on an empty road, automatically answers 2 + 2 = ?, reads words, and understands simple sentences. System 1, Kahneman says, is responsible for "effortlessly originating impressions and feelings." Kahneman also notes that many of these mental actions are completely involuntary.

Providing relatable and simple examples of System 1 processing goes a long way in allowing us to understand how much it encompasses. System 1 is vital to processing sensory information like sounds and sights and automatic calculations that our brain has developed over time.

System 2, on the other hand, is responsible for thoughts and actions that require attention, and which are disrupted if attention is drawn away. This includes focusing on a single voice in a crowded room, looking for a woman with white hair, counting the instances of the letter "a" on a page, comparing two washing machines for value, and checking the validity of a complex logical argument. These things do not come naturally and require exertion of at least some effort.

The list of processing responsibilities belonging to System 2 is varied, allowing Kahneman to demonstrate the way in which System 2 encompasses a wide array of actions and thoughts that require a bit more effort, distinguishing it from System 1.

Kahneman writes that the phrase "pay attention" is apt, because we have a limited budget of attention to allocate. We cannot calculate 17 x 24 when driving a car in heavy traffic—we must focus on one activity or the other.

Kahneman introduces this first pitfall of System 2, noting that we only have so much attention to allocate—and the way in which we divide our attention can sometimes lead to mistakes.

Kahneman illustrates this concept in a famous study conducted by Christopher Chabris and Daniel Simons. They showed participants a short film of two teams—one wearing white and one wearing black—passing basketballs. The viewers are instructed to count the passes of the white team and ignore the team with black shirts. Most people become so focused on the task, and about half of them do not notice a woman wearing a gorilla suit who appears, crosses the court, thumps her chest, and moves on. The gorilla study shows that we can be blind to the obvious, and blind to our blindness.

Kahneman goes on to describe a famous experiment that illustrates the mistakes of System 2. The experiment provides a salient—and funny—example of how difficult it is for System 2 to be attuned to more than one task at once. Even the most surprising events don't faze us when we are deliberately focused on other things. The experiment provides a visual example of that concept, but throughout the book Kahneman shows it to be true of cognitive concepts as well.

When System 1 runs into difficulty, it calls on System 2 to support it, as in the problem of 17 x 24. System 2 also comes into play when people experience a surprise that violates the expected model of the world (such as when they notice a person in a gorilla suit in a basketball game), because it then tries to make sense of the surprising stimulus. System 2 also continuously monitors a person's behavior and works to maintain self-control.

The idea that System 2 tries to constantly interpret surprising events in the world is revisited in later chapters, when Kahneman demonstrates how we prefer to rely on narratives to make sense of the world around us, rather than try to understand that much of what happens in the world is due to randomness.


The division of labor between System 1 and System 2 is highly efficient, minimizing effort. System 1 is generally sufficient and its models of familiar situations are generally accurate. It does have biases, however, and it cannot be turned off.

The involuntary nature of System 1 will become one of its primary pitfalls, which Kahneman will discuss in greater detail when he brings up visual and cognitive illusions later in the chapter.

Kahneman then asks readers to participate in an experiment, reading two sets of words. In each set, there are two columns (a left and right column). Some of the words are in all upper-case letters, and some of them are in all lower-case letters. The difference between the two sets is that in the left set, the words alternate between "left" and "right." In the right set, the words alternate between "upper" and "lower." Kahneman asks people to complete two tasks: first calling out whether the words a person is reading is in upper or lower case, and then calling out whether the word is printed to the left of center or the right of center.

The task allows us to observe, as we try it ourselves, how we recognize that we have to change our processing. We consciously slow down as we complete the task so that we can overcome what Kahneman later calls a "cognitive minefield." The goal of the book is to help us recognize other situations like this, in which we have to force our System 2 to overcome our System 1 processing.

What Kahneman reveals, and what we find when we participate, is that it is easier to call out whether the word is in upper or lower case if we are not reading the words "upper" and "lower," and that it is easier to call out whether the word is printed to the left or right if we are not reading the words "left" and "right." It is harder to carry out the task when there is a conflict between that task and an automatic response (reading the word itself). System 2 is called in to overcome the impulses of System 1.

The reason that it is difficult to call out "upper" and "lower" when we are also reading those two words is because we are being primed for those words, a concept that Kahneman will elaborate on in Chapter 4. Priming adjusts our automatic processing because we already have those words in the forefront of our minds, and it is hard to overcome an automatic response like reading.

Kahneman next introduces illusions, including a famous image called the **Müller-Lyer illusion**. It shows two figures: on the top is a horizontal line with arrows or fins attached to it, that point outward, away from the line. On the bottom is another horizontal line with arrows or fins that point inward, towards the line. Even though measuring would reveal that the two horizontal lines are the same, the horizontal line in the bottom figure always appears longer. Thus, even though we believe that the two lines are equally long, that is not our impression of it.

The Müller-Lyer illusion allows us to recognize the difference between our impressions and our beliefs. We believe and know, after measuring, that the two lines are the same length, but we still have the impression that the bottom one is longer. This is another kind of flawed automatic thinking that Kahneman believes we have to learn to overcome.

The **Müller-Lyer illusion** is an example of a visual illusion, but there are cognitive illusions as well. As a graduate student, Kahneman attended courses on psychotherapy. One professor said that the students might meet a patient who will share a tale of mistakes in his past treatment, but who feels that they (the students) will be able to help—a feeling the students would share. The professor then tells them that despite their sympathy and their intuition, they would not be able to help this patient, as he is likely a psychopath.

The difference between a visual and a cognitive illusion is that one can simply learn the correct answer in a visual illusion like Müller-Lyer. But for cognitive illusions, we are often unaware of them until someone points them out, like Kahneman's professor here. This is why Kahneman wrote the book, so that we can become aware of and learn the mistakes we make due to cognitive illusions.

Kahneman understands that it is impractical to constantly question our own thinking. But he writes that what we can do is learn to "recognize situations in which mistakes are likely and try harder to avoid significant mistakes when the stakes are high."

Even though cognitive illusions are harder to assess, as Kahneman writes, recognize the general principles that cause us to make cognitive mistakes will help us to see our blinds spots in the future.

Kahneman then includes a disclaimer by saying that he talks about System 1 and System 2 as though they have personalities, abilities, limitations, and agency. He says that this way of speaking is considered taboo in his professional circles because they conjure up images of little people inside a person's head. But Kahneman explains that he only uses the two terms as a shorthand, and using the two systems as the subjects of sentences makes it easier for people to understand those sentences.

It is important to recognize that these two systems are outgrowths of our consciousness, and not separate from us. But the reason Kahneman uses them as agents is also because, as he notes later, we have a preference for stories that make sense of the world, and building a narrative about two "characters" allows us to understand those concepts better.

PART 1, CHAPTER 2

In chapter 2, Kahneman advises readers to try an exercise: write out several strings of four digits, and, while keeping a steady beat, report each string, wait two beats, and then report the same string but add one to each digit. So, for example, if the string is 5294, a person should read out that number, and then say aloud 6305. Most people have a difficult time with this exercise.

Kahneman's exercises continue to raise our awareness of the limits of our attention and mental effort. We can focus our System 2 on calculations, but it is difficult to do this at the same time as another process: keeping a beat. Our laziness leads us to want to focus on one or the other.

In experiments, Kahneman and a colleague—Jackson Beatty—found that people's eyes dilated the harder they worked during this exercise. People's eyes dilated most when they were asked to add three to each digit; with anything more demanding, people simply gave up. This also led Kahneman to observe that in casual conversation, people's eyes did not dilate at all. Mental life is normally conducted without much effort.

The giving up described in this exercise is distinct from the laziness people exhibit for other problems; in examples that Kahneman will describe in later chapters, our minds simply tend towards exerting as little effort as possible. This is not the same, however, as being asked to exert mental effort beyond our capacity.

The Add-3 exercise also reveals that we cannot expend more energy on a mental task than we need. One would never be able to spend more energy memorizing four digits than in completing the Add-3 exercise, because we simply do not need as much energy to do so, and will always use the least amount of energy possible.

The fact that we cannot extend more energy than a task requires likely led to our tendency towards laziness: even when we are able to exert additional necessary energy for a task, we often forgo that effort.

Additionally, as a person becomes skilled in a task, its demand for energy diminishes. Talent has similar effects. Highly intelligent individuals need less effort to solve the same problems, which we know both from monitoring both pupil size and brain activity.

Although intelligence may allow people to expend less effort, they are only slightly less immune to certain fallacies—proving that even intelligent people can still be lazy thinkers.

Kahneman then questions what makes certain tasks more demanding than others. He believes that more effort is required to maintain several ideas that require separate actions, or in which information has to be combined to make decisions—like choosing between two options at a restaurant. Time pressure, as experienced in Add-3, is another driver of effort.

Time pressure is likely a big driver of effort because, as Kahneman goes on to explain in chapter 3, we not only expend effort in whatever calculations we must make, but we must also spend effort in order to force ourselves to focus.

Switching between tasks is also difficult, because we train our brains to accomplish a particular task when we focus on it. For example, if we are asked to count all the instances of the letter *f* on a page, it would not come naturally, but gradually we would train ourselves to focus on the letter f. But if we were then asked to count the commas in a page, we would have to overcome our newly acquired tendency to focus on the letter f.

This point relates to some of Kahneman's later explorations of expertise. Experts (like chess masters) are able to learn and recognize patterns in their area of expertise, and therefore they do not need to expend as much energy making various calculations and assumptions. When we train our brains to learn something specific, we are building up our expertise.

Kahneman finishes the chapter by commenting that very few things in our lives force us to expend as much mental effort as Add-3. We avoid mental overload by breaking up work into easy steps, or by relieving our working memory when we use pencil and paper rather than trying to hold a variety of information in our head. We take our time and try to expend as little energy as possible.

When we encounter situations that require a significant amount of mental effort, we work to avoid our laziness through strategies like the ones that Kahneman mentions here. But there are some incorrect calculations that we make without much mental effort; and we have a difficult time overcoming these biases because we are too lazy to check our work.

PART 1, CHAPTER 3

Kahneman relays that System 2 has a natural speed. We expend some mental energy in considering random thoughts and in monitoring what goes on around us, but normally there is little strain. We make many small decisions and absorb pieces of information without much effort.

The normal effortlessness of our everyday mental processes contributes to our laziness in dealing with more complicated thoughts and calculations, as we work to exert as little effort as possible.

Normally, it is easy to walk and think at the same time, but at the extremes these activities compete for resources. If we are asked while walking to compute 23 x 78, we will surely stop. Or if we walk at a very fast pace, we hinder our ability to think.

This concept becomes a bedrock principle of why we make mistakes: in addition to the fact that we are lazy thinkers by nature, we also often have to think about many things simultaneously, which hinders our ability to think about each concept with equal care.

Often, we also have to monitor our self-control while we think. Maintaining difficult cognitive work requires effort not only in thinking, but in forcing ourselves to continue that work (like reading a difficult book). Sometimes, however, people are able to expend considerable effort for long periods of time without having to exert willpower, which psychologist Mihaly Csikszentmihalyi calls *flow*.

The concept of having to think hard and simultaneously having to exert willpower exposes why cognitive effort seems so difficult. Deliberation is inherently more difficult than relying on intuition.

It has been proven that self-control and cognitive effort are both forms of mental work. People who are asked to retain seven digits for a minute or two and are simultaneously offered the choice between a fruit salad and chocolate cake are more likely to select the cake. When we are cognitively busy, we are less able to maintain self-control.

This concept provides another reason why we prefer to be lazy: cognitive effort not only effects the energy we exert with our minds, but also effects many other, unrelated choices as we become less able to avoid various temptations.

Psychologist Roy Baumeister discovered that if you have to force yourself to do something, you are less willing or less able to exert self-control when the next challenge presents itself, something called ego depletion. Or, if you successfully exert self-control in one task, you often do not feel like making an effort in another.

Cognitive laziness, then, is be particularly difficult to avoid; as we are forced to face it again and again, while we become more and more "ego depleted."

Baumeister's group also showed that the idea of "mental energy" is not a metaphor. The nervous system consumes more glucose than most other parts of the body, and people who were given lemonade with sugar before participating in a focusing task did not show the same ego depletion that people who were given lemonade with Splenda.

Kahneman explains how the concept of cognitive laziness is not just a psychological principle, but actually one rooted in cognitive science: the more glucose we consume, the less depleted we become. It is possible that this also explains our preference for the chocolate cake over the fruit salad in Kahneman's earlier example.

A disturbing effect of ego depletion in judgment was recently reported. Judges in Israel spent days reviewing applications for parole. The judges were much more likely (65% approval vs. 35% approval) to approve requests at the beginning of the day and after a meal. When they are ego depleted, they fall back on the easier position of denying parole.

Even though the statistics Kahneman presents are staggering, one would hope that these statistics are then acknowledged by judges and that they are able to counter this effect so that meal breaks do not have an effect on the judges' determinations.

One of the main functions of System 2 is to monitor the actions "suggested" by System 1. Kahneman provides a sample puzzle: "A bat and ball cost $1.10. The bat costs one dollar more than the ball. How much does the ball cost?" The intuitive answer is 10 cents, but this is the wrong answer. More than 50% of the students at Harvard, MIT, and Princeton gave the incorrect answer. At less selective universities, the rate of failure was 85%.

This puzzle is a quintessential example of how, even though we could put a little more effort into calculation and see that our intuitive answer is wrong, we stick with our intuitive answer because it comes up quickly and readily, and because we are inherently lazy.

These percentages are shocking, considering that checking the math would require only a few seconds of extra work. Failure to answer the bat-and-ball problem correctly, as well as other puzzles like it, is a matter of insufficient motivation. People who avoid the wrong answer are more alert, intellectually active, and more skeptical about their intuitions.

Like learning various visual illusions, the bat-and-ball problem represents a cognitive illusion that we have to learn not to trust. This also plays into overconfidence: those who are less willing to be confident in their answers will check their work and discover the correct answer.


Researchers have spent some time trying to discover the connection between cognitive aptitude and self-control. In a famous experiment, Walter Mischel gave four-year-old children the choice between a small reward (one Oreo) which they could receive at any time, or a larger reward (two cookies) for which they could wait 15 minutes.

Mischel's test focuses on self-control as a predictor of aptitude. In line with Kahneman's earlier arguments, theoretically those who forgo the cookie would be more "intellectually active" because they would exhibit self-control in this and in other aspects of their lives.

About half of the children manage to wait for the two cookies. Ten or fifteen years later, a large gap had opened up between those who could wait and those who could not. The resisters had high measures of self-control, were less likely to take drugs, and had substantially higher scores on intelligence tests.

In Mischel's study, forgoing the cookie not only correlated to more self-control now and in the future, but it also tied to less laziness as they scored higher on intelligence and aptitude tests.

This test shows that some people think more with System 1, and some think more with System 2. Keith Stanovich and Richard West, who introduced the terms System 1 and System 2, believe that intelligence is not the only thing that distinguishes these two kinds of people. Stanovich believes they are more rational—a quality he believes to be distinct from intelligence.

It is particularly notable that Stanovich makes a distinction between intelligence and rationality, perhaps asserting that people who do well on cognitive aptitude tests are not necessarily more intelligent but are instead more willing to question and check their work.

PART 1, CHAPTER 4

Kahneman next introduces how we form associations and stories. He presents two words: "Bananas" and "Vomit." He then points out that seeing those two words together causes our minds to experience some disgust, recall unpleasant memories, and form sketchy scenarios that may cause us to have temporary aversions to bananas. These associations occur quickly and effortlessly, as our System 1 attempts to make as much sense as possible of the two words.

The introduction of stories, and our automatic tendency to create them, becomes a central theme throughout the rest of Kahneman's book. This unconscious tendency, which allows us to simplify and make more sense of the world, also disallows our understanding of statistics and our knowledge that the world is sometimes random.

The brain is constantly building associations of ideas, with each idea linked to a vast network of other ideas. Causes are linked to effects (virus to cold); things to properties (lime to green); and things to categories (banana to fruit). The mind does not go through a sequence of ideas one at a time, but instead one idea activates many others.

The associations and categorizations that we build contribute to the stories that we formulate about the world, particularly the "causes to effects" network that Kahneman describes here.

In the 1980s, psychologists discovered that exposure to a word causes immediate and measurable changes in a person's ability to retrieve related words. For example, if you have recently seen or heard the word EAT, you will be more likely to complete the word fragment SO_P as SOUP. But if you have recently seen or heard the word WASH, you will be more likely to complete it as SOAP. This tendency is called priming, because the idea of EAT primes the idea of SOUP, and WASH primes SOAP. And EAT primes not only the word SOUP, but also a multitude of food-related ideas.

Kahneman explains how System 1 learns different patterns and categories; as it becomes better at intuiting different calculations, this automatic processing also opens itself to mistakes and also to being affected by different stimuli of which we may be unaware.

Priming is not merely restricted to concepts and words. In an experiment conducted with students from NYU, one group of students had to unscramble sentences that contained words associated with the elderly, while another group had more neutral words. After unscrambling the sentences, each student had to walk down a hall to get to the next experiment. The students who had words that evoked the elderly walked significantly more slowly down the hall than the others. Thus, people can be primed for a behavior.

Priming serves as an example of how unaware we can be of how the things we process automatically can affect our decisions and behavior. Simply reading the words on a page—an automatic process controlled by System 1—can change our walking pace significantly.

This link also worked in reverse. In another study with university students, students were asked to walk around a room for five minutes at a very slow pace. After this experience, the participants were much quicker to recognize words related to old age than other students who were made to walk at a normal pace.

The reverse example shows just how strong the associations that System 1 creates are, such that our own behavior can actually prime us to think differently.

Gestures can also unconsciously influence our thoughts. People who are made to smile by holding a pencil between their lips find things funnier than those who are made to frown—even though they don't realize that they are being made to do so. People who are told to shake their heads while listening to a message are less likely to accept that message than people who are told to nod their heads while listening to the same thing.

Kahneman again reinforces the automatic and subconscious nature of these System 1 associations. Even smiling or nodding without meaning to or realizing that one is doing so—merely the physical act itself—activates built-in feelings that we find things funny or that we agree with them.

Studies of priming effects sometimes threaten our self-image as conscious and autonomous. A study of voting patterns in 2000 showed that support for propositions that increased school funding gained far more support when the polling station was in a school than when it was at a nearby location. This difference surprisingly outweighed the difference in voting between parents and other voters.

Kahneman expands to show how broad an effect priming can have on our subconscious. These aren't necessarily mistakes, but they are certainly ways in which the laziness of our System 1 can cause it to be vulnerable to biases.

Students who are primed for money in an experiment (even unconsciously) are more independent and selfish. They are less willing to help another student who pretends to be confused about a task. When an experimenter dropped a bunch of pencils on the floor, money-primed people will pick up fewer pencils.

This experiment has large implications for a society that focuses constantly on money. Being primed for money may lead to or explain a general bias towards individualism—and away from altruism.

Kahneman writes that people often react to this information in disbelief. He tries to quell fears by saying that the effects of the primes are "robust but not necessarily large"—that among 100 voters, only a few uncertain people will vote differently on a school issue if their precinct is in a school. But the results are not made up, and they are true about everyone.

Kahneman brings up the fact that everyone is affected by these things in order to try to tamp down our inherent overconfidence. As he writes later in the book, we often like to assume the best about ourselves, even while seeing the pitfalls faced by others. This passage is meant to counteract those thoughts.

Kahneman concludes with an experiment conducted in an office kitchen. The office asked for people to pay for the tea or coffee that they consumed by putting money into an "honesty box" with suggested prices posted. Above the price listing was a decorative poster. Each week, they poster would shift between a flowery pattern and a set of eyes. The weeks in which there were eyes above the prices, people contributed almost three times as much money. System 1's processing, therefore, often affects us without our even being aware of it.

This experiment perhaps brings up the true dangers of priming: the fact that people are susceptible to influence as a result of these primes. Being aware of them, and knowing that we are affected by them, perhaps gives us some more awareness of the environment around us and how we can be manipulated by it (in the same way that we can be manipulated by positive or negative framing devices).

PART 1, CHAPTER 5

Kahneman describes how, when we are conscious, multiple computations are happening in our brains: to monitor that things are going well, that there are no threats, and that our attention should not be redirected. We are constantly evaluating whether we are experiencing cognitive ease (a sign that things are going well) or cognitive strain (in which we have to mobilize System 2). This means that a sentence that is printed in a clear font or color, or has been repeated, is processed with ease.

Cognitive ease forms the bedrock of how we fall into patterns that enable us to be lazy. When we inherently prefer things that provide us with a sense of cognitive ease, we start to form positive associations with those things even though something that is easily processed may not necessarily be right or good, leading to mistakes.

Kahneman next writes about illusions of memory. He writes down a few names: David Stenbill, Monica Bigoutski, Shana Tirana. After a few days, if we are shown a long list of names that includes these three, we will be likely to identify them as celebrities rather than an unknown person. This happens because we know someone is a minor celebrity based on our ability to recall having seen the name before, and this creates an illusion of memory.

The "minor celebrity" experiment serves as a first example of how incorrect assumptions are made based on cognitive ease. Things that we have seen before breeds familiarity, and Kahneman goes on to argue throughout the chapter that we are inherently drawn to familiarity.

We often make judgments based on whether information is cognitively easy to retrieve. Kahneman describes how he retook a driving test after moving to a new state. Some answers knew because he had driven for many years, but for some questions, for which there seemed to be no good answer, he simply relied on cognitive ease.

There is some sense to relying on cognitive ease, particularly if we know that we have seen the correct answer to a question before. In situations with a time crunch, intuition can be useful to come up with quick answers. But without it, checking answers using System 2 processing can be far more accurate.

Messages are easier to believe if they are clearer—even font contrast, letter size, and paper quality make a difference. Kahneman advises not to use complex language when simpler language suffices, and that adages with rhymes are more likely to be taken as truth. All of these factors aid in cognitive ease.

Not only are all of these things processed more easily, but they are also then easier to retrieve. Thus cognitive ease has as much to do with our ability to remember the information as it has to do with processing that information.

