

was considered useful to the war effort. The family escaped to unoccupied France and spent the rest of the war in hiding and on the run. His father died in 1944, and 12-year-old Danny moved to Palestine with his mother two years later.

Kahneman thought of becoming a physicist or economist, but he ended up studying math and psychology at Hebrew University in Jerusalem. He finished his B.A. at the age of 20. Having survived so many horrors, he had already developed a deep distrust of things that others take for granted—the notion that humans are rational, the confidence that knowledge can solve all problems, even the belief that there's a God. He entered the work force as an unorthodox thinker determined to challenge the status quo. In 1955, as a skinny 21-year-old in the Israeli army, he saw that the psychological screening system for recruits was a mess; new soldiers designated as officer material often weren't, while many of those on combat duty should have been peeling potatoes. Kahneman set out to overhaul the system.

"From the beginning, Danny was different," says his assistant on that project, Mina Zemach, now Israel's top political pollster. "He thought like an outsider." In the 1950s, Israel was a frontier society, and many men wore their shirts unbuttoned. Kahneman insisted on wearing a tie. "If I leave my shirt open," Zemach recalls him saying, "people will look at my chest when I interview them. I want them to look at my eyes." After months of interviews, Kahneman replaced the old method of haphazard, subjective questioning with a standardized survey—systematically rating recruits on six factors like aggressiveness and masculine pride. His system was so effective that, with some modifications, the Israeli army used it for decades.

Kahneman went on to earn a Ph.D. at Berkeley, studying statistics, the psychology of visual perception—why things look the way they do—and how people interact in groups. Then, at 27, he returned to Hebrew University to teach statistics and psychology. One former student recalls that Kahneman's notes for his dazzlingly diverse lectures consisted of a few words scribbled on a cigarette pack on his way to class. "Danny was exhilarating," says Michael Kubovy, now a psychology professor at the University of Virginia. "He thinks in a way that imports ideas from everywhere."

Kahneman captured his first great insight by observing his own students. In the late 1960s, he was teaching a class on the psychology of training to flight instructors in the Israeli air force. Concerned at how the instructors screamed obscenities and pummeled trainees' helmets until they cried, Kahneman told his class that research on pigeons showed reward to be a better motivator than punishment. One flight instructor burst out, "With all due respect, sir, what you're saying is for the birds." He heatedly told Kahneman that trainees almost always did worse on their next flight if they'd been praised—and tended to fly better just after getting yelled at.

Kahneman was dumbstruck. He realized he was staring into the face of a profound misperception: The flight instructor believed that his own praise or criticism caused the trainee's performance to reverse. In reality, Kahneman knew, chance alone dictates that an unusually good or bad event is typically followed by a much more ordinary one—what statisticians call "regression to the mean."

Regression also explains why hot funds go cold and why the Nasdaq, after doubling in 1998 and 1999, has imploded. But, like the Israeli flight instructor, most investors fail to see how powerful a force regression is. We know in theory that "what goes up must come down"—but, as Kahneman saw that day, we vehemently resist recognizing it in practice.

In 1969, Kahneman asked Amos Tversky, also a Hebrew University psychology professor, to visit his class. Tversky insisted in his lecture that the average person, while flawed, is basically rational in appraising risks and calculating odds. "I just don't believe it!" exclaimed Kahneman, and after class he and Tversky retreated for lunch. By the time they'd polished off their appetizers, Tversky saw Kahneman's point—and was raising him. Volleying ideas at each other in an inspired frenzy, they speculated that people use mental shortcuts to estimate probabilities and predict risks. Over the next decade, they ran dozens of experiments that confirmed their lunchtime hypotheses.

• **We base long-term decisions on short-term information.** The

"law of large numbers" holds that only a vast sample of data (a nationwide poll, say) can give an accurate picture of the population it's drawn from. But Kahneman and Tversky found that the typical person acts on what they christened the "law of small numbers"—basing broad predictions on narrow samples of data. For instance, we buy a fund that's beaten the market three years in a row, convinced it's "on a hot streak"—even though a mountain of research shows that three-quarters of all funds underperform in the long run. And many investors concluded in 1999 that growth stocks would clobber value stocks indefinitely, since they'd done so for five—yes, five!—years running. Sure enough, value stocks trounced growth by more than 28 percentage points last year.

