



The University Press Group

# Mathematics

University of California Press

Columbia University Press

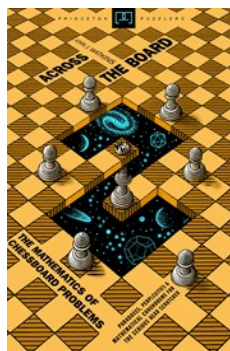
Princeton University Press

**New and Best of Backlist**

Autumn 2023



CALIFORNIA  
COLUMBIA  
PRINCETON  
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## Across the Board

John J. Watkins

9780691154985

£15.99 • \$18.95

Trade Paperback

Mathematics / Recreations & Games

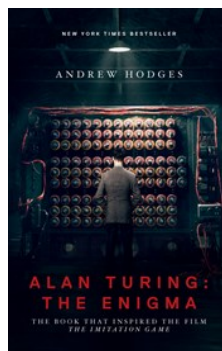
July 2012

Princeton University Press

*Across the Board* is the definitive work on chessboard problems. It is not simply about chess but the chessboard itself—that simple grid of squares so common to games around the world. And, more importantly, the fascinating mathematics behind it. From the Knight's Tour Problem and Queens Domination to their many variations, John Watkins surveys all the well-known problems in this surprisingly fertile area of recreational mathematics. Can a knight follow a path that covers every square once, ending on the starting square? How many queens are needed so that every square is targeted or occupied by one of the queens?

Each main topic is treated in depth from its historical conception through to its status today. Many beautiful solutions have emerged for basic chessboard problems since mathematicians first began working on them in earnest over three centuries ago, but such problems, including those involving polyominoes, have now been extended to three-dimensional chessboards and even chessboards on unusual surfaces such as toruses (the equivalent of playing chess on a doughnut) and cylinders. Using the highly visual language of graph theory, Watkins gently guides the reader to the forefront of current research in mathematics. By solving some of the many exercises sprinkled throughout, the reader can share fully in the excitement of discovery.

Showing that chess puzzles are the starting point for important mathematical ideas that have resonated for centuries, *Across the Board* will captivate students and instructors, mathematicians, chess enthusiasts, and puzzle devotees.



## Alan Turing: The Enigma

Andrew Hodges

9780691164724

£14.99 • \$17.95

Trade Paperback

Biography & Autobiography / Science & Technology

November 2014

Princeton University Press

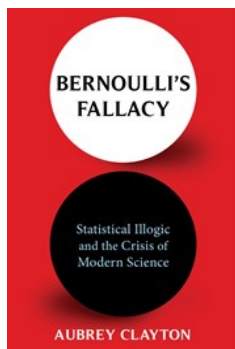
A NEW YORK TIMES BESTSELLER

The official book behind the Academy Award-winning film *The Imitation Game*, starring Benedict Cumberbatch and Keira Knightley

It is only a slight exaggeration to say that the British mathematician Alan Turing (1912-1954) saved the Allies from the Nazis, invented the computer and artificial intelligence, and anticipated gay liberation by decades—all before his suicide at age forty-one. This *New York Times*–bestselling biography of the founder of computer science, with a new preface by the author that addresses Turing's royal pardon in 2013, is the definitive account of an extraordinary mind and life.

Capturing both the inner and outer drama of Turing's life, Andrew Hodges tells how Turing's revolutionary idea of 1936—the concept of a universal machine—laid the foundation for the modern computer and how Turing brought the idea to practical realization in 1945 with his electronic design. The book also tells how this work was directly related to Turing's leading role in breaking the German Enigma ciphers during World War II, a scientific triumph that was critical to Allied victory in the Atlantic. At the same time, this is the tragic account of a man who, despite his wartime service, was eventually arrested, stripped of his security clearance, and forced to undergo a humiliating treatment program—all for trying to live honestly in a society that defined homosexuality as a crime.

The inspiration for a major motion picture starring Benedict Cumberbatch and Keira Knightley, *Alan Turing: The Enigma* is a gripping story of mathematics, computers, cryptography, and homosexual persecution.



