From the shelves of the
National Library ...

Reviewed by Leong Yu Kiang

These two books are about mathematics and mathematicians. The author invites you to take "a journey through two millenia of mathematical landmarks" across several continents and different civilizations. The snapshots taken on this journey will provide a panoramic picture from three vantage points of view — the historical, the biographical and the "theorematical". At journey's end, you will be filled with "a sense of awe that comes from appreciating the greatness of others".

The first book begins its journey at some point in the mist of antiquity of ancient Egypt around 2,000 B.C., with the mist clearing around the 6th Century B.C. when the incipient ideas of Euclidean geometry began to crystallize. The first five chapters are devoted to the high points of ancient Greek mathematics, reaching its apex in Archimedes' masterpiece on the determination of areas and surfaces of cylinders, spheres and related solids. The golden age of classical Greek mathematics ended with the destruction of the great library at the ancient city of Alexandria in 641 A.D., followed by a period of classical scholarship in the Arab civilization.

The next half of the book, comprising 7 chapters, brings us into the modern era beginning with the Italian achievements in algebra (solution of the cubic and quartic equations) in the 15th and 16th Centuries. The Renaissance witnessed a spurt of prodigious and intense activity in mathematics and the sciences on an unprecedented scale — an activity which continues unabated even as we enter the 21st Century. Featured prominently in the book are some of the principal mathematical players of this formative period: Gerolamo Cardano, Isaac Newton, the Bernoulli family, Gottfried Leibniz, Leonhard Euler, Carl Friedrich Gauss and Georg Cantor. Many major players are not mentioned or only mentioned in passing for the apparent reason that the author has chosen depth to breadth. He did not produce a travel catalogue; instead, he offers a trip which will take you to some monumental sites.

The second book is similar in spirit to the first. The second journey, however, is more of a surrealistic journey with frequent flashbacks to various epochs and different personalities. The chapters are not numerically numbered but are arranged alphabetically according to their titles. There are 25 chapters, one for each letter of the alphabet except for the letters X, Y which share one chapter (called "X-Y Plane"). Unlike the first book whose historical development of ideas obliges you to read linearly, the second journey can be savoured by proceeding directly to any of the 25 sites offered.

In both books, the author did not stint on or flinch from the necessary calculations or logical arguments which make the great theorems tick. The prerequisite for understanding their proofs is only a knowledge of high school algebra and geometry plus a little patience. The impression one gets is that the mathematical treatment in the second book is a little gentler than that in the first book. Also, the reproductions of some pages from the original masterpieces, some in Latin, add historical authenticity to this intellectual venture.

A not-so-mathematically-minded reader may do better to start with the second book, picking out whichever nugget he or she fancies and taking time to appreciate it. One good piece to begin with is the least demanding chapter "Mathematical Personality", which exposes some amusing quirks of the absentminded mathematician. If you are more interested in the usefulness of mathematics, go straight to "Utility". But that is not the only place which proffers "real-life" applications. The last two pages of "Natural Logarithm" show you how Newton's law of cooling can be used to provide the perfect alibi for a murder suspect. (It will be interesting to ascertain whether real-life forensic experts actually use such a method in their investigations.) Another application, this time of a probabilistic nature, is given in "Bernoulli trials".

If you are interested in integers per se, there is an abundance of nuggets in "Arithmetic", "Fermat" and "Prime Number Theorem" that will keep you enthralled. Incidentally, the largest prime known in 1992 and mentioned in "Arithmetic", is $2^{756,839} - 1$. (In comparison, the largest prime known in November, 1996, and found through a huge collective effort over the Internet, is, according to the website www.utm.edu/research/primes/ largest.html $2^{1,398,269} - 1$) And the rumour, widespread in 1994 and reported in "Fermat", that Andrew Wiles of Princeton University had proved the famous 300-year-old problem misleadingly called "Fermat's Last Theorem" has, of course, recently reached a happy conclusion.

The chapter "Justification" reveals some of the subtle points about proofs and disproofs in mathematics with the help of concrete examples and results. More logic is offered in "Russell's Paradox" with an interesting biographical sketch of the well-known logician and philosopher Bertrand Russell thrown in as a bonus. And there are at least 7 chapters containing geometrical gems, some time-honoured and some not so well-known.

In these two books, there is genuine mathematics, there is history, and there is entertainment. History and entertainment are often intertwined in the form of anecdotes which, together with insight into the socio-psychological background of the creators of great theories, add flesh and blood to an otherwise hard and dry skeleton of a subject commonly regarded as esoteric to the uninitiated. If these two books form some kind of "duology", one hopes that the author will come up with a third book that will complete a trilogy which will not only dramatize but also humanize the ever-unfolding spectacle that is mathematics.

(Both books are available from the Ang Mo Kio, Bedok, Bukit Merah, Geylang East, Jurong East, Marine Parade, Queenstown and Toa Payoh Community Libraries, while the first book, Journey through genius, is also available from Tampines Regional Library.)