

Thinking, fast and slow

Daniel Kahneman-- 2011

Introduction.

- So this is my aim for watercooler conversations: improve the ability to identify and understand errors of judgment and choice, in others and eventually in ourselves, by providing a richer and more precise language to discuss them.

Part 1: two systems.

Chapter 1: the characters of the story.

- As a graduate student, I attended some courses on the art and science of psychotherapy. During one of these lectures, art teacher imparted a morsel of clinical wisdom. This was what he told us: “you will from time to time meet a patient who shares a disturbing tale of multiple mistakes in his previous treatment. He has been seen by several clinicians, and all failed him. The patient can lucidly describe how his therapists misunderstood him, but he has quickly perceived that you are different. You share the same feeling, are convinced that you understand him, and will be able to help” at this point my teacher raised his voice as he said, “do not even think of taking on this patient! Throw him out of the office! He is most likely a psychopath and you will not be able to help him.” Many years later I learned that the teacher had warned us against psychopathic charm, and the leading authority in the study of psychopath he confirmed that the teacher’s advice was sound.
- This matters, because anything that occupies your working memory reduces your ability to think.

Chapter 2: attention and effort.

Chapter 3: the lazy controller.

- My experience is that I can think while strolling but cannot engage in mental work that imposes a heavy load on short-term memory. If I must construct an intricate argument under time pressure, I would rather be still, and I would prefer sitting to standing.
- This phenomenon has been named ego depletion.
- The evidence is persuasive: activities that impose high demands on system two require self-control, and the exertion of self-control is the pleading and unpleasant. Unlike cognitive load, ego depletion is at least in part a loss of motivation. After exerting self-control and one task, you do not feel like making an effort in another.
- The authors of the study plotted the proportion of approved requests against the time and since the last food break. The proportion spikes after each meal, when about 65% of requests are granted. During the two hours or so and told the judges next feeding, the approval rates drop steadily, to about zero just before the meal. As you might expect, this is an unwelcome result in the authors carefully checked many alternate explanations. The best possible outcome of the data provides ad news, tired and hungry judges tend to fall back on the easier default position of denying requests for parole. Both fatigue and hunger probably play a role.

- People who say \$.10 up here to be ardent followers of the law of least effort. People who avoided that answer appear to have more active minds.
- Many people are overconfident, prone to place too much faith on their intuitions.
- “His ego was depleted after a long day of meetings. So she just turned to standard operating procedures and self thinking through the problem.”

Chapter 4: the associative machine.

- The marvels of priming. If you recently seen or heard the word eat, you are temporarily more likely to complete the word fragment S0 – P as soup then as soap. The opposite would happen of course, if you had seen wash. We call this priming effect.
- Another major advantage in our understanding of memory was the discovery that priming is not restricted to concepts and words. You cannot know this from conscious experience of course, but you must accept the alien idea that your actions and your emotions can be primed by events of which you are not even aware. In an experiment that became an instant classic, the psychologist John Bargh and his collaborators asked students at New York University-most aged 18 to 22--to assemble four word sentences from a set of five words(for example, “finds she it yellow instantly”). For one group of students, half the scrambled sentences contain words associated with the elderly, such as Florida, forgetful, bald, and gray or wrinkle. When they had completed that task, the young participants were sent out to do another experiment an office down the hall. That short walk was what the experiment was about. The researchers unobtrusively measured the time it took people to get from one end of the core door to the other. As he predicted, the young people who had fashioned a sentence from the words with an elderly theme walked down the hallway significantly more slowly than the others.
- A separate experiment showed that exposing people to images of classrooms and school lockers also increase the tendency of participants to support a school initiative.

Chapter 5: cognitive ease.

- Experiments have shown that the first fact out of two is more likely to be believed. More advice: if your message is to be printed, use high-quality paper to maximize the contrast between characters and their background. If you use color, you’re more likely to be believed if your text is printed in bright blue or red then in middling shades of green, yellow or pale blue. If you care about being thought credible and intelligent, do not use complex language where simpler language would do.
- My Princeton colleague refuted a myth prevalent among undergraduates about the vocabulary of professors find most impressive. In an article titled “consequences of erudite vernacular utilized introspective of necessity: problems with using long words needlessly,” he showed that catching familiar items in pretentious language is taken as a sign of poor intelligence.
- In addition to making your message simple, try to make it memorable. But ideas and verse if you can, they will be more likely to be taken as truth. Participants in a much cited experiment read dozens of unfamiliar aphorisms. Aphorisms were judged more insightful when they were primed them when they did not.
- The experimenters recruited 40 Princeton students to take the CRT. Half of them saw puzzles in a small font in washed out gray print. The puzzles were legible, but the font induced cognitive