## Bernoulli's Fallacy

Aubrey Clayton

9780231199957

£20.00 • \$24.95

Trade Paperback

Mathematics / History & Philosophy

November 2022

Columbia University Press

There is a logical flaw in the statistical methods used across experimental science. This fault is not a minor academic quibble: it underlies a reproducibility crisis now threatening entire disciplines. In an increasingly statistics-reliant society, this same deeply rooted error shapes decisions in medicine, law, and public policy with profound consequences. The foundation of the problem is a misunderstanding of probability and its role in making inferences from observations.

Aubrey Clayton traces the history of how statistics went astray, beginning with the groundbreaking work of the seventeenth-century mathematician Jacob Bernoulli and winding through gambling, astronomy, and genetics. Clayton recounts the feuds among rival schools of statistics, exploring the surprisingly human problems that gave rise to the discipline and the all-too-human shortcomings that derailed it. He highlights how influential nineteenth- and twentieth-century figures developed a statistical methodology they claimed was purely objective in order to silence critics of their political agendas, including eugenics.

Clayton provides a clear account of the mathematics and logic of probability, conveying complex concepts accessibly for readers interested in the statistical methods that frame our understanding of the world. He contends that we need to take a Bayesian approach—that is, to incorporate prior knowledge when reasoning with incomplete information—in order to resolve the crisis. Ranging across math, philosophy, and culture, *Bernoulli's Fallacy* explains why something has gone wrong with how we use data—and how to fix it.



## The Best Writing on Mathematics 2021

Mircea Pitici

9780691225708

£20.00 • \$24.95

Trade Paperback

Mathematics

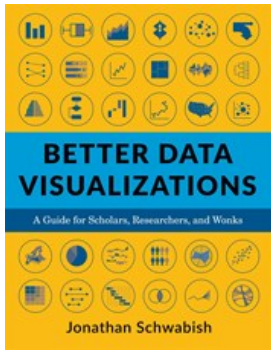
July 2022

Princeton University Press

The year's finest mathematical writing from around the world

This annual anthology brings together the year's finest mathematics writing from around the world—and you don't need to be a mathematician to enjoy the pieces collected here. These essays—from leading names and fresh new voices—delve into the history, philosophy, teaching, and everyday aspects of math, offering surprising insights into its nature, meaning, and practice, and taking readers behind the scenes of today's hottest mathematical debates.

Here, Viktor Blåsjö gives a brief history of "lockdown mathematics"; Yelda Nasifoglu decodes the politics of a seventeenth-century play in which the characters are geometric shapes; and Andrew Lewis-Pye explains the basic algorithmic rules and computational procedures behind cryptocurrencies. In other essays, Terence Tao candidly recalls the adventures and misadventures of growing up to become a leading mathematician; Natalie Wolchover shows how old math gives new clues about whether time really flows; and David Hand discusses the problem of "dark data"—information that is missing or ignored. And there is much, much more.



## Better Data Visualizations

Jonathan Schwabish

9780231193115

£25.00 • \$28.95

Trade Paperback

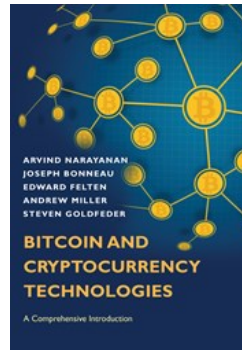
Computers / Data Science / Data Visualization

February 2021

Columbia University Press

Now more than ever, content must be visual if it is to travel far. Readers everywhere are overwhelmed with a flow of data, news, and text. Visuals can cut through the noise and make it easier for readers to recognize and recall information. Yet many researchers were never taught how to present their work visually.

This book details essential strategies to create more effective data visualizations. Jonathan Schwabish walks readers through the steps of creating better graphs and how to move beyond simple line, bar, and pie charts. Through more than five hundred examples, he demonstrates the do's and don'ts of data visualization, the principles of visual perception, and how to make subjective style decisions around a chart's design. Schwabish surveys more than eighty visualization types, from histograms to horizon charts, ridgeline plots to choropleth maps, and explains how each has its place in the visual toolkit. It might seem intimidating, but everyone can learn how to create compelling, effective data visualizations. This book will guide you as you define your audience and goals, choose the graph that best fits for your data, and clearly communicate your message.



