# BOOK REVIEWS

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In Pursuit of the Unknown: 17 Equations That Changed the World by Ian Stewart
ISBN: 978-0-465-08598-9, Softcover, 342 + x pages
Basic Books, 2012, US$16.99

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Mention the word equations to a random person on the street and you are likely to get a tale of woe. Yet to a mathematician, scientist or engineer, equations are ways to communicate relationships and a medium for solving problems and making discoveries. In the introduction to his book *In Pursuit of the Unknown: 17 Equations That Changed the World*, Ian Stewart tells the story of how Stephen Hawking was told by the publishers of *A Brief History of Time* that every equation included in his book would probably halve the sales. Stewart, fortunately, doesn't heed this advice, his excuse being that since the book is about equations, they are going to have to play a large part in the contents.

Ian Stewart is a well-known mathematical writer. He spent ten years writing the *Mathematical Recreations* column in *Scientific American*. He has written numerous books on puzzles and mathematical recreations like *Professor Stewart's Cabinet of Mathematical Curiosities* and *How to Cut a Cake*; mathematical expositions on topics such as Chaos in *Does God Play Dice? The New Mathematics of Chaos*; as well as textbooks such as *Galois Theory* and *Algebraic Number Theory and Fermat's Last Theorem* (with D. Tall). In *In Pursuit of the Unknown* Stewart takes us on a trip through the history and interconnectedness of mathematics.

The seventeen chapters, each devoted to a particular equation, give us the background of where an equation came from, how it is used, why it is important and how it is tied in with some of the other equations that he explores. The equations and topics explored, illustrated by the subtitles of the chapters, are: Pythagoras's Theorem, Logarithms, Calculus, Newton's Law of Gravity, The Square Root of Minus One, Euler's Formula for Polyhedra, Normal Distribution, Wave Equation, Fourier Transform, Navier–Stokes Equation, Maxwell's Equations, Second Law of Thermodynamics, Relativity, Schrödinger's Equation, Information Theory, Chaos Theory and Black–Scholes Equation.
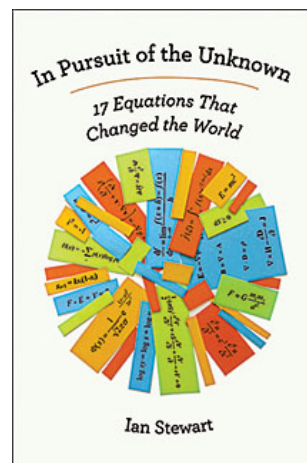
The opening chapter *The squaw on the hippopotamus*, discussing Pythagoras's Theorem, gives the reader the sense of what is to come. We are led through the

stories of Pythagoras (c. 570 BC - c. 495 BC) and Euclid (fl. 300 BC) and told how Babylonian tablets a thousand years before Pythagoras showed evidence that the relation was known at that time. The chapter continues with how the theorem is related to the development of trigonometry, and how trigonometry and triangulation transformed surveying and map making in the sixteenth century. We are shown how the theorem is central to analytic geometry and the chapter concludes with a generalization of the theorem by examining non-Euclidean geometries. Later, in Chapter 13 *One Thing is Absolute*, about the theory of relativity, Pythagoras's Theorem is used in a thought experiment whose result shows, paradoxically, that observers moving relative to each other would measure different time intervals between the same events. Yet again in Chapter 15 *Codes, Communications, and Computers*, about information theory, Pythagoras's Theorem, used as a way to calculate distance in Euclidean space, is generalized to give the *Hamming distance* which measures the distance between two bit–strings, or binary "words". Using the Hamming distance, codes can be created that can detect and correct errors that occur in transmission, a necessary tool in this increasingly digital world.

This book is a wonderful snapshot of some of the history of mathematics and science and how it is all tied together. It is accessible to a wide audience. I would highly recommend this book to teachers, motivated high school students, or any admirer of mathematics and science.