Kahneman proves how cognitive ease can distort our processing. In a study, participants are given three questions (including the bat-and-ball problem) in which the intuitive answers are wrong. Half of the students saw the puzzles in a normal font, and 90% of this group made at least one mistake. The other half saw the puzzles in a less legible font, and only 35% of them made a mistake. Cognitive strain mobilizes System 2 and is more likely to reject the intuitive answer.

As Kahneman implied earlier in the chapter, cognitive ease can be deceptive as it allows us to sometimes process information too quickly. Without an easy ability to read the puzzle, we work harder both to read the words and to understand them. This deeper understanding then allows us to overcome our intuitive but incorrect responses and combat our brains' laziness.

In other examples, participants in an experiment were shown pictures of objects, and smiled and relaxed more when the images were easier to see. Easily pronounced words evoke favorable attitudes; companies with pronounceable names do better than those without. Familiarity also breeds affection: participants in a study run by Robert Zajonc were shown words in a foreign language that they did not understand. They associated the words that were shown more frequently with good meanings.

These examples again give us insight into how to optimize brain power and how to use some facts about automatic processing to our advantage (one could imagine that these examples would be very helpful to a marketing company). Yet at the same time, it highlights some of our biased tendencies, so that we might see that the affection we possess for familiar things is merely a result of how we process those things.

Zajonc argued that the "exposure effect" has a long evolutionary history: that organisms react cautiously to new stimuli because they could represent danger, whereas familiar things are thought of favorably once we have learned that they do not cause anything bad to happen.

While the bias towards familiar things once aided the survival instinct, now it has become so ingrained in our psyches that it has given us a propensity even for familiar words and ideas, not just physically present objects and people.

Cognitive ease is something we sense long before we are conscious of it. If people are shown three words (like *dive*, *light*, and *rocket*), they are often able to recognize that they share a word that connects them, even if they cannot immediately think of that word (which is *sky*).

The associated words experiment again reinforces cognitive ease as a subconscious concept. Even though we may not be wholly aware of the concept, we understand that there are ideas, words, feelings, objects, etc. that are more easily retrieved.

Putting participants in this experiment in a good mood doubles their accuracy of recognizing if the words are linked. When in a good mood, people become more intuitive and more creative but also less vigilant and more prone to errors. This also makes biological sense: a good mood is a signal that the environment is safe and that it is all right to let one's guard down.

This concept functions in the same way that smiling makes things funnier: System 1 associates good moods with safety and cognitive ease, and so we generally expend less mental effort when we are in a good mood.

Returning to the experiment with the connected words, if participants are told that their emotions are being influenced by good music, they do not have the same accuracy in connecting the words because they do not associate their emotional response with their determination of coherent or incoherent words. This demonstrates that the brief emotional response that follows the presentation of words (pleasant if they are coherent, unpleasant otherwise) is actually the basis of the judgment of coherence.

This experiment not only demonstrates the existence of cognitive ease, but also how we rely on cognitive ease in order to make judgments about whether things make sense together or relate. The cognitive ease that System 1 produces, then, is the direct source of our view of the world as coherent.

PART 1, CHAPTER 6

The main function of System 1, Kahneman reiterates, is to maintain and update the model of the world, which represents what is normal within it. On a second occasion of an abnormality, people become distinctly less surprised. Kahneman provides an example: he and his wife were driving from New York City to Princeton and saw a car on fire by the side of the road. When this happened again at the same part of the road some weeks later, they were less surprised, and even had a future expectation of seeing a burning car when they passed the same stretch after that. The second abnormality will retrieve the first from memory, and both make sense together.

This kind of processing of surprise serves as a way of illustrating how we construct stories in order to make sense of the world. We become less surprised as we start to construct a story about surprising events that share a pattern, as Kahneman and his wife discover in these two incidents with the burning cars. They construct a story about this stretch of the road and come to connect it with accidents.

"How many animals of each kind did Moses take into the ark?" Kahneman asks. Very few people detect what is wrong with the question, because the animals in the ark set up a biblical context, and Moses makes sense in that context.

Like the bias inherent in cognitive ease, when an idea is not surprising in a given context we devote less attention to it and are less likely to detect abnormalities about it.

Violations of normality, however, are detected with a great degree of speed and subtlety. A problem will immediately emerge from the sentence "Earth revolves around the trouble each year," or a male voice saying, "I believe I am pregnant," or an upper-class voice saying, "I have a large tattoo on my back." These statements violate the norms and patterns that System 1 has constructed over time.

Even though System 1 has its flaws in terms of ruling things normal or abnormal, there are some areas in which it is not easily fooled: concepts that defy grammar, logic, universal rules of biology, even simply common social patterns. When those patterns are broken, System 2 is then mobilized.

Kahneman writes, "Fred's parents arrived late. The caterers were expected soon. Fred was angry." He points out that we know why Fred was angry, and it was not because the caterers were expected soon. Anger and lack of punctuality are linked as effect and possible cause. We see causality in everything, including in videos of triangles in which one appears to bully another. Kahneman explains that using causality to explain situations that require statistical reasoning is a recurrent theme in the book.

The patterns that System 1 constructs over our lifetime allow us to predict events, relating one thing to another. In this example, Fred's parents arriving late causes Fred to be angry; that is how we are able to make sense of these sentences together. We encounter issues, however, when we mistakenly attribute causality to random occurrences.

PART 1, CHAPTER 7

System 1 allows us to use intuition to draw conclusions. Kahneman introduces two shapes that can either look like the letter "B" or the number "13" depending on the surrounding context. He also describes a sentence, "Ann approached the bank," which can change associations based on whether an earlier sentence has to do with money or with rivers. In each case, a definite choice was made in our minds, and people are often unaware of the ambiguity of the shape or the sentence.

Kahneman's B/13 example, and the Ann example, demonstrate not only how we automatically (and unknowingly) process things, but also how we immediately move to construct stories and patterns from previously encountered contexts.


Psychologist Daniel Gilbert argues that to understand a statement, one must first attempt to believe it, and then consider whether it is untrue. Even a nonsensical statement, like "whitefish eat candy," will initially evoke belief until it is proven false. If people are forced to hold digits in their brain and simultaneously determine whether statements are true, they will often believe many false statements. The conclusion: when System 2 is otherwise engaged, we believe almost anything.

Like the earlier example of the woman in the gorilla suit earlier, when our minds are preoccupied with other tasks it can be difficult to process and evaluate information. And because, as Gilbert proves here, we tend to err on the side of belief versus disbelief, we can make mistakes about the most basic information.

This concept contributes to a general confirmation bias. Asking "Is Sam friendly?" will lead to a different thought process than "Is Sam unfriendly?" We automatically look for confirming evidence. This is contrary to the rules of science, which advises testing hypotheses by trying to refute them.

The confirmation bias is an aspect of human overconfidence, about which Kahneman goes into detail later. Here, people look for evidence to confirm the impressions that they already have.

The "halo effect" is an outgrowth of confirmation bias—it is the tendency to like (or dislike) everything about a person, including things that we might not have observed. The halo effect is one of the ways that System 1 generates a simpler representation of the world than actually exists.

The halo effect serves as a confirmation bias because new things that we learn about a person are affected by the beliefs we already hold about that person; we simplify their traits instead of seeing them as complex.

Kahneman describes a scenario in which one might meet a woman named Joan at a party. Joan is personable and easy to talk to. If her name comes up as a possible donor for a charity, we retrieve good feelings about her and think that she is likely to be generous (a relatively baseless assumption). And now that we believe she is likely to be generous, we like her even more.

In the Joan example, the halo effect is a particularly insidious kind of fallibility, because our errors compound. When we like a person, we tend to attribute more positive traits to them (even if those attributions are not based on concrete evidence), which in turn adds to our good feelings toward that person.

Another psychologist, Solomon Asch, presented descriptions of two people and asked for comments about their personality. The descriptions included the exact same words, but for Alan, the description began "intelligent—industrious—impulsive," and ended "critical—stubborn—envious." For Ben, the words were listed in the opposite order. People are much more likely to have a positive view of Alan because the initial traits were positive, but for Ben the initial traits were negative. We view the second set of words in the context of the first.

Asch's experiment demonstrates just how strongly our first impressions of a person (guided by System 1) can affect our view of that person going forward. Even given a string of six words about two fictional people, we tend to weight the earlier characteristics we are given more than the later characteristics.

Kahneman describes the halo effect he himself experienced when grading students' exams. He would often be biased by their first essay score. When he started to score the tests blind, working one essay at a time before moving on to the next, he found that his new grading system made it more difficult to give a coherent score (because the essay grades varied wildly), but was less biased. He no longer experienced cognitive ease.

Kahneman gives a personal example in order to demonstrate how this halo effect can change our views of people and their personalities, but also have consequences on how we evaluate their work—something we might hope to be more subjective about.

A procedure to tame the halo effect is by using the opinions of many people, called "decorrelate error." If people are forced to guess the number of pennies in a jar, their individual estimates will be relatively poor, but the average of a group of estimates tends to be quite accurate. The only caveat is that their estimates must be independent; they cannot be allowed to affect each other. Organizations can learn from this: open discussions often give too much weight to the opinions of those who speak early and assertively.

Kahneman then gives a real-world example of how to overcome this confirmation bias, and also the overconfidence of a few individuals. In group discussions, confidence is often viewed as reassuring, but in fact the separate opinions of many people tend to create more successful calculations and plans.

Kahneman next introduces a principle, which he terms "What You See Is All There Is" (WYSIATI). If we are asked whether a person will be a good leader and are told first that they are intelligent and strong, we automatically assume that they will be, even though the description might go on to say that the person is also corrupt and cruel. We jump to conclusions based on the information available to us.

WYSIATI is a major element of both the overconfidence and laziness of the brain. Our System 1 automatically takes the information available and uses it for the basis of our assumptions, often without consulting System 2 to see if there is outside information that might be useful to the question as well.

In an experiment constructed by Kahneman's long-time scientific partner Amos Tversky, people were presented with a legal scenario. Some people heard the defense, others heard the prosecution, and some heard both sides. The participants were aware of the setup and could have generated the argument for the other side. Nevertheless, the presentation of one-sided evidence strongly affected judgments, and people who only saw one side where far more confident in their judgments than people who saw both.

Even though being presented with both sides of the case leads to a fairer and more informed process, people are less confident in their judgments when they hear both sides. This is dangerous, because even though we prefer information to be simple, when it comes to court determinations, it is important to have all of the information.

WYSIATI implies that neither the quality nor the quantity of the evidence counts for much. The confidence that people have in their beliefs is based on the quality of the story they can tell about what they see. We often fail to allow for "the possibility that evidence that should be critical to our judgment is missing."

Here, Kahneman also relates WYSIATI and overconfidence to our tendency to create stories. The more that we can make a coherent narrative out of evidence presented to us, the more confident we are in our conclusions.

WYSIATI also accounts for framing effects. The statement that "the odds of survival one month after surgery are 90%" is more reassuring than "mortality within one month of surgery is 10%," and people's decisions about whether to go through with surgery can be affected by the framing that they see.

In a situation like this, there is no "correct" answer as to whether someone should undergo surgery. But the book shows that is important to be able to make a decision without being biased by how the information is presented (although, as Kahneman explains in later chapters, in a situation like this people are likely to be risk averse).

Lastly, WYSIATI accounts for what Kahneman calls "base-rate neglect." Kahneman briefly describes a fictional man named Steve in the introduction and reintroduces him here. Steve is "a meek and tidy soul" who has a "need for order and structure." If people are asked if it is more likely for Steve to be a librarian or a farmer, people will say a librarian, even though there are about twenty male farmers for every male librarian. The statistical facts did not come into mind, only the description. What we see is all there is.

Base-rate neglect not only reveals our overconfidence in the information with which we have been presented, but also illuminates our inherent preference for stories over statistics (like the Linda example later). The description fits our stereotype of a librarian, so we assume he is a librarian despite the statistical improbability.

PART 1, CHAPTER 8

System 1 continuously monitors what is going on outside and inside the mind, without specific intention and with little to no effort. These basic assessments play an important role in intuitive judgment, like the ability to distinguish friend from foe at a glance. Biologically, we are endowed with the ability to quickly evaluate how dominant a person is, and how trustworthy that person is.

Many of the features of System 1's processing are rooted in biological necessity, like determining threats. But this early necessity has allowed System 1 to expand relatively unchecked as it processes too much information and we rely on it too heavily, as in this next example.

This ancient mechanism has some modern influence: it affects how people vote. Kahneman's colleague Alex Todorov showed his students pictures of the faces of political candidates who were running for office and asked the students to rate them on attributes like likeability and competence. The candidates whose faces had earned higher ratings of competence won in about 70% of the races for senator, congressman, and governor. Todorov demonstrated that people judge competence by these same two factors: strength and trustworthiness. The faces that exude competence have a strong chin and a slight, confident smile.

Even though competence is essentially unrelated to the way a person looks, people rely on "ancient mechanisms" to evaluate at a glance whether someone might make a competent politician and leader. Misattributing what makes us like a political candidate can have pretty far-reaching effects.

Political scientists followed up on these findings and determined that this automatic preference is likely to play a large role among uninformed voters and voters who watch a lot of television, but less so for others who are better informed and watch less TV.

It is worth noting that relying less on image and relying more on information alleviates some of this biased evaluation, thus suggesting how we can avoid these kinds of mistakes.

In addition to understanding language, System 1 carries out basic assessments like computations of similarity and representativeness. Kahneman demonstrates this with a drawing. Two towers of blocks are immediately recognizable as having the same height, but it is more difficult to determine whether a set of those blocks laid flat would have the same height as those towers. In another figure, Kahneman presents a set of short lines, each with different lengths. It is easy for people to pick out one of the lines as being relatively average, but if we are asked what the total length of the lines is, we are unable to answer. We are good with intuiting averages but very poor with sums.

System 1 has a difficult time determining sums and lengths, as exhibited by these two examples. However, System 1 does well with comparisons—both comparing the height of the towers, and in comparing the length of the lines. This makes sense, considering how much Kahneman has emphasized that System 1 relies on context and has a difficult time with probabilities.

In an experiment, participants were asked about their willingness to pay for nets to cover oil ponds in order to save migratory birds from drowning. Different groups stated their willingness to pay to save 2,000, 20,000, or 200,000 birds. The average contributions of each group were about the same—between $78 and $88. The number of birds made little difference: instead people reacted to the image of a drowning bird they conjured.

Kahneman then introduces an example that has much more drastic consequences. Here, the idea of the birds evokes a sense of how much money people should donate to the cause. The subjective number of the birds is essentially irrelevant, demonstrating how much people rely on stories over numbers.

Kahneman introduces another aptitude of System 1: matching across diverse dimensions. Kahneman introduces a fictional woman named Julie, who read fluently when she was four years old. He then asks, "How tall is a man who is as tall as Julie was precocious?" 6 feet is probably too little, but 7 feet is probably too much. It's easy to pick a number, and that number will match that of other people in our cultural milieu. But Kahneman writes that later, we will observe the flaws in this mode of prediction.

Julie will be reintroduced in Chapter 18, where Kahneman demonstrates that these comparisons over different dimensions (associating reading ability to height) force us to simplify our conceptions of both of these concepts. When the two concepts have some relation to each other (like reading ability at four and college GPA), we also are quick to view some link between them even though their correlation may be relatively small.

System 1 constantly carries out computations, and often computes more than we want to or need to—which Kahneman calls the "mental shotgun." In an experiment, people are asked to press a key as quickly as possible if they hear a pair of words that rhyme. They are much quicker to identify "vote" and "note" as rhymes than "vote" and "goat" as rhymes. Even though they are only listening to the words, they are still slowed down because System 1 computes the spelling.

Again, System 1's major flaw is its automatic nature. We often ignore information that is relevant but would require slightly more effort or thought, and we take into account calculations that actually impede our ability to think clearly because they happen so instantly.

In another study, people listened to a series of sentences with the instruction to determine as fast as possible if the sentence was literally true. Kahneman lists some sentences: "Some roads are snakes." "Some jobs are snakes." "Some jobs are jails." All are literally false, but the second is more obviously false because the other two are metaphorically true. The intention to perform one computation evoked another and disrupted our performance.

Like the previous example, even our fast processing is hindered by our automatic ability to determine if sentences are metaphorically true. Not only do we tend towards laziness in our mental processing, but the "mental shotgun" introduces extraneous information that we ought to discount.

PART 1, CHAPTER 9

The normal state of our minds is to have intuitive feelings about almost everything, often having answers to questions that we do not completely understand and relying on evidence that we cannot explain. When we are faced with difficult questions that we cannot answer quickly, we substitute that question with an easier one.

This chapter explores how System 1's laziness causes us to rely on our intuition when answering complex questions. Yet, as Kahneman goes on to show, this simplification leaves a lot of room for error.

Kahneman presents a set of difficult questions and the easier questions we often substitute for them. "How much would you contribute to save an endangered species?" is replaced with "How much emotion do I feel when I think of dying dolphins?" "How happy are you with your life these days?" is replaced with "What is my mood right now?" "How popular will the president be six months from now?" is replaced with "How popular is the president right now?"

Without System 1's ability to simplify, our brains would have to retrieve a lot more information to answer something like "How happy are you with your life?" or perform a lot more calculations to predict the how popular the president might be in six months.

The mental shotgun makes it easy to generate quick answers to difficult questions. We also couple this with System 1's ability to compare across different dimensions. In the example question about the dolphins, we find the intensity of our emotions about dolphins and pick a financial contribution that matches that feeling.

This example partly explains the earlier example about how much people would contribute to save birds from drowning. The number of animals is irrelevant, because we match our emotional response to the situation with a corresponding financial contribution.

Kahneman includes another visual illusion: three men walking down a road. Due to the perspective of the image, it appears that the man on the right is much bigger and the man on the left is much smaller, but in reality they are the same size. When asked if the figure on the right is taller than the figure on the left, System 1 actually answers the question "how tall are the three people?" and uses the cues that make the image look three-dimensional to determine that the man on the right is very tall and the man on the left is short.

Again, Kahneman demonstrates the pitfalls of automatic processing with a visual illusion before moving on to a cognitive one that demonstrates the same effect. Here we use the visual cues in the image to determine the height of the men in comparison with their surroundings, rather than directly comparing the two.

The question, "How happy are you with your life these days?" came from a survey of German students. They were asked this question, and then asked how many dates they had last month. Their answers to these questions were uncorrelated. But another group saw the two questions in reverse order. This time there were huge correlations between number of dates and happiness.

When the students are first asked about happiness and then about dates, they take in different factors. But when asked first, the question about dates primes the students and affects their thoughts about their happiness.

What happens with these students is the same as what happens with the visual illusion. They do not want to spend time on precise calculations, and so they substituted the question with one for which they had already calculated their answer. This is also an example of WYSIATI. The present state of mind looms very large when people evaluate happiness.

These different answers show just how easy it is to manipulate System 1, as it relies on present evidence and seeks to expend as little energy as possible in making calculations. In this example, it appears to avoid expending energy altogether. The intuitive answer draws on the answer the students have already given.


Particularly when emotions are involved, people often use their preexisting beliefs to come to conclusions, rather than considering new arguments. Psychologist Paul Slovic has proposed an "affect heuristic," in which people let their likes and dislikes determine their beliefs about the world. If we like the current health policy, we believe its benefits are substantial and its costs more manageable than alternatives. In this way, System 2 becomes "an apologist for the emotions of System 1." It searches for information and arguments that are consistent with existing beliefs.

The affect heuristic serves as a kind of confirmation bias. We work to integrate new information into the beliefs that we already hold. Even though we are using our System 2 processing, System 2 is greatly affected by the impressions and associations formed by System 1 and works to justify those impressions when presented with new information, which is why Kahneman describes it as an "apologist."

Kahneman concludes Part 1 by summing up the features and activities attributed to System 1 that he has introduced: generating impressions, operating automatically, creating patterns of ideas, inferring causes, exaggerating consistency (the halo effect), focusing on existing evidence (WYSIATI), matching intensities across scales (e.g., size to loudness), computing more than intended, substituting easy questions for hard ones.

As the first part of the book concludes, Kahneman recaps some of System 1's most important aspects. In reviewing this information as a whole, one can see that Kahneman has proven how System 1 is prone to laziness (and subsequently to error) through each of these concepts.

PART 2, CHAPTER 10

A study of new diagnosis of kidney cancer across the United States' counties reveals that the counties in which the incidence of kidney cancer is lowest are rural, sparsely populated counties in the Midwest. The counties in which the incidence of kidney cancer is highest are also rural, sparsely populated counties in the Midwest. Even though one might think that something about the location of the counties explains these facts, the key factor is actually that rural counties have small populations.

The descriptions of the counties with both the highest and lower kidney cancer incidence reveals our immediate and automatic search for causality. When we read the first fact, we instantly work to explain why rural, sparsely populated counties have low incidence of kidney cancer—that is, until Kahneman reveals that those same counties have the highest incidence.

System 1 is inept when faced with "merely statistical" facts, which change probabilities of certain outcomes but do not cause them to happen. Kahneman asks readers to imagine a large urn filled with marbles. Half the marbles are red, and half are white. Two people—Jack and Jill—each draw marbles. Jack draws four marbles each time, Jill draws seven marbles each time. They both record each time they observe a homogeneous sample—all red or all white. Jack will observe these extreme outcomes much more often than Jill (12.5% of the time versus 1.56% of the time). It is a statistical fact that samples of four marbles yield extreme results more often than samples of seven marbles do.

The moral of this chapter is that because of System 1's ongoing quest to make sense of the world, we have a very difficult time accepting randomness when there are facts that might help us explain causality and construct a story. Kahneman tries to counteract this impulse by demonstrating mathematically (though still through constructing a story) how smaller samples simply yield more extreme results.

This purely statistical fact explains the statistics of kidney cancer in rural areas. Extreme outcomes (both high and low) are more likely to be found in small than large samples. There is no causal explanation: small populations do not cause nor prevent cancer. This principle makes some sense to people: we have long known that the results of large samples deserve more trust than small samples.

Even though we have learned that large sample sizes are important and more accurate, we still have a difficult time understanding why on the most basic level, revealed by our inability to identify the correct explanation for the cancer incidence example.

Kahneman and Tversky's work in the early 1970s began with an exploration of whether people who have no training in statistics are good "intuitive statisticians." This is particularly important in the field of psychology because it is crucial in research to choose a sample size that can accurately prove one's hypothesis. The risk of error for a given sample size can also be calculated fairly simply.