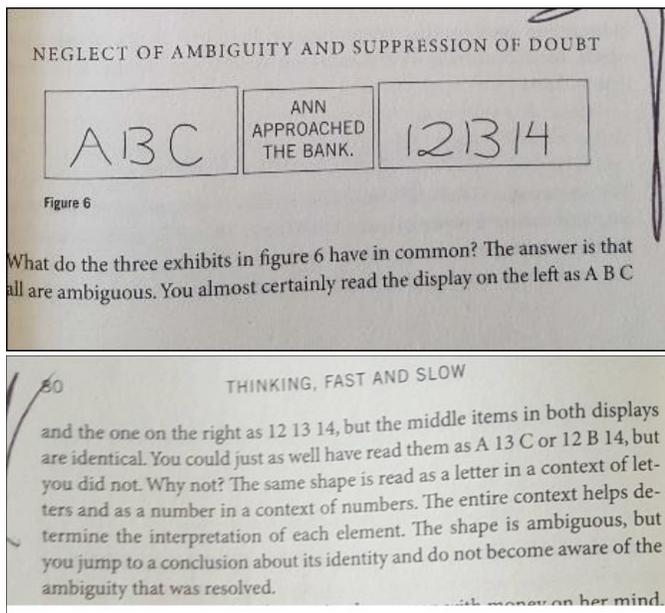
strain. The results tell a clear story: 90% of the students who saw the CTR and normal font made at least one mistake in the test, but the proportion dropped to 35% when the font was barely legible. You read this correctly: performance is better with the bad font. Cognitive strain, whatever its source, mobilizes system two, which is more likely to reject the intuitive answers suggested by system one.

- When the mysterious series of ads ended, the investigators sent questionnaires to the University communities, asking for impressions of whether each of the words “mean something good or something bad.” The results are spectacular: the words that were present more frequently were rated much more favorably than the words that have been shown only once or twice. The finding has been confirmed in many experiments, using Chinese ideographs, faces and randomly shaped polygons.
- Around 1960, a young psychologist named Sarnoff Mednick thought he had identified the essence of creativity. His idea was as simple as it was powerful: creativity is associative memory that works exceptionally well. He made up a test, called the remote Association test are eight key, which is still often used in studies of creativity.
- They found that putting the participants in a good mood before the test by having them sing Your thoughts more than doubled accuracy.
- Mood enviably affects the operation of system one: when we are uncomfortable and unhappy, we lose touch with our intuition.

Chapter 6: norms, surprises and causes.

- The rules of associative coherence hell us what happened.

Chapter 7: a machine for jumping to conclusions.



- The disruption of system two had a selective effect: it made it difficult for people to unbelief false sentences. In a later test of memory, the depleted participants ended up thinking that many of the

false sentences were true. The moral is significant: when system two is otherwise engaged, we will believe almost anything. System one is gullible and biased to believe, system two is in charge of doubting and unbelieving, but system two is sometimes busy, and often lazy. Indeed, there is evidence that people are more likely to be influenced by empty persuasive messages, such as commercials, when they are tired and depleted.

- In an enduring classic of psychology, Solomon Asch presented descriptions of two people and asked for comments on the personality. What do you think of Allen and Ben?
 - Allen: intelligent, industrious, impulsive, critical, stubborn, envious
 - Ben: envious, stubborn, critical, impulsive, industrious, and intelligent.
- If you're like most of us, you viewed Allen much more favorably than Ben. The initial traits in the list change the very meaning of the traits that appear later. The stubbornness of an intelligent person is seen as likely to be justified and may actually invoke respect, but intelligence in an envious and stubborn person make him more dangerous.
- Sequence matters.
- The principle of independent judgment has immediate applications for the conduct of meetings, an activity which executive in organizations spend a great deal of their working days. A simple rule can help: before an issue is discussed, all members of the committee should be asked to write a very brief summary of their position. This procedure makes good use of the value of the diversity of knowledge and opinion in the group. The standard practice of open discussion gives too much weight to the opinions of those who speak early and assertively, causing others to line up behind them.
- Indeed, you'll often find that knowing that little makes it easier to fit everything you know into a coherent pattern.
- They made that big decision on the basis of a good report from one consultant. WYSIATI— what you see is all there. They did not seem to realize how little information they had.

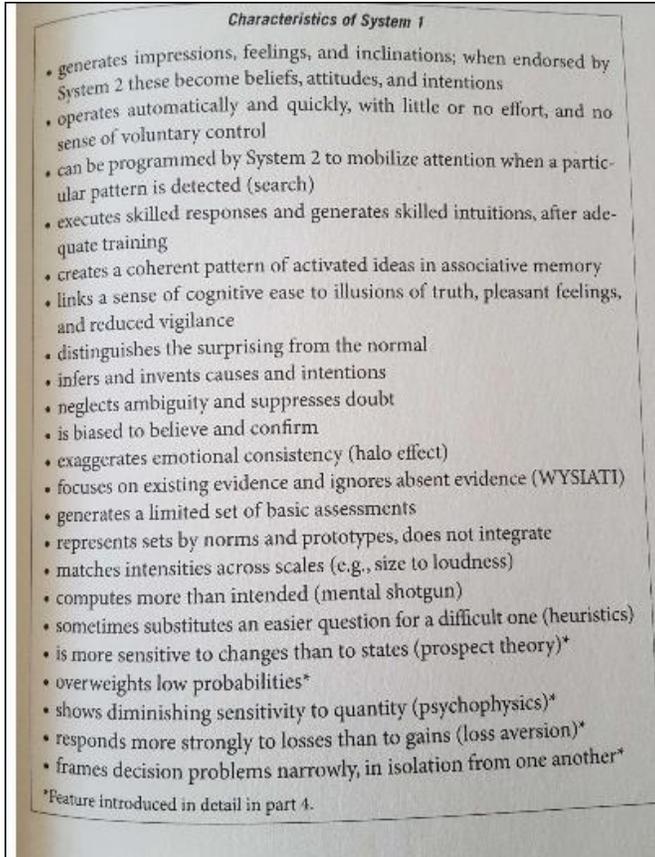
Chapter 8: how judgments happen.