## Bitcoin and Cryptocurrency Technologies

Arvind Narayanan

9780691171692

£48.00 • \$56.00

Hardcover

Computers / Computer Science

July 2016

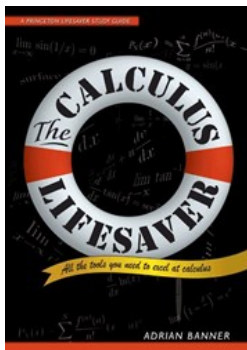
Princeton University Press

**An authoritative introduction to the exciting new technologies of digital money**

*Bitcoin and Cryptocurrency Technologies* provides a comprehensive introduction to the revolutionary yet often misunderstood new technologies of digital currency. Whether you are a student, software developer, tech entrepreneur, or researcher in computer science, this authoritative and self-contained book tells you everything you need to know about the new global money for the Internet age.

How do Bitcoin and its block chain actually work? How secure are your bitcoins? How anonymous are their users? Can cryptocurrencies be regulated? These are some of the many questions this book answers. It begins by tracing the history and development of Bitcoin and cryptocurrencies, and then gives the conceptual and practical foundations you need to engineer secure software that interacts with the Bitcoin network as well as to integrate ideas from Bitcoin into your own projects. Topics include decentralization, mining, the politics of Bitcoin, altcoins and the cryptocurrency ecosystem, the future of Bitcoin, and more.

- An essential introduction to the new technologies of digital currency
- Covers the history and mechanics of Bitcoin and the block chain, security, decentralization, anonymity, politics and regulation, altcoins, and much more
- Features an accompanying website that includes instructional videos for each chapter, homework problems, programming assignments, and lecture slides
- Also suitable for use with the authors' Coursera online course
- Electronic solutions manual (available only to professors)



## The Calculus Lifesaver

Adrian Banner

9780691130880

£25.00 • \$28.95

Trade Paperback

Mathematics / Calculus

March 2007

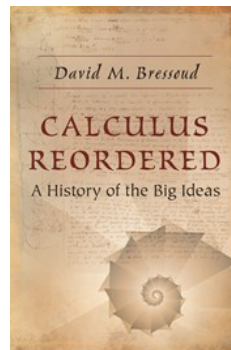
Princeton University Press

For many students, calculus can be the most mystifying and frustrating course they will ever take. *The Calculus Lifesaver* provides students with the essential tools they need not only to learn calculus, but to excel at it.

All of the material in this user-friendly study guide has been proven to get results. The book arose from Adrian Banner's popular calculus review course at Princeton University, which he developed especially for students who are motivated to earn A's but get only average grades on exams. The complete course will be available for free on the Web in a series of videotaped lectures. This study guide works as a supplement to any single-variable calculus course or textbook. Coupled with a selection of exercises, the book can also be used as a textbook in its own right. The style is informal, non-intimidating, and even entertaining, without sacrificing comprehensiveness. The author elaborates standard course material with scores of detailed examples that treat the reader to an "inner monologue"—the train of thought students should be following in order to solve the problem—providing the necessary reasoning as well as the solution. The book's emphasis is on building problem-solving skills. Examples range from easy to difficult and illustrate the in-depth presentation of theory.

*The Calculus Lifesaver* combines ease of use and readability with the depth of content and mathematical rigor of the best calculus textbooks. It is an indispensable volume for any student seeking to master calculus.

- Serves as a companion to any single-variable calculus textbook
- Informal, entertaining, and not intimidating
- Informative videos that follow the book—a full forty-eight hours of Banner's Princeton calculus-review course—is available at Adrian Banner lectures