The difficulty that people have with understanding statistics does not merely lead them to attribute incorrect explanations to different scenarios, as Kahneman explores throughout the chapter. The misunderstanding of statistical principles can have a large effect on people's time, work, and money.

Kahneman had read shortly before his work with Tversky that psychologists commonly chose samples that exposed them to a 50% risk of failing to confirm a true hypothesis, and found that he often made those same mistakes by relying on intuition and tradition. The pair developed a questionnaire that described a research situation and asked researchers to choose the sample size. Kahneman saw that the mistakes he had made were shared by a large majority of the respondents.

Kahneman's and other psychologists' errors have echoes with some of the errors explored in earlier chapters. Even though the psychologists could avoid their errors with slightly more effort, they instead rely on their intuition to judge sample size and as a result end up making errors that could change the outcome of their research.

Kahneman next presents a statement: "In a telephone poll of 300 seniors, 60% support the president." The summary of this poll is "elderly support president." Unless people are professionals, they may not react differently to a sample of 300 vs. 3,000. When reliability is obviously low, we discredit the message. But it's difficult to distinguish between degrees of belief. We usually believe smaller sample sizes because we are prone to exaggerate the consistency and coherence of what we see.

Again, as Kahneman wrote in earlier chapters, we have a difficult time understanding the significance of numbers in a given context. We know that a sample size of 3,000 is better than a sample of 150, but it is likely that we would believe the information in both studies. The story that the study creates is more resonant to us than the "degree of belief" it carries.

Our preference towards causes exposes us to serious mistakes in evaluating randomness. Kahneman proposes a scenario: looking at the sex of six babies born in sequence at a hospital. The sequences BBBGGG, GGGGGG, and BGBBGB are equally likely, though our intuition biases us into thinking that BGBBGB is more likely. We do not expect to see regularity produced by a random process.

In addition to discounting sample size, we are biased towards believing causality over randomness. When we detect what appears to be a rule (like six girls being born in a row), we reject the idea that the process is random—even though we know that there is always equal probability between the birth of a boy and the birth of a girl.

Kahneman soon applied this principle in his own work. When the Yom Kippur War broke out in Israel in 1973, Kahneman was working in the Israeli Air Force. At first the air war was going quite badly for Israel because of the performance of Egyptian ground-to-air missiles. In two squadrons that flew from the same base, one of them lost four planes while the other lost none. An inquiry was conducted in the hopes of finding out what the unfortunate squadron did wrong. But Kahneman saw that with no operational differences between the two, the command should accept that the different outcomes were due to blind luck.

Like the sequence of six girls being born in a row, the fact that one squadron lost four planes and the other lost none seemed to imply that something within the unlucky squadron must have caused their losses. It follows the same principle: when we observe patterns, we reject that the idea that there is randomness or luck involved. We prefer to form a story that can help us avoid similar issues in the future.

The illusion of causality has many forms: it makes us think that there is a "hot hand" in basketball, that a certain investment adviser is unusually skilled, or that a CEO is particularly talented at making acquisition deals. Often, we misclassify random events as systematic.

Again, Kahneman provides other real-world examples that demonstrate scenarios in which we choose to believe causality over luck and randomness.

Kahneman finishes the chapter by providing an example that mirrors the one about cancer incidence. Research has shown that the most successful schools were, on average, small schools. The Gates foundation then made a $1.7 billion investment in the creation of small schools. This makes intuitive sense: small schools give more personal attention and encouragement to students. But the facts are wrong: if the studies had looked at the worst schools, they also tend to be smaller than average.

Kahneman's final example is also perhaps its most shocking. Both the researchers in this story and the executives at the Gates foundation made the same mistake in ignoring the fact that smaller samples provide more extreme results. But this example in particular shows the consequences of those mistakes: 1.7 billion dollars to build schools that might not, in fact, be better.

We pay more attention to the content of messages than to information about reliability, and statistics produce many observations that ask for causal explanations but in fact do not have causal explanations. Many facts of the world are simply due to chance.

Kahneman's conclusion supports a major thematic idea: that we vastly prefer objective stories over subjective numbers, both when we ignore sample sizes and when we assume causation.

PART 2, CHAPTER 11

Kahneman and Tversky once rigged a wheel of fortune that was marked from 0 to 100, so that it would only stop at 10 or 65. Participants would write down the number it landed on. They then asked participants two questions: "Is the percentage of African nations among UN members larger or smaller than the number you just wrote?" and "What is your best guess of the percentage of African nations in the UN?"

Kahneman and Tversky's experiment introduces the anchoring effect, which provides another way in which System 1 influences System 2's calculations in a way that makes us more prone to error.

The spin of a wheel of fortune cannot possibly provide useful information, but the participants did not ignore it. The average estimates of those who saw 10 and 65 were 25% and 45%, respectively. This is called the anchoring effect: the estimates stay close to the number that people consider.

The anchoring effect shows how even System 2 can be lazy: we use deliberate calculations to try and estimate the answer, but we rely on available information even though it appears to be random.

Kahneman describes another example: if people are asked whether Gandhi was more than 114 years old when he died they will give a much higher estimate of his age at death than if the first question referred to death at 35. Any number people are asked to consider as a possible solution to an estimation problem will induce the effect.

Again, the numbers here are obviously wrong: 114 is much too high, and 35 is much too low. But they provide a basis from which to start, as Kahneman goes on to explain.

Tversky believed this effect was due to the idea that someone would start from an anchoring number and adjust from there. The adjustment usually ends prematurely, because people stop when they are no longer certain that they should continue. This will happen when people are asked when George Washington became president, or the boiling point of water at the top of Mount Everest. An immediate anchor comes to mind, and then people move from it until they are no longer sure they should go farther.

Tversky's explanation for anchoring places more blame on System 2 than Kahneman's explanation, arguing that we use answers that come to mind (in these examples, the year 1776 and 100 degrees Celsius) and then deliberately move away from those answers as far as we feel confident.

Other studies found that this adjustment is deliberate: people whose mental resources are depleted or who are doing another task at the same time will adjust less (staying closer to the anchor), implying that System 2 is involved.

This experiment proves the involvement of System 2. As Kahneman explained in the earlier chapters, mental effort is the domain of System 2; when we are mentally depleted, we cannot provide that effort.

Kahneman, on the other hand, believed that anchoring is produced by priming. In the Gandhi example, if the anchoring number is 144 years old at age of death, people do not adjust down from that number, but they are still affected by it. They are primed by the image of an ancient person and are then prone to believe that Gandhi was very old when he died.

Kahneman, unlike Tversky, focuses his theory on System 1, particularly because we sometimes do not realize that we are affected by the number that has been presented to us.

Another experiment conducted by German psychologists demonstrated this aspect of anchoring. People were asked to estimate if the annual mean temperature in Germany was higher than 20 degrees Celsius or lower than 5 degrees Celsius. Those who were shown the first question had an easier time recognizing summer words, and those who were shown the second question had an easier time with winter words.

The experiment here supports Kahneman's hypothesis, as people's automatic responses become primed based on the number with which they are presented—either for summer or for winter, and therefore for the words associated with those seasons.

Powerful anchoring effects have been observed in real estate (with asking prices for homes) or in charitable contributions (where people are provided with a suggested donation number). There are situations, however, in which relying on anchoring seems reasonable. If asked a difficult question about which we know little, we will use any information available to us.

Our brains are laziest when we do not have a way of figuring out the answer to a question; like the Gandhi example, we use the random number because we assume that that number is close to the actual answer—in effect using it as a hint, even though we have no reason to believe that should be taken in that way.

Anchoring reveals that we are very suggestible, a fact that is often exploited. Arbitrary rationing is an effective marketing ploy. If a sign on a shelf of soup cans says "Limit of 12 Per Person" vs. "No Limit Per Person," people will take twice as many cans. Still, many people believe that they are not affected by anchors, in the same way that they do not believe that they are not affected by primes because that is not their subjective experience.

Again, people are prone to be overconfident and that they are not affected by universal psychological phenomena, and that makes them easy to manipulate. But if people become aware of these unconscious effects, they can more accurately try to resist them.

The anchoring effect can be combated, however, by mobilizing System 2 in the correct ways. For example, people will be much more successful in avoiding the influence of anchors in negotiations if they focus their attention on the minimal offer that the opponent would accept, rather than being drawn up to the initial offer that the opponent provided.

Kahneman implies that the anchoring effect can be avoided if people are able to ignore the anchor. But in order to do so, they must first be aware that they have been exposed to an anchor. This is part of Kahneman's purpose in writing the book in the first place: to give people the tools to recognize the things that make them prone to error.

PART 2, CHAPTER 12

Kahneman and Tversky spent 1971-72 at the Oregon Research Institute, studying what they called the "availability heuristic." This heuristic describes the thought process that people use when they estimate the frequency of a category, like "people who divorce over the age of 60." They often judge frequency by the ease with which instances of that category come to mind.

The availability heuristic is an example of people's overestimation and overreliance on their own experience when estimating a category. In this example, someone who got divorced over the age of 60 would likely overestimate that category because they put too much weight in their own experience.

Kahneman and Tversky considered how many instances must be retrieved to get an impression of ease. The answer is none. If presented with the strings of letters "XUZONLCJM" and "TAPCERHOB" we immediately know, without generating any instances, that far more words can be constructed with the second string of letters.

The availability heuristic also relies on System 1, because we understand ease automatically and intuitively—as readers can experience by looking at the two strings of words that Kahneman provides.

The availability heuristic substitutes the question "how frequent or how sizeable is this category?" with "how easily can I think of examples of this category?" Events that attract attention (like celebrity divorces), dramatic events in the news (like plane crashes), and personal experiences, pictures, and vivid examples will all alter our sense of how frequent they are.

This substitution is again automatic in order to make our thought process easier. The examples that Kahneman gives demonstrates our mistaken overestimation of things that we have experienced or recently witnessed or heard about.

The availability heuristic explains why we overestimate our own contributions to group activities. When spouses are asked to estimate the percentage of the housework that they do, their responses usually add up to more than 100%.

In this example as well, people rely too much on their own experiences and ignore the fact that they are often not privy to the work that their spouse may have contributed.

In the early 1990s, German psychologists led by Norbert Schwarz studied how people's impressions of frequency are affected by requirements to come up with specific examples of that category. They asked people to list six (or, in another group, twelve) instances in which they behaved assertively, and then to evaluate how assertive they are. They wanted to see whether people would base their evaluation on the number of examples they could come up with, or the ease with which they could come up with them. The results yielded a clear-cut winner: people who had listed twelve instances rated themselves as less assertive than people who listed six.

The results that the German psychologists found show how much we base our judgments on cognitive ease. Earlier, this principle showed that our tendency toward cognitive ease allowed us to be lazy. Here, the fact that people are not able to experience cognitive ease (in having to come up with many example of their assertiveness) leads them to believe that they must not be assertive because it is difficult to come up with those examples.

This result is paradoxical, and it is due to the strain of coming up with more examples. When Schwarz provided an explanation for the difficulty (i.e., by telling participants that the background music would affect performance in the memory task), they rated themselves equally assertive when coming up with six or twelve examples.

Schwarz further proves that cognitive ease becomes the true basis of the participants' judgments: when the cognitive strain is explained by something else, it no longer becomes a factor of people's ratings of their assertiveness.

Schwarz and his colleagues discovered that people who are personally involved in the judgment are more likely to consider the number of instances they retrieve and less likely to go by fluency. Students with no family history of heart disease were asked to recall three or eight behaviors that could affect their health. They felt safer if asked to retrieve many risky behaviors (which they found hard to do). Students with a family history of heart disease felt greater danger when they retrieved many instances of risky behavior.

This portion of the study perhaps implies that when people are personally involved in the judgment, they are more mentally invested in the answers that they provide, and thus they think more with System 2 (deliberation and logic) and less with System 1 (which, as in the previous example, relies purely on ease and intuition).

People are more affected by ease of retrieval than by content if they meet certain conditions, including the following: if they are engaged in another effortful task at the same time, if they are in a good mood, if they have a large amount of faith in intuition, or if they are made to feel powerful.

This last quality is particularly interesting, implying that if people are made to feel powerful, they have more confidence in their own intuition and judgment than they might otherwise feel.

PART 2, CHAPTER 13

Economist Howard Kunreuther noticed that the availability heuristic explained the pattern of insurance purchase after disasters. After disasters, people are very concerned and buy insurance, but this concern dims over time. He also observed that protective actions are usually designed to be adequate for the worst disaster that has been experienced. It is difficult for people to prepare for disasters that may be worse.

The fact that people have a hard time preparing for disasters that may be worse again demonstrates how people put more stock into their own experiences, rather than objectively identifying possible risk.

An influential study designed by Paul Slovic asked participants in a survey to consider pairs of causes of death (e.g., diabetes and asthma). Participants indicated the more frequent cause and estimated the ratio of the two frequencies. The results were clear: estimates of causes of death were warped by media coverage, which is biased toward novelty and poignancy (for example, death by accidents were judged to be more than 300 times more likely than death by diabetes, but diabetes is actually four times more likely). Causes of death that yielded frightening and visceral images were particularly overestimated.

Slovic's study provides another example of how we overestimate frequency of certain things—in this case, causes of death—based on the ease with which we can think of examples of that happening. This thought process also seems inextricably linked from the emotional aspect of System 1, as frightening images becomes even more available and overestimated in our minds.

Paul Slovic eventually developed the notion of the affect heuristic, in which people substitute the question "What do I think about it?" with "How do I feel about it?" When surveying people about the benefits and risks of various technologies, people who liked a technology exaggerated its benefits and underplayed its risks; when they disliked a technology, the opposite happened.

The example of the various risks and benefits of technologies also recalls the halo effect, in which people have a tendency to like or dislike everything about a person or thing in order to simplify their thought processes about that thing.

After completing the initial survey, people then read brief passages with arguments in favor of certain technologies. They found that simply reading about the benefits of a technology change people's mind about its risk, even though they had received no evidence about the risks.

This other example Kahneman provides also exhibits the halo effect, in which learning about benefits caused people to try to form a more simplistic and coherent idea of that technology, thus decreasing their worry about its risks.

Slovic does a lot of work with risk and paints a picture of the average person as guided by emotion rather than reason. Expert judgments about risk are often based more in logic and statistics. Slovic argues, however, that expert opinions should not be accepted without question when they conflict with average people—that risk is subjective, and people's emotions about it should be taken into account when creating public policies.

This argument between the "average person" and the "expert" highlights the way in which people, most of the time, are deeply affected by stories and are highly subjective. The experts, on the other hand, represent the confidence in statistical objectivity.

Another scholar, Cass Sunstein, argues against Slovic. Sunstein believes that the system of regulation in the United States reflects public pressure and sets poor priorities. He believes that risk can be calculated by lives and dollars cost.

While Slovic sides more with the average person, Sunstein takes on the objective viewpoint and sides with the experts in trying to deal with risk.

Sunstein's research focuses on two examples that are still debated: the Love Canal affair and the Alar scar. In Love Canal, buried toxic waste was exposed during a rainy season in 1979. There were daily stories about it, and the control of toxic waste became the major environmental issue of the 1980s. But scientists believed that the risks were overstated, and the expense incurred by cleaning up the waste could have saved many more lives if directed to other priorities. The Alar scare provides a similar example in which the small risks of a chemical sprayed on apples became hugely overstated.

These two stories play not only with the tension between subjective fear and objective risk assessment, but also with the availability heuristic that Kahneman brought up before. In both of these examples, the large amount of media attention caused people to become fearful of these risks, and therefore swayed by their dangers.

The Alar scare demonstrates how we have a difficult time dealing with small risks: we either ignore them or give them far too much weight. This "availability cascade," in which events given prominent media attention garner a large overreaction, explains why terrorism is so potent. Even in a county plagued by terror campaigns, like Israel, the weekly number of casualties never comes close to the number of traffic deaths, but the media attention biases our perception.

Again, the availability cascade relies on a human fault: that we tend to become particularly fearful or particularly affected by gruesome and unique events. Media stories then often focus on these kinds of events because we have such strong reactions to them, and as a result we become even more fearful.

Kahneman writes that he sees the merit in both arguments: that availability cascades are real and lead to overreactions. But fear is also painful, and policy makers must endeavor to protect the public from fear, not only from real dangers. Additionally, availability cascades can alert people to classes of risk, like environmental concerns as a whole. Risk policies should combine expert knowledge with the public's emotions and intuitions.

This is perhaps the only time in the book where Kahneman sees the merit in creating policy or making decisions based on emotion. He understands that on a large scale, it is hard to control fear, and sometimes it is just as important to make the public feel comfortable as it is to solve the actual problem, because the issue really stems from the fear that is incurred from a given event.

PART 2, CHAPTER 14

Kahneman next introduces a puzzle that he created, which centers on a fictional graduate student named Tom W. Kahneman asks us to rank the likelihood of Tom studying in nine different fields (e.g., business, medicine, humanities, etc.). If people are given only this fact, they will rank the fields based on their relative frequencies. But if a description of Tom includes the facts that he likes sci-fi, is intelligent but not really creative, not very sympathetic, people will vastly alter their rankings. They will prioritize fields like computer science and engineering, even though statistically these groups are much smaller, because he is more "representative" of those categories.

The Tom W example becomes (like the Linda example in the next chapter) one of the prime ways in which Kahneman demonstrates how we value stories over statistics. Even though the first part of the problem requires people to calculate what they think the base rates of given graduate fields are, these base rates become largely irrelevant to people in the face of new information about Tom's personality.

The study is meant to demonstrate that people will most of the time ignore base rates and instead prioritize the similarity of Tom W to the stereotype of a computer scientist. Instead of answering the question about probability, people answer a question about similarity. This is a large mistake, as judgments of similarity and probability have very different rules.

In the second part of the Tom W problem, people rely on their intuitive System 1 to come up with their probabilities even while they ignore the effortful calculations that they performed in the first part that gave them much more accurate probabilities.

The relevant "rules" for the cases like Tom W are provided by Bayesian statistics—named after Reverend Thomas Bayes. Bayes's rule specifies that prior beliefs (base rates) should be combined with representativeness. If 3% of graduate students are enrolled in computer science (the base rate) and you also believe that Tom W is 4 times more likely to be a computer scientist than a student in another field, the probability that Tom W is a computer scientist is still only 11%.

The actual mathematical calculations that Kahneman lays out prove just how misguided our intuitions are at calculating probability when we try to incorporate representativeness: we often vastly overweight similarity instead of taking into account the base rates.

Kahneman writes that the mathematical details are not relevant in the book, but there are two ideas to keep in mind: we should anchor probability on a plausible base rate, and question how much the evidence presented to us should affect our answer.

Kahneman returns to the thesis of his book: in a "cognitive minefield" like this one, we should slow down, question our intuitions, and rely on our System 2 processing.

PART 2, CHAPTER 15

Kahneman introduces another puzzle he created about a fictional person, this time a "single, outspoken, and very bright" woman named Linda who majored in philosophy and was concerned about social justice. When asked which alternative is more probable, most people will say that Linda is more likely to be a bank teller who is active in the feminist movement than merely a bank teller, even though this violates the laws of probability because every bank teller is by default a bank teller.

The Linda problem, like the Tom W problem, demonstrates how our intuitive processing can even overrule principles of logic, demonstrating the depth to which we have a preference for coherent stories over statistical principles.

This cognitive illusion, which Kahneman and Tversky dubbed "the conjunction fallacy," still remains attractive even when people realize that they have violated the laws of probability. The most coherent story is not necessarily the most probable, but perhaps the most plausible. Adding detail to scenarios might make them more persuasive, but still less likely.

The potency of the cognitive illusion is demonstrated by the fact that even when we become aware of the fallacy, we still have a difficult time admitting that Linda is more likely to be a bank teller than a feminist bank teller.

Kahneman puts forth counterexamples to show why plausibility is so pernicious. He asks which alternative is more probable: that Mark has hair, or that Mark has blond hair. This question does not cause the fallacy because it does not create a more coherent story.

The Mark counterexample further demonstrates the power of coherence in the Linda example: this example does not tell a story, and therefore we do not make the same mistakes in evaluating probability.

Christopher Hsee ran an experiment in which people were presented with sets of dinnerware that were almost identical, and most dishes were in good condition. But Set A contained 8 cups (with two of them broken) and 8 saucers (with seven of them broken). Set B contained no cups or saucers. When people are shown both sets of dinnerware, they will on average pay a little more for Set A than for Set B ($32 vs. $30).

Hsee's experiment is based less on stories, but it still introduces the subjective nature by which we evaluate things. When taken together, we do not commit the conjunction fallacy—we understand that adding more dishes (even if a few are broken) should improve the value of a dinner set.

But when people are shown only one set, the results reverse: people would pay on average $23 for Set A and $33 for Set B, even though Set A contains all of the dishes in Set B, because no one wants to pay for broken dinnerware. By removing 16 items from Set A (7 of them intact), the value is improved.

Yet, in contrast to the first experiment, here people do commit the conjunction fallacy because they have nothing that they can anchor the value of the set to. This also introduces a concept of prospect theory, which is that our decisions about money and goods are governed less by intrinsic value and more by comparisons.

The error incurred in the conjunction fallacy is greatly reduced, however, if people are asked about numbers rather than percentages. In a study people are told that a health survey was conducted among 100 adult men. If people are asked "How many of the 100 participants have had one or more heart attacks?" and "How many of the 100 participants both are over 55 years old and have had one or more heart attacks?" people will commit the conjunction fallacy far less than if they are asked about percentages.

Even though in this example we might still be affected by coherence (as people over 55 are more likely to have had one or more heart attacks), we are affected less because we think about concrete individuals. This example shows how our brains are very ill-equipped to deal with pure statistics and probability even if we understand the underlying calculations.

PART 2, CHAPTER 16

Kahneman asks us to consider a scenario and note our intuitive answer: a cab was involved in a hit and run accident at night. 85% of the cabs in the city are green and 15% are blue. A witness identified the cab as blue; witnesses under these circumstances correctly identify cab colors 80% of the time. Usually, people ignore the base rates of the number of cabs, and instead favor the witness's accuracy, guessing about 80% percent. According to Bayes's rule, the correct answer is 41%.