- The almost complete neglect of quantity in such emotional context as been confirmed many times.

Chapter 9: answering an easier question.

- Another group of students of the same two questions, or in reverse order:
 - How many dates did you have last month?
 - How happy are you these days?
- The results this time were completely different. In this sequence, the correlation between the number of dates and reported happiness was about as high as a correlation between psychological measures can get. What happened? The explanation is straightforward, and it is a good example of substitution. Dating was apparently not the center of the student's lives but when they were asked to think about their romantic life, they certainly had an emotional reaction. The students who had many dates were reminded of a happy aspect of their life, while those who had none were reminded of loneliness and rejection. The emotion aroused by the date in question was still on everyone's mind when the query about general happiness came up.

- The dominance of conclusions over arguments is most pronounced when emotions are involved. The psychologist Paul Slovic has proposed an affect heuristic in which people let their likes and dislikes determine their beliefs about the world. Your political preference determines the arguments that you find compelling. If you like the current health policy, you believe its benefits are substantial and its costs more manageable than the costs of alternatives.



Part two: heuristics and biases.

Chapter 10: the law of small numbers.

- Traditionally psychologists do not use calculations to decide on a sample size. They use their judgment, which is commonly flawed.
- Players on both teams adapt to this judgment—teammates are more likely to put half to the hot score and the defense is more likely to double team. Analysis of thousands of sequences of shots led to a disappointing conclusion: there is no such thing as a hot hand in professional basketball, either in shooting from the field or scoring from the foul line. Of course, some players are more accurate than others, but this sequence of successes and missed shots satisfy all the tests of randomness. The hot hand is entirely in the eye of the beholder, who are consistently too quick to perceive order and causality and randomness. The hot hand is a massive and widespread cognitive illusion.
- I learned about it from an amusing article by two statisticians. Their essay focused on a large investment, some \$1.7 billion, which the Gates foundation made to follow up intriguing findings

on the characteristics of the most successful schools. Many researchers have sought the secret of successful education by identifying the most successful schools in hopes of discovering what distinguished them from the others. One of the conclusions of this research is that most successful schools, on average are small. In a survey of 1602 schools in Pennsylvania, six of the top 50 were small, which is an overrepresentation by a factor of four. These data encourage the Gates foundations to make a substantial investment in the creation of small schools, sometimes by splitting large schools into smaller units. At least half a dozen other prominent institutions, join the effort, as did the US Department of education smaller learning community program.

Chapter 11: anchors.

- Amos and I once rigged a wheel of fortune. It was marked from 0 to 100 but we had built it so it would stop only at 10 or 65. We recruited students of the University of Oregon as participants in our experiment. One of us would stand in front of a small group, spin the wheel and ask them to write down the number on which the wheel stop, which of course was either 10 or 65. We then asked them two questions: (is the percentage of African nations among UN members larger or smaller than the number you just wrote? What is your best guess of the percentage of African nations in the UN?” The spin of a wheel of fortune—even one that is not rigged—cannot possibly yield useful information about anything, and the participants in our experiment should simply have ignored it. But they did not ignore it. The average estimates of those who sought 10 and 65 with 25% and 45% respectively. The phenomenon we are studying is so common and so important in the everyday world that you should know its name: it is an anchoring effect. It occurs when people consider a particular value for an unknown quantity before estimating that quantity. What happens is one of the most reliable and robust results of experimental psychology: the estimates stay close to the number that people considered.
- If you are asked whether Gandhi it was more than 114 years old when he died you will end up with a much higher estimate of his age at death then you would have if the anchor question referred to death at 35. If you consider how much you should pay for a house, you’ll be influenced by the asking price.
- In an experiment conducted some years ago, real estate agents were given an opportunity to assess the value of the house I was actually on the market. They visited the house and studied a comprehensive booklet of information that included an asking price. Half the agents saw the asking price that was substantially higher than the listed price of the house, the other half saw an asking price that was substantially lower. Each agent gave her opinion about a reasonable buying price for the house and the lowest price at which she would agree to sell the house if she owned it. The agents were then asked about the factors that had affected their judgment. Remarkably, the asking price was not one of the factors, the agents took pride in their ability to ignore it. They insisted that the listing price had no effect on their response, but they were wrong: the anchoring effect was 41%. Indeed, professionals were almost as susceptible to anchoring effect as business school students with no real estate experience, those anchoring index was 48%. The only difference between the two groups was that the students conceded that they were influenced by the anchor, while the professionals had denied that influence.
- When no anchor was mentioned, the visitors at the Exploratorium generally and environmentally sensitive crowd said they were willing to pay \$64 on average. When the anchoring amount was

only five dollars, contributions averaged \$20. When the anchor was a rather extravagant \$400, the willingness to pay rose to an average of \$143.