## Calculus Reordered

David M. Bressoud

9780691218786

£17.99 • \$20.95

Trade Paperback

Mathematics / Calculus

May 2021

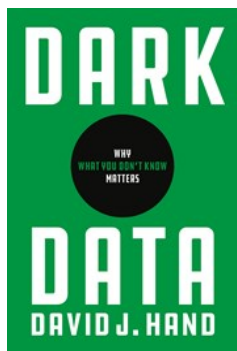
Princeton University Press

**A look at how calculus has evolved over hundreds of years and why calculus pedagogy needs to change**

*Calculus Reordered* tells the remarkable story of how calculus grew over centuries into the subject we know today. David Bressoud explains why calculus is credited to seventeenth-century figures Isaac Newton and Gottfried Leibniz, how it was shaped by Italian philosophers such as Galileo Galilei, and how its current structure sprang from developments in the nineteenth century. Bressoud reveals problems with the standard ordering of its curriculum—limits, differentiation, integration, and series—and he argues that a pedagogy informed by the historical evolution of calculus represents a sounder way for students to learn this fascinating area of mathematics. From calculus's birth in the Hellenistic Eastern Mediterranean, India, and the Islamic Middle East, to its contemporary iteration, *Calculus Reordered* highlights the ways this essential tool of mathematics came to be.



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## Dark Data

David J. Hand

9780691234465

£16.99 • \$19.95

Trade Paperback

Computers / Data Science / Data Analytics

February 2022

Princeton University Press

### A practical guide to making good decisions in a world of missing data

In the era of big data, it is easy to imagine that we have all the information we need to make good decisions. But in fact the data we have are never complete, and may be only the tip of the iceberg. Just as much of the universe is composed of dark matter, invisible to us but nonetheless present, the universe of information is full of dark data that we overlook at our peril. In *Dark Data*, data expert David Hand takes us on a fascinating and enlightening journey into the world of the data we *don't* see.

*Dark Data* explores the many ways in which we can be blind to missing data and how that can lead us to conclusions and actions that are mistaken, dangerous, or even disastrous. Examining a wealth of real-life examples, from the Challenger shuttle explosion to complex financial frauds, Hand gives us a practical taxonomy of the types of dark data that exist and the situations in which they can arise, so that we can learn to recognize and control for them. In doing so, he teaches us not only to be alert to the problems presented by the things we don't know, but also shows how dark data can be used to our advantage, leading to greater understanding and better decisions.

Today, we all make decisions using data. *Dark Data* shows us all how to reduce the risk of making bad ones.



## Do Not Erase

Jessica Wynne

9780691199221

£30.00 • \$35.00

Hardcover

Mathematics

June 2021

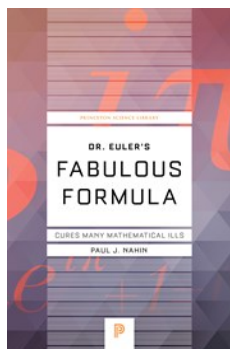
Princeton University Press

### A photographic exploration of mathematicians' chalkboards

"A mathematician, like a painter or poet, is a maker of patterns," wrote the British mathematician G. H. Hardy. In *Do Not Erase*, photographer Jessica Wynne presents remarkable examples of this idea through images of mathematicians' chalkboards. While other fields have replaced chalkboards with whiteboards and digital presentations, mathematicians remain loyal to chalk for puzzling out their ideas and communicating their research. Wynne offers more than one hundred stunning photographs of these chalkboards, gathered from a diverse group of mathematicians around the world. The photographs are accompanied by essays from each mathematician, reflecting on their work and processes. Together, pictures and words provide an illuminating meditation on the unique relationships among mathematics, art, and creativity.

The mathematicians featured in this collection comprise exciting new voices alongside established figures, including Sun-Yung Alice Chang, Alain Connes, Misha Gromov, Andre Neves, Kasso Okoudjou, Peter Shor, Christina Sormani, Terence Tao, Claire Voisin, and many others. The companion essays give insights into how the chalkboard serves as a special medium for mathematical expression. The volume also includes an introduction by the author, an afterword by *New Yorker* writer Alec Wilkinson, and biographical information for each contributor.

*Do Not Erase* is a testament to the myriad ways that mathematicians use their chalkboards to reveal the conceptual and visual beauty of their discipline—shapes, figures, formulas, and conjectures created through imagination, argument, and speculation.



