Two-person games, both zero-sum and non-zero sum are treated in some detail, with protagonists Carla and Ron, who become more and more fed up with each other as the sequence of games proceeds. ‘Perhaps Carla refuses to negotiate with Ron [in a non-zero-sum game based on ‘Chicken’], considering what has transpired when playing the previous two games.’ In this example, Ron wins 1 million dollars by being drunk and incapable of hitting the panic button, and Carla phones her lawyer and financial advisor. You can see from this that the book has its lighter side. It is replete with ‘paradoxes’; some are, as the book’s title suggests, in fact unexpected and counter-intuitive outcomes (Monty Hall or the St. Petersburg paradox for example), while others have two apparently convincing but contradictory explanations. (I have to say that paradoxes which depend for their effect on the existence of omnicient or near-omnicient beings who can predict your actions leave me rather unmoved.) Among the zero-sum games the author discusses solvability, which is the existence of an optimum strategy for both players. (He has an original spelling for ‘naughts and crosses’—a concession to British terminology but with a swipe at British spelling perhaps. Spelling and the use of apostrophes both seem to present significant challenges; all these blemishes, and some rather confusing misprints, should have been removed at the proof stage.) Checkers—draughts (droughts?)—has been proved solvable, and I learned that Jonathan Schaeffer produced a program ‘Chinook’ in 2007 which, so it is claimed, plays a perfect game. This program is available on the web.

The author points out that many of the games and paradoxes appear only too readily in real life situations. A painful example is ‘Chicken’—the Cuban missile crisis, or negotiations on the budget in the United States, for example—and a commonly occurring one is the ‘Prisoner’s dilemma’, which is given considerable space. Other examples given include ‘Parrando’s paradox’ whereby two games, each of which is a losing game for a player can, when combined suitably (or even randomly), produce a win. This leads to various curious situations of the ‘survival of the weakest’ kind. Another chapter is devoted to games of imperfect recall where information available at one stage of a game is subsequently forgotten or lost, closely modelling situations involving real people. There is a full discussion of Benford’s Law on the distribution of digits in many data-sets which have some property like scale invariance. This discussion includes applications to the detection of financial fraud.

Apart from its general interest this book contains much material which would be suitable for presentation to students at many levels of achievement. When full details are not included there are adequate references to the literature, and there is a good balance between mathematics and qualitative description.

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Readers may be familiar with the ‘very short introduction’ series – very small books, only 11cm by 17cm, and this one packs a lot into its 128 pages.

The publisher’s statement of the envisaged readership of books in the series says ‘... are for anyone wanting a stimulating and accessible way in to a new subject’.

REVIEWS
This book is certainly both stimulating and accessible, written by an academic expert in probability, already established as a reliable populariser of a difficult subject with his 1999 book, *Taking chances – winning with probability*.

Most of life is about making decisions under conditions of uncertainty, and the range of topics to which an understanding of probability can contribute is vast, much of which is covered in these pages. Since there is virtually no mathematics in the book, it must be for readers for whom mathematics in general may be a new venture. Even elementary bits of mathematics at about GCSE level would have made some of the exposition easier, and by not allowing himself even this luxury the author's task is even harder. It is easy for a mathematician to be irritated by this maths avoidance, but I have to admit that, in the main, the book works and is a very persuasive appetizer for those who would like to know more. For such a reader there is 'further reading', which includes Fellar, Savage and Kolmogorov as well as more popular texts, so willingness to travel up a steep learning curve is needed.

The first three chapters cover different interpretations of probability – frequentist, objective and degree of belief; the importance of mutual exclusiveness and independence with their associated addition and multiplication rules; the 'neat trick' of calculating $1 - \Pr(A)$ rather than $\Pr(A)$; the law (and strong law) of large numbers; the central limit theorem; and a whirlwind tour of the history of probability from gambling in 17th century Florence to the early 20th century, with interesting snippets such as Gorbachev cancelling his plans in order to attend Kolmogorov's funeral.

