national needs of the time. They really were heroes and this book has rightly brought their story to prominence as part of the history of mathematics.

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Africa and mathematics: from colonial findings back to the Ishango Rods by Dirk Huylebrouck, pp. 229, £27.99 (hardback), ISBN 978-3-03004-036-9 Springer Verlag (2019).

This is my first encounter with a book on ethnomathematics. Such books attempt to show the contributions to mathematics that originated from a specific part of the world and in the context of a specific culture. This book, part of the Springer series 'Mathematics, culture and the arts', discusses the origins of several mathematical concepts in the African continent, and it brings to light the rich heritage of African mathematics.

The author, an expert in African ethnomathematics, tells us that several counting methods existed in Africa long before they first appeared in other parts of the world. There is a detailed discussion of the origins and the cultures in which these counting methods originated. Parallels are drawn between the various counting methods that were used in Africa and those used elsewhere, with special mention of the Russian Peasant Algorithm for multiplication. According to the author, this method originated in Africa and was carried to Greece and subsequently to Russia from where it gains its popular name.

Several cultures have little or no written script, so the spoken form of the language is the only way to express and preserve them in historical records. The book gives several compelling reasons for the belief that Africa has been the birthplace of numerous mathematical concepts and activities. However, the author has not blown it out of proportion; for example, he discounts the commonly claimed assertion that detailed mathematical treatments of fractals were known to the Africans.

The book also contains a detailed account of several games popular in the African continent that have deep connections with mathematics. Besides explaining the rules of these games, the author explains the mathematics required to master them.

The most important and the most detailed discussion in the book is that of the Ishango Rod. This bone, excavated at the Ishango site in the Democratic Republic of Congo in 1950 by Professor Jean de Heinzelin, is evidence for the chronological richness of African mathematics. It is estimated to be at least 22,000 years old, which would make Africa a strong candidate for being the place of origin of a plethora of mathematical activities and ideas; indeed, the Ishango Rod is claimed to be the oldest surviving mathematical instrument known. In the words of Vladimir Pletser, who has written the foreword to this book:

> [S]uddenly the history of mathematics shifted from the supposed cradle of civilization around the Mediterranean Sea to the heart of Africa, not far from where, according to the commonly accepted hypothesis, the human race was born.

The book contains a detailed account of the discovery of the rod along with several other important events related to it, including a recent exhibition of the rod in Brussels. Many photographs of the excavation process of the Ishango Rod enhance the narrative through their visual beauty. There has been much discussion of the

three mysterious rows of markings on the bone, with speculation that they might represent gaming positions, some kind of multiplication, or a lunar calendar.

The book then reaches a very sensitive topic, the claim that African mathematics has not received the kind of attention and treatment it deserves. It demonstrates the richness of African mathematics, using historical sources on ancient Greece and ancient Egypt as well as the modern understanding of DNA, thus making readers realize that African mathematics is deeper and wider in its contribution to mathematics than is commonly thought. But the author rejects outright the view that all advances in mathematics originated in Africa, believing that such a notion is not helpful and does more harm than any good.

Africa and Mathematics is an excellent source for anyone interested in the history of mathematics, and it is a major asset in ethnomathematics. It will be useful to undergraduates, postgraduates and teachers as well as the general reader.

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Mathematics is the poetry of science by Cédric Villani, translated by Malcolm DeBevoise, pp 69, £9.99, ISBN 978-0-19-884643-7, Oxford University Press (2020)

It feels unusual to embark on a book review which will take longer to write than I needed to read the relevant text, but this slim manuscript by the Fields Medallist Cédric Villani can be read comfortably in twenty minutes. The approach is aphoristic and provocative, as can be gauged from the opening remarks of the first chapter: 'Mathematics, whatever else it may be, is a science'. More than once, as I read this book, I was reminded of Nietzsche.

Villani goes on to justify this assertion on the grounds that the discipline seeks to describe, understand and act on the world—the 'holy trinity' of the sciences—via processes such as *a priori* scepticism, the process of peer review, and the lack of reliance on authority. He is also adamant that mathematical discovery partakes of many of the qualities of 'art', in particular the feeling for aesthetic values in a good piece of mathematics. All the same, he is insistent that the categorisation of mathematics as 'science' is appropriate.

The next eight chapters are very short, ranging from two to four pages, and they examine the relationship of mathematics to other artistic endeavours, but particularly (as in the book's title) *poetry*. Mathematics and poetry share a requirement for constraints and rules, they rely upon the vision of a creator, they establish connections between unlikely elements, they are both essentially cerebral and they place a high value upon the evocative power of language. Both poets and mathematicians comprehend and reorder the raw material of their discipline. It is often the beautiful and unexpected character of a vision which convinces the creator of its soundness. Both rely on inspiration, but this often requires long and unremitting effort.

Having argued cogently along these lines, Villani turns his attention, somewhat surprisingly, to sport, and indicates analogies between the mathematician and the footballer in selecting appropriate strengths to solve a problem. The longest chapter in the book is the last, which is largely a reprint of a lecture celebrating the work of Henri Poincaré. As a bonus, the full text of Poincaré's essay on mathematical discovery is reprinted as an appendix.