This chapter becomes another prime example to support the idea that people vastly prefer stories over statistics. Instead of relying on the numbers provided to them (the fact that there are far more green cabs than blue cabs), people prefer to rely on the story provided by the witness.

However, if the first sentence had said that green cabs are involved in 85% of accidents, people give more weight to that information because they construct a story assuming that the green cabs are more reckless. The information is literally the same, but people prefer base rates that hint at a cause.

This slight change in the way the information is presented also supports the idea that stories take precedence over statistics, as this fact provides people with the ability to construct a coherent story about the green cabs.

The causal version of the cab problem creates a stereotype that green cab drivers are dangerous. Kahneman admits that social stereotypes can be harmful, but that stereotypes in general allow us to create categories and norms—like horses, refrigerators, and police officers. Stereotyping in the case of the green cabs makes people more accurate.

A stereotype is, at its core, a way of constructing stories about a given category in order to make the world more coherent and reliant on patterns—which is why our System 1 likes to rely on them.

Kahneman and Tversky borrowed the notion of causal base rates from Icek Ajzen. In an experiment, Ajzen showed participants descriptions of students. He told one group that 75% of the students passed an exam, and told another group that 25% of the students had passed. Every student was judged more likely to pass the high-success condition than in the high-failure rate, because participants assumed that the test had been brutally difficult.

Like the green cab experiment, constructing a stereotype allowed the participants to make correct inferences about the students—that generally, it is safe to assume that the students in the 75% passing group were more likely to have done better than the students in the 25% passing group. But the next example complicates the idea that people understand this concept.

In another classic experiment, social psychologists Richard Nisbett and Eugene Borgida told their students about a "helping experiment" that had been conducted a few years earlier. Participants were separated into individual booths made to think that someone in another booth was having a seizure and choking. Only four out of fifteen them responded to the person's call for help.

Nisbett and Borgida make very clear the base-rates of their experiment. Even though we might like to believe otherwise, eleven out of fifteen people will not rush to help a dying stranger if they believe that someone else has heard the same call.

Nisbett and Borgida described this experiment in the hopes that their students would see the low base-rates and assume that it was a difficult test. But when students were shown videos of brief interviews with two of the participants, who appear to be nice, normal decent people, the students believed that both individuals would rush to the choking person's aid—despite the fact that they knew there was only a 27% chance of this being the case.

The 27% statistic is surprising, and it conflicts with our idea of people (and of ourselves) as generally decent and helpful. And so, when individuals appear to be decent and helpful, they confirm our previously held beliefs and this information takes precedence over the statistic.

For a teacher of psychology, Kahneman writes, the study is disheartening because the results did not change their beliefs about people's behavior. But in another part of the experiment, Nisbett showed another group of students the two interviews (without describing the full results) and told his students that these two individuals did not help the choking person. Nesbitt and Borgia then asked them to guess the global results, and the students' guesses were extremely accurate.

Again, the stories (particularly about individuals) take precedence over the statistics. When confronted with surprising individual cases, we are more likely to make accurate inferences about the general population than if they are shown a surprising statistic and unsurprising individual cases.

The results demonstrate that when students were surprised by a statistical fact, the students did not change their assumptions. But when surprised by individual cases, they immediately made the generalization and inferred that helping is more difficult than they thought. This, Kahneman says, is why his book contains questions that are addressed to the reader: being surprised by one's own behavior is more powerful than being surprised by people's behavior more generally.

Kahneman's style in the book—which often uses "you" and "we" pronouns, takes its basis from this principle. We often believe that certain psychological principals don't apply to us, and when we are surprised by individual cases (including ourselves), we are more likely to learn the general lessons that he offers.

PART 2, CHAPTER 17

Kahneman describes how, while working with the Israeli Air Force, one of the instructors emphasized punishment over reward. The instructor stated that when he praised flight cadets for a good maneuver, they usually did worse the next time. Screaming into a cadet's ear for bad execution, however, generally led to better performance.

The instructor's assumptions not only misattribute causality (as Kahneman goes on to describe), but the instructor also places too much confidence and weight into his own actions as a reason why the cadets do better after being yelled at.

Kahneman notes that the instructor was right—but also very wrong! The instructor was inappropriately attaching causality between his actions and the cadets' performances, ignoring the fact that a particularly good execution of a certain maneuver will likely be followed by a less well-executed maneuver, and vice-versa with a particularly bad execution.

The instructor's perspective provides another aspect of our predilection for stories. We prefer to think that all events have causal explanations, despite the fact that some things simply occur due to randomness.

Kahneman writes that success = talent + luck. Kahneman explores this principle in looking at a golf tournament. A golfer who scores above average on day 1 can be assumed to be both more talented and luckier; a golfer who scores below average on day 1 is both less talented and less lucky. On the second day, the golfer who did well on day 1 is likely to be successful, but less successful than on the first day because his luck will likely not hold. The golfer who did poorly will probably be below average on day 2, but will improve because his streak of bad luck is unlikely to continue.

We often place more emphasis on talent than on luck in determining what makes someone successful. On any day, if a person does particularly well one can assume that their success was due at least in part to luck—but we have a very difficult time understanding this in practice and like to believe that their talent is the true cause of good performance.

This pattern is called regression to the mean. The more extreme the original score, the more regression we expect, because an extremely good score suggests a very lucky day. The same effect can be observed by looking at day 2 and then day 1, which should help convince people that regression does not have a causal explanation.

Regression to the mean is a difficult concept for many people to understand because regression has an explanation, but not necessarily a cause—and our System 1 processing is designed to look for causes and to make coherent sense of the world.

Regression effects are everywhere, and people often misattribute causes to explain them. Kahneman points to analysis of the Olympic ski jump, in which athletes jump twice. If athletes have a good first jump, commentators say they will have a worse second jump because they will feel pressure; if athletes have a bad first jump, commentators say that they have nothing to lose and will have a better second jump. The analyst has detected a principle of luck and chance and has assigned a causal story to it.

The Olympic ski jump provides another example of how regression to the mean works, and the commentator's analysis also demonstrates some of the ways in which we will create explanations to provide a sense that there is a causal explanation for the athletes' performances.

Kahneman goes on to discuss how regression can be measured between variables on different scales, using a "correlation coefficient." The correlation coefficient is a measure of the relative weight of the factors they share. For example, the correlation between height and weight among adult American men is .41, meaning they share some factors. The correlation between family income and the last four digits of their phone number is 0, meaning these two qualities are unrelated.

By establishing correlation as related to regression, Kahneman can elaborate on how regression does not necessarily have a cause. Even though height and weight are correlated, one's height does not cause one's weight—they simply share factors.

Correlation and regression are different perspectives on the same concept. Whenever the correlation between two scores is imperfect, regression can be found, as in this example: highly intelligent women tend to marry men who are less intelligent than they are. People will readily explain this statement in terms of causality. But when faced with this statement, "the correlation between the intelligence scores of spouses is less than perfect," people do not bat an eye, even though it means the same thing. It is a mathematical inevitability that highly intelligent women will be married to husbands who are on average less intelligent than they are.

This example, when stated both in terms of regression (the first sentence) and in terms of correlation (the second sentence) explains yet again how we like to look for causality to create coherent stories. People have a hard time understanding probability that does not have an explanation, and so they try to invent explanations as to why intelligent women might intentionally marry less intelligent men.

Kahneman makes up a headline: "Depressed children treated with an energy drink improve significantly over a three month period." He writes that the fact that it reports is true, but it would be true without the energy drink as well. Depressed children are an extreme group, and they regress to the mean over time. This is why control groups are so vital in experiments.

Kahneman explains why it is important to understand that causation and correlation are not the same thing. It is important that the regression effect is not the only thing that accounts for certain outcomes in testing of medicine and other research scenarios.

In a final example, Kahneman adapts a question from Max Bazerman's *Judgment in Managerial Decision Making*. The given circumstances are as follows: you are a sales forecaster for a department store chain. All stores are similar in size and merchandise, but their sales differ due to location, competition, and random factors. Overall sales are expected to increase by 10% across the board. It then asks the reader to complete a table, predicting how each store will do in the coming year. It is tempting simply to add 10% to each store's sales, but one must also adjust for regression and add slightly more to the underperforming stores, and slightly less for the overperforming stores.

Lastly, Kahneman provides an example that might be more relevant outside the fields of psychology and research. Understanding the effects of regression can allow people to more accurately make predictions about the future, as is the case with this scenario in which the reader can attempt to make projections about the performance of different department stores.

PART 2, CHAPTER 18

There are many scenarios in which people make predictions: economists forecasting unemployment, the military predicting casualties, producers predicting audiences, etc. Some predictions involve precise calculations, but others involve intuition and System 1. The predictions that rely on intuition can stem from skill and expertise (like chess masters) but some of them can stem from the operation of heuristics, which can lead to mistakes.

Chapter 18 focuses on taming our intuitive predictions. While some people (like chess masters) can rely on intuition because of their learned expertise, for almost everyone else it is important to motivate System 2 and avoid some of the biases we inherently rely on.

Kahneman reintroduces Julie, a current senior at a state university who read fluently when she was four years old. He asks what readers believe her GPA is. System 1 makes several quick calculations, creating a causal link between Julie's reading and her current GPA. System 1 evaluates how precocious a child is who reads at age 4, and what percentile of GPA might correspond with this achievement.

This is another case in which System 1 relies on its tendency to create cause and effect where there might be none, and also to rely on easier questions in order to answer something more complicated. System 1 draws an equivalent connection between reading ability at age 4 and GPA here, but GPA is based on many additional factors.

Kahneman then describes another question he and Tversky once asked people. After describing a freshman student as "intelligent, self-confident, well-read, hardworking, inquisitive," they then asked people what percentage of descriptions of freshman would impress them more. The answers were generally in the top 15% but not in the top 3%. When they then asked other participants what percentage of freshman obtain a higher GPA than this student, their answers remained the same, despite the fact that predicting someone's GPA from five adjectives is bound to yield an inaccurate answer.

Like the Julie example above, this serves as another case in which System 1 replaces a hard question with an easier one—and Kahneman makes the simplification clear by asking one group the simple question (what percentage of descriptions would impress you more) and asking one group the difficult question (what percentage of freshman would obtain a higher GPA), demonstrating that they yield the same answers.

In the case of Julie, Kahneman writes, it is necessary to perform several calculations for an accurate answer. 1) Start with the estimate of average GPA (the base rate). 2) Determine the GPA that matches your impression of the evidence (your intuition). 3) Estimate the correlation between reading precocity and GPA. 4) If the correlation is .3, move 30% of the distance from the average to the matching GPA. This approach builds on intuition but regresses it toward the mean.

Kahneman's explanation gives people the tools to avoid their inherent laziness. In an example like Julie's, he argues that it is important not simply to rely on System 1 (intuition), but to factor it into calculations that System 2 should perform in order to gain a more accurate answer.

Kahneman writes that the biases we find in predictions that are expressed on a scale (like Julie's GPA) are similar to the biases observed in judging probabilities of outcomes (as in the example in which people are asked what kind of graduate student Tom W is). In each case, it is important to start with the baseline and the intuition and aim for an intermediate number between those responses.

In the case of both Julie and Tom W, we either ignore the basic statistical information that we have (like the base rates of a given field) or we do not acknowledge our ignorance of the base rates at all. Instead, we use the narrative presented to us to shape our intuitions.


Correcting intuitive predictions is a task that System 2 handles. It requires significant effort and often means that it will be difficult to predict extreme outcomes. Objections to this last principle are important, however: to a venture capitalist, missing out on the next Google is more important than the risk of making an investment that ultimately fails. The goal of some jobs is to call extreme cases correctly.

Kahneman uses this example to show that sometimes it is important to be able to predict something extreme. But this allows people who are not venture capitalists (or something similar) to realize that it is more important to do the proper calculations to make predictions.

Kahneman writes that the most valuable contribution of these corrective measures is that they require people to think about how much they know. He presents an example in which a department is hiring two candidates: Kim and Jane. Kim leaves a strong impression and has great recommendations but has no substantial track record of scientific productivity. Jane's research record is excellent, but her interviews are less sparkling. Kim is an extreme example, and she is more likely to regress toward the mean. Thus, Jane might be the more solid candidate.

The example of Kim and Jane is particularly salient because it is a circumstance that many people might encounter in their own fields, as interviewing and hiring people is very common to a lot of jobs. Thus, Kahneman is able to introduce an example that people might actually remember and avoid making decisions purely with their intuition.

PART 3, CHAPTER 19

Trader-philosopher-statistician Nassim Taleb introduced the notion of a "narrative fallacy" to describe how flawed stories of the past shape our views of the world and our expectations for the future. We search for simplicity in the world, assign more weight to talent and stupidity than luck, and focus on events that do happen rather than those that don't.

The third part of Kahneman's book focuses on human overconfidence and the mistakes that we make due to that overconfidence. Taleb's points demonstrate that we believe that our actions change outcomes more than they actually do.

Compelling narratives foster an illusion of inevitability, like Google's story. Two creative graduate students at Stanford come up with a superior way of searching for info on the internet. They obtain funding to start a company and within a few years, the company is one of the most valuable stocks in America. In this story, every decision the founders made was a good one and contributed to its success.

The story of Google is an example of the emphasis we place on our own actions. Although the narrative is true, that the founders made a lot of good decisions, they were also extremely lucky—a factor that we often leave out of narratives about success.

This narrative tells only part of the story, because no story can include the myriad of events that would have caused a different outcome. Bad luck could have disrupted any one of the successful steps, but instead, the founders had a great deal of good luck.

It is difficult to incorporate ideas of luck into success stories because nonevents (things that don't happen) are hard to conceptualize, particularly because in some ways they can be infinite.

Many people, Kahneman writes, claim they knew that the 2008 financial crisis was inevitable. But Kahneman explains they could not have known it; instead they could only have thought that it would happen and were proven correct. We know and understand the past less than we believe we do.

People become particularly overconfident in hindsight. The financial crisis example demonstrates that people overstate their ability to know and understand the past.

When an unpredicted event occurs, we adjust our view of the world to accommodate the surprise so that the surprise makes sense. We have a hard time reconstructing past states of knowledge or beliefs. Once we adopt a new view of the world, we immediately lose much of the ability to recall what we used to believe. This causes us to underestimate the extent to which we were surprised by past events, or "hindsight bias."

Hindsight bias serves as another example of overconfidence. It is a way in which the brain essentially changes what we thought our prior beliefs were. This effectively makes us more correct about an event than we actually had been in the past.

In 1972, Baruch Fischhoff conducted a survey just before President Nixon travelled to China to meet with Mao Zedong. Respondents assigned probabilities to different possible outcomes of the meeting. After Nixon's return, respondents were asked to recall the probability they assigned to different outcomes. If the event had actually occurred, they exaggerated what they had thought the probability of that event was.

Fischoff's experiment illustrates the concept of hindsight bias that Kahneman describes, and people's overconfidence in their answers having been correct.

Hindsight bias leads us to assess the quality of a decision not by whether the process was sound but by whether its outcome was good or bad. We often blame decision makers for good decisions that worked out badly and give them too little credit for successful moves that appear obvious later—called an "outcome bias." The worse the consequence, the greater the hindsight bias, as in the harsh judgment brought on the CIA after 9/11 for not anticipating the attack. Hindsight bias and outcome bias usually foster risk aversion, but they also bring undeserved rewards to irresponsible people who take risky gambles and win.

As Kahneman illustrates here, these forms of overconfidence lead us to make unfair judgments on people. We believe, after something has happened, that that outcome appeared more obvious than it actually was. Thus, we judge people using knowledge that neither they nor we had, which leads to the cruel kind of feedback that Kahneman describes.

In discussing recipes for success, Kahneman brings up a study that looks at the correlation between the quality of a CEO and the success of their firm. In a predictable world, the correlation would be 1. Instead, a generous estimate finds the correlation to be .30, indicating 30% overlap of shared factors. This means that given a pair of CEOs and a pair of firms, the stronger CEO would lead the stronger firm about 60% of the time—only 10% better than random guessing.

Overconfidence also yields inappropriate narratives about success. We like to believe that successful CEOs tend to run successful firms, but mathematically this isn't necessarily the case, as Kahneman demonstrates by showing that the correlation is positive but not particularly strong.

Yet even given this statistic, consumers like to believe that CEOs have a great impact on the success or failure of a firm. Entire genres of literature have been devoted to analyzing the success or failure of individuals and companies. But a business school professor named Philip Rosenzweig shows in his book *The Halo Effect* that the knowledge of the success or failure of a company greatly affects how we view the CEO. The CEO of a successful company is called flexible, methodical, and decisive. That same CEO, if things later go sour, might be called confused, rigid, and authoritarian.

The overconfidence we place in successful CEOs plays into another form of overconfidence that Kahneman has already discussed: the halo effect, which is also aptly the title of Rosenzweig's book. In the halo effect, we tend to like everything about a person, and that becomes true when we consider the success of a given firm. It would be strange to use the negative adjectives to describe the CEO when the firm is garnering success.

Many books are devoted to analyzing good managerial practices, which they argue will lead to good results. But this ignores the fact that firms that are more or less successful could also simply be described as more or less lucky. Stories to the contrary maintain an "illusion of understanding," which again provide causal explanations for random events.

Kahneman finishes the chapter by reiterating that many events have a lot of random factors, and the success of any person or company requires luck. Still, we choose to search for and believe narratives that imply concrete causes and effects.


PART 3, CHAPTER 20

Decades ago, Kahneman watched soldiers in the Israeli Army as they completed a group exercise. He and a colleague took note of who tried to lead, who was rebuffed, who seemed to be stubborn, arrogant, patient, persistent, etc. After a few hours, they evaluated who should be eligible for officer training. They were very confident of their rankings, and rarely experienced doubts or formed conflicting impressions.

Kahneman continues to illuminate some of the factors of overconfidence by providing a personal story in which he is asked to evaluate soldiers, highlighting his own confidence and that of his colleague as they tried to make predictions about the future.

The evidence that Kahneman and his colleague were not able to forecast accurately was overwhelming. Their forecasts were better than blind guesses, but not by much. Still, this knowledge of this failure of their predictions did not change the way they evaluated soldiers. It should have shaken their confidence, but it did not. This is the "illusion of validity."

The illusion of validity is an aspect of overconfidence—by which people are so confident in their own abilities and impressions that even in the face of statistical evidence showing their errors, they do not change their behavior.

In 1984, Kahneman, Tversky, and a friend named Richard Thaler visited a Wall Street firm. Kahneman remembers being struck by the stock market and wondering what motivates some people to buy a stock while others sell it. He also started to realize that this industry of trading stocks appeared to be built on an illusion of skill, with each participant believing that they know more than others.

The illusion of skill is essentially the same as the illusion of validity, whereby instead of being confident in their judgments, investors are confident in the skills that they possess over others in their same field (who also happen to believe in their own extraordinary skill).

Kahneman describes how a student of his, Terry Odean, began studying the trading records of individual investors over seven years. Odean saw that in each trade, the investors expected the stocks they bought to do better than the stocks they sold. Odean discovered that on average, after one year the stocks they sold did better than those they bought by 3.2 percentage points.

Odean's findings demonstrate the overconfidence that investors and traders have. But as he demonstrates through tracking prices of different stocks that people bought and sold, that overconfidence is unwarranted.

Odean's discoveries imply that for the majority of investors, doing nothing would have been a better policy than following their intuition. On average, the most active traders had the poorest results, while the investors who traded the least earned the most returns. Men often traded more than women, and thus women achieved better investment results than men.

Odean's findings make clear why the illusion of validity might be so pernicious to investors, because the fact that inaction and restraint is the true demonstration of skill is a difficult idea for many people to accept.

Investors often like to lock in gains by selling "winners," stocks that have gone up since they were purchased, and they hang on to their losers. But recent winners tend to do better than recent losers in the short run, so individuals sell the wrong stocks. Few stock pickers have the skill to beat the market consistently, year after year. For a large majority of them, the selection of stocks is more like rolling dice than playing poker. Kahneman discovered in his own research that differences in skill were not to be found.

This fact hints at overconfidence, but also hints at a part of prospect theory on which Kahneman elaborates later: that people consider the buying price when deciding whether they should buy or sell, despite the fact that they should really only consider how a stock might do in the future, not how valuable it was in the past.

Executives at these firms reward luck as if it were skill. Kahneman presented his findings to these executives, who certainly believed the findings but whose behavior was unaffected by the information. The statistics clashed with their personal impressions from experience. The advisors similarly were unaffected by the information. They bought into the potent psychological illusion that people who pick stocks are exercising high-level skills, and that they are among the few who can do what they believe others cannot.

In addition to overconfidence, the lessons about the investors remind us that we tend to look at the world as more coherent and sensical than it actually is. It is nicer to create a story that says that investors need skills to do well, and thus those investors that do well deserve to be rewarded, than an alternative story which implies that the investor's outcomes are due largely to chance.

Kahneman moves on to discuss pundits in business and politics, whose hindsight bias makes it difficult to accept the limits of forecasting ability. The image of the "march of history" makes developments seem inevitable, but large historical events are determined by luck as well. Kahneman illustrates this idea by mentioning that there was a 50-50 chance that the embryo that became Hitler would have been female.

Pundits make the same error in trying to explain events that might simply be due to chance, which Kahneman demonstrates vividly in his example about Hitler. Certainly some things have causes and events, but if we fully understood the trends of the past, we should by the same logic be able to predict the future.

Psychologist Philip Tetlock interviewed 284 people who made their living by commenting or advising on political and economic trends. He asked them about to rate probabilities of three future possibilities (e.g., the persistence of the status quo, more economic growth, less economic growth). The experts performed worse than they would have if they had simply assigned equal probabilities to those three outcomes (or worse than a "dart-throwing monkey," as Kahneman writes).

Tetlock's experiment demonstrates how hindsight bias comes into play just as tangibly with experts as with the average person in predicting future events. This example can be seen in comparison with the example concerning Mao and Nixon's meeting in Chapter 19, in which the same results were found.

Those who know more forecast very slightly better than those who know less. But those with the most knowledge are often less reliable, because those people develop an enhanced illusion of their skill and become unrealistically overconfident. Experts also resist admitting that they were wrong, and often have a collection of excuses as to why they were wrong.