In chapter 4 we get more technical with the idea of a probability distribution and the various types of discrete and continuous distributions, but still all done verbally and graphically. There is an explanation of why certain situations should lead us to expect particular distributions, and a section on extreme value statistics – of topical interest in these days of extreme weather, financial collapse, etc.

Chapter 5 pursues the match, and sometimes the mis-match, between apparent and actual meanings of probabilistic statements. Some examples: a discussion of how headlines such as 'new drug cuts cancer risk in half' can be true but meaningless; a survey revealing four different (incorrect) interpretations by the public of 'there is a 30% chance of rain tomorrow'; the unreality of a 'law of averages' to suggest a head after nine tails; how our attitude should be different with respect to choosing between a guaranteed £10 or a 50% chance of £20 and choosing between a certain £10 000 000 or a 50% chance of £20 000 000. The idea of a utility function is of help in some of these situations but, as far as I could detect, the idea is hinted at but never actually defined.

Chapter 6 is all about games – lotteries, TV game shows, card games. The probabilistic features of all the examples are balanced by an entertaining account of their non-random and psychological aspects. Bayes' rule plays a part in poker hands, and non-transitivity gets a mention in pairwise preferences between hands.

Chapter 7 returns to more serious applications to science, medicine, genetics, operational research, queuing theory, batch testing and epidemiology. The roles of pseudo-random number generators and Monte Carlo methods are explained.

Chapter 8 mops up some remaining applications – to legal matters, randomised response to sensitive questions, drug testing in sport and the Black-Scholes equation. The final chapter mentions a few more apparent paradoxes and finally raises the important ethical issues centred on the question of whether we *should* do some of the things which modern probability theory makes it *possible* to do.
Before reading this book by John Haigh I would have said that most of this material was too dependent on mathematical sophistication to succeed with a non-technical audience. I am delighted to be proved wrong. Furthermore, it is a very entertaining read.

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So this physics teacher has an intelligent dog Emmy, and, in between assessing homework and working at his computer, he attempts to explain to her the theories of special and general relativity. Emmy is particularly interested in doggie-like things like catching bunnies as fast as she can and outwitting the neighbourhood cat, so she asks all sorts of searching questions which allow Chad to provide everyday models for modern physics. This is done without requiring any mathematical sophistication from his pet since, as we all know, dogs don't do sums. By the time the book is finished, Emmy understands about space-time and Feynman diagrams, has a grasp of particle physics and cosmology and appreciates the need for a grand unified theory which will explain both the very big and the very small.

That, in a nutshell, is what this book does. Its great merit is that this structure does enable the author to tackle a large number of misconceptions about relativity in a gentle Socratic dialogue. The many diagrams allow you to imagine observing the world from the viewpoint of various local dogs, cats and bunnies and thereby get a good feeling for the principle of relativity — so long, that is, as you can tell the dogs apart in the little pictures. The fundamental problem, for me, was what no doubt sells the book in the States — the lack of mathematics. As a result, I continually found myself filling in the gaps for myself and justifying the statements about time-dilation, space-contraction and relativistic dynamics. At the very least I would have appreciated an appendix which gave the mathematical framework so that I could be sure that my hazy memories of relativity from forty years ago were reasonably accurate. And often the deliberate avoidance of the mathematical model makes the concepts much harder to grasp; this is particularly true of the Lorentz transformation between the space-time diagrams of different observers, which is clearly just an affine map in four dimensions.

Of course, once you reach general relativity, even the most mathematically literate amateur is going to find a proper treatment too demanding unless their Riemannian geometry is up to scratch. Hence I found the second half of the book much more useful than the first, since the author is trying to explain very complex ideas to a lay audience and is remarkably successful in his efforts. In the final chapters we learn something about black holes, the Big Bang and the paradox of dark energy, and there is even a mention of string theory at the end.

I must admit that I was getting tired of the doggy theme as time passed, and I couldn't help suspecting that the text could have been cut by about 40% if the allusions to squirrels, kibble, belly rubs and bacon were cut. But there are many good things in it and, if you aren't a grumpy old spoilsport who ought to get a sense of humour, then you will probably enjoy it without any of these reservations.

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