THE WISDOM OF CROWDS

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ANCHOR BOOKS
A Division of Random House, Inc.
New York

INTRODUCTION

1

One day in the fall of 1906, the British scientist Francis Galton left his home in the town of Plymouth and headed for a country fair. Galton was eighty-five years old and beginning to feel his age, but he was still brimming with the curiosity that had won him renown—and notoriety—for his work on statistics and the science of heredity. And on that particular day, what Galton was curious about was livestock.

Galton's destination was the annual West of England Fat Stock and Poultry Exhibition, a regional fair where the local farmers and townspeople gathered to appraise the quality of each other's cattle, sheep, chickens, horses, and pigs. Wandering through rows of stalls examining workhorses and prize hogs may seem to have been a strange way for a scientist (especially an elderly one) to spend an afternoon, but there was a certain logic to it. Galton was a man obsessed with two things: the measurement of physical and mental qualities, and breeding. And what, after all, is a livestock show but a big showcase for the effects of good and bad breeding?

Breeding mattered to Galton because he believed that only a very few people had the characteristics necessary to keep societies healthy. He had devoted much of his career to measuring those characteristics, in fact, in order to prove that the vast majority of

people did not have them. At the International Exhibition of 1884 in London, for instance, he set up an "Anthropometric Laboratory," where he used devices of his own making to test exhibition-goers on, among other things, their "Keenness of Sight and of Hearing, Colour Sense, Judgment of Eye, [and] Reaction Time." His experiments left him with little faith in the intelligence of the average person, "the stupidity and wrong-headedness of many men and women being so great as to be scarcely credible." Only if power and control stayed in the hands of the select, well-bred few, Galton believed, could a society remain healthy and strong.

As he walked through the exhibition that day, Galton came across a weight-judging competition. A fat ox had been selected and placed on display, and members of a gathering crowd were lining up to place wagers on the weight of the ox. (Or rather, they were placing wagers on what the weight of the ox would be *after* it had been "slaughtered and dressed.") For sixpence, you could buy a stamped and numbered ticket, where you filled in your name, your address, and your estimate. The best guesses would receive prizes.

Eight hundred people tried their luck. They were a diverse lot. Many of them were butchers and farmers, who were presumably expert at judging the weight of livestock, but there were also quite a few people who had, as it were, no insider knowledge of cattle. "Many non-experts competed," Galton wrote later in the scientific journal *Nature,* "like those clerks and others who have no expert knowledge of horses, but who bet on races, guided by newspapers, friends, and their own fancies." The analogy to a democracy, in which people of radically different abilities and interests each get one vote, had suggested itself to Galton immediately. "The average competitor was probably as well fitted for making a just estimate of the dressed weight of the ox, as an average voter is of judging the merits of most political issues on which he votes," he wrote.

Galton was interested in figuring out what the "average voter" was capable of because he wanted to prove that the average voter was capable of very little. So he turned the competition into an im-

promptu experiment. When the contest was over and the prizes had been awarded, Galton borrowed the tickets from the organizers and ran a series of statistical tests on them. Galton arranged the guesses (which totaled 787 in all, after he had to discard thirteen because they were illegible) in order from highest to lowest and graphed them to see if they would form a bell curve. Then, among other things, he added all the contestants' estimates, and calculated the mean of the group's guesses. That number represented, you could say, the collective wisdom of the Plymouth crowd. If the crowd were a single person, that was how much it would have guessed the ox weighed.

Galton undoubtedly thought that the average guess of the group would be way off the mark. After all, mix a few very smart people with some mediocre people and a lot of dumb people, and it seems likely you'd end up with a dumb answer. But Galton was wrong. The crowd had guessed that the ox, after it had been slaughtered and dressed, would weigh 1,197 pounds. After it had been slaughtered and dressed, the ox weighed 1,198 pounds. In other words, the crowd's judgment was essentially perfect. Perhaps breeding did not mean so much after all. Galton wrote later: "The result seems more creditable to the trustworthiness of a democratic judgment than might have been expected." That was, to say the least, an understatement.

