The M α TH β OOK

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The M α TH β OOK: From Pythagoras to the 57th Dimension, 250 Milestones in the History of Mathematics

Clifford A. Pickover

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The Neumann Prize from the British Society for the History of Mathematics is awarded to a book written for a general audience that incorporates mathematical history. The book under review, by Clifford Pickover, won this prize in 2011. One reason is surely the visual beauty of *The M α TH β OOK*, starting with its striking cover, which looks great on a coffee table. In fact, it has been sitting on our own coffee tables, and, while undersized compared to our other books, it holds its own. Catching the light from a certain angle, the cover reveals numbers and objects in what resembles a colorful foil-stamped effect. Look closely to see spheres and Möbius bands, as well as the numbers from 1 to 999. Certain numbers are highlighted—they are the primes from 2 to 997.

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Why is the number 1 also highlighted? We guess that was a mistake on the part of the layout artist. Nevertheless, we love the cover effects and feel they would definitely appeal to those browsing the shelves in a bookstore or a library.

The book is a collection of two-page articles, in which the first page is devoted to text and the facing page to an accompanying image. So each turn of a page opens to a new and wonderful picture. Some of the images successfully make connections and extend the mathematics of the articles they are paired with. For instance, an approximation of a hyperbolic dodecahedron by Paul Nylander accompanies the article on Platonic solids. However, other images, though still visually appealing, are less mathematically effective, such as the cicada picture accompanying an article on prime number life cycles.

The organization of the book is chronological, with each article focusing on one “milestone.” The first is “Ant Odometer,” which is dated circa 150 million BC, and the last is “Mathematical Universe Hypothesis,” dated 2007. In each article the date corresponding to the milestone is prominently displayed in large type. This is attractive graphic design, but in some cases, assigning a single date rather than a range of dates is awkward or even downright misleading. For example, the article on non-Euclidean geometry carries the date of 1829, as that is the year of publication of Nikolai Lobachevsky’s paper “On the principles of geometry.” The implication is that the field started in 1829, whereas in fact it evolved slowly as mathematicians through the centuries grappled with the

fifth postulate (see, e.g., [3]). To be fair, the article does highlight some other contributors, including Euclid of Alexandria, János Bolyai, Bernhard Riemann, and Albert Einstein; Carl Friedrich Gauss, however, is notably absent. For some articles, the book uses not publication dates but the date of a significant event to indicate the timing of the mathematical development being described. For example, the article on Bayes's Theorem gives the year of Thomas Bayes's death as the milestone, even though the theorem that bears his name was not officially published until three years later, in 1764 [1].

In fact, the use of the term "milestones" creates its own awkwardness. For example, the Klein bottle is discussed a number of times in the book and even has its own article, as do several other surfaces. To call the Klein bottle a "milestone" makes little sense. A more fitting milestone might have been Felix Klein's *Erlanger Programm*, which had profound effects on geometry research but is not mentioned at all in the book. We also wouldn't have included certain other topics in the book as mathematical "milestones," such as the Rubik's Cube or the television show *NUMB3RS*. While they certainly helped popularize mathematics and are of interest to a general audience, we do not consider them to be a true "milestone" in the history of mathematics. Perhaps a different term than "milestones" would have worked better for the articles.

Despite the chronological ordering of the articles, the real focus of the book is on people and places, starting with the book's subtitle *From Pythagoras to the 57th Dimension*. Pythagoras is mentioned in several articles, including one called "Pythagoras Founds Mathematical Brotherhood." The 57th dimension is found in the article "The Quest for Lie Group E_8 ," which highlights the contributions of Marius Sophus Lie and Wilhelm Karl Joseph Killing. We like the way Pickover has included contributions not just of the historical stars of mathematics but also of many different people in many different cultures. There are some missteps: the name of the Hausa people of Africa is misspelled as "Hasua," and the statement that "Abaci are still used in... parts of the Soviet Union" needs "former" before "Soviet." Nevertheless, the fact that contributions from so many peoples are included is a real strength of the book.

Sometimes the effort to dramatize the contributions of diverse mathematicians pulls the focus away from the mathematics. For example, the inside front cover of the book poses the question, "Why was the first woman mathematician murdered?" Virtually the entire article on Hypatia of Alexandria focuses on the circumstances of her death, in rather gruesome detail, rather than her life or mathematical work; the latter receives only

a scant three sentences. Even worse, from a mathematics history standpoint, this article asserts as fact many speculative details about Hypatia, such as those from a fictionalized account of her life and work [4]. The article also explicitly mentions Hypatia's attractiveness even though there is no historical evidence indicating what she looked like [2]. For example, she might have resembled Egyptian women of the day rather than the blond-haired, nude image of Hypatia that was imagined by a nineteenth-century artist and that accompanies the article. The author's treatment of other female mathematicians seems more consistent with the author's presentations of male mathematicians, where he provides some interesting historical and personal details but focuses on their mathematical contributions. At times the exposition is a bit sensationalist and exploitive, as in the use of the word "sinister" when describing the quipu as an Inca death calculator, but, overall, the writing, like in Pickover's other books, is creative and engaging and connects mathematics to society, human thought, and applications.

The book successfully highlights many topics that would be of interest to a general audience. It makes for great recreational reading for students of science and mathematics and interested laypeople. It can serve as a starting point for those who want to learn more, as further readings are included in the notes at the end of the book. Although certain topics like puzzles and geometric spaces are overrepresented, the book successfully showcases the beauty, utility, and breadth of mathematics. If you are seeking a scholarly work on the history of mathematics, look elsewhere. However, if instead you want a handsome, lively, and entertaining book, we highly recommend this one.

References

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- [4] ELBERT HUBBARD, *Little Journeys to the Homes of Great Teachers*, The Roycrofters, East Aurora, New York, 1908.