algorithms such as quantum computing and more general computability theory.

For each chapter, the author takes the reader through some interesting historical context and some motivation towards the central ideas. He then uses that motivation to introduce the central ideas and then uses some examples to explain the concepts further. All this helps to engage readers and to ensure that by the end of the chapter they will have understood where the algorithm comes from, the processes that make up the algorithm and the way that it is relevant to real world applications.

There are few real prerequisites for the reader. I think it could be understood by a student before GCSE, but there is no reason why someone younger couldn't get a firm grasp on the relevant concepts. It might be useful to have met matrix multiplication before, but even that is not seen much in the book and only used in a chapter or so, and the author explains as much is needed to understand what is going on.

I recommend this book to anyone who wants an instructive first book on what algorithms are and how they are used in ways that affect readers' own lives. However, if they already have a good understanding of what an algorithm is then they might only be able to get much out of at most the last couple of chapters. Nevertheless these chapters might be useful in suggesting further reading and the next stages in the study of algorithms.

10.1017/mag.2022.106 © The Authors, 2022
Published by Cambridge University Press
on behalf of The Mathematical Association

HUGO AARONSON
Trinity College,
Cambridge CB2 1TQ

The best writing on mathematics 2019 by Mircea Pitici (ed.), pp. 272, £20.00, ISBN 978-0-691-19835-4, Princeton University Press (2019)

This is the tenth annual volume of mathematical essays chosen by Mircea Pitici. In his introduction, the Editor says that the series should be judged in its entirety, rather than as individual volumes, and that the enterprise is to be treated 'not only an anthology of intriguing and stimulating readings', but also as 'a reference work meant to facilitate an easy introduction into the valuable literature on mathematics currently published'.

There are a number of interconnecting themes, but the one that stands out is 'big data'. This is not just the exposure of school pupils to large spreadsheets so that they can utilise them in project work. Increasingly much serious research in mathematics runs up against the issue that the numbers which arise are very big.

The first two contributions address the problem of *gerrymandering*—the drawing of electoral boundaries which result in unfair bias towards one of two interested parties. The contributions are distinctly different in flavour. The first explains that one cannot simply evaluate all possible ways of dividing an area into districts, because there are just too many ways of doing it. Instead of doing systematic enumeration, an approach known as the 'Markov chain Monte Carlo' method is employed. This provides p-values for the likelihood of undesirable outcomes as a result of undertaking large random simulations. The second essay tackles this topic in an entirely different way. The author explains how results such as the Borsuk-Ulam theorem can guarantee desirable outcomes about fairness in dividing a map. This is intriguing from a mathematical point of view—I have always enjoyed the ham sandwich theorem—but I suspect that it is not quite as pertinent as the work described in the first essay.

Other essays explore the way current mathematical research deals with the big data problem. Jeremy Avigad surveys the mechanisation of mathematics using the tools of information technology. Such tasks include verifying complex calculations, checking lengthy proofs, undertaking meticulous enumeration of cases and searching the net for relevant research. This has been an issue ever since the celebrated Appel-Haken proof of the four colour theorem and Thomas Hales' approach to the Kepler conjecture about sphere-packing, which involved the checking of many individual cases using complex computer calculations. Hales was prompted to launch a cooperative enterprise in proof-checking—the Flyspeck project—in order to persuade the mathematical community that his work was correct.

Neil Sloane is well-known as the instigator of the online *Encylopaedia of Integer Sequences*, an invaluable reference point for problem-solvers. His essay cherry-picks some of his favourite examples, many inspired by the work of John Conway. Particularly interesting are some where only a small number of terms in the sequence are known. The Peaceable Queens problem asks for the largest equal number of white and black Queens which can be placed on an n by n chessboard without any one of them attacking another of the opposite colour. Only the first 13 terms of the sequence are known. Another problem, easy to state, but desperately hard to tackle, is to enumerate the number of topologically distinct ways to draw n circles in the affine plane. Here only the first five terms of the sequence are known, the last two being 173 and 16951.

There are several contributions relating to mathematical logic, but, despite this being the subject of my doctorate, I did not find these very interesting. For me, the best was a discussion of Kolmogorov complexity, defined as the shortest computer program which can produce a given string of characters. It turns out, maybe not surprisingly, that no computer can calculate the Kolmogorov complexity of any string.

I enjoyed the last two essays in this book. Michael Barany narrates the history of the controversies and compromises involved in the establishment of the Fields Medal as the 'Nobel Prize of Mathematics'. This is a pithy contribution which ends on a note of challenge: would it be possible or sensible to ensure that the Medal reflects diversity and recognises the achievements of minorities? Melvyn Nathanson explores the 'Erdös paradox' concerning the itinerant Hungarian mathematician. His work was often seen as marginal to twentieth century mathematics, but it is turning out to be central to that of the current one.

In view of all this, how successful is this anthology at satisfying the Editor's two criteria: to be entertaining and stimulating, and to serve as a review of current knowledge? There is clearly a tension here. Some selections gave me the impression that their primary purpose was to satisfy criteria for research grants. One, authored by nine individuals, begins with a intimidating review of the literature, includes in the main text lengthy quotations in Latin and ends with an alarming list of references. I suspect that many readers will do like me and skip these essays. A separate issue I have is with the language used by some authors. What is meant by 'tossing the funny-looking maps' or 'creates an end run round the SYZ conjecture'? It is a little distracting to have to resort to Google to decode the idiomatic usage.

With these reservations, then, this is a welcome addition to the Princeton series and most readers of the *Gazette* will find plenty to enjoy in it.

10.1017/mag.2022.107 © The Authors, 2022
Published by Cambridge University Press
on behalf of The Mathematical Association

GERRY LEVERSHA
15 Maunder Road,
Hanwell, London W7 3PN
e-mail: *g.leversha@btinternet.com*