• **If something is easy to recall, we think it happens more often than it does.** Kahneman and Tversky had people listen to a list of male and female names, both famous and obscure, and then recall whether it contained more men or women. When more of the famous names were female, 81% of people concluded that women made up more than half the list—when, in fact, there were more men on the list.

Likewise, it's easy to recall initial public offerings that have been famously lucrative, like Cisco and Microsoft. Yet IPOs that fizzle—like, say, 3DO Co. or Quarterdeck Software—vastly outnumber those that sizzle. Historically, IPOs have actually underperformed the rest of the stock market by three

**"All of us would be
BETTER
INVESTORS
if we just made fewer
decisions," declares
Kahneman.**

to five percentage points a year, but many gung-ho investors fail to recognize that the majority of new stocks are stinkers.

• **When estimating future values, we “anchor” our projections on any number that happens to be handy.** In one experiment, Kahneman and Tversky asked people to estimate various statistics, such as the percentage of African countries in the United Nations. Before each person guessed, the researchers spun a “wheel of fortune” to generate a number between 0 and 100. When the wheel landed on a low number, people tended to guess that African nations made up a small percentage of UN members; when it landed on a high number, they guessed that Africa accounted for much more of the UN’s membership.

Experiments like this prove that the mere suggestion of an outside number is enough to distort people’s views. That’s just what happens when an analyst publicizes a price target for a stock. Such targets often are utter garbage—but investors still “anchor” on them. On Dec. 29, 1999, PaineWebber analyst Walter Piccyk slapped a 12-month target of \$250 (split-adjusted) on Qualcomm. That day, the stock soared 31% to \$165, as investors headed toward Piccyk’s anchor. But 12 months later, Qualcomm had belly flopped to \$82, 67% below his target; it now wallows around \$50.

THE ODD COUPLE

Pushing ahead with their experiments, Kahneman and Tversky were on fire with what they had found. “Their eyes shone,” says former student Maya Bar-Hillel, now a leading psychologist at Hebrew University. “It was hard to believe that serious work could be so much fun. Danny and Amos never stopped talking about it.”

The two men were like an academic Odd Couple. Tversky was a math wizard with deep, focused knowledge; Kahneman had brilliant instincts and broad interests. Tversky kept nothing on his desk but an expensive pen and one sheet of paper on which he’d scrawl equations from memory, says a former student, while “Danny was always messy and panicked. He constantly couldn’t find things.”

In the late ’70s and early ’80s, they focused on how people perceive risks. Economists had long argued that a rational person will wager an equal amount for the chance to win \$100 or avoid a \$100 loss. After all, either gamble leaves you \$100 better off. But Kahneman and Tversky showed that most people don’t think that way. Try one of their experiments yourself: Imagine a coin toss in which you’d lose \$100 if tails

For his own investing, Kahneman favors index funds: “I don’t try to be clever at all.”

came up. How much would you have to win on heads to be willing to take the bet? Most people insist on at least \$200. The lesson: Losing \$100 feels roughly twice as painful as gaining \$100 feels pleasant.

In fact, Kahneman and Tversky concluded that we hate losses so much that we make inconsistent gambles in the hope of avoiding them. Their findings help explain, for example, why people tend to sell their winning stocks too early, while holding on to losers for too long: We want to lock in a sure gain before something jeopardizes it, but we’ll hang on to a losing stock in a bet that it will eventually break into the black.

Kahneman and Tversky’s proofs of the pain of loss also show why more investors don’t stake all their money on stocks. History suggests that stocks should outperform bonds over any period of 30 years—but few of us bet every cent on stocks. That’s because the short-term pain of owning them in a disastrous year like 2000 overwhelms our perception of the long-term gain they should eventually produce.

KAHNEMAN’S COMMANDMENTS

Today, five years after Tversky’s death, Kahneman is as intense as ever. When I ask him what he plans to do in retirement, he shudders visibly and says, “I don’t want to think about that at all.” The study in his Princeton home is ankle-deep