It is particularly fascinating that those who know the most are less reliable than those who know only some information. Our knowledge in some ways gives more license to our intuition, because we believe that our thoughts are guided by that deep knowledge and don't feel as responsible to engage System 2.

Tetlock uses terminology from Isaiah Berlin's essay on Tolstoy: "The Hedgehog and the Fox." Hedgehogs have one coherent theory about the world and are confident in their forecasts. They are opinionated and clear, which is exactly what makes them good for television. Foxes, on the other hand, are complex thinkers. They recognize that reality emerges from many different agents and forces, including luck.

As Tetlock points out, society often rewards those who are the most confident, even though they are not necessarily the most accurate. They also construct coherent stories, which, as Kahneman has demonstrated, can often lead to mistakes about causality.


There are two main points to this chapter, Kahneman writes. The first is that the errors of prediction are inevitable, and the second is that high subjective confidence is not to be trusted as an indicator of accuracy—low confidence could be more informative.

Kahneman's second point seems particularly salient. We often look towards people who are confident in their predictions because they give the illusion of validity, but confidence and even knowledge do not necessarily lead to correct predictions.

PART 3, CHAPTER 21

Psychologist Paul Meehl reviewed the results of 20 studies and analyzed whether clinical predictions made by trained professionals were more accurate than statistical predictions made by combining scores according to a rule. For example, he found that his statistical formula was more accurate at predicting the grades of college freshman than 11 of 14 professional counselors. Meehl reported similar outcomes in predicting violations of parole, success in pilot training, and criminal recidivism.

Meehl's discoveries pick away at the overconfidence that people experience about humans at large but particularly their own abilities—especially when they have expertise in a given field, as the counselors do here, for example.

Meehl's book prompted shock and disbelief, and a lot of subsequent research was devoted to proving him wrong. Still, 60% of the studies (which cover a variety of medical variables, economic measures, questions of interest to government agencies, and other outcomes like winners of football games and future wine prices) have shown significantly better accuracy for algorithms, while other studies simply scored a draw in accuracy.

Even the draw in accuracy between algorithms and humans is, in effect, a blow to the confidence of humans because algorithms often cost a lot less than professionals. It is also remarkable that they can be applied to a wide range of fields, demonstrating the ubiquitous nature of overconfidence.

Meehl suggests that this discrepancy is due to the fact that experts sometimes consider complex combinations of features to make predictions, while the algorithms focus on simple combinations of features. People often feel that they can overrule the formula because they have additional information. This is only true in an odd case—for example, a formula that predicts whether a person will go to the movies tonight should be disregarded if a person receives information that the person broke a leg today. But broken legs are both rare and decisive.

It is interesting that Meehl believes the issue to be human tendency toward complexity, as all of Kahneman's arguments have focused on human desire to make things simple. But in these cases of prediction where System 2 is already activated, overconfidence actually cause mistakes because some factors are emphasized that are not actually as relevant as others.


Humans are also very inconsistent, unlike formulas. When asked to evaluate the same information twice, they frequently give different answers. This can be a matter of real concern, as with radiologists who contradict themselves 20% of the time. These inconsistencies are likely due to the context dependency of System 1. Formulas do not suffer from the same problems.

System 1 plays a big factor in human inconsistency because, as Kahneman introduced in the earlier chapters, System 1 is unconsciously affected by factors like priming and different ways of framing questions.

Kahneman also introduces the idea that some formulas don't even require any statistical research. Psychologist Robin Dawes provides an example of this kind of formula: marital stability is predicted by frequency of lovemaking minus frequency of quarrels. Positive numbers signify good results. This formula can compete with an optimally weighted formula and is often better than expert judgment.

Human fallibility is made even more apparent when Kahneman proves how formulas based essentially on common sense (and no research) are better able to predict outcomes than human experts are.

An application of this approach was developed to save infants' lives. Obstetricians had always known that a newborn that is not breathing normally a few minutes after birth is at a risk for brain damage or death. Virginia Apgar came up with a scoring system to develop consistent standards for determining which babies were in trouble, and it has been credited with reducing infant mortality. It is still in use every day in every delivery room.

The invention of the Apgar test demonstrates the importance of recognizing human fallibility. Instead of trusting the experts, who may have biased judgment, the creation of a standardized test helped to lower infant mortality.

The hostility to Meehl's ideas from clinical psychologists resulted from their own experience of their good intuitions and judgments. But the tasks at which they fail typically require long-term predictions about the patient's future, and it is hard to know the boundaries of their skill. Additionally, the debate centers on the idea that our sympathies inherently lie with our fellow humans over machines.

Yet even in the face of these examples, people are still hesitant to trust algorithms. This makes some sense: in the same way that we prefer stories over statistics, we often prefer human judgment over mechanical predictions.

The prejudice against algorithms is magnified when the decisions are consequential, and because the cause of a mistake often matters to people. The story of a child dying because an algorithm made a mistake draws more outrage than the same tragedy occurring because of human error. But overall, the role of algorithms has been expanding—like the calculations of credit limits or the amount a professional team should pay for a player.

Even though, overall. we may feel better if mistakes are made by humans, this is a somewhat illogical position, as fewer mistakes would be made overall if we trusted the predictive results of algorithms.

In 1955, at 21 years old, Kahneman was assigned to set up an interview system for the army. At the time, every soldier completed psychometric tests and then had a personality assessment conducted by other young draftees. This interview procedure was found to be almost useless for predicting success.

Kahneman description of his own discovery of some of Meehl's principles makes even clearer his stand on trusting numerical scales over human judgment.

Kahneman decided that instead of learning about the interviewee's mental life, the army should obtain specific information and let go of global evaluations to determine the final decision. The interviewers would evaluate several personality traits and score each separately. In this way, he hoped to combat the halo effect.

Kahneman understood that the issue is not only that humans are overconfident in their judgments, but also that their judgments contain many of the flaws that he has already introduced, like the bias to like everything about a person.

The interviewers were displeased to be ordered to switch off their intuition and ask factual questions. Kahneman then compromised and instructed them to give them a global score on the scale of 1 to 5. The new method was a substantial improvement over the old one. Even the intuitive judgment did better, because it was based on more objective information and scales. Kahneman makes clear that this anecdote could be useful for anyone interested in better interview procedures.

Kahneman leaves one glimmer of hope for human judgment: when people are forced to be held to a more objective scale, their intuition becomes more predictive. This is similar to the Apgar test that Kahneman described earlier, which became effective when people were forced to report answers based on a standard scale.

PART 3, CHAPTER 22

Kahneman next writes about his collaboration with Gary Klein, a colleague who did not agree with his work on experts and was deeply skeptical about the value of using rigid algorithms to replace human judgment. Klein had studied the expertise of firefighters and analyzed how experienced professionals develop intuitive skills. Kahneman invited him to join in an effort to try to discover when one can trust an experienced professional who claims to have prediction abilities.

Kahneman's and Klein's work centered on the question not only of when one can trust an experienced professional's prediction abilities, but essentially when one can trust those professional's intuitions. As Kahneman has demonstrated, intuition is deeply flawed, and so correct predictions must be able to pass certain tests of consistency.

Kahneman's view of intuition was formed by observing the illusion of validity with his own work and Meehl's work. Klein's views were shaped by his work studying firefighting teams. The commanders could draw on patterns that they had learned and could intuit quickly the best option to fight a fire, without having to generate other options.

Klein's view of intuition arose from studying different kinds of experts. Whereas Kahneman looked at people who claimed to be able to find patterns in random situations (particularly in the future), Klein's studies focused on people who encountered similar environments over and over again.

Klein calls this the recognition-primed decision (RPD) model, which also applies to experience in other domains like chess. In it, a tentative plan comes to mind by the associative memory in System 1. The next phase is a deliberate process in which the plan is checked by System 2. Kahneman believes that this kind of intuition is really recognition of information stored in memory.

Kahneman demonstrates that Klein's work blurs the line between intuition and memory. If a person has encountered a scenario before, instead of relying on intuition to come up with a new plan, they recall the previous situation.

Certain types of intuitions are stored in memory very quickly: a dubious dish that leaves us hesitant to return to a restaurant, or a bad experience on a certain street that causes us to remember it when we pass. This emotional learning is quick, but expertise takes a long time to develop. An expert chess player can understand a complex position at a glance, but it takes years (studies show at least 10,000 hours) to develop that kind of ability.

In the same way that we recall visceral stories in the news more than we recall mundane (if more frequent) occurrences, emotional memory is easier for System 1 to recall than complex situations that we should learn from. Perhaps this is because System 1 usually handles emotions rather than complex thought processes, and so storing and recalling emotions is easier for that process.

Becoming an expert at chess can be compared to learning to read. A first grader works hard to recognize letters and parse syllables, but adult readers can perceive entire clauses automatically. Chess is harder than reading because there are more letters in the "alphabet" of chess and longer "words," but eventually chess masters can read situations instantly.

Reading is a good example of how, with practice, processes that are initially the domain of System 2 gradually become less effortful, more automatic, and move into the domain of System 1.

Kahneman and Klein realized that their disagreements stemmed from the fact that they had different experts in mind. Klein had worked with firefighters and nurses, while Kahneman worked with financial traders and political scientists. Klein argued that true experts know the limits of their knowledge; Kahneman argued that there are many "pseudo-experts" who don't know what they don't know.

Klein's point that true experts know the limits of their knowledge is comparable to some of the ideas that Kahneman has expressed: much of human overconfidence stems from the fact that we do not know what we do not know. Theoretically, those who understand their limits do not fall victim to that overconfidence.

Kahneman concluded that there are two conditions to acquire real expertise: an environment that is sufficiently regular so as to be predictable, and an opportunity to learn these regularities through practice. Bridge and poker players, nurses, physicians, athletes, and firefighters all satisfy these conditions. But these professionals use highly valid cues to make predictions, while political scientists make long-term forecasts that often have no valid cues.

The difference that Kahneman finds between these two groups largely lies in the situations they regularly encounter. Expert firefighters, nurses, and poker players commit fewer heuristic fallacies because they have had the opportunity to practice and learn from their mistakes, unlike the people that Kahneman has largely observed.

Meehl's work demonstrated that algorithms do better than humans, but even the algorithms did not have extremely high accuracy because the situations it evaluated did not allow for that accuracy. Statistical algorithms can find weakly valid cues and use them consistently, but if a strong predictive cue exists, humans can usually find it. Thus, it is wrong to blame anyone for failing to forecast accurately in an unpredictable world. But it does seem fair to blame professionals for believing they can succeed at something impossible.

Kahneman recognizes that there are situations in which humans can do just as well as algorithms, particularly when there are predictive cues. But his main point is that in the absence of truly predictive cues (particularly when trying to forecast long-term events and economic trends), people vastly overstate or are overconfident in their abilities, leading to both mistakes and ways of misleading the public.

There are a few conditions one can meet to become an expert, and those are immediate and unambiguous feedback as well as sufficient opportunity to practice. Chess is good for these conditions. But surgeons can be much more proficient in some operations than others. Psychotherapists get good feedback from patients as they speak with them, but do not have a chance to get feedback on the success of long-term treatments until many years later, and the results are often ambiguous.

Kahneman makes a distinction not only between which "experts" can be trusted and which cannot, but also different expert judgments within a given field that can be or cannot be trusted. There are aspects of some jobs in which people can become experts while others do not allow for that expertise, as in the example of the psychologists.

The conclusion that Kahneman and Klein came to is that, for the most part, it is possible to distinguish intuitions that are likely to be valid from those that are likely to be bogus. If the environment is regular and the judge has had a chance to learn its regularities, System 1 will recognize situations and generate quick and accurate predictions and decisions.

Part of Kahneman's intention in the book is not only to try to help people identify their own overconfidence, but also to allow them to recognize the overconfidence of other people and to know when it is likely to lead to mistakes.

PART 3, CHAPTER 23

A few years after beginning his work with Tversky, Kahneman convinced some officials in the Israeli Ministry of Education of the necessity for a textbook on decision making and judgment. After about a year, the team that Kahneman had assembled had constructed a detailed outline, written a few chapters, and had run a few sample lessons. Kahneman asked the group to individually estimate how long it might take to submit a finished draft. The estimates ranged from 1.5 to 2.5 years.

Even as Kahneman was writing a textbook about these topics, he fell victim to overconfidence as well, emphasizing its pervasiveness and how difficult it is to overcome. In polling his colleagues, each of them gave the best-case scenario time frame by which they might finish the textbook.

Then Kahneman asked Seymour Fox, an expert in curriculum development, whether he could think of teams similar to theirs who had developed curricula, and how long they took. Fox realized that many teams did not finish the project, and those who did took around seven to ten years. Seymour's estimate had been in the same range as everyone else's until Kahneman prompted him; he had not utilized the prior knowledge that he had.

Fox, like the rest of the team, also fell victim to overconfidence—but his was unique, due to the fact that he could have easily recalled information that would have disproven his intuition. But instead, he let his System 1 processing prevail over System 2's deliberation.

The statistics that Fox provided, Kahneman writes, should have dissuaded them from continuing the project. It took them eight years to finish it and by that time Kahneman was neither living in Israel nor still part of the team. The enthusiasm for the textbook in the Ministry of Education had waned, and it was never used.

For Kahneman, the principle of overconfidence that he and his team exhibited had real-life consequences. Despite spending eight years of time and effort in creating the textbook, this hard work was unlikely to and does not pay off.

Kahneman learned three lessons from this incident. The first is the distinction between the two methods of forecasting (which he labels the inside view and the outside view). The inside view of forecasting is what the team had initially adopted to estimate their remaining time. But they made mistakes by basing it off of the work they had already done: the first chapters they wrote were likely easier, and their commitment had been at its highest.

The inside view and the outside view could just as easily be labelled the "System 1 view" and the "System 2 view." The inside view had essentially substituted the simpler question of how long it had taken them to complete their current work for the question of how much work they had remaining.

The outside view directed Seymour's attention to a class of similar cases to theirs. This allowed him to come up with a base rate, which gave a better idea of the range of possibilities—and showed that the group's inside-view forecasts were not even close.

The outside view, on the other hand, consisted of System 2 utilizing a base rate. This base rate stemmed not from a biased view of the team's own work, but instead from examples of other teams.

The second lesson is that Kahneman and his team estimated a best-case scenario rather than a realistic assessment. Even though the rest of the group did not have Seymour's outside information, they did not feel they needed it. They felt very comfortable making predictions from an individual case, rather than needing information about other groups. And they assumed that they would do better than others who had similarly tried and failed.

In Kahneman and the rest of the group's case, even though they did not have the base rate, they still fell victim to overconfidence. This is a clear case of WYSIATI, wherein the group only used the biased information they had available to them to make their calculations.

The third lesson is that they should have given up the project. This is similar to the experiment that suggested the futility of teaching psychology: learning about the general cases did not alter the students' assessments of the individual people they were introduced to.

The inability to abandon the project also suggests overconfidence because the team believed that the principles that applied to other teams would not also apply to them.

Kahneman and Tversky coined the term planning fallacy to describe plans like this that are unrealistically close to best-case scenarios and could be improved by consulting the statistics of similar cases. Examples of the planning fallacy can be found in government projects, businesses plans, and home renovations. People begin from an overly optimistic place and end up spending more than if they had started with a more expensive but realistic plan.

Kahneman then expands his analysis of overconfidence to provide larger examples that might be true of his readers. He discusses areas in which they might also commit the planning fallacy, in the hopes that they might take measures to avoid that fallacy.

The outside view, Kahneman and Tversky found, is the cure to the planning fallacy. It is now called reference class forecasting—using information from other similar ventures to help predict how much something might cost or how long it might take. It is also important for organizations to recognize overly optimistic plans and to instead reward planners for precise execution.

In keeping with one of the goals of the book, Kahneman lays out the ways in which people can avoid the planning fallacy. Instead of taking the easy, optimistic route, finding a deliberate, realistic path often saves time and effort in the end.

Kahneman realizes that not only did the team commit the planning fallacy, but he was particularly at fault because he did not have an accurate baseline prediction when they started. If they had, they surely would not have begun the project. And because they had already invested effort, it was hard to give up at that point. In the future, he writes, he hopes that he would begin with the outside view.

Kahneman's point here touches on the "sunk cost fallacy"—another example of human fallibility that he discusses in the next chapter, in which people have a difficult time letting go of projects in which they've already invested time and effort.

PART 3, CHAPTER 24

The planning fallacy is an example of optimistic bias. Optimistic people view their own attributes as more favorable than they truly are and see their goals as more achievable. Optimists exaggerate their ability to forecast, and therefore are overconfident. Their self-confidence leads them to take more risks than they realize and underestimate the odds that they face.

Optimistic bias, like the planning fallacy, is an aspect of overconfidence—usually in one's own abilities. This chapter explores how human overconfidence in the face of difficult odds can lead to poor decisions, both financial and otherwise.

The chances that a small business will survive for five years in the United States is about 35%, but each person who opens such a business does not believe that the statistics apply to them: their estimate of the chance of success of a business like theirs was 60%. 81% of them put their own personal odds of success at 7 out of 10 or higher.

People who begin small businesses are Kahneman's first example of the way in which people are overly optimistic, even in the face of difficult odds.

Optimism encourages persistence in the face of obstacles, but that persistence can be costly. A Canadian organization called the Inventor's Assistance Program rates inventions on a letter grade scale, where D and E predict failure. Their predictions are largely accurate: none of the 411 projects with a D or E grade became commercially successful. Still, after hearing this result, 47% of the inventors with those grades continued developmental efforts even in the face of hopeless odds, often doubling their initial investment.

Perhaps one of the factors that cause people to have overconfidence stems from Kahneman's theme that people have a hard time weighing statistics over personal experience. They understand their own drive and skill more than they are able to fully digest the odds they have been given. Kahneman will also go on to demonstrate in later chapters how people overweight small probabilities.

Years prior, Kahneman and his wife were on vacation and found a nice but deserted motel in a little-traveled area owned by a couple. The couple said that they had been able to buy it cheap, because six or seven prior owners had failed to make the business profitable. They felt no need to explain why they expected to succeed.

The example of the motel owners provides a concrete anecdote demonstrating the concept of overconfidence and optimism: the couple, like most people, believe that they could succeed where others had failed.

Cognitive biases play an important role in optimism. We focus on our goal and neglect base rates, exposing ourselves to the planning fallacy. We focus on our own qualities and neglect the plans and skills of others. We focus on skill and neglect the role of luck. We focus on what we know and neglect what we do not know.

Overconfidence in business ventures sums up many of the points that Kahneman introduced up to this point, as each factor here contributes to the extreme optimism that we have about our own chances of success.

Kahneman asks readers to consider two questions: "Are you a good driver?" and "Are you better than average as a driver?" Most people say yes to the first. They have a more difficult time with the second, and usually substitute the first answer for the second. When people are asked about tasks they find difficult, they readily rate themselves as lower than average. Thus, "people tend to be overly optimistic about their relative standing on any activity in which they do moderately well."

The example in which Kahneman asks whether a person is a good driver introduces a logical fallacy and a cognitive illusion. We understand that most people will say that they are good drivers, but have a difficult time reconciling this information with the fact that not everyone can be a better-than-average driver, and we have a minimal reference point for what average driving might look like.

Returning to the example of people working on a business venture, Kahneman writes they will also overestimate their own effect on outcomes, rather than considering the actions of the markets and competition. This is why many big-budget movies might open on a given weekend: they focus on their own abilities and ignore the competition.

This concept is another example of WYSIATI. Instead of considering outside knowledge that the studio may not have, film executives might only focus on how to market and sell their own film to audiences.

Professors at Duke University conducted a survey of large corporations, asking the chief financial officers (CFOs) to estimate the returns of the Standard & Poor's index over the following year. In addition to this estimate, the CFOs provided two other estimates: a value that they were 90% sure would be too high and one that they were 90% sure would be too low. The range between these two values is known as the 80% confidence interval. In reality, their estimates were far too conservative: about 67% of outcomes fell outside of the range (more than 3 times higher than the expected 20%). This demonstrates that CFOs were grossly overconfident about their estimates.

The 80% confidence interval is standard practice among statisticians for estimates of any kind, in order provide a range for an outcome that they can predict with fair certainty. But outside of statistical analyses, people have a hard time broadening their estimates in this way and will often be far too specific (and therefore far too confident) in that range of estimates.

Kahneman acknowledges, however, that if CFOs had given the accurate 80% range, they would have been laughed out of any company because it is far too broad for financial standards. Organizations like to take the word of overconfident experts. This is true not only in financial institutions, but also in fields like medicine, where high confidence (even if it's unwarranted) earns the trust of clients.

Kahneman also demonstrates why this overconfidence is rewarded, because people naturally associate expertise with confidence. People are also comforted by experts who will confidently confirm their own beliefs (an aspect of the confirmation bias).

Overconfident optimism is difficult for individuals to tame but perhaps possible for organizations. Gary Klein proposed a procedure called a "premortem." When making a decision, Klein instructs a company to imagine that it is a year into the future, and the plan they had implemented was a disaster. They should take a few minutes to write a history of that disaster. The premortem overcomes groupthink and legitimizes doubts. It also encourages supporters of a decision to search for possible pitfalls of a plan that they may not have considered earlier. It will not offer protection against all surprises, but it reduces the damage of plans that are borne of uncritical optimism.

The premortem overcomes optimistic bias in the same way that many people's estimates of the number of pennies in a jar will make the group more successful as a whole. The procedure allows for different perspectives, and also helps overcome certain cognitive biases that some individuals may have and others may not. And simply by considering a negative perspective, it prevents people from following a plan simply because it is the cognitively easier thing to do.

PART 4, CHAPTER 25

Kahneman introduces the difference between the way in which economists and psychologists think about people. Economists think about people as rational, selfish, and unchanging. Psychologists think about people as neither fully rational, nor completely selfish, and as anything but stable. Behavioral economist Richard Thaler designates these ideas of people using the names Econs and Humans.

In this chapter, Kahneman lays the ground work for his introduction to prospect theory. Here he ties in some of his earlier ideas about human fallibility to show how psychologists' ideas of people are vastly different from economists' ideas of people.

After discovering this difference in the early 1970s, Tversky proposed to Kahneman that they study decision making to discover what rules govern people's choices between simple gambles, and between gambles and sure things. The most popular theory that enumerates these rules is called expected utility theory. This theory is not based on psychology but instead on the logic of choice.