- The conclusion is clear: anchors do not have their FX because people believe they are informative.
- Anchoring effects explain why, for example, arbitrary rationing is an effective marketing ploy. A few years ago, supermarket shoppers in Iowa encountered a sales promotion for Campbell's soup at about 10% off the regular price. On Sundays, a sign on the shelf said limit of 12 per person. On other days, the sign said no limit per person. Shoppers purchased an average of seven can when the limit was in force, twice as many as they bought when the limit was removed.
- We see the same strategy at work in negotiation over the price of a home, when the seller makes the first move by setting the list price. As in many other games, moving first is an advantage in single issue negotiations, for example, when price is the only issue to be settled between a buyer and seller. As you may have experienced with negotiating for the first time in a bazaar, the initial anchor was a powerful effect. My advice to students when I taught negotiations was that if you think the other side has made an outrageous proposal, you should not come back with an equally outrageous counteroffer, creating a gap that will be difficult to bridge in further negotiations. Instead you should make a scene, storm out or threaten to do so, and make it clear—to yourself as well as to the other side—that you will not continue the negotiation with that number on the table.
- The psychologist Adam Galinsky proposed more subtle ways to resist to the anchoring effect in negotiations. They instructed negotiators to focus their attention and search their memory for arguments against the anchor. The instruction to activate system two was successful. For example, the anchoring effect is reduced or eliminated when the second mover focuses his attention on the minimal offer that the opponent would accept, or on the costs to the opponent of failing to reach agreement. In general, a strategy of deliberately thinking the opposite may be good defense against anchoring effects. Because it negates the biased recruitment of thoughts produced by these effects.
- The main moral of priming research is that our thoughts and behavior are influenced, much more than we know or want, by the environment of the moment.

Chapter 12: the science of availability.

- One of the best-known studies of availability suggests that awareness of your own biases can contribute to peace and marriages, and probably and other joint projects. In a famous study, spouses were asked, "How large was your personal contribution to keeping the place tidy, in percentages?" They also answered similar questions about taking out the garbage, initiating social engagements etc. With the self estimated contributions add up to 100% or more, or less? As expected, the self assessed contribute shins added up to more than 100%. 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 difference in judge to frequency. The bias is not necessarily self-serving: spouses also overestimated their contribution to causing quarrels, although to a smaller extent than their contributions to more desirable outcomes. The same bias contributes to the common observation that many members of a collaborative team feel like they've done more than their share and also feel that the others are not adequately grateful for their individual contributions.

- The mere observation that there is usually more than 100% credit to go around is sometimes sufficient to diffuse the situation.
- You will occasionally do more than your share, but it is useful to know that you are likely to have that feeling even when each member of the team feels that way.
- The request to list 12 instances pits the two determinants against each other. On the one hand, you've just retrieved an impressive number of cases in which you are assertive. On the other hand, while the first three or four instances of your own assertiveness probably came easy to you, you almost certainly struggled to come up with the last few to complete a set of 12, fluency was low. Which will count more—the amount retrieved for the ease and fluency of retrieval? The contest yielded a clear-cut winner: people who had just listed 12 instances waited themselves as less assertive than the people who had listed only six. Furthermore, participants who had been asked to list 12 cases in which they had not behaved assertively ended up thinking of themselves as quite assertive!
- A professor at UCLA found an ingenious way to exploit the availability bias. He asked different groups of students to list ways to improve the course, and he varied the required number of improvements. As expected, the student to list in more ways to improve the class rated it higher!

Chapter 13: availability, a motion and risk. PG 137

- Strokes cause almost twice as many deaths as all accidents combined, but 80% of respondents judged accidental death to be more likely.
- Tornadoes were seen as more frequent killers than asthma, although the latter cause 20 times more deaths.
- Death by lightning was judged less likely than death by botulism even though it is 52 times more frequent.
- Death by disease is 18 times as likely as an accidental death, but the two were judged about equally likely.
- Death by accidents was judged to be more than 300 times more likely than death by diabetes, that the ratio is 4 to 1.
- “She’s raving about an innovation that has large benefits and no costs. I suspect the effect heuristic.”

Chapter 14: Tom W specialty

- The correct answer to the Tom W puzzle is that you should stay very close to your prior beliefs, slightly reducing it be initially high probabilities of well populated fields (humanities and education, social science and social work) and slightly raising of the low probabilities of rare specialties (library science, computer science). You are not exactly where you would be if you had known nothing at all about Tom W, but the little evidence you have is not trustworthy, so the base rates should dominate your estimates.

Chapter 15: Linda: less is more.

- If you visit a courtroom you will observe that lawyers applied to styles of criticism: to demolish a case they raise doubts about the strongest arguments that favor it; to discredit a witness, they

focus on the weakest part of the testimony. The focus on weaknesses is also normal and political debates.

- “They added a cheap gift to the expensive product, and it made the whole deal less attractive. Less is more in this case.”

Chapter 16: causes trump statistics.

- This is a profoundly important conclusion. (Subjects unwillingness to deduce the particular from the general was matched only by their willingness to and for the general from the particular.) People who are taught surprisingly statistical facts about human behavior may be impressed to the point of telling their friends about what they have heard, but this does not mean that their understanding of the world has really changed. The test of learning psychology is whether your understanding of situations you encounter has changed, not whether you have learned and new fact. There is a deep gap between our thinking about statistics and are thinking about individual cases. Statistical results with a casual interpretation have a stronger effect on our thinking than non-casual information. But even compelling casual statistics will not change long-held beliefs or beliefs rooted in personal experience. On the other hand, surprising individual cases have had a powerful impact and are more effective tool for teaching psychology because the incongruity must be resolved and embedded in a casual story. This is why this book contains questions that aren't addressed personally to the reader.
- You are more likely to learn something by finding surprises in your own behavior than by sharing surprising facts about people in general.

