Reviews

On the plus side by Chris Pritchard, pp 208, £12 (+ p&p, SMC website). ISBN 978-1-3999-8226-9, Scottish Mathematical Council (2024)

The author of this book will be well known to those involved in mathematical education in schools in the UK. For many years he has been editor of the journal *Mathematics in School*, published by The Mathematical Association; he also served the Scottish Mathematical Council as Chair and, for 18 years, as the editor of the *SMC Journal*. He is now retired from his career in teaching, a large part of which was spent as Principal Teacher of Mathematics at McLaren High School in Callander. In recent years he has written several books, including *The Room in the Elephant* (2019) and *Pick up a Penguin* (2020), both of which were very favourably reviewed in the *Gazette*.

Much of the material in this new book has been collected from articles which have already been published in the *SMC Journal* and elsewhere. Throughout all of his writing, several things shine through—the author's enthusiasm for mathematics, his desire to help teachers to enthuse students, his love for geometry, his interest in the history of the mathematics, and his desire to encourage students to think creatively and to explore and investigate. The subtitle of the book is *Thoughts on Mathematics and its Teaching*, and the book provides many suggestions and material to help the teacher back up and develop the skills and techniques basic to mathematical development.

In the first chapter the author describes his early teaching days, teaching the newly introduced Standard Grade syllabus in a small rural school. He later wrote an article about this in the SMC Newsletter, and excerpts from that article are provided. This leads on to his account of the early days of the SMC, and we are introduced to one of the founding members, Tom O'Beirne, who was well known through his monthly column on recreational mathematics in the *New Scientist* and through his book *Puzzles and Paradoxes* published by OUP.

The second chapter is largely concerned with communication, through language and the use of diagrams. The need for clarity in the meaning and correct spelling of mathematical terms is emphasised, and the persuasiveness of a good diagram or picture is discussed.

Chapters 3 and 4 provide a vast amount of material on creating and solving mathematical problems, and exploring open-ended investigations. Teachers are encouraged to think up new problems or investigations to suit their particular classes. In 2017, Maths Week Scotland was launched, and the Deputy First Minister asked the SMC to provide daily problems suitable for S2 pupils (aged around 13). Many of these were created by Chris, and 25 of these problems provide the core material for Chapter 3. Many interesting investigations are offered in Chapter 4, most of them new, providing many opportunities for classroom investigation at different levels. Topics covered include tetrominoes, hextiles, matchsticks, the power of chess pieces, and equable polygons (polygons with integer sides whose perimeter and area are numerically equal).

In Chapter 5 interest turns to cyclic quadrilaterals. Geometry at school level includes some study of triangles and their elegant properties, such as the concurrency of the medians, but little is said about quadrilaterals which seem to be too general to provide much of interest. However, if you take any irregular quadrilateral and draw in the four interior angle bisectors, they form a quadrilateral which is always a cyclic quadrilateral– providing order out of chaos! Cyclic quadrilaterals are a source of many elegant results, and the author enthusiastically presents some of these—for

example that the perpendicular bisectors of the sides of a cyclic quadrilateral *ABCD* are concurrent at the centre of the circle on which the vertices *A*, *B*, *C* and *D* lie; and, further, these perpendicular bisectors divide the quadrilateral up into four smaller quadrilaterals which are also cyclic. There is also a discussion of Ptolemy's Theorem on the product of the diagonals of a cyclic quadrilateral, and the theorem is then used to deduce the sine rule and the addition formulae for $\sin{(a + b)}$ and $\cos{(a + b)}$. There is much in this chapter to show senior school pupils something of the beauty of geometry which is so sadly missing from many modern syllabuses.

The author's interest in the history of mathematics is clear throughout the book, and in Chapter 6 the reader is introduced to Christopher Wren and the cycloid, Archimedes' tangrams, an arithmetic textbook written by the 18th century schoolmaster John Mair from Ayr, the statistical diagrams of William Playfair, and the late 19th century study of the flight of a golf ball by Peter Guthrie Tait, who held the chair of Natural Philosophy in Edinburgh while Lord Kelvin held the corresponding chair in Glasgow.

There is a lot of material in this book to interest teachers at all levels. Presentation is very clear throughout, accompanied with lots of diagrams, many of which are in colour. I noticed very few misprints; perhaps one to be pointed out is a missing arrow in the diagram on page 120.

The spread of material is remarkable, showing a wealth of experience and scholarship, and a deep longing to communicate a love of mathematics to the next generation. Teachers can adapt the problems and investigations to suit their needs. I hope the book is well used.

IAN ANDERSON
School of Mathematics and Statistics
University of Glasgow, G12 8QQ
e-mail: *iananderson2357@gmail.com*

Victorians & numbers by Lawrence Goldman, pp. 448, £35 (hard), ISBN 978-0-19284-774-4, Oxford University Press (2022)

The catch-phrase of Charles Dickens's Mr Gradgrind was "Now, what I want is, Facts." That arch-villain of *Hard Times* is usually taken to represent simple Utilitarianism, but Lawrence Goldman shows us that Gradgrind, like his predecessor Mr Slug of the Mudfog Association, actually encapsulates Dickens's mistrust of the growth of statistics in the first half of the nineteenth century.

Any state concerned about its finances needs to have some idea of its population and their needs, so there is no question of statistics in Britain starting with the Victorians. (Indeed, the book's title is somewhat inaccurate; the Statistical Society of London was founded in 1834 in response to an already growing systemisation of data collection, and Goldman gives considerable space to the years before 1837.) Political Arithmetic had been systematised in German states in the eighteenth century; *Statistik* was related to the creation and administration of the state (*Staat*), and that is the etymology of the modern word. Goldman identifies the catalyst for the growth of statistics in the expansion of the State since the 1790s, coupled with the reform of Britain's political and governmental institutions and the political crisis of the late 1820s. There was a perception that the state had insufficient data about the country's economy and society. The General Register Office (now the Office for National Statistics) was formed in 1837 for the simple enough purpose of registering all births, deaths and marriages, a task previously carried out at a parish level and which thereby confined dissenting communities to