BOOK REVIEWS

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The Universe in Zero Words:
The Story of Mathematics as Told Through Equations
by Dana MacKenzie
Princeton University Press, 2012
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My recommendation to you after reading "The Universe in Zero Words" by Dana Mackenzie is — buy and read this book!

The subtitle "*The story of mathematics as told through equations*" tells us how and what the author intended to do and succeeded in doing — giving a brief and selective history of mathematics by choosing to focus on twenty–four equations. These twenty–four equations are evenly divided into 4 parts, where each part is representative of a time period.

Roughly these time periods are: antiquity, the age of exploration (1500 – 1700), the Promethean age (1700 – 1900), and in our own time (1900 to present). A very nice feature of the book is that certain concepts are traced through from one period to the next. For example, infinity in antiquity comes up in Zeno's paradoxes, infinity in the age of exploration appears in the development of calculus, infinity in the promethean age appears in Fourier series and in our time, we see infinity conceptualized more precisely in the work of Cantor and the continuum hypothesis.

By choosing to discuss mathematics throughout its entire history, the author out of necessity had to make hard choices, and it would be hard to argue that anything that was chosen should not have been. The absence of the Schrödinger equation is notable but quantum mechanics is discussed by considering the Dirac wave equation.

The varying level of difficulty of material in a historical survey such as this can be a formidable obstacle to an entertaining and inspiring presentation. This issue is handled brilliantly. The author is straightforward and clear in all of his presentations, and he is very good at giving real world analogies to illustrate difficult concepts. For example, when discussing the Dirac wave equation (nicely tied back to the discussion of quaternions in the preceding time period), the author uses the Feynman plate trick to illustrate how you can rotate one thing by 360 degrees (a plate on your open palm standing in for space) and have something else rotate by 180 degrees (your arm standing in for the wave function and causing the electron to go from "spin–up" to "spin–down"). The reader with a bit of familiarity with physics will get more from the latter part of the book.

The final equation of the book — the Black–Scholes equation — was an inspired choice. This equation underlies the methods that Wall Street uses to price a variety of financial products (derivatives). The spectacular market failure of Lehman Brothers that we have recently seen makes this topic very relevant, and it allows the author the opportunity to discuss a second example (the first having been weather forecasting) where mathematical modeling of the world is extraordinarily difficult and subject to chaos.

Interspersed throughout the book are amusing anecdotes that cleverly complement the more serious material and give some colour and depth to the people portrayed. I learned that a vuvuzela is a type of plastic horn at the same time I learned that it is topologically equivalent to a coffee cup or doughnut.

The book is beautifully printed in full colour. The accompanying artwork has been carefully and intelligently chosen and adds tremendously to the beauty and interest of the book.

A final word on beauty: I was thrilled that this idea — that mathematics is beautiful — was emphasized throughout. A great equation is surprising, concise, consequential, and universal. And the sum of these equations is itself an object of beauty. I reiterate: buy and read this book.