Chapter 17: regression to the mean.

- I was telling them about an important principle of skill training: rewards for improved performance work better than punishment of mistakes.

Chapter 18: taming intuitive predictions.

Part three: over confidence.

Chapter 19: the illusion of understanding.

- The trader-philosopher-statistician Nassim Taleb could also be considered a psychologist. In *The Black Swan*, he introduced the notion of narrative fallacy to describe how flawed stories of the past shape our views of the world and our expectations for the future.
- Narrative fallacies arise inevitably from our continuous attempt to make sense of the world.
- Hindsight bias has pernicious effects on the evaluation of decision-makers.

Chapter 20: illusion of validity.

- One test, called the “leaderless group challenge,” was conducted on an obstacle field. Eight candidates, strangers to each other, with all insignia of rank removed and only numbered tags to identify them, were instructed to lift a long log from the ground and haul it to the wall about 6 feet high. The entire group had to get to the other side of the wall without the log touching either

the ground or the wall and without anyone touching the wall. If any of these things happen, they would have to declare it and start again.

- There was more than one way to solve the problem. A common solution was for the team to send several men to the other side by crawling over the pole as it was held at an angle, like a giant fishing rod, by the other members of the group. Or else some soldiers would climb onto someone's shoulders and jump across. The last man would then have to jump up at the pole, held up at an angle by the rest of the group, shimmy his way along its length as the others kept him and the pole suspended in the air, and leap safely to the other side. Failure was common at this point, which required them to start all over again.
- As a colleague and I monitored the exercise, we made note of who took charge, who tried to lead but was rebuffed, how cooperative each soldier was in contributing to the group effort. We saw who seem to be a stubborn, submissive, arrogant, patient, hot tempered, persistent, or equator. We sometimes sought competitive spite when someone whose idea had been rejected by the group no longer worked very hard. And we saw our reactions to crisis: Huber rated a comrade whose mistake had cause the whole group to fail, who stepped forward to lead when the exhausted man had to start over. Under the stress of the event, we felt, each man's true nature revealed itself. Our impression of each candidate's character was as direct and compelling as the color of the sky.
- The evidence from more than 50 years of research is conclusive: for a large majority of fund managers, the selection of stocks is more like rolling dice than like playing poker. Typically at least two out of every three mutual funds do not achieve their own benchmark in a given year.
- More important, the year-to-year correlation between the outcomes of mutual funds is very small, barely higher than zero. The successful funds in any given year are most likely lucky; they have a good roll of the dice. There is general agreement among researchers that nearly all stock pickers, whether they know it or not—and few of them do—a play a game of chance.

Chapter 21: intuitions versus formulas.

- It is generally agreed that the effect of vintage can be due only to variations in the weather during the grape growing season. The best wines are produced when the summer is warm and dry, which makes the wine industry a likely beneficiary of global warming.
- Experienced radiologists who evaluate chest x-rays as normal or abnormal contradict themselves 20% of the time when they see the same picture on separate occasions.
- The research suggests a surprising conclusion: to maximize predictive accuracy, final decisions should be left to formulas, especially in low validity environments. In admission decisions for medical schools, for example, the final determination is often made by the faculty members who interview the candidate. The evidence is fragmentary, but there are solid grounds for conjecture: conducting an interview is likely to diminish the accuracy of a selection procedure, if the interviewer is also make the final admission decision. Because interviewers are overconfident in their intuitions, they will aside too much weight to their personal impressions and too little weight to other sources of information, lowering of validity.
- Marital stability is well predicted by a formula: frequency of lovemaking minus frequency of quarrels.
- A classic application of this approach is a simple algorithm that has saved the lives of hundreds of thousands of infants. Obstetricians had always known that an infant who is not breathing

normally within a few minutes of birth is at high risk of brain damage or death. Until the anesthesiologist Virginia Apgar intervened in 1953, physicians and midwives use their clinical judgment to determine whether a baby was in distress. Different practitioners focused on different cues. Some watched for breathing problems while others monitored how soon the baby cried. Without a standard procedure, danger signs are often missed, and many newborn infants died.

