Chance: A Guide to Gambling, Love, the Stock Market, and Just About Everything Else

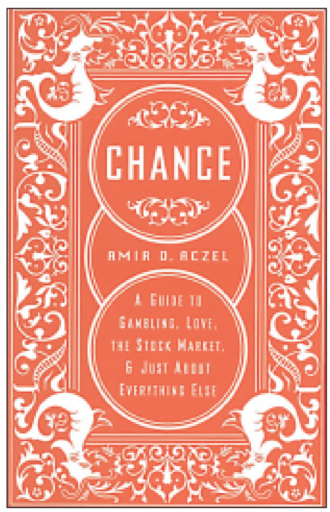
Reviewed by Rick Durrett

Chance: A Guide to Gambling, Love, the Stock Market, and Just About Everything Else
Amir D. Aczel
Thunder's Mouth Press, 2004
Hardcover, US$21.00
ISBN 1-56858-316-8

The inside flap at the back of this book says that Aczel is also the author of *Fermat's Last Theorem: Unlocking the Secret of an Ancient Mathematical Problem*, which has been translated into fifteen languages. I doubt if the book under review will be that successful. The first thing one notices about the book is that it is tiny. The text is 121 pages minus a dozen pages that are blank or have full-page figures, plus a 29-page appendix on gambling by coauthor Brad Johnson. The book's short length is matched by a small text width of 3.3 inches and text height of 5.5 inches, which is about 60 percent of the size of a small-footprint text such as those in the Springer Series in Statistics. When you divide the $21 cost by the number of characters, the ratio does not rise to that of [insert the name of your favorite evil publisher], but the book is hardly a bargain.

As Louie says at the end of the movie *Casablanca*, the book "rounds up the usual suspects." In addition to the standard definitions and formulae one needs to explain the subject, the book plays some of the greatest hits of the eighteenth century, the nineteenth century, and today. For the benefit of readers who may not be familiar with probability theory, "one of the most amazing inventions—or discoveries—of the human race,"

Rick Durrett is professor of mathematics at Cornell University. His email address is `rtd1@cornell.edu`.



I will tell some of these tales.

The Monty Hall Problem. Behind one of three curtains is a new car. You pick curtain #1. The emcee opens curtain #3 to show you a donkey. Should you switch to curtain #2? When this problem appeared in Marilyn vos Savant's column in *Parade* magazine, several hundred readers wrote to tell her in forceful terms that she was a moron—by symmetry the two remaining choices must have equal probability. Her answer, which is the correct one, is that before the emcee showed you curtain #3, your probability of winning was 1/3 and nothing has happened to change that, so curtain #2 must have probability 2/3.

Chevalier de Méré's Miscalculation. It is bad enough to make a mistake, such as overestimating the probability of weapons of mass destruction, but it is awful to have people talk about it for 250 years. Since $4/6 = 24/36$, our seventeenth-century French gambler thought that the probability of throwing a six in four attempts is the same as throwing a double six in twenty-four attempts. However, thinking in terms of the probability of not getting a success, we see the two probabilities are

$$1 - (5/6)^4 = 0.5177 > 0.4914 = 1 - (35/36)^{24},$$

explaining why he made money with the first bet and lost with the second.

Inspection Paradox. On the back cover we find the question: "Does the bus always seem to take longer than average to arrive? There's a mathematical reason for this." To see the reason, mark the bus arrival times as X's on a line. We pick a point at random from the line (= go to the bus stop at a randomly chosen time). The point falls in an interval between two X's, and that interval is chosen with probability proportional to its length. Thus the interval in which the point falls will be longer than the typical interval.

The Birthday Problem. What is the probability that in a class of twenty-five people two people will have the same birthday? This sounds rather unlikely until you realize that there are $25 \cdot 24/2 = 300$ pairs of people. If we pretend the events are independent, then the probability of no match is

$$(1 - 1/365)^{300} \approx \exp(-300/365) = .4395.$$

A more accurate computation shows that the exact probability is .4313.

How to Gamble If You Must. As Dubins and Savage explain in their book with this name, the best strategy to beat an unfavorable game is bold play. In other words, if you are down to \$10 and need to win enough at roulette to pay the \$1,280 rent on your outrageously expensive Collegetown apartment, the best strategy is to place a bet on red and hope you win seven times in a row. On the other hand, this ignores the benefit of getting a few free drinks as you lose your money gradually by betting \$1 at a time.

How to Find a Good Wife. To quote the book: "You will maximize the probability of finding the best spouse if you date a fraction e^{-1} of the available women and then choose to stay with the next candidate who is better than all of the ones you have seen before." This is usually formulated as the "secretary problem". The quoted algorithm results in picking the best individual with positive probability independent of the size of the set. However, in the romantic setting the rate of convergence is painfully slow.

As you can see from the stories I cited, there is some interesting material here. However, most of these stories can be found in other books. Aczel does a good job of telling these stories, but his treatment of the preliminaries is somewhat brief. His discussion is clear, but overall I feel that the book is a little light in content. A list of alternative books, many of which are better than the one under review, can be found on the Web page for David Aldous's freshman probability course at Berkeley, Stat 24: `http://www.stat.berkeley.edu/users/aldous/24/index.html`.