II

What Francis Galton stumbled on that day in Plymouth was the simple, but powerful, truth that is at the heart of this book: under the right circumstances, groups are remarkably intelligent, and are often smarter than the smartest people in them. Groups do not need to be dominated by exceptionally intelligent people in order to be smart. Even if most of the people within a group are not especially well-informed or rational, it can still reach a collectively wise

decision. This is a good thing, since human beings are not perfectly designed decision makers. Instead, we are what the economist Herbert Simon called "boundedly rational." We generally have less information than we'd like. We have limited foresight into the future. Most of us lack the ability—and the desire—to make sophisticated cost-benefit calculations. Instead of insisting on finding the best possible decision, we will often accept one that seems good enough. And we often let emotion affect our judgment. Yet despite all these limitations, when our imperfect judgments are aggregated in the right way, our collective intelligence is often excellent.

This intelligence, or what I'll call "the wisdom of crowds," is at work in the world in many different guises. It's the reason the Internet search engine Google can scan a billion Web pages and find the one page that has the exact piece of information you were looking for. It's the reason it's so hard to make money betting on NFL games, and it helps explain why, for the past fifteen years, a few hundred amateur traders in the middle of Iowa have done a better job of predicting election results than Gallup polls have. The wisdom of crowds has something to tell us about why the stock market works (and about why, every so often, it stops working). The idea of collective intelligence helps explain why, when you go to the convenience store in search of milk at two in the morning, there is a carton of milk waiting there for you, and it even tells us something important about why people pay their taxes and help coach Little League. It's essential to good science. And it has the potential to make a profound difference in the way companies do business.

In one sense, this book tries to describe the world as it is, looking at things that at first glance may not seem similar but that are ultimately very much alike. But this book is also about the world as it might be. One of the striking things about the wisdom of crowds is that even though its effects are all around us, it's easy to miss, and, even when it's seen, it can be hard to accept. Most of us, whether as voters or investors or consumers or managers, believe that valuable knowledge is concentrated in a very few hands

(or, rather, in a very few heads). We assume that the key to solving problems or making good decisions is finding that one right person who will have the answer. Even when we see a large crowd of people, many of them not especially well-informed, do something amazing like, say, predict the outcomes of horse races, we are more likely to attribute that success to a few smart people in the crowd than to the crowd itself. As sociologists Jack B. Soll and Richard Larrick put it, we feel the need to "chase the expert." The argument of this book is that chasing the expert is a mistake, and a costly one at that. We should stop hunting and ask the crowd (which, of course, includes the geniuses as well as everyone else) instead. Chances are, it knows.

III

Charles Mackay would have scoffed at the idea that a crowd of people could know anything at all. Mackay was the Scottish journalist who, in 1841, published *Extraordinary Popular Delusions and the Madness of Crowds,* an endlessly entertaining chronicle of mass manias and collective follies, to which the title of my book pays homage. For Mackay, crowds were never wise. They were never even reasonable. Collective judgments were doomed to be extreme. "Men, it has been well said, think in herds," he wrote. "It will be seen that they go mad in herds, while they only recover their senses slowly, and one by one." Mackay's take on collective madness is not an unusual one. In the popular imagination, groups tend to make people either dumb or crazy, or both. The speculator Bernard Baruch, for instance, famously said: "Anyone taken as an individual is tolerably sensible and reasonable—as a member of a crowd, he at once becomes a blockhead." Henry David Thoreau lamented: "The mass never comes up to the standard of its best member, but on the contrary degrades itself to a level with the lowest." Friedrich Nietzsche wrote, "Madness is the exception in indi-

viduals but the rule in groups," while the English historian Thomas Carlyle put it succinctly: "I do not believe in the collective wisdom of individual ignorance."

Perhaps the most severe critic of the stupidity of groups was the French writer Gustave Le Bon, who in 1895 published the polemical classic *The Crowd: A Study of the Popular Mind.* Le Bon was appalled by the rise of democracy in the West in the nineteenth century, and dismayed by the idea that ordinary people had come to wield political and cultural power. But his disdain for groups went deeper than that. A crowd, Le Bon argued, was more than just the sum of its members. Instead, it was a kind of independent organism. It had an identity and a will of its own, and it often acted in ways that no one within the crowd intended. When the crowd did act, Le Bon argued, it invariably acted foolishly. A crowd might be brave or cowardly or cruel, but it could never be smart. As he wrote, "In crowds it is stupidity and not mother wit that is accumulated." Crowds "can never accomplish acts demanding a high degree of intelligence," and they are "always intellectually inferior to the isolated individual." Strikingly, for Le Bon, the idea of "the crowd" included not just obvious examples of collective wildness, like lynch mobs or rioters. It also included just about any kind of group that could make decisions.