- One day over breakfast, a medical resident asked how Dr. Apgar would make a systematic assessment of a newborn. Apgar jotted down five variables (heart rate, respiration, reflex, muscle tone, and color) and three scores zero, one, or two depending on the robustness of each sign. Realizing that she might have made a breakthrough that any delivery room could implement, she began reading infants by this rule one minute after they were born. A baby with a total score of eight or above was likely to be pink, squirming, crying, grimacing with a pulse of 100 or more—in good shape. A baby with a score of four or below was probably blushed, flaccid, passive with lower slow or weak pulse—in need of immediate intervention. Applying this score, the staff and delivery rooms finally had a consistent standard for determining which babies were in trouble, and the formula is credited for an important contribution to the reducing of infant mortality. The Apgar test is still used every day in every delivery room.
- The message of this chapter is readily applicable to the tasks other than making a manpower decision for an army. Implementing interview procedures requires relatively little effort but substantial discipline. Suppose that you need to hire a sales representative for your firm. If you are serious about hiring the best possible person for the job, this is what you should do. First, select a few traits that are prerequisites for success in the position (technical proficiency, engaging personality, reliability and so on). Don't overdo it—six dimensions is a good number. The traits you choose should be as independent as possible from each other, and you should feel that you can assess them reliably by asking a few factual questions. Next, make a list of those questions for each trait and think about how you will score it, say on a 1 to 5 scale. You should have an idea of what you will call very weak or very strong.
- These preparations should take you half an hour or so, a small investment that can make a significant difference in the quality of people you hire. To avoid halo effects, you must collect information on one trait at a time, scoring each before we move onto the next. Do not skip around. To evaluate each candidate, add up the six scores. Because you are in charge of the final decision, you should not do a close your eyes. Firmly resolved that you will hire the candidate whose final score is the highest, even if there is another one who you like better—try resisting your wish to invent broken legs to change the ranking. A vast amount of research offers a promise: you are much more likely to find the best candidate if you use this procedure than if you do what people normally do in such situations, which is to go into the interview on prepared and make the choices by overall intuitive judgment such as “I looked into his eyes and liked what I saw.”
- Speaking of judges of versus formulas.
 - Whenever we can replace human judgment by formula, we should at least consider it.
 - He thinks his judgments are complex and subtle, but a simple combination of scores could probably do better.
 - Let's decide in advance what weight to give the data that we have on the candidate's past performances. Otherwise we'll give too much weight in our impression from the interviews.

Chapter 22: expert intuition: when can we trust it?

- What Pavlov's dogs learned can be described as a learned hope. Learn fears are even more easily acquired.

Chapter 23: the outside view.

- The proper way to collect information from a group is not by starting with a public discussion but confidentially collecting each person's judgment. This procedure makes better use of the knowledge available to the members of the group than the common practice of open discussion.
- This embarrassing episode remains one of the most instructive experiments of my professional life. I eventually learned three lessons from it. The first was immediately apparent: I had stumbled onto a distinction between two profoundly different approaches to forecasting, which Amos and I later labeled the inside view in the outside view. The second lesson was that our initial forecasts about two years for the completion of a project exhibited a planning fallacy. Our estimates are closer to a best case scenario than to a realistic assessment. I was slower to accept the third lesson, which I call irrational perseverance: the folly we displayed that day and failing to abandon the project. Facing a choice, we gave up rationally rather than give up the enterprise.

Chapter 24: the engine of capitalism.

- If you were allowed one wish for your child, seriously consider wishing him or her optimism. Optimists are normally cheerful and happy, and therefore popular, they are resilient in adapting to failures and hardships, their chances of clinical depression are reduced, their immune systems are stronger, they take better care of their health, they feel healthier than others and are in fact likely to live longer.
- A study of people who exaggerate their expected lifespan beyond predictions showed that they worked longer hours, are more optimistic about their future income, and are more likely to remarry after divorce (the classic triumph of hope over experience), and are more prone to bet on individual stocks. Of course, the blessings of optimism are offered only to individuals who are only mildly biased and who are able to "accentuate the positive" without losing track of reality.
- Optimistic individuals play a disproportionate role in shaping our lives. They decisions to make a difference; they are the inventors, the entrepreneurs, the political and military leaders, not average people. They got to where they are by seeking challenges and taking risks. They are talented and they have been lucky, almost certainly luckier than eight knowledge. They are probably optimistic by temperament, a survey of founders of small businesses concluded that the entrepreneurs are more sanguine than mid-level managers about life in general. Their experiences of success have confirm their faith in their judgment and in their ability to control of events. There self-confidence is reinforced by the admiration of others. This reasoning leads to a hypothesis: the people who have the greatest influence on the lives of others are likely to be optimistic and overconfident, and to take more risks than they realize.
- Overall, the return on private invention was small, "lower than the return on private equity and on high risk securities." More generally, the financial benefits of self-employment are mediocre: given the same qualifications, people achieve higher average returns by selling their skills to

employers rather than setting out on their own. The evidence suggests that optimism is widespread, stubborn and costly.

- For number of years, professor at Duke University conducted a survey in which the chief financial officers of large corporations estimated the returns of the standard and poor's index over the following year. The Duke scholars collected 11,600 such forecasts and examined their accuracy. The conclusion was straightforward: financial officers of large corporations had no clue about the short-term future of the stock market; the correlation between the estimates and the true value was slightly less than zero! When they said the market would go down, it was slightly more likely than not that it would go up. These findings were not surprising. The truly bad news is that the CFOs did not appear to know that their forecasts were worthless.
- Organizations may be better able to tame optimism and individuals than individuals are. The best idea for doing so was contributed by Gary Klein, my "adversarial collaborator" who generally defends intuitive decision-making against claims of bias and is typically hostile to algorithms. He labels his proposal the premortem. The procedure is simple: when the organization has almost come to an important decision but has not formally committed itself, Klein proposes gathering for a brief session a group of individuals who are knowledgeable about the decision. The premise of the session is short speech: "imagine that we are a year into the future. We implemented the plan and now it exists. The outcome was a disaster. Please take 5 to 10 minutes to write a brief history of that disaster."
- Gary Klein's idea of the premortem usually invokes immediate enthusiasm. After I described it casually at a session, some of the Hymie muttered, "it was worth coming here just for this!" (I later noticed that the speaker was the CEO of a major international corporation.") The premortem has two main advantages: it overcomes the groupthink that affects many teams once a decision appears to have been made, and it unleashes the imagination of knowledgeable individuals in much-needed direction. As a team converges on the decision, and especially when the leader tips their hand—public doubts about the wisdom of the planned move are gradually suppressed and eventually come to be treated as evidence of flawed loyalty to the team and its leaders. The suppression of doubt contributes to overconfidence in the group where only supporters of the decision have a voice. The main virtue of the premortem is that it legitimizes doubts. Furthermore, and encourages even supporters of the decision to search for possible threats that they have not considered earlier. The premortem is not a panacea and does not provide complete protection against nasty surprises, but it goes some way towards reducing the damage of the plans that are subject to biases and uncritical optimism.

