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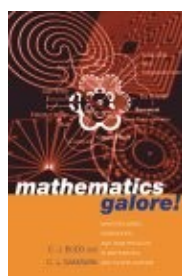
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Reviews

## 'Mathematics Galore'

reviewed by Adam Bishop



## Mathematics Galore

by C.J. Budd & C.J. Sangwin

"As Obi-Wan Kenobi said about the Light Sabre in Star Wars IV, a slide-rule is an ancient weapon from a more civilised age," state Chris Budd and Chris Sangwin in their book, *Mathematics Galore*, soon to be released by Oxford University Press. The book digs up the slide-rule and a few more historical artefacts, as well as the art of country dancing, to present a pick-and-mix bag of mathematical ideas for the aspiring mathematician or the mathematically inclined general reader. "The aim has not been to stick to material which is likely to be met in a typical school syllabus," say the authors. "Rather we have let ourselves explore some areas of mathematics a long way from traditional courses." In this way they have provided an exotic recipe book for extra-curricular maths lessons answering the question: You play sport after school, why can't you play maths?

In *Mathematics Galore*, maths champion Budd and his colleague Sangwin have recorded and expanded material that they have used with 13 and 14 year olds during maths workshops where university lecturers, students, teachers and pupils team up to have fun with maths. Workshops of this kind have taken place regularly up and down the country since 1981 as the Royal Institution's Mathematics Masterclasses. Michael Sewell of the University of Reading was the first to collect up material from Masterclasses given in his area of Berkshire, in his book "Mathematical Masterclasses" (OUP 1997). Now Budd and Sangwin have done the same for the Bath and Bristol area. The result is another astonishing mix of mathematics but a very different book.

A particular feature of this book is the way that history is used to present many of the mathematical ideas. As well as learning about the slide-rule and log tables your grandfather might have used to make calculations

## 'Mathematics Galore'

before we had digital calculators, you can build your own sundial to see how people told the time before we had digital watches. Through geometry and with fractals you can learn how the best castles were built. And the maths of codes and ciphers are introduced by explaining how the Roman Emperor Caesar sent secret messages to his armies. Here too you can learn how King Minos built a labyrinth to house his monster, the Minotaur, and how the walls of Jericho were also once built like a labyrinth; and how the ancient Mayans counted in blocks of twenty, while the ancient Babylonians counted in groups of sixty, just as we most often count in groups of ten (our decimal system).

Throughout the book fabulous suggestions are made to use drama, art and craft in the learning of mathematics. And most remarkably, there are lists at the end of many chapters suggesting great places you could visit for fun mathematical day-trips and excursions. Visit a maze or a museum with your family or school and learn some maths. You might already have school outings to art galleries, the theatre, and geography field trips, but now you can have fun mathematics field trips too. The authors remark, "Even the coach journey can be used to advantage, by providing everyone with problem sheets to puzzle over as they travel."

At the beginning of each chapter there is a lot of interesting description and the maths is easy-going, but it gets gradually harder. Enthusiastic 13 and 14 year olds might easily find themselves overshooting, without realising, into the two closing sections of each chapter. These are intended for older readers including six-formers, teachers and undergraduates. Fortunately the descriptive content of the chapters is more than enough to keep these readers interested until they can start some more challenging maths at the end, which often questions some of the assumptions that have been made during the chapter.

The authors claim that "some material, when suitably presented, also works for primary school audiences from the age of five upwards." This is true for at least two of the eight chapters that have you drawing simple mazes to challenge your friends with and dancing simple folk dances. But other chapters, including the one on making sundials, have some maths that might be a little too challenging even for 13- and 14-year-olds without heavy supervision. These chapters are likely to have teachers enthusiastically taking over the projects of their students.

One of the reasons why some of the maths might be challenging for 13 and 14 year olds is that by exploring areas of maths a long way from normal curriculum courses the book lacks the gradual building up of ideas and context that you would find in a normal course or textbook (boring). This is the great strength of *Mathematics Galore*, not a weakness. It goes where it likes. Its clear, although in this sense unsupported, explanation of ideas allows it the freedom to visit small but fun islands in the sea of mathematics. In this way it shows off the surprising "rabbit hole" principle of mathematics: you can start off in a chapter, say, on secret codes, then disappear down a mathematical rabbit hole of modular arithmetic, then suddenly pop up again, out of a black hat and into a chapter on magical mathematics. In this way the book finds a unifying force by repeating similar ideas throughout the chapters and helping the reader to more fully understand them.

It is perhaps unfortunate that some of the workshops have been expanded to include more material for a chapter in print, since the structure of a workshop is sometimes lost. There seems too much of a wealth of information and range of difficulty in some of the chapters to take them each as ready-made workshops. But the book is ideal for a teacher or even a parent, with a reasonably good judgement, to pick out small chunks to build their own workshops of fun maths.

Here and there the authors delight in "a satisfyingly complicated formula that amply justifies the employment of a mathematician", so if you really want to learn the maths thoroughly you will need to put pen to paper and follow the written exercises. You'll be learning a bit of topology, network and number theory; stuff they don't tell you about in school. But if as a teacher or parent you just want to help others have some fun with maths, then *Mathematics Galore* will give you plenty of ideas.

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The book will certainly not appeal directly to sufferers of mathematics anxiety wanting unlearn their fears, but placed in the right hands it is a powerful weapon. May the force be strong with *Mathematics Galore* readers. Was there ever a civilised age when mathematics was taught as eclectically as this? Word is that the next book will have a chapter on origami. Yippee! I love origami.

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### *Book details:*

*Mathematics Galore*

C.J. Budd and C.J. Sangwin

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