So Le Bon lambasted juries, which "deliver verdicts of which each individual juror would disapprove." Parliaments, he argued, adopt laws that each of their members would normally reject. In fact, if you assembled smart people who were specialists in a host of different fields and asked them to "make decisions affecting matters of general interest," the decisions they would reach would be no better, on the whole, than those "adopted by a gathering of imbeciles."

Over the course of this book, I follow Le Bon's lead in giving the words "group" and "crowd" broad definitions, using the words to refer to everything from game-show audiences to multibillion-dollar corporations to a crowd of sports gamblers. Some of the groups in

this book, like the management teams in Chapter 9, are tightly organized and very much aware of their identities as groups. Other crowds, like the herds of cars caught in traffic that I write about in Chapter 7, have no formal organization at all. And still others, like the stock market, exist mainly as an ever-changing collection of numbers and dollars. These groups are all different, but they have in common the ability to act collectively to make decisions and solve problems—even if the people in the groups aren't always aware that's what they're doing. And what is demonstrably true of some of these groups—namely, that they are smart and good at problem solving—is potentially true of most, if not all, of them. In that sense, Gustave Le Bon had things exactly backward. If you put together a big enough and diverse enough group of people and ask them to "make decisions affecting matters of general interest," that group's decisions will, over time, be "intellectually [superior] to the isolated individual," no matter how smart or well-informed he is.

IV

Judging the weight of an ox is hardly a complex task. But, as I suggested above, collective intelligence can be brought to bear on a wide variety of problems, and complexity is no bar. In this book, I concentrate on three kinds of problems. The first are what I'll call *cognition* problems. These are problems that have or will have definitive solutions. For example, "Who will win the Super Bowl this year?" and "How many copies of this new ink-jet printer will we sell in the next three months?" are cognition problems. So, too, is "How likely is it that this drug will be approved by the FDA?" Questions to which there may not be a single right answer, but to which some answers are certainly better than others—such as, "What would be the best place to build this new public swimming pool?"—are cognition problems, too.

The second kind of problem is what's usually called a *coordi-*

nation problem. Coordination problems require members of a group (market, subway riders, college students looking for a party) to figure out how to coordinate their behavior with each other, knowing that everyone else is trying to do the same. How do buyers and sellers find each other and trade at a fair price? How do companies organize their operations? How can you drive safely in heavy traffic? These are all problems of coordination.

The final kind of problem is a *cooperation* problem. As their name suggests, cooperation problems involve the challenge of getting self-interested, distrustful people to work together, even when narrow self-interest would seem to dictate that no individual should take part. Paying taxes, dealing with pollution, and agreeing on definitions of what counts as reasonable pay are all examples of cooperation problems.

A word about structure. The first half of this book is, you might say, theory, although leavened by practical examples. There's a chapter for each of the three problems (cognition, coordination, and cooperation), and there are chapters covering the conditions that are necessary for the crowd to be wise: diversity, independence, and a particular kind of decentralization. The first half begins with the wisdom of crowds, and then explores the three conditions that make it possible, before moving on to deal with coordination and cooperation.

The second part of the book consists of what are essentially case studies. Each of the chapters is devoted to a different way of organizing people toward a common (or at least loosely common) goal, and each chapter is about the way collective intelligence either flourishes or flounders. In the chapter about corporations, for instance, the tension is between a system in which only a few people exercise power and a system in which many have a voice. The chapter about markets starts with the question of whether markets can be collectively intelligent, and ends with a look at the dynamics of a stock-market bubble.