Part four: choices.

Chapter 25: Bernoulli's Errors.

- Bernoulli's essay is a marvel of concise brilliance. He applies his new concept of expected utility (which he called "moral expectation") to compute how much a merchant in St. Petersburg would be willing to pay it to ensure a shipment of spice from Amsterdam if "he is well aware of the fact that at this time of the year 100 ships which sell from Amsterdam to Petersburg, five are usually lost." There's utility function explained why poor people buy insurance and why richer people sell it to them. As you can see in the table, the loss of 1 million causes a loss of four points of utility—from 100 to 96—to someone who has 10 million and a much larger loss of 18 points to

someone who starts off with 3 million. The poor man will happily pay a premium to transfer the risk to the richer one, which is what insurance is about.

- To predict the subjective experience of loudness, it is not enough to know its absolute energy, you also need to know they reference sound to which it is automatically compared.

Chapter 26: prospect theory.

- A theory in which utilities were attached to the changes of wealth rather than to states of wealth.

Chapter 27: the endowment effect.

Chapter 28: bad events.

- “Bad emotions, bad parents, and bad feedback have more important impact than good ones, and bad information is processed more thoroughly than good. The self is more motivated to avoid bad self definitions than to pursue good ones. Bad impressions and bad stereotypes are quicker to form and more resistant to the disconfirmation than good ones.”
- They cite John Gottman, the well-known expert in marital relations, who observed that the long-term success of a relationship depends far more on avoiding the negative than on seeking the positive. Gottman estimated that a stable relationship requires that good interactions outnumber bad interactions by at least 5 to 1.
- Loss aversion refers to the relative strengths of two motives: we are driven more strongly to avoid losses than to achieve gains.
- Golf players were more successful when putting for par than for birdie. The difference in the array of success when going for par to avoid a bogey or for a birdie was 3.6%. This difference is not trivial. Tiger Woods was one of the participants in their study. If in his best years Tiger Woods had managed to pot as well for birdies as he did for par, his average toward them and score would have improved by one stroke and his earnings by almost 1,000,000 per season.
- “They would find it easier to renegotiate the agreement if they realized the pot was actually expanding. They’re not allocating losses, they are allocating gains.

Chapter 29: the fourfold pattern.

- The improvement from 95% to 100% is another qualitative change that has a large impact, the certainty effect. Outcomes that are almost there and are given less weight than their probability justifies. To appreciate the certainty effect, imagine that you inherited \$1 million, but your greedy stepsister has contested the win in court. The decision is expected tomorrow. Your lawyer assures you that you have a strong case and that you have a 95% chance to win, but he pains to remind you that the judicial decisions are never perfectly predictable. Now you are approached by every risk adjustment company, which offers to buy or case for \$910,000 outright—take it or leave it. The offer is lower by \$40,000 than the expected value of waiting for the judgment, which is \$950,000, but are you quite sure that you would reject it? If such an event actually happens in your life, you should know that a large industry of structured settlements exist to provide certainty at a hefty price, by taking advantage of the certainty effect.

Chapter 30: rare events

- The story, I believe is that a rich and vivid representation of the outcome, whether or not it is emotional, reduces the role of the probability in the evaluation of an uncertain prospect. This hypothesis suggests that a prediction, in which I have reasonably high confidence: adding relevant but vivid details to a monetary outcome also disrupts calculation. Compare your cash equivalents for the following outcomes:
 - 21% (or 84%) chance to receive \$59 next Monday.
 - 21% (or 84%) chance to receive a large blue cardboard envelope containing \$59 and that Monday morning.
- The new hypothesis is that there will be less sensitivity to probability in the second case, because the blue envelope invokes a richer and more fluent representation than the abject notion of the sum of money.
- The idea that fluency, vividness and the ease of imagining contribute to decision weights gains support from many other observations. Participants in the well-known experiment are given the choice of drawing a marble from one of two urns, in which red marbles win a prize:
 - Urn A contains 10 marbles, of which one is red.
 - Urn B contains 100 marbles, which eight are red.
- Which urn would you choose? The chances of winning are 10% in urn A and 8% in B, so making the right choice should be easy, but it's not: about 30-40% of students choose the urn with the larger number of winning marbles, rather than the urn that provides a better chance of winning.
- The effect of the frequency format is large. In one study, people who saw information about a disease that kills 1286 people out of every 10,000 judged it as more dangerous than people who were told about "a disease that kills 24% of the population." The first disease appears more threatening than the second, although the former risk is only half as large as the latter!