Although utility theory provides reasoning for many of people's choices, because people themselves are not always rational and logical (often relying on intuition), a theory based largely on logic will also be imperfect, as Kahneman shows it to be.

Utility theory focused on the decisions of Econs, but Tversky and Kahneman wanted to investigate the intuitive decisions of Humans. Five years after studying gambles, they completed an essay on what they dubbed "prospect theory." Prospect theory was closely modeled on utility theory but explained violations of rationality that people committed in choices between gambles. It became the most significant work they ever did.

Prospect theory, on the other hand, takes into account some of the ways in which people ignore logic in favor of their intuitive answers. These intuitions are based on their emotional reactions to the change in wealth that is presented to them.

In 1738, Swiss scientist Daniel Bernoulli investigated the relationship between the psychological value of money (its utility) and the actual amount of money. He argued that a gift of 10 ducats has the same utility to someone who has 100 ducats as a gift of 20 ducats has to someone with 200 ducats.

Utility theory takes into account the relationship between different choices, but it does not take into account the relationship between the choices and the current state of wealth (which is what prospect theory does).

Bernoulli disproved the assumptions of his day, which is that gambles are assessed by their expected value. The expected value of this gamble—80% to win $100 and 20% chance to win $10—is $82. But between this gamble and a guaranteed $80, most people will take the sure thing, even though the expected value of the gamble is more. Bernoulli observed that most people dislike risk and want to avoid the worst outcome. Thus, people's choices are not based on dollar value, but on the psychological values of outcomes.

Bernoulli, like Kahneman and Tversky, discovered that people dislike risk and are generally risk averse when they want to avoid bad outcomes. But Kahneman and Tversky elaborated on this idea by demonstrating that people dislike losses more than they like gains, because they would rather maintain their current state of wealth.

Bernoulli created a table (shown on page 273) that calculated the utility of different amounts of money, taking into account the fact that people often prefer sure things to gambles. Consider this choice: a gamble in which you have equal chance to win 1 million or 7 million ducats, or a sure 4 million ducats. Using Bernoulli's table, the expected utility of the first choice is 47, but 60 for the second—which is why most people prefer the second.

Bernouilli's theory also explains why, in circumstances in which all of the outcomes are positive, people are often risk-averse and will chose sure things. The possibility of losing a sure thing weighs more heavily on people's minds than the possibility of a larger gain.

Bernoulli's essay explains why poor people buy insurance and why rich people sell it: the loss of 1 million ducats represents a greater decrease in utility for a poorer person than a richer one, and so poor people are willing to pay a premium in order to transfer the risk to the richer person.

Utility theory is also elaborated on by prospect theory: poor people feel the loss of 1 million ducats more tangibly because it represents a great change in wealth than for a rich person.

But Bernoulli's theory has a major flaw. It assumes that the utility of one's wealth is what makes people more or less happy. But it does not take into account their change in wealth. If yesterday Jack had 1 million and Jill had 9 million, and today they both have 4 million, they are not equally happy. Their recent change in wealth is more important to their experience than their state of wealth.

Prospect theory latches on to this major distinction: the reference point of a person when considering a gamble is crucial in evaluating how they feel about the outcomes, and therefore the choices they might make.

Another flaw in Bernoulli's theory is found in this example: Anthony's current wealth is 1 million. Betty's wealth is 4 million. They are both offered a choice between a gamble a sure thing. The gamble: equal chances to end up owning 1 million or 4 million. The sure thing: own 2 million. To Bernoulli, they face the same choice: their expected wealth will be 2.5 million if they take the gamble and 2 million if they prefer the sure thing. This prediction, however, is incorrect. Anthony prefers the sure thing because his wealth will double with certainty. Betty prefers the gamble because she wants to avoid losing half her wealth with certainty and instead will take the risk to try to lose nothing.

This example illustrates one of the major findings of prospect theory, and a large theme in Kahneman's book. We dislike losses more than gains. Thus, in this example, Anthony will give up the risk in order to certify a gain. Betty, on the other hand, wants to avoid the sure loss. As Kahneman points out, Bernoulli's theory would make their choices the same, but their reference points are crucial in understanding the decisions they make. For Betty, it is more important to her to maintain her wealth.

Kahneman is fascinated with the idea that the theory survived for so long when there are such obvious counterexamples to be found. He calls it theory-induced blindness: once you have accepted a theory, it is difficult to notice its flaws.

As Kahneman explained in the earlier chapters, it is easier to find evidence to confirm a theory than it is to find examples that disprove it—a bias of System 1.

PART 4, CHAPTER 26

Kahneman discovered the flaws in Bernoulli's theory because he noticed that gambles were often spoken of in terms of a few pennies. He wondered if it was possible to assume that people evaluate gambles by tiny differences in wealth. Likewise, Tversky quickly realized that another economist had proposed that utilities were attached to changes of wealth rather than states of wealth.

Kahneman's discovery that gambling pennies only scratches the surface of how people gamble illuminates the idea that when we gamble, we take into consideration the change to our monetary status. Thus, higher-stakes scenarios are necessary to understand true decision making.

In utility theory, there is no way to represent the fact that gains and losses have different utilities. These differences were neither expected nor studied. When Kahneman and Tversky casually shifted from speaking about winning to speaking about losing in different thought experiments, they realized that their preferences shifted as well.

The difference between gains and losses becomes the primary evidence for prospect theory's claim: that people's choices about gambles are determined less by the inherent value of money, and more by the way their wealth has changed.

Kahneman asks readers to consider two problems: 1) Get $900 for sure OR 90% chance to get $1,000; 2) Lose $900 for sure OR 90% chance to lose $1,000. Most people choose the sure thing in the first problem and the gamble in the second. In the second problem the sure loss is very aversive, and this drives people to take the risk. People become risk-seeking when all options are bad. Bernoulli's theory did not have a way to accommodate this difference.

People dislike the certainty of losing, and in choices between two potential losses, would rather attempt the chance of maintaining their current wealth, even though it means they might eventually lose more money. But for winning, they would rather have a guarantee of improving their wealth than the potential of not gaining any money at all.

Kahneman gives two more problems: 1) You are given $1,000. You are then asked to choose between a 50% chance to win an additional $1,000 OR get $500 for sure. 2) You are given $2,000. You are then asked to choose between a 50% chance to lose $1,000 OR lose $500 for sure. In both problems, the final states of wealth are identical. According to Bernoulli's theory, people should have the same preferences in both. In reality, people are risk-averse in the first problem (choosing the sure thing) and risk-seeking in the second (choosing the gamble).

This example highlights how framing plays into prospect theory. Even though these two outcomes are essentially the same, the reference point (and the fact that we might win or lose) has a big effect on the decisions that people make, demonstrating clearly that we care more about losing than we do about winning.

Kahneman and Tversky found three cognitive features at the heart of prospect theory: 1) Evaluation is relative to a neutral reference point—outcomes that are better than the reference points are gains. Below the reference point they are losses. 2) A principle of diminishing sensitivity applies to wealth. The difference between $900 and $1,000 is smaller than the difference between $100 and $200. 3) Losses loom larger than gains.

The three principles cohere into a larger argument that Kahneman makes throughout the book—in this chapter as well as chapter in which he talks about goods rather than money. We care less about the intrinsic value of money, and more about how our wealth changes.

Many options we face in life are choices between a risk of loss and opportunity for gain. A simple example is this: if a coin shows tails, you lose $100. If a coin shows heads, you win $150. For most people, the fear of losing is more intense than the hope of gaining. To balance the potential loss of $100, most people require the opportunity to win about $200. The greater the potential loss, the more people usually require to offset that loss in a gamble.

This comparison shows explicitly how the pain of losing is a bigger factor than the joy of winning, because we care more about maintaining our current status than improving it unless it is balanced by a much better prospect (in this case, $200).

Kahneman points out another flaw in Bernoulli's theory, proved by Matthew Rabin in 2000. He notes that most Humans reject this gamble: 50% chance to lose $100 and 50% to win 200. According to utility theory, that same Human will also turn down this gamble: 50% chance to lose $200 and 50% chance to win $20,000—but of course, no one would turn down this gamble.

Because utility theory does not account for changes in wealth, it demonstrates that people who are very risk averse are risk averse in every scenario (including ones in which enormous gains are possible). But this is a flaw in the theory: the change in wealth is crucial to understanding why people would take this gamble.

Kahneman admits that there are benefits to utility theory, especially in introductory economic texts. The basic concepts of economics are not easy and are also grounded in rationality. Introducing psychology makes those concepts even more complicated.

This is one of the sole concessions that Kahneman makes to the idea of simplifying in order to ease understanding, and acknowledging that economic theory has objective rules, while the human mind is subjective and constantly changing.

Prospect theory also has flaws. Consider three gambles: A) One chance in a million to win $1 million. B) 90% chance to win $12 and 10% chance to win nothing. C) 90% chance to win $1 million and 10% chance to win nothing. In each case, winning nothing is possible and prospect theory assigns the same value to each instance of winning nothing—a value of zero. In reality, this is true of the first two options, but in the third option the idea of winning nothing is intensely disappointing. Prospect theory does not change the value of an outcome when it is highly unlikely, or when the alternative is valuable.

Prospect theory's flaws can be attributed to our subjectivity concerning numbers. In addition to losses looming greater than gains, we also begin to attach expectations and assumptions to numbers (in the third case, the assumption that we will win $1 million). This psychological valuation makes pinning down subjective rules in every instance very difficult.

Prospect theory and utility theory also fail to allow for regret. Consider problem 6: Choose between 90% chance to win $1 million OR $50 with certainty. Now problem 7: Choose between 90% chance to win $1 million OR $150,000 with certainty. Failing to win is disappointing in both, but problem 7 is made even worse by knowing that if you choose the gamble and lose you will regret the "greedy" decision of not opting for a sure $150,000.

Again, as in the previous example, we have attached our subjective feelings to the outcomes of the gambles—and these feelings will vary both from situation to situation and also from person to person. It is difficult for us to prefer objectivity when we often attach emotional value to goods and money.

PART 4, CHAPTER 27

Chapter 27 begins with a figure that displays an "indifference map" for two goods—in this case, the relationship between leisure days/year and income. The curve of the graph shows the points at which the two goods have the same worth to people. What is missing from the figure, however, is an indication of current income and leisure.

Kahneman investigates another piece of accepted economic theory, and again demonstrates the importance of noting the reference point so that the change in wealth and goods is considered, not only the amount by itself.

The reference point's importance is demonstrated by an example featuring Albert and Ben, two fictional characters who have identical tastes and who have identical starting jobs. The firm then offers them two new positions: Albert will get a raise of $10,000, and Ben will get an extra day of paid vacation each month. Some time passes, and the firm offers them the chance to switch jobs (and also perks) if they wish. The standard theory assumes that they will need little to no incentive to switch. Prospect theory asserts that they will definitely prefer to stay as they are, because they have become accustomed to their added benefits. Prospect theory thus favors the status quo.

In this example, prospect theory accounts for Ben and Albert's desire to remain with the status quo. Because they have become accustomed to these benefits, the pain of giving up the benefits they currently have hurts worse than the enjoyment they would gain from the newly added benefit—the concept of loss aversion.

Behavioral economics got its start with Richard Thaler in the early 1970s, who was a graduate student at the time. He liked to point out evidence of economic irrationality of his professors. One of them, Professor R, was a firm believer in economic theory. He also loved wine, and Thaler observed that he would buy wines at auctions, but only for less than $35. At the same time, he was very reluctant to sell a bottle of his collection for $100 or less.

In this example from Thaler's experience, the concept of loss aversion is true not only of money or benefits, but also extends to various goods—in this case, a bottle of wine. Thus, loss aversion has a broad set of applications even beyond pure monetary value and shows that wealth is measured by several parameters.

This gap is inconsistent with economic theory: if the wine is worth $35, Professor R should be willing to sell that wine for any price over $35. But in this instance, owning the good appeared to increase its value. Thaler found many examples like this and discovered what he called the "endowment effect." Thaler read an early draft of prospect theory and realized that loss aversion could explain the endowment effect. The pain of giving up the bottle is harsher than the joy of getting the bottle.

In Professor R's case, the value of the wine is not determined by the mere monetary value of the wine (what he could buy or sell it for), but instead how he valued it—how he felt it added to his personal circumstances. This value, then, makes it hard for him to want to relinquish it.

Thaler spent a year at Stanford while Kahneman and Tversky completed their work. During this period, they become friends and explored the endowment effect. They realized that the concept was not universal: there is no loss aversion when you shop for shoes, for example. To the seller, the shoes are a proxy for the money they want to receive. To the buyer, the money is a proxy for the shoes. The difference between the shoes and the wine, is that the shoes are "for exchange" and the wine is held "for use," to be consumed or otherwise enjoyed.

A possible explanation for the lack of loss aversion in the instance of the shoes is that the shoes are (to the buyer) the more valuable goods, while to the seller the money is actually more valuable. And thus, each one feels an improvement in their general circumstances based on the exchange.

Kahneman, Thaler, and a local economist named Jack Knetsch, designed an experiment that would highlight the contrast between these two types of goods. A limited number of coffee mugs (a good for use) are distributed to the participants in a "market"—some had to buy, and some had to sell. The results demonstrated that for a good that is for use, the average selling price was nearly double the average buying price, and the number of trades was much less than a similar experiment run with a good that was "for exchange."

Even in a fake "market" experiment, in which people did not even have truly own the goods, the same principle was shown—that goods that they might have the opportunity to use were worth more to people than goods that would simply be exchanged for money.

Observations in real markets illustrate the power of the idea of the reference point. A study of the market for condo apartments in Boston during a downturn yielded these clear concepts. Econs would ignore buying prices—the current market value is all that should matter. But not so for Humans. Owners who have paid more money for their homes set a higher price and spend a longer time trying to sell them, eventually receiving more money.

This example recalls the example of the traders who hang on to their "losers" while selling their "winners." People are loath to sell something for less than they bought it for, and thus they hang on to it. This is a better strategy when selling a home than trading stocks, however, because the value of homes are much larger and because people buy and sell them a lot less frequently.

Trading experience makes people oddly immune to the endowment effect, however. Economist John List found that inexperienced traders are reluctant to make trades, but experienced traders will make them much more readily. Veteran traders ask the correct question when considering a trade: "How much do I want to have that mug, compared with other things I could have?" This eliminates the endowment effect because it reduces the pain of giving something up.

The difference between the perspective of traders and the perspective of other people is that, in this scenario, the traders treat the thing that they have as a potential proxy for other things (as in the shoe example) and not as something they already own and with which they do not want to part.

Poor people also do not experience the endowment effect, but for different reasons. For them, all costs are losses, and so the pain of buying something is the same as the pain of giving something up.

For poor people, loss aversion is present in every economic decision, because like the traders, they view every purchase as the potential to buy something else instead.

PART 4, CHAPTER 28

Loss aversion has a biological and psychological root in which negativity dominates positivity. Kahneman shows pictures of two sets of eyes—one wide and frightened, the other calmer. We are drawn to the first set because the brain contains a mechanism that gives priority to bad news. The brain responds even to symbolic threats: words like "war" and "crime" attract more attention than "peace" and "love." Loss aversion is part of a broad negativity dominance: bad information has more impact and is processed more thoroughly. Bad impressions and bad stereotypes are quicker to from than good ones.

Loss aversion and prospect theory is thus shown to stem from System 1 processing. System 1 is an emotionally-driven type of processing and pain is a particularly visceral emotion. Thus, we try to avoid it as much as we can, along with other negative emotions and ideas.

The aversion to failure to reach a goal is much stronger than the desire to exceed it. Golf provides a good example of this. Each hole has a par—a number of strokes associated with it. A birdie (one stroke under par) is a gain, and a bogey (one stroke over par) is a loss. The difference in the rate of success when going for par or for a birdie was 3.6%. For a player like Tiger Woods, this would improve his average tournament score by one stroke and his earnings by almost $1 million per season.

The example of Tiger Woods expands the realm of loss aversion even further, into our unconscious behavior. Even though certainly athletes do not try to avoid losses more than they try to earn gains, the 3.6% statistic is a significant one, and demonstrates the power of not wanting to lose (even more than wanting to win).

Loss aversion shows up in negotiations, and particularly in renegotiations of an existing contract. It creates an asymmetry that makes agreements difficult to reach: concessions that you make are gains for me, but losses for you. They will cause you more pain than pleasure for me. Loss aversion thus favors minimal changes from the status quo.

Like the example of Albert and Ben and their leisure time, negotiations tend to maintain the status quo because of the loss aversion principle: one party will always feel the outcome more painfully than the other.

Thaler, Knetsch, and Kahneman next designed a survey to examine people's view of fairness in economic transactions. One question described a hardware store that sells snow shovels for $15, but the morning after a snowstorm, raises the prices to $20. Even though the store acts according to the standard economic model, 82% of people rate this action as Unfair or Very Unfair.

In evaluating corporations, people also consider the principle of loss aversion. In this example, people put themselves in the shoes of the buyers and feel entitled to the standard price of the snow shovel. This causes them to see the extra $5 as a loss.

In another example (written in 1984), people viewed it as unfair if a small shop reduced the wage of its only employee from $9 to $7 an hour, even if other competitive shops hired workers at the lower rate. But people did not consider it unfair if the current employee left and the shop hired a new employee at $7 an hour. People do not like firms that exploit their power and believe that the first employee is entitled to a given rate, but also understand that the firm wants to maintain its current profit. Employers who violate rules of fairness are punished by loss of both productivity and sales.

Similar to the example with the snow shovel, people place themselves in the shoes of the worker. They feel like the company acts unfairly in the first instance and not in the second; the difference is that in the first case, the worker experiences a painfully felt loss. In the second, the worker experiences no such loss, and thus they do not feel like the company acts unfairly.

The influence of loss aversion and entitlements extends into justice. A merchant whose goods were lost in transit may be compensated for costs (which people view as losses) but is unlikely to be compensated for lost profits (which people view as foregone gains).

Again, when considering the plight of others, people inherently operate under the concept of loss aversion: the loss of goods is viewed as a change in wealth, but the profits were never made, and therefore not experienced as a loss.

PART 4, CHAPTER 29

In the face of an uncertain prospect, people will assign weights to different possible outcomes—essentially evaluating how much they believe a certain outcome will occur. The weights—called decision weights—are correlated with the probabilities of these outcomes, and usually people assign these weights automatically and unconsciously.

Kahneman moves on to another important aspect of prospect theory: how we view different gambles and anticipate different outcomes. This happens without our knowledge and can lead to severe biases on which Kahneman elaborates.

In Bernoulli's theory, gambles were assessed by their expected value—the average of each outcome, weighted by the probability of that outcome. But this theory does not reflect reality. Kahneman gives four examples of probability changes: 1) From 0 to 5%, 2) From 5 to 10%, 3) From 60 to 65%, 4) From 95 to 100%. In each case, one's chances of receiving $1 million improves by 5%, but everyone agrees that option 1 and option 4 are psychologically more affecting.

As Kahneman has demonstrated throughout the prior chapter, the value of a change in wealth is more important than the actual value of money. Here, the change in possibility of a given outcome actually becomes more important than the number itself. Subjectively, the change from 0 to 5% feels more important than 5 to 10%, even though 10% is obviously higher.

The impact of 0 to 5% illustrates the possibility effect, which causes unlikely outcomes to be weighted disproportionately more. The improvement from 95% to 100% is similarly impactful, called the certainty effect. Outcomes that are almost certain are given less weight than their probability justifies, because people disproportionately fear the 5% possibility that things may not work in their favor. This causes people to be risk-averse.

The possibility and certainty effects also demonstrate our loss aversion, because the slim chance of losing something even when it is 95% guaranteed causes people to take extremely cautionary actions in order to protect themselves.

In terms of bad outcomes, the psychological difference between a 95% risk of disaster and a 100% certainty of disaster appears to be even greater: the sliver of hope looms very large for people. In sum: the decision weights that people assign to outcomes are not identical to the probabilities of those outcomes.

The opposite concept, when people have to weigh options primarily in terms of losses, causes them to take extreme risks in order to hold out hope that they might avoid a loss.

Kahneman asks what the reader would prefer in two problems: A. 61% chance to win $520,000 OR 63% chance to win $500,000. B. 98% chance to win $520,000 OR 100% chance to win $500,000. Most people prefer the first choice in problem A and the second choice in problem B, but this violates logic because one should be consistent in favoring either an improvement in odds or an improvement in potential winnings. This problem, introduced in 1952, came to be known as the Allais paradox. It is explained by the certainty principle.

The Allais paradox demonstrates an instance in which even numbers are subjective. Instead of following rationality, people make personal (and somewhat illogical) choices based on a sense of numbers that does not stem from their actual probabilities, but instead our subjective weighting of those probabilities.

Table 4 (page 315) shows people's "decision weights," demonstrating that on the low end, unlikely events are overweighted (a 1% chance for an outcome gives it a 5.5 decision weight). On the high end, highly probable events are even more underweighted (a 99% chance has a 91.2 decision weight). This is because the fear of losing an almost-sure thing weighs more than the slight hope of an incredible unlikely thing.

Because our decision weights are subjective and based on various biases, it makes sense that those weights are subject to loss aversion as well. The way we view probability is not based on objective value, but instead based on our automatic emotions about the potential outcomes.

Probabilities that are extremely low or high (less than 1% or more than 99%) are sometime ignored, but if they are not, we tend to overweight them. Additionally, people are almost completely insensitive to variations of risk among small probabilities. A cancer risk of .001% is not easily distinguished from a risk of .00001%, even though the former would translate to 3,000 cancers in the United States, and the latter to 30.

These statistics in some ways recall chapter 13, in which people were asked to compare causes of death. It is hard to estimate certain causes accurately because they are vastly overrepresented in the media, and therefore we are biased to believe they are more important or more frequent than they actually are.

When we pay attention to threats, we worry about them, and our worry is not proportional to the probability of the threat. In an example, a $10 insect spray causes 15 inhalation poisonings and 15 child poisonings per 10,000 bottles of it. Parents are willing to pay an additional $2.38 to reduce the risks by two-thirds, and an additional $8.09 to eliminate it completely.

