Slicing Pizzas, Racing Turtles and Further Adventures in Applied Mathematics. Robert B. Banks. Princeton University Press, 41, William Street, Princeton, NJ 08540. USA. pp. 286. Price: US $15.95.

Expository books on mathematics are starting to appear in increasing numbers in the market and are gaining in popularity, with the recent saga of Fermat's 'last theorem' providing plenty of human interest. Books on mathematical personalities too are starting to appear (e.g. the books on Paul Erdős), and puzzle books and problem books seem to be in fairly good demand. However expository books where the accent is on applications of mathematics are quite rare. The book under review is one of the few of this kind.

In his preface, the author describes his book as 'a collection of topics characterized by two main features: the topics are easy to analyse using simple mathematics and for the most part, they deal with phenomena that we either run across in our everyday lives or can comprehend without too much trouble', and he goes on to list some of the questions he has tackled: (a) You need to get from here to there in a pouring rainstorm. To get least wet, should you walk slowly through the rain or run as fast as you (possibly) can? (b) The number of people in the world is approximately 6.0 billion as we begin the new century. Is this a large percentage or a small percentage of the number of people who have ever lived on earth? (c) The colours of America's flag are, of course, red, white, and blue. Which of the three colours occupies the largest area of the flag and which colour the smallest? (d) How many golf balls could you put into an entirely empty Washington Monument? (e) What is the length of the seam on a baseball or the groove on a tennis ball?

And there are other questions of this kind. The author seems to have made a habit of this genre of writing: this book is a sequel to an earlier volume titled *Towing Icebergs, Falling Dominoes, and Other Adventures in Applied Mathematics.*

The author has certainly succeeded in his aim – the result is a wonderful book! What makes the reader's task really enjoyable is the author's use of language: it is simple, lucid, and full of tongue-in-cheek wit and humour. The chapter/section titles are chosen with care, and the use of diagrams and graphical displays is good. There is an impressive reference section, with more than one hundred titles, and at the end of each chapter (sometimes at the end of each section) there are thoughtfully made suggestions for further reading. The index has been made well. All in all, the author has done a very imaginative and thorough job, and the reader certainly comes away with a good initiation into applied mathematics. High school readers will have much to learn from the book, though in parts the mathematics may seem somewhat daunting.

Some chapters are particularly readable; the best, perhaps, is Chapter 6, *Which Major Rivers Flow Uphill?* The interpretation of 'uphill' is most novel, and the chapter is a pleasure to read. (If you are intrigued by this question, then perhaps this review will entice you into reading the book!) Chapter 22 provides an excellent introduction to the fascinating topic of map projections and chapter 23 has a nice discussion on population growth and the logistic equation.

Chapters 10, 11 and 15 are good, and also chapters 8 and 9 on π, e, i and other 'famous numbers'. The author's interpretation of the equation $e^{\pi i} = -1$ is indeed novel: the slow 'strangulation' of the number –1 by the infinite series $1 + i\pi - \pi^2/2 - i\pi^3/6 + \pi^4/24 - \cdots$ (this is titled 'How to strangle a negative number'). Several questions of the kind known in some circles as 'Fermi questions' have been tackled, e.g. 'How much air is there in the world or 'how many times has the world's air been breathed by humans?'. As stated earlier, the language used by the author is full of gentle humour and warms the reader's heart. Here is an instance: 'Without question, (Fibonacci) has our eternal gratitude for hastening the demise of the ghastly Roman numeral system'. The account of the young woman's dilemma in chapter 12 makes for extremely amusing reading. There are riches in plenty in the book!

However I do have some quibbles. The one really serious objection has to do with the author's choice of topics. I feel that some of the questions chosen rate rather low in intrinsic interest. Question (c) mentioned earlier would seem to be of this variety. (However the author salvages the essay by a nice interlude on the regular pentagram, bringing in the golden ratio ϕ and its amazing ubiquity.) The same comment may be made about (d); estimating the number of golf balls that could fit into an empty Washington Monument does not seem to me to be a particularly exciting task! (However the author goes on to compute the volume of several interesting solids, including the Mayon volcano and the Hershey chocolate 'Kiss'.)

Here are a few areas where things might have been done somewhat differently. (1) In chapter 22, more could have been said about how the parallels and meridians in the Mercator projection must be drawn to meet the objective of conformality. (2) In Chapter 2, the analysis of the 'slicing pizza' problem could have included a discussion on *why* the answer is correct. The author has simply fitted a formula to the data, using standard curve fitting techniques, and has made no effort to explain, using combinatorial reasoning, why the formula must be true. This could have been done with very little extra effort. (3) A few loose statements could be done away with, e.g. (p. 59) '(a) consequence of (the) transcendental nature of π is that the numbers to the right of the decimal point go on for ever and ever without any apparent order or pattern'. In fact there are transcendental numbers with lots of pattern in their decimal digits (the number $10^{-1!} + 10^{-2!} + 10^{-3!} + \ldots$ is an example). On page 72 it is stated that $i^i = e^{-\pi/2}$. This is however only the principal value of i^i. (4) With regard to question (e) mentioned earlier concerning the length of the seam on a baseball, a discussion on the aerodynamics of the baseball, and why the seam is there in the first place and what function it serves would have been of greater interest to the reader. A few more such areas could be listed.

But these quibbles are minor. The author states in his preface: 'In attempts to make things a bit easier, I have tried to be somewhat light-hearted. We all know that mathematics is a serious subject. However, this does not mean we cannot be little frivolous now and then.' He has definitely succeeded in his aim! I enjoyed reading the book, and so I imagine would most readers.

SHAILESH A. SHIRALI

Rishi Valley School,
Rishi Valley 517 352, India