Chapter 31: risk policies.

Chapter 32: keeping score.

- Two avid sports fans plan to travel 40 miles to see a basketball game. One of them paid for his ticket; the other was on his way to purchase a ticket when he got one free from a friend. A blizzard is announced for the night of the game. Which of the two ticket holders is more likely to brave the blizzard to see the game?
- The answer is immediate: we know that the fan who paid for his ticket is more likely to drive. Mental accounting provides the explanation. We assume that both fans set up an account for the game they hope to see. Missing the game will close the counts with a negative balance. Regardless of how they came by their ticket, both will be disappointed—but the closing balance is distinctly more negative for the one who bought the ticket and is now out of pocket as well as deprived from the game. Because staying home is worse for this individual, he is more motivated to see the game and therefore more likely to make the attempt to drive into a blizzard. These are tacit calculations of emotional balance, the kind that system one performs without deliberation. Emotions that people attach to the state of their mental accounts are not knowledgeable in the standard economic theory. An Econ would realize that the ticket has already been paid for and cannot be returned. It's cost is

sunk and the Econ would not care whether he had bought the ticket to the game or got it from a friend.

- If the problem is framed as a choice between giving yourself pleasure and causing yourself pain, you will certainly sell blueberry tiles and enjoy your investment prowess. As might be expected, finance research has documented a massive preference for selling winners than losers— a bias that has been given an opaque label: the disposition of fact.
- A rational decision maker is interested only in the future consequences of current investments. Testifying earlier mistakes is not among the Econ’s concerns.
- Imagine a company that has already spent \$50 million on a project. The project is now behind schedule and the forecasts of its ultimate return are less than favorable than the initial planning stage. An additional investment of \$60 million is required to give the project a chance. An alternate proposal is to invest the same amount in a new project that currently looks likely to bring higher returns. What will the company do? All too often a company of slick did by sunk costs dives into the blizzard, throwing good money after bad rather than accepting the humiliation of closing the account of a costly failure. The situation is in the top right sell the forefront’s pattern, page 317, where the choice is between a sure loss and an unfavorable gamble, which is often unwisely preferred.
- The escalation of commitment to failing endeavors is a mistake from the perspective of the firm but not necessarily from the perspective of the executive who owns a floundering project. Canceling the project will leave a permanent stain on the executive’s record, and his personal interests are best served by gambling further with the organization’s research in hopes of recouping the original investment.
- To appreciate the link of regret to normality, 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.
 - Who of the two will experience greater regret over the episode?
- The results are not surprising: 88% of the respondents said Mr. Brown, 12% said Mr. Smith. Regret is not the same as blame. Other participants were asked this question about the same incident: “who will be criticized the most severely by others?” The results: Mr. Brown 23%, Mr. Smith 77%.
- Losses are weighted about twice as much as gains in several contexts.
- Daniel Gilbert and his colleagues proactively claim that people generally anticipate more regret than they will actually experience, because they underestimate the efficacy of the psychological defenses they will deploy e—which they label the psychological immune system. Their recommendation is that you should not put too much weight on regret; even if you have a Psalm, it will hurt less than you think now.

Chapter 33: reversals.

Chapter 34: frames and reality.

- The credit card lobby pushed hard to make differential pricing illegal, but it had a fallback position: the difference, if allowed, would be labeled a cash discount, not a credit surcharge. Their psychology was sound: people will be more readily forego a discount than pay a surcharge.
- The remarkable results illustrate the potential of the new discipline of neoeconomics.

- An experiment that almost carried out with his colleagues at Harvard Medical School is a classic example of emotional framing. Physician participants were given statistics about the outcomes of two treatments for lung cancer: surgery and radiation. The five-year survival rates clearly favor surgery, or in the short-term surgery is riskier than radiation. Half the participants read statistics about survival rates, the other received the same information in terms of mortality rates.
- These enormous differences are a framing effect, which is caused by the format of the critical question. The high donation countries have an opt-out form, where individuals who wish not to donate must check an appropriate box. Unless they take this simple action, they are considered willing donors. The low contribution countries have an opt-in form: you must check a box to become a donor. That is all. The best single predictor of whether or not people will donate their organs is the designation of a default option that will be adopted without having to check a box.

Part 5: Two Selves.

Chapter 35: 2 selves.

- Peak and rule: the global retrospective rating was well predicted by the average of the level of pain reported at the worst moment of the experience and at its end.
- Duration neglect: the duration of the procedure had no effect whatsoever on the rating of the total pain.

Chapter 36 life as a story.

Chapter 37 experienced well-being.

- Here we found one of the few contrasts between French and American women: French women spend less time with their children but enjoy it more, perhaps because they have more access to childcare and spend less of the afternoon driving children to various activities.
- The feelings associated with different activities suggest that another way to improve experience is to switch time from passive leisure, such as TV watching, to more active forms of leisure, including socializing and exercise.

Chapter 38: thinking about life.

- At the participants found a dime on the copying machine, planted there by the experimenter. All participants then completed a questionnaire about their life satisfaction. The lucky ones who had just found a dime were much more satisfied with their life as a whole! A mood heuristic is one way to answer life satisfaction questions.

Conclusion