In a situation in which a person's well-being is at stake, people become even more loss averse because even a slight uncertainty of a good outcome means that a life might be lost, and people understandably do not want to take the risk that it might be their child.

The fourfold pattern is described as follows: in terms of gains, with a 95% chance to win, there is fear of disappointment, people become risk averse, and accept unfavorable settlements. With a 5% chance to win, there is hope of large gain, people become risk seeking, and they reject favorable settlements (this explains why lotteries are popular).

The possibility effect is one of the biases at play here, particularly in the lottery example. Combined with the fact that people do not deal well with extremely small probabilities, even the slim chance of enormous gain makes people want to take a risk and buy into it.

In terms of losses, with a 5% chance to lose, there is fear of large loss, people become risk averse, and they accept unfavorable settlements (this is why people buy insurance). With a 95% chance to lose, there is hope to avoid loss, people will become risk seeking, and will reject a favorable settlement. This leads people to make desperate gambles in the small hope of avoiding a large loss.

When speaking about losses, people act essentially in the same way (avoiding risk when they are almost guaranteed not to lose and seeking it when they are nearly certain to lose)—again, all in the hopes of avoiding losses.

Kahneman then applies the fourfold pattern to a court case. Plaintiffs with good chances will want to take unfavorable settlements because they worry about their odds of losing, even though those odds are slim. Defendants with bad chances, on the other hand, will try to push for court because the sure loss of a settlement is painful. In this face off, the defendant holds the stronger hand.

By applying the fourfold pattern to a court case, Kahneman demonstrates how inherent biases can have serious and real-world consequences. In this scenario, we empathize with and understand the plaintiff's position, even though we know we are underweighting the probability that they would win in court.

Kahneman contrasts this case with a frivolous suit, in which a plaintiff with a flimsy case files a large claim. They overweight their success and are aggressive in negotiating a settlement. For the defendant, they want to avoid the small risk of a very bad outcome, and so the plaintiff holds the stronger hand.

In this case, we again understand the viewpoint of the defendant in the case and can experience simply by reading about the suit how our emotions guide us to act in the exact same way.

It is easy to empathize with the plaintiffs and defendants who do not have the stronger hands. However, in the long run, this strategy can be costly. If the City of New York faces 200 frivolous suits each year, with a 5% chance to cost the city $1 million. If the city settles each case for $100,000, its total loss will be $20 million. If the city litigates all 200 cases and loses 10, it will lose only $10 million. Taking the long view of these cases demonstrates that paying a premium to avoid a small risk of a large loss is costly.

Following the goals of his book, Kahneman alerts people as to why acting against a rational model can be damaging in the long run. He urges them to acknowledge their bias and to not be controlled by the emotional, automatic response of System 1 in making their choices.

PART 4, CHAPTER 30

Kahneman visited Israel several times during a period in which suicide bombings became a concern for bus riders. There were 23 bombings on buses between 2001 and 2004, which caused 236 fatalities. The number of daily bus riders was 1.3 million at the time. The risks were tiny, but that was not how the public felt about them—they avoided buses as much as possible. Emotion and vividness influence availability and thus judgments of probability.

The judgment of the risk of riding a bus in this example recalls earlier examples of plane crashes to demonstrate the availability bias. We mistakenly overestimate things that we have recently witnessed or heard about, particularly if they evoke visceral images or have dominated the media.

The possibility of a rare event is likely to be overestimated particularly when the alternative is not fully specified. A psychologist recruited basketball fans and asked them to estimate the probability that each of eight given teams would win the playoff, focusing on one team at a time. Their estimates of each of the eight teams should add up to 100% probability, but instead they added up to 240%. With each question, a different team became the focus, and that team's chances were overweighted.

In this example, people place too much confidence in each team's success because they do not fully consider the alternatives (recalling the principle of "what you see is all there is"). This leads to gross mistakes as people's estimates defy the logic of probability.

Prospect theory and utility theory differ in that utility theory asserts that probabilities and decision weights are the same, while prospect theory holds that people's decision weights are correlated with but do not exactly match probability. Psychologists at the University of Chicago found that decision weights in gambles were even less correlated with probability when the fictitious outcomes were emotional ("meeting and kissing your favorite movie star" or "getting a painful, but not dangerous, electric shock").

It makes sense that decision weights become less correlated with probability when outcomes are emotionally driven, because emotions are processed largely by System 1. Therefore, people are even less considerate of the actual probabilities of some outcomes and focus on their desire or aversion towards a given outcome.

Vividness and ease of imagining can change people's decisions, as in this example: Urn A contains 10 marbles, 1 of which is red. Urn B contains 100 marbles, 8 of which are red. Drawing a red marble wins a prize. Which do you choose? About 30-40% of students choose the urn with the larger number of red marbles because of what Kahneman calls "denominator neglect." A single red marble against an undefined white background seems to provide a lower chance than eight marbles against an undefined background, even though mathematically this is not the case.

When we consider the problem of the two urns, it is just as easy to visualize the two urns (perhaps even easier) as it is to calculate the probability of a red marble in each case. Yet when we do not mobilize System 2 and instead rely on System 1, we are more prone to make mistakes.


Denominator neglect explains why there are many different ways of communicating risks. A vaccine that carries a 0.001% risk of permanent disability seems much safer than a vaccine that carries this description: "One of 100,000 vaccinated children will be permanently disabled." People have a hard time translating percentages and fractions, and the different ways of framing create opportunities for people's opinions to be manipulated.

Denominator neglect once again serves as an example of our difficulty with statistics—when we think of the vaccine in terms of statistics, we view it as safe. But when we think of it in terms of individuals, we conjure a story in our mind of a disabled child and rate it as much riskier.

Kahneman gives an example of a study that refutes part of prospect theory. Instead of receiving descriptions of gambles, people are given the choice between two buttons, each of which has a gamble. The expected value of each gamble is approximately the same, but one option is riskier than another (for example, one button would have 5% to win $10 while the other would have 50% to win $1). When participants press a button, an outcome is drawn based on the odds of the gamble. They are given many trials, and thus learn the consequences of pressing one button or another. In these "choice by experience" situations, overweighting the rare event is never observed, and underweighting is common. A possible explanation for this effect is that people almost never experience the rare event.

Even though this experiment appears to be based mostly on intuition, it satisfies some of the earlier conditions that Kahneman lays out on what constitutes being able to garner expertise. Because the participants are exposed to a regular environment, get immediate feedback, and have ample trials to practice, the participants get to know the outcomes of the two buttons and start to gain some predictive skill. This leads to a lessening of overconfidence, and thus a lessening of mistakes like overweighting.

For comparison, Kahneman gives an example of two different people from whom a person may want advice. Adele is consistent and helpful, but not exceptional. Brian is not quite as friendly or helpful most of the time, but on some occasions he has been extremely generous. Adele is closer to a sure thing, and people generally prefer her because of their global representation of her (thus they do not overweight rare events).

This example, evaluating the personalities of two people, is comparable to participants' analysis of the two buttons. They have a global view of the person and understand that the rare event is just that—rare. Thus, they prefer consistency over optimism.

This evidence is distinct from "choice by description," because in the instance of 99% chance to win $1,000 and 1% chance to win nothing, our attention is called to the rare event, and thus we give it more concern than we would otherwise.

Another contrast between the description of a gamble and the experience above is that here, people are not often exposed to these chances. Thus, it's hard for them to fully grasp the reality that 99 out of 100 times, they would win $1,000—they instead focus on the possibility of not winning.

PART 4, CHAPTER 31

Kahneman asks readers to imagine a pair of concurrent decisions. In the first, choose between A) a sure gain of $240, or B) 25% chance to gain $1,000 and 75% chance to gain nothing. In the second, choose between C) a sure loss of $750 or D) 75% chance to lose $1,000 and 25% chance to lose nothing. Most people prefer choices A and D. But Kahneman shows that if people consider both decisions together, choosing B and C is actually unequivocally better than choosing A and D together.

Chapter 31 explores the instinctual preference we have toward evaluating problems one at a time. Unfortunately, this instinctual preference can lead to unfortunate errors, because in this case, looking at the four choices globally leads to a better evaluation of the options, and subsequently a better outcome.

The different perspectives to consider the problem are called "narrow framing"—considering them as two separate simple decisions—and "broad framing"—a single comprehensive decision, with four options. Broad framing will be superior in every case, even though Humans are narrow framers by nature.

The natural tendency towards narrow framing relates to the first few chapters. In this previous example, people have intuitive preferences that are easy to follow. People could calculate the more complex options, but our tendency towards laziness prevents us from doing so.

Economist Paul Samuelson asked a friend if he would accept a gamble in which he could lose $100 or win $200 on the flip of a coin. His friend responded that he would accept if Samuelson let him make 100 of the same bet. This makes sense: the aggregated gamble has an expected return of $5,000, with only a 1/2,300 chance of losing any money. But it illuminates the broad/narrow framing issue: if he encounters the offer on two separate occasions, he will turn it down both times. However, if he bundles the two together, they are jointly worth $50.

The Samuelson gamble illuminates why it is important to not be risk averse in every scenario, particularly when there are favorable odds. Broad framing is both more complex and also goes against our instinctual emotions, which caution us against taking this risk.

The combination of loss aversion and narrow framing is costly, but individuals can avoid it with discipline. Experienced financial traders shield themselves from the pain of losses with broad framing. Broad framing is also useful in creating risk policies, like "always take the highest possible deductible when purchasing insurance" and "never buy extended warranties." It allows people to make consistent decisions that will ultimately be financially advantageous.

By creating a risk policy, people can help to combat their inherent laziness. Standard rules allow people to override their intuition, but still enable them to make better choices without having to think too hard—thus, curbing mistakes that arise from laziness.

A risk policy is analogous to the outside view Kahneman discussed earlier: both shift the focus from the specific situation to the statistics of outcomes in similar situations. Using both helps alleviate two conflicting biases: the planning fallacy and loss aversion.

Both risk policies and the outside view help people to override their fallible intuitive predictions (in which they often place a great deal of confidence) in favor of deliberate thinking.

Kahneman concludes the chapter with an anecdote from Richard Thaler, who had a discussion with 25 managers of a large company. He asked them to consider a risky option in which, with equal probabilities, they could lose a large amount of the capital they controlled or earn double the amount. None of them would do so. The CEO then asked all of the managers to take the risk. He adopted a broad frame that encompassed all 25 bets, counting on statistical aggregation to mitigate the risk.

Thaler's story about the CEO demonstrates the real-world consequences of adopting narrow framing, and how even those who deal often with gambles can make the same mistakes. The broader view of the CEO represents the perspective that people should have over their decisions as a whole, instead of simply focusing on one decision at a time and being loss averse.

PART 4, CHAPTER 32

The main motivators of money-seeking are not always economic, Kahneman writes. For example, two sports fans travel 40 miles to see a basketball game. One of them paid for his ticket; the other got it for free. A blizzard is announced for the night of the game. The fan who paid for his ticket is more likely to brave the blizzard, otherwise he will have lost both the game and the cost of the ticket. He has attached an emotional value to the game and to the ticket.

In this chapter, Kahneman broadens the idea of loss aversion to apply to goods and situations. The fan is afraid of losing both the ticket and the experience of the game, and therefore braves a potentially dangerous situation.

A related issue afflicts individual investors when they sell stocks. If they have to sell a stock, they would rather sell a stock that has earned money than a stock that has lost money. But the only consideration according to the rational economic model should be whether the stock is likely to do well in the future, not the original buying price.

This concept again supports prospect theory. The main consideration for the investors is not the value of the stock, nor is it the money that they could gain by holding on to one stock over another. Instead, it is the reference point—whether a given stock has lost or gained value.

The decision to invest additional resources in a losing account is known as the sunk-cost fallacy, a costly mistake. Kahneman asks readers to imagine a company that has already spent $50 million on a project. The project is behind schedule and the forecasts of its returns are less favorable than they had been. An additional investment of $60 million is required. An alternative proposal is to invest in a new project which might bring higher returns. All too often a company afflicted by sunk costs will make additional investments to avoid a sure loss.

The sunk-cost fallacy serves as another example of loss aversion. Even though rational deliberation would reveal that it is better to invest resources in something that has a better chance of an outcome, we are extremely hesitant to take the sure loss that would come with admitting that the original $50 million investment was for nothing.

Fear of regret is also a factor in many of the decisions that people make. It is often triggered by the availability of alternatives to reality. For example, consider the following scenario: Mr. Brown almost never picks up hitchhikers. Yesterday he gave a man a ride and was robbed. Mr. Smith frequently picks up hitchhikers. Yesterday he gave a man a ride and was robbed. 88% of people believe Mr. Brown will experience more regret, while only 23% will believe that Mr. Brown will be the most severely criticized. Both serve as comparisons to the norm.

Fear of regret is yet another manifestation of loss aversion, particularly when our actions cause us to deviate from our normal lives. We feel regret over the alternate reality that we have lost: in this case, Mr. Brown's usual behavior of not picking up hitchhikers.

Intuitions about regret are remarkably uniform. In an example, Paul owns shares in company A and considered switching to stock in company B but decided against it. He learns that he would have been better off by $1,200 if he had switched stocks. George, on the other hand, owned shares in company B, but then switched to company A. He also would have been better off by $1,200 if he had kept his stock. 92% of people believe that George feels greater regret. Situations outside the norm will garner more regret, particularly if one takes action (as opposed to inaction).

This example is comparable to Kahneman's earlier assertion that goods gain value when we own them. Because George gave up the stock that he owned, and then lost money, people believe he took a greater loss than Paul, who merely forewent a gain by not switching stocks.

The fear of regret favors conventional choices: even life-or-death decisions can be affected. In the case of a physician with an ill patient, the physician may prefer the normal choice over an unusual treatment, even if the unusual treatment may improve the patient's chances. The physician who prescribes the unusual treatment faces risk of regret, blame, and perhaps litigation.

Kahneman demonstrates how loss aversion can cause us to make conservative decisions, possibly to the detriment of a better outcome, because we fear the consequences of making an abnormal decision so much, and because it is easy to imagine what might have happened under the normal circumstances.

People become particularly loss-averse when they might bear some responsibility for the loss. In a scenario, you have been exposed to a disease which leads to a quick and painless death. The probability that you have it is 1/1,000. There is a vaccine available that is effective only before symptoms appear. People are willing to pay a significant but limited amount for the vaccine.

In this example, people bear no responsibility for risk, and thus they are less loss averse (even when they may be exposing themselves potential fatal consequences) than if they choose to expose themselves to risk.

In a variation, volunteers are needed for research on the same disease. People must expose themselves to a 1/1,000 chance of contracting the disease. What is the minimum you would need to be paid in order to volunteer? This price is usually much higher, because people consider the regret they may feel if they realize they have sold their life.

In addition to the responsibility that the people in this example feel for their own deaths, there is also a greater fear of regret because they took action to cause a bad outcome, rather than choosing inaction to cause a bad outcome, as in the example of Paul and George earlier.

Kahneman reintroduces the example from Chapter 29 of parents who are buying an insect spray. He writes that respondents were then told to imagine that there is a less expensive insecticide was available, for which the risk rose from 15 to 16 per 10,000 bottles. Many parents responded that they would not purchase the new product at any price. This is understandable, but money saved from a minute increase in risk may be used for other safety equipment. The real concern for parents in the scenario is the fear of regret.

This example of the insect spray is not only made by loss aversion, but also by the issue of narrow framing. With a narrow view of safety, parents believe that they would never want to expose their kids to risk, when in fact there are many safety concerns. The issue is that it takes a lot more deliberate thought to consider that this increase in risk is negligible.

We spend a good deal of our day anticipating the emotional pain we inflict on ourselves. But we can inoculate ourselves against regret by remembering that we considered the possibility of regret before making decisions. If we are thorough when making decisions, we can prevent ourselves from saying "I almost made a better choice."

Kahneman's advice for avoiding the loss aversion inherent to regret is to understand that foregoing a different reality is not, in fact, a loss. If choices are made deliberately, we insure ourselves against the loss of having done something differently.

PART 4, CHAPTER 33

Kahneman presents another puzzle, asking the reader to set compensation for a victim of a violent crime—in this case, a man who lost his arm after being shot during a robbery. The puzzle asks, should the store in which the man was shot (either his regular store, or a different store he rarely went to) make a difference in the compensation amount? When people evaluate these two scenarios at the same time (called joint evaluation), most people believe that the compensation should be the same in both situations, because location should not be a factor.

When the two situations are considered together, people are able to understand that location should not be pertinent to their calculation of victim compensation. In this instance, they are able to mobilize System 2 in order to evaluate what information is and is not relevant to the task at hand.

When people are given one option or the other (rather than both together), they assign a much higher compensation to the version in which the store is not his regular store, because they see it as more poignant. Seeing only one option is how people normally experience life: alternatives that might change our minds or affect our decisions are absent.

In comparison with the example above, there is a clear instance of WYSIATI here. The information that people have been provided is the only thing they consider—a bias inherent in System 1. This demonstrates how difficult it is to mobilize System 2 in a case like this, because often we don't know what alternatives might change our mind.

Another economic experiment focused on these kinds of reversals. In this experiment, participants are told that they have a choice between two bets, played on a roulette wheel with 16 sectors. Bet A: 11/36 to win $160, 25/36 to lose $15. Bet B: 35/36 to win $40, 1/36 to lose $10. People usually prefer bet B. But, if they imagine that they own each bet and must determine the lowest price at which they would sell it, the selling price is higher for A than for B. This experiment was surprising to economists, but they accepted that individual choice can depend on the context—a clear violation of the idea that people are rational and make the same choice in every scenario.

Again, reversals constitute a particularly interesting problem of the human mind. When we evaluate certain odds, we rely on our intuition—a feature of System 1. But when our intuition appears inconsistent, we have a difficult time understanding what our basic underlying beliefs are.

The fact that evaluation depends on context and categories is proven in this example: John is 6. He is 5 feet tall. Jim is 16. He is 5 feet 1 inches tall. Individually, everyone will agree that John is tall, and Jim is not. But the question "Is John as tall as Jim?" yields a different answer, because it prompts a direct comparison.

System 1 understands features of a given category, and direct comparisons among a category are easy to do. But the next example demonstrates how comparisons across categories—even though we have intuitions about them—often yield inconsistencies.

Kahneman next asks readers to imagine that they have been asked to contribute money to help set up pollution-free breeding locations for dolphins. People can come up with an amount by translating their attitudes towards dolphins onto the scale of their normal contributions (particularly referencing contributions to environmental issues).

This example builds upon Kahneman's earlier discussion of substitution. We make our evaluation easier by noting how much we care about dolphins, perhaps in comparison to other sea creatures, and by matching that affinity to an appropriate dollar amount.

On another occasion, readers might be approached to support medical check-ups for farmworkers, who have a higher rate of skin cancer. People's contributions reflect how urgent they feel the issue is, particularly in comparison with other medical concerns. In single evaluation, the dolphins generally attract larger contributions. But taken together, the issues are represented differently, because people feel that humans deserve more aid than animals.

Here is where the example becomes more difficult: we have intuitions both about how much we like dolphins and about how much we care about farmers, but when we have to compare the two directly our intuitions drastically shift. These questions demonstrate how much we need to simplify questions in order to answer them, whether it is by comparing dolphins to other sea animals or farmers' risk of cancer to other medical issues.

Reversals can be found in the justice system as well. In mock juries, people assessed pairs of cases. In the first case, a child suffered moderate burns when his pajamas caught fire; the firm that produced the pajamas had not made them fire resistant. In the second case, the unscrupulous dealings of a bank cost another bank $10 million. In single evaluation, the bank was awarded higher damages than the child. In joint evaluation, sympathy toward the individual victim prevailed and the jurors awarded higher damages to the child.

The inconsistencies in the justice system are troubling because we do not have inherent anchors for different crimes. Any jury might be affected by a case that came before or after it, because their frame of reference for damages in various crimes is relatively narrow. In this example, the damages for the bank becomes an anchor, and so the child is given more money than he might have otherwise received. Again, this shows how moral intuitions can vary with context.

In another study, psychologists compared different administrative punishments that can be imposed by government agencies like OSHA and the EPA. The punishments given by an individual agency seem sensible, but between agencies appear incoherent. A fine for a serious violation of regulations concerning worker safety is capped at $7,000, while a violation of the Wild Bird Conservation Act can result in a fine up to $25,000. One can see the absurdity only when the two cases are viewed together.

This study shows how far-reaching the inconsistencies are. Even between entities that are controlled by the same governing body (which would presumably have a greater body of knowledge than a jury), inconsistencies abound in evaluating violations against humans versus violations against wildlife. Once again Kahneman demonstrates that biases are not unique to individuals or even one system but are far-reaching in society.

PART 4, CHAPTER 34

Kahneman demonstrates that two statements about the results of the 2006 World Cup final: "Italy won" and "France lost" are logically equivalent but evoke different associations and meanings. This feature of System 1 makes it difficult for people to act consistently when presented with different frames.

Frames, like primes, serve as a way of influencing System 1 in how it processes information. Because often the frame is not fully apparent, it is difficult to deliberately adjust our perspective and make judgments in a less biased way.

Kahneman and Tversky applied frames to gambles in these two scenarios. They asked some participants, "Would you accept a gamble that offers a 10% chance to win $95 and a 90% chance to lose $5?" They asked others, "Would you pay $5 to participate in a lottery that offers a 10% chance to win $100 and a 90% chance to win nothing?" These two problems are identical, but the second usually attracts many more positive answers. Losses evoke stronger negative feelings than costs.

This example plays into both the concept of framing, as well as the concept of loss aversion. In the second example, the question is framed to minimize the idea that a person has a chance to lose money (even though of course they are losing money by paying to play the gamble).

In an essay, Richard Thaler describes another example: the credit card lobby pushed against gas stations that charged more if people paid with a credit card. But their fallback position was to request that the vendors call it a "cash discount" rather than a "credit surcharge," because people will more readily forgo a discount than pay a surcharge.

Kahneman gives a real-world example that is essentially equivalent to the prior example: the credit card companies are manipulating customers by deemphasizing that they are losing money by using the credit card.