There are many stories in this book of groups making bad

decisions, as well as groups making good ones. Why? Well, one reason is that this is the way the world works. The wisdom of crowds has a far more important and beneficial impact on our everyday lives than we recognize, and its implications for the future are immense. But in the present, many groups struggle to make even mediocre decisions, while others wreak havoc with their bad judgment. Groups work well under certain circumstances, and less well under others. Groups generally need rules to maintain order and coherence, and when they're missing or malfunctioning, the result is trouble. Groups benefit from members talking to and learning from each other, but too much communication, paradoxically, can actually make the group as a whole less intelligent. While big groups are often good for solving certain kinds of problems, big groups can also be unmanageable and inefficient. Conversely, small groups have the virtue of being easy to run, but they risk having too little diversity of thought and too much consensus. Finally, Mackay was right about the extremes of collective behavior: there are times—think of a riot, or a stock-market bubble—when aggregating individual decisions produces a collective decision that is utterly irrational. The stories of these kinds of mistakes are negative proofs of this book's argument, underscoring the importance to good decision making of diversity and independence by demonstrating what happens when they're missing.

Diversity and independence are important because the best collective decisions are the product of disagreement and contest, not consensus or compromise. An intelligent group, especially when confronted with cognition problems, does not ask its members to modify their positions in order to let the group reach a decision everyone can be happy with. Instead, it figures out how to use mechanisms—like market prices, or intelligent voting systems—to aggregate and produce collective judgments that represent not what any one person in the group thinks but rather, in some sense, what they all think. Paradoxically, the best way for a group to be

smart is for each person in it to think and act as independently as possible.

V

I began this Introduction with an example of a group solving a simple problem: figuring out the weight of an ox. I'll end it with an example of a group solving an incredibly complex problem: locating a lost submarine. The differences between the two cases are immense. But the principle in each is the same.

In May 1968, the U.S. submarine *Scorpion* disappeared on its way back to Newport News after a tour of duty in the North Atlantic. Although the navy knew the sub's last reported location, it had no idea what had happened to the *Scorpion,* and only the vaguest sense of how far it might have traveled after it had last made radio contact. As a result, the area where the navy began searching for the *Scorpion* was a circle twenty miles wide and many thousands of feet deep. You could not imagine a more hopeless task. The only possible solution, one might have thought, was to track down three or four top experts on submarines and ocean currents, ask them where they thought the *Scorpion* was, and search there. But, as Sherry Sontag and Christopher Drew recount in their book *Blind Man's Bluff,* a naval officer named John Craven had a different plan.

First, Craven concocted a series of scenarios—alternative explanations for what might have happened to the *Scorpion.* Then he assembled a team of men with a wide range of knowledge, including mathematicians, submarine specialists, and salvage men. Instead of asking them to consult with each other to come up with an answer, he asked each of them to offer his best guess about how likely each of the scenarios was. To keep things interesting, the guesses were in the form of wagers, with bottles of Chivas Regal as prizes. And so Craven's men bet on why the submarine ran into

trouble, on its speed as it headed to the ocean bottom, on the steepness of its descent, and so forth.

Needless to say, no one of these pieces of information could tell Craven where the *Scorpion* was. But Craven believed that if he put all the answers together, building a composite picture of how the *Scorpion* died, he'd end up with a pretty good idea of where it was. And that's exactly what he did. He took all the guesses, and used a formula called Bayes's theorem to estimate the *Scorpion*'s final location. (Bayes's theorem is a way of calculating how new information about an event changes your preexisting expectations of how likely the event was.) When he was done, Craven had what was, roughly speaking, the group's collective estimate of where the submarine was.

The location that Craven came up with was not a spot that any individual member of the group had picked. In other words, not one of the members of the group had a picture in his head that matched the one Craven had constructed using the information gathered from all of them. The final estimate was a genuinely collective judgment that the group as a whole had made, as opposed to representing the individual judgment of the smartest people in it. It was also a genuinely brilliant judgment. Five months after the *Scorpion* disappeared, a navy ship found it. It was 220 yards from where Craven's group had said it would be.

What's astonishing about this story is that the evidence that the group was relying on in this case amounted to almost nothing. It was really just tiny scraps of data. No one knew why the submarine sank, no one had any idea how fast it was traveling or how steeply it fell to the ocean floor. And yet even though no one in the group knew any of these things, the group as a whole knew them all.