In another experiment conducted by British psychologists, participants are given £50 and then asked to choose between a sure outcome of £20 and a game of chance, in which the person has a 2/5 chance to keep the entire amount that they have been given. The £20 can either be framed as KEEP £20 or LOSE £30. When the frame is designated as KEEP £20, subjects more likely choose the sure thing. When it is LOSE £30, subjects are more likely to gamble.

Again, the frame affects our decisions due to our inherent loss aversion. Rather than take what is framed as a sure loss, people take a gamble. But when that same loss is framed as a gain, people opt for the sure thing.

People's brain activity is monitored during this experiment. When the subject chose the more frequent option (in either frame), a region associated with emotional arousal was active. When subjects did not do what comes naturally, a brain region associated with conflict and self-control was active.

The study of brain activity while this experiment was going on provides a good illustration of how the emotions caused by a word like KEEP or LOSE can impact people's choices. When people tried to combat this emotion, their System 2 was mobilized.

An experiment that Tversky carried out is another example of emotional framing, in which two outcomes of surgery are described to physicians: "The one-month survival rate is 90% and "There is a 10% mortality in the first month." Recommending surgery was more popular in the former frame than in the latter.

This framing problem directly relates to WYSIATI. When people see the positive outcomes of surgery, they are more likely to recommend it. When they see the negative outcomes, they are less likely to recommend it.

Kahneman and Tversky also explored framing with this example: the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. If program A is adopted to combat it, 200 people will be saved. If program B is adopted, there is a 1/3 probability that 600 people will be saved, and a 2/3 probability that no people will be saved. A majority of people choose program A.

As in other examples, when the emphasis is on a positive word—saved—people focus on the surest positive outcome in the hopes that they will avoid losses (i.e., they become risk-averse).

Now consider different framings: If program A' is adopted, 400 people will die. If program B' is adopted, there is a 1/3 probability that nobody will die and a 2/3 probability that 600 people will die. The consequences of A and A' are the same, as are B and B'. In the second frame, however, most people choose the gamble.

When one examines the opposite perspective on the problem, people focus on the negative outcomes—deaths. They want to avoid sure losses and therefore become risk-seeking. Yet unlike the earlier examples Kahneman describes to illustrate prospect theory, here the only difference between the outcomes is how they are presented to people, highlighting their inconsistency.

When people are confronted with this inconsistency, they often don't know how to decide. They know intuitively that saving lives with certainty is good, and certain death is bad. But System 2 does not always have a way of answering the question on its own. Our moral intuitions too often rely on descriptions, not substance.

The framing in this example exposes that we sometimes make decisions—even important moral ones—based on intuitive reactions to emotional words. Though Kahneman doesn't exactly propose a solution to the fact that System 2 seems to be without a compass, he highlights the necessity of understanding how System 1's mode of reasoning can be flawed, even when it comes to decisions that seem obvious.

Some frames can be more useful than others. Kahneman asks readers to consider a pair of problems. In the first, a woman loses two $80 tickets. In the second problem, a woman loses $160 in cash. Kahneman asks whether the first woman would buy two more tickets, and whether the second would buy tickets anyway. People who see the problems believe that the first woman not buy two more tickets, and the second woman will buy tickets. Kahneman advises that in each case, sunk costs should be ignored. He would ask the first woman, "Would you have bought the tickets if you had lost the equivalent amount of cash?" If yes, she should buy two more tickets.

In this pair of problems, the only difference between the two women is the framing of the loss: one has lost money intended for tickets, while the other has simply lost money out of an overall account (even though her money was also intended for tickets). By framing the loss of tickets as simply a broader loss of wealth, the woman can avoid the bias of believing that the price of the tickets has doubled—thus proving that frames can also be helpful.

Another example of bad framing centers on two drivers: Adam and Beth. Adam switches from a gas-guzzling car with 12 mpg to one with 14 mpg. Beth switches from a 30 mpg car to a 40 mpg car. Intuitively, people think that Beth is saving more gas, but if each person drives 10,000 miles, Adam will reduce his consumption by 119 gallons, and Beth will only reduce hers by 83 gallons. The mpg frame is wrong, and Cass Sunstein, a psychologist who worked with Richard Thaler, helped to change policy that now requires fuel economy information to be printed in gallons-per-mile instead of mpg.

This example is perhaps even more concrete than the last—not only because driving is common to many people, but also because nearly everyone's intuitive answers about the problem are wrong. The miles-per-gallon frame is misleading not only to consumers but also to policy makers. Sunstein's role in changing public policy demonstrates the need for more people who understand these biases to help come up with ways to combat them.

Framing is important in yet another example regarding organ donation. In 2003, a study was done that discovered that nearly 100% of people in Austria choose to be organ donors, but only 12% in Germany; 86% in Sweden, but 4% in Denmark. The difference is that the high-donation countries must check a box to *opt out* of organ donation; low-contribution countries must check a box to *become* a donor. An important choice is controlled by an inconsequential feature of the situation.

The difference in organ donation serves as a good demonstration of how frames can also play into the laziness of our brains. For those who have thought about organ donation, the frame does not matter. For those who have not thought about it, the easiest intuition is the option that is already selected for them.

PART 5, CHAPTER 35

Kahneman provides two different definitions for utility: "experienced utility," which refers to the enjoyability of outcomes as people live them, and "decision utility," which refers to the desirability of a choice. He writes that these two concepts will coincide if people want what they enjoy and enjoy what they choose for themselves.

In the final part of the book, Kahneman explores how we evaluate our own experiences, and how those evaluations are largely subjective—even if they are grounded in objective data, as in the next example.

Kahneman creates a puzzle that asks whether people would pay more to reduce a number of planned injections from 20 to 18, or from 6 to 4. Usually, people would pay more to reduce the number from 6 to 4 because it reduces the proportion of injections. But this is somewhat nonsensical, because in each case a person is reducing the total pain by the same amount. The person pays different amounts to achieve the same gain of experienced utility.

Kahneman's puzzle illustrates our subjectivity surrounding different experiences. Even though the two cases here would reduce the same amount of pain, we have created a story about each experience, and reducing the injections from 6 to 4 is more valuable to us than the alternative.

Kahneman then examines the experience of two patients undergoing a painful colonoscopy. His study was conducted in the early 1990s, before anesthetics were widespread for the procedure. The patients were prompted every 60 seconds to indicate their pain level. A graph shows that Patient A's procedure lasted 8 minutes and finished with the peak pain intensity the person experienced—8 on a scale of 10. Patient B's procedure lasted 24 minutes and also had a peak pain intensity of 8, but the pain deescalated over the second half of the procedure.

By any objective measure, one would think that Patient B's procedure was more painful, because it lasted longer. But as this study and others will go on to show, what is important is not the overall objective experience, but instead the subjective memory of the experience. And, in most cases, memory often overweighs what a person felt at the end.

Most people believe that Patient B had a more painful procedure because they had the same peak intensity as Patient A, but their procedure lasted longer. Surprisingly Patient A rated their procedure as much more painful. This led to two findings: 1) The peak-end rule, which holds that the overall rating of the procedure is predicted by the level of pain reported at the worst moment and at the end. 2) The duration of the procedure has no effect. These findings have implications for medical practice: if the objective is to reduce patients' memory of pain, lowering peak intensity and end intensity could be more important than minimizing the duration of the procedure.

These findings emphasize our lack of objectivity regarding what we experience, to the point where we even contradict what we intuitively believe to be true. Countering intuition is important, in this case, because the broad implications here can help us to reduce painful memories, even if we might not necessarily be able to adjust the pain of a procedure as it happens.

It is difficult to distinguish the experiencing self (which answers the question "Does it hurt now?") from the remembering self (which answers the question "How was it, on the whole?"). Kahneman reports how an audience member in a lecture of his stated that a record scratch at the end of a record ruined the experience, despite the fact that the past is fixed.

In conjunction with the peak-end rule, the anecdote here even implies that the past is not objectively fixed—it can be adjusted by another memory.

The remembering self has more decision-making power than the experiencing self. In an experiment, people are exposed to two experiences: first, 60 seconds of putting their hand in a cold-water bath; second, 60 seconds of putting their hand in a cold-water bath followed by thirty additional seconds with slightly less cold water. People prefer to repeat the second experience rather than the first, even though the second experience encompasses the first experience, because they have a less aversive memory of that experience due to the peak-end rule.

This experiment serves as another example in which, objectively, the first experience should be better than the second. But because the experience gets slightly better at the end in the second trial, people prefer that experience because it alleviates the pain in their subjective memory. This plays into a larger theme about narrative: the story of our experiences that we construct is important to us than the objective facts we experience.

Kahneman describes how these rules have bases in biology: even rats ignore duration of pain and pleasure and only focus on the peak intensities of each emotion. This function of memory is a feature of System 1, and it is not necessarily rational.

System 1 is responsible both for impressions of the things we experience and for storing those impressions in memory. With the information that Kahneman has provided about our automatic processing up to this point, it makes sense that this System's memory is not consistent with what we objectively experience.

PART 5, CHAPTER 36

Kahneman relates to the peak-end rule with his own experience: seeing *La Traviata*. The opera ends with the heroine dying, waiting for her beloved. Her lover is able to get to her in time, and after ten minutes of glorious duets, the heroine dies. Kahneman explains that had the heroine's life been a year shorter, it would not have been as important as if the last ten minutes of her life had been lost.

The subjectivity of our own lives and experiences comes into play once again. We value the resolution of the heroine's story more than we value an objectively longer life she might have lived.

In a description of a fictitious woman named Jen, Kahneman says she was never married and had no children. In one version of her story, she was extremely happy through her life (different people read that she was 30 or 60) and was killed painlessly and instantly in a car crash. Another version of her story added 5 extra years to her life (so she died at 35 or 65). The extra years were pleasant but less so than before. Participants were asked about the total happiness she experienced. The study found no difference between responses when she was 30 or 60. But adding 5 slightly happy years to a very happy life caused a substantial drop in evaluations of her total happiness.

This example also echoes the peak-end rule from the prior chapter: how this woman's life ended (with either very happy years or with slightly less happy years) is more important in our subjective evaluations than the many happy years she experienced over the course of her life.

Another study found that people choose by memory, not by experience, when they decide whether or not to repeat an experience. Taking vacations as an example, Kahneman asks a thought experiment: if you knew that you would have no pictures, videos, or memories of a vacation, how would this affect your vacation plans? Many people choose to maximize pleasure by returning to a place where they have been happy; others say that they would not bother to go at all.

This example demonstrates how much value we place on good stories, particularly in our own lives and experiences. The difference in vacations that people would take highlights how much our actions are motivated by the future memories we will have of an experience.

In another thought experiment, Kahneman writes that you will undergo a painful surgery for which you will be awake and will scream and beg for it to stop. However, you are promised an amnesia-inducing drug that will wipe out memories of the episode. Kahneman's informal observations are that most people are relatively indifferent to their own pain and treat themselves like a suffering stranger, and some do not care at all.

The same idea is true of painful experiences: we care little about how much pain we might actually endure if our future subjective memory of that experience contains less pain.

PART 5, CHAPTER 37

Kahneman describes how when he became interested in the study of well-being, most information about the subject came from the answer to this question or some variation of it: "All things considered, how satisfied are you with your life these days?" This question is directed to the remembering self, but Kahneman proposed that people should focus instead on the well-being of the experiencing self.

This question, as we have already learned, plays into System 1's inherent tendency to substitute easier questions for a complicated question like global happiness. Thus, it makes sense that Kahneman might be skeptical of how we answer a question that also asks us to evaluate our global experiences simply by remembering them.


Kahneman and a team of psychologists developed a method to measure well-being of the experiencing self. They asked participants (all women) in their study to relive the previous day in detail (a method that they called the Day Reconstruction Method or DRM), answering questions about each "episode" of the day and rating the intensity of different feelings on a scale.

The DRM method aims to combat the biases that we experience when we remember events in our lives (the peak-end rule and duration neglect). Instead of asking us to remember events years or months in the past, it aims to collect people's day-to-day experiences as they happen.

The study found that long episodes counted more than shorter episodes when considering a day as a whole. And even though there were many positive and negative emotions in a given episode, one could classify most moments in life as ultimately positive or negative. They found that American women spent about 19% of the time in an unpleasant state (a measure called the U-index), compared to 16% for French women and 14% for Danish women.

The results of the study show the tendencies we have in evaluating our lives. In our constant quest to make sense of the world and ourselves, we label experiences as ultimately positive or negative despite the fact that we might experience many complex emotions about a given event—a product of System 1's tendency to simplify.


The study also found significant inequality in emotional pain. About half of the participants reported going through an entire day without an unpleasant episode, but a significant minority experienced considerable distress for much of the day. A U-index—the proportion of time that people spend in a negative emotional state—can also be computed for activities. The U-index was higher by about 6% on weekdays than weekends, for example.

The fact that there might be a significant inequality in emotional pain actually makes sense, given much of Kahneman's other findings. If we have positive feelings about our lives as a whole, we are more likely to find positive events to corroborate that belief (a feature of the confirmation bias).

Kahneman found that our emotional state is largely determined by what we focus on. If we are in love, we may be happy even when in traffic. To get pleasure from eating, we have to notice that we are doing so. These observations imply that while we cannot change our disposition, we can spend less or more time focusing on the things that we enjoy doing with people we like.

The dynamic between System 1 and System 2 returns here. System 1 is the source of our emotions, but with a little more effort from System 2, we can focus on the things that make us happier and have an overall better emotional state.

Measures of experienced well-being can be compared with the judgments people make when they make global evaluations of their lives. More education is associated with a higher life evaluation, but not with greater well-being. Children lessen experienced well-being, but the adverse effects on life evaluation are smaller. Religion positively impacts well-being but not life evaluation. In terms of money, being rich may greatly enhance life evaluation but does not improve experienced well-being. This implies that life satisfaction is not a flawed measure of experienced well-being—it is simply a different measure altogether.

Experienced well-being and global life satisfaction are simply different measures of happiness based on two ways that we experience our lives. Even though experienced well-being is driven by emotions, it is slightly more objective in that it happens more frequently and is based on ratings on a scale. Life evaluation, however, is much more subjective and dependent on which parts of our lives we think of when we evaluate it and our memories of different experiences.

PART 5, CHAPTER 38

Kahneman includes a graph that tracks life satisfaction between the four years before and the five years after a person gets married. It starts low and gradually increases, peaking at the year of marriage, and then gradually decreases over time. Kahneman describes how the graph usually evokes nervous laughter, because it appears to show that there is a steep decline of life satisfaction in the years after marriage.

Once again, Kahneman demonstrates our inherent tendency to assume causal relationships in statistics—people laugh nervously at the graph because they seem to assume that marriage causes life satisfaction to decline as the years decline.

The figure takes on a different meaning, however, when we remember that "How satisfied are you with your life?" is not a simple question. When answering it, people think of significant events in the recent past or near future. People who are recently married or expecting to marry are likely to retrieve that fact, which affects their answer. But those who are not do not think of marriage when answering. The graph could be read as the likelihood that people will think of their marriage when asked about their lives.

This demonstrates once again how we are "blind to our blindness"—how we are unaware of the heuristic mistakes that we make. In evaluating this graph, people do not understand that respondents have substituted their answer to how satisfied they are with their life with how easily they can think of happy events in their lives.

There is a low correlation between circumstances and satisfaction with life because experienced happiness and life satisfaction are heritable traits. People who appear equally fortunate vary greatly in how happy they are. The goals that people set for themselves are also important in helping them achieve happiness: young people who list being well-off financially as essential are more likely to achieve it. Experienced well-being, therefore, should not be the only meter of happiness. People do not engage in a careful evaluation of life—they make substitutions.

Kahneman understands the value of different ways of measuring happiness, but here he appears to acknowledge the limits of these kinds of measurements. People are rarely subjective when they answer these kinds of questions, but at the same time objective measures do not tell the whole story (as demonstrated by the two equally fortunate people who are not equally happy).

Kahneman introduces another concept about happiness and well-being that has to do with attention: nothing in life is as important as you think it is when you are thinking about it. If asked, "How much pleasure do you get from your car?" an answer comes to mind immediately, but the question people are really answering is, "How much pleasure do you get from your car when you think about it?" Most of the time, people do not think about their car, even when they are driving it. This is called the focusing illusion.

The focusing illusion serves as a particularly tricky bias when we answer questions. If a person is asked to evaluate their car, they cannot help but focus on it—but this additional automatic focus biases their intuitions and causes them to overestimate the pleasure or frustration they have with it. And again, as with other biases, they often do not realize that they have been affected simply by directing attention.

A similar bias distorts judgments of the happiness of Californians. Most people believe Californians are happier because of the climate, but most Californians are unlikely to think of the climate when asked about their global happiness. This is not true, however, for people who recently moved to California, who are more likely to think about this recent change when asked about happiness. Over time, with few exceptions, attention is withdrawn from a new situation as it becomes familiar. The main exceptions are chronic pain, constant exposure to loud noise, and severe depression—all of which attract one's attention.

One can see how the focusing illusion can lead to common misconceptions—like thinking that Californians are happier because of the weather. This survey demonstrates another example of how people (like those who have recently moved) make substitutions when they globally evaluate their happiness, evaluating how happy their new climate makes them.

In a study conducted by one of Kahneman's undergraduate students, the student collected data on people who were asked about the percentage of time that paraplegics spent in a bad mood. Some were told that the crippling accident had occurred a month earlier, and some a year earlier. The respondents also indicated whether they knew a paraplegic personally. Her findings showed that personal acquaintance made little difference if the accident had occurred a month earlier. But people who knew a paraplegic estimated that they had much better moods a year after the accident than people who did not personally know a paraplegic—they understood the gradual recovery of mood that most people experience.

Like the previous assumptions that people make about the global happiness of Californians, this experiment serves as another example of the way in which people misconstrue what factors into evaluations of happiness on a day-to-day level. They assume that paraplegics' moods depend exclusively on their disability, even after they have had a year to become accustomed to it. People thus do not realize how much the things they devote attention to can affect their mood and happiness.

Psychologists Daniel Gilbert and Timothy Wilson introduced the word *miswanting* to describe bad choices that arise from errors of forecasting. Compare two commitments: buying a new car and joining a group that meets weekly, like a poker or book club. People overestimate the long-term benefits of the car, but do not make the same mistake for a social gathering, because social gatherings demand attention.

Kahneman ended the previous chapter by writing that a way to become happier is by spending time doing things we like with people we like, which is corroborated by this example. The things that System 2 focuses on—the book club, for example—make us happier than the things that we gradually no longer devote attention to.

CONCLUSIONS

Kahneman concludes by reexamining some of the larger principles in the book, beginning with the experiencing and remembering selves. The remembering self is a construction of System 2, but duration neglect and the peak-end rule originate in System 1. We do not treat all moments the same—some are more memorable, and some are more important.

Kahneman's conclusions highlight some of his most important points: in the case of the experiencing and remembering selves, it is that people rarely favor objectivity over subjectivity, especially when it comes to evaluating their own experiences.

The issue of which of the two selves matters more is important to both medicine and welfare. He wonders, through a series of rhetorical questions, whether investments should be made based on the actual suffering that people experience, or how much, holistically, they want to be relieved of their condition.

Kahneman questions the broader implications that subjectivity has on policy, but perhaps illustrates the limits of our knowledge best in not having an answer to his own questions in terms of the best way to go about policy.

Kahneman then returns to the idea of Econs and Humans, as well as basic economic theory. He argues that the definition of rationality as being consistent and coherent removes reasonable people from the definition of rationality. Humans are not irrational, but they need help to make accurate judgments and better decisions. In a nation of Econs, government should keep out of the way, but Humans require more guidance.

Returning to standard economic theory and prospect theory, Kahneman also reiterates that Humans do not always make decisions based on the intrinsic values of money and probability. Although informing people of their biases is important, Kahneman also realizes that in some cases, government action and guidance may be even more crucial to counter people's faulty intuitions.

In Richard Thaler and Cass Sunstein's book *Nudge*, they address the dilemma of how to help people make good decisions without curtailing freedom. They come up with libertarian paternalism, which has great appeal across a broad political spectrum. One example of a "nudge" is that joining a pension plan is the default option. Another example lies in a policy that many firms now offer employees: those who sign on allow the employer to increase their contribution to their savings plan by a fixed proportion whenever they receive a raise. It improved the savings rate and brightened the future prospects of millions of workers.

In a way, government "nudge" policies do not overcome people's biases, but instead simply use frames and the inherent laziness of our brains to their advantage. Like the example of organ donation, making the option of joining a pension plan or saving money the default option greatly increases the amount that people will save—an objectively positive outcome that people barely have to think about.

Additional applications of libertarian paternalism introduced by Sunstein include the gas mileage example from earlier, a new version of dietary guidelines that eradicated the Food Pyramid and replaced it with a Food Plate, and an inclusion of both frames on labels like "90% fat-free" alongside "10% fat."

In these scenarios, the policies don't play into our inherent laziness, as with the pension plan, but they do illuminate how we are affected by frames and try to help us combat them by including both the positive and negative phrasings.

Kahneman ends by returning to the two systems: the automatic System 1 and the effortful System 2. System 1 is the origin of much of what we do wrong, but also much of what we do right. Our thoughts and actions are generally on the mark, but sometimes it becomes unreliable. The way to block errors that originate in System 1 is simple: "recognize the signs that you are in a cognitive minefield, slow down, and ask for reinforcement from System 2." This is what occurs when we encounter the **Müller-Lyer illusion** after we have learned that our intuition is incorrect.

Kahneman acknowledges that our intuitions can often be right, but still highlights the necessity for calling in backup when we are presented with cognitive illusions. Reiterating the comparison with the Müller-Lyer illusion reminds readers that even after we understand concepts, we may not be able to apply them unless we explicitly recognize the heuristics upon which we are relying.

Organizations are better than individuals when it comes to avoiding errors, and can institute and enforce the application of checklists, reference-class forecasting, and the premortem.

Instituting policies that force people to rely on objective data allow people to avoid making costly mistakes.

Ultimately, having a vocabulary for the different heuristics is also important in avoiding their errors. Labels like "anchoring effects," "narrow framing," or "excessive coherence" reminds us of our potential biases, their causes, effects, and what can be done about them.

Kahneman returns to his aim in writing the book: by giving people the tools to recognize the different heuristics (and often fallacies) that they use, they can recognize when these mental shortcuts are helpful versus when they allow for lazy mistakes.

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