## Dr. Euler's Fabulous Formula

Paul J. Nahin

9780691175911

£20.00 • \$23.95

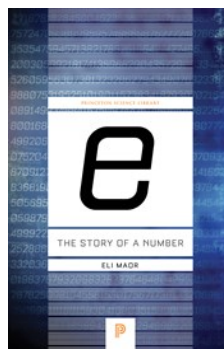
Trade Paperback

Mathematics / History & Philosophy

April 2017

Princeton University Press

In the mid-eighteenth century, Swiss-born mathematician Leonhard Euler developed a formula so innovative and complex that it continues to inspire research, discussion, and even the occasional limerick. *Dr. Euler's Fabulous Formula* shares the fascinating story of this groundbreaking formula—long regarded as the gold standard for mathematical beauty—and shows why it still lies at the heart of complex number theory. In some ways a sequel to Nahin's *An Imaginary Tale*, this book examines the many applications of complex numbers alongside intriguing stories from the history of mathematics. *Dr. Euler's Fabulous Formula* is accessible to any reader familiar with calculus and differential equations, and promises to inspire mathematicians for years to come.



## e: The Story of a Number

Eli Maor

9780691168487

£14.99 • \$17.95

Trade Paperback

Mathematics / History & Philosophy

September 2015

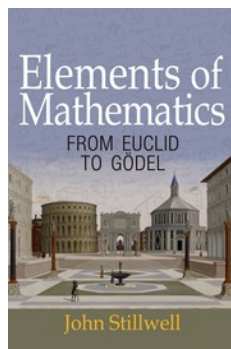
Princeton University Press

The interest earned on a bank account, the arrangement of seeds in a sunflower, and the shape of the Gateway Arch in St. Louis are all intimately connected with the mysterious number  $e$ . In this informal and engaging history, Eli Maor portrays the curious characters and the elegant mathematics that lie behind the number. Designed for a reader with only a modest mathematical background, this biography brings out the central importance of  $e$  to mathematics and illuminates a golden era in the age of science.





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## Elements of Mathematics

John Stillwell

9780691178547

£18.99 • \$22.95

Trade Paperback

Mathematics / History & Philosophy

November 2017

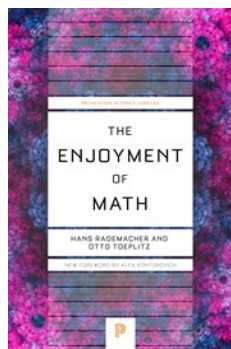
Princeton University Press

### An exciting look at the world of elementary mathematics

*Elements of Mathematics* takes readers on a fascinating tour that begins in elementary mathematics—but, as John Stillwell shows, this subject is not as elementary or straightforward as one might think. Not all topics that are part of today's elementary mathematics were always considered as such, and great mathematical advances and discoveries had to occur in order for certain subjects to become "elementary." Stillwell examines elementary mathematics from a distinctive twenty-first-century viewpoint and describes not only the beauty and scope of the discipline, but also its limits.

From Gaussian integers to propositional logic, Stillwell delves into arithmetic, computation, algebra, geometry, calculus, combinatorics, probability, and logic. He discusses how each area ties into more advanced topics to build mathematics as a whole. Through a rich collection of basic principles, vivid examples, and interesting problems, Stillwell demonstrates that elementary mathematics becomes advanced with the intervention of infinity. Infinity has been observed throughout mathematical history, but the recent development of "reverse mathematics" confirms that infinity is essential for proving well-known theorems, and helps to determine the nature, contours, and borders of elementary mathematics.

*Elements of Mathematics* gives readers, from high school students to professional mathematicians, the highlights of elementary mathematics and glimpses of the parts of math beyond its boundaries.



## The Enjoyment of Math

Hans Rademacher

9780691241548

£16.99 • \$19.95

Trade Paperback

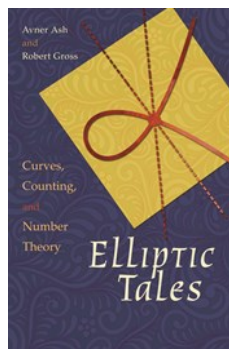
Mathematics / History & Philosophy

January 2023

Princeton University Press

### The classic book that shares the enjoyment of mathematics with readers of all skill levels

What is so special about the number 30? Do the prime numbers go on forever? Are there more whole numbers than even numbers? *The Enjoyment of Math* explores these and other captivating problems and puzzles, introducing readers to some of the most fundamental ideas in mathematics. Written by two eminent mathematicians and requiring only a background in plane geometry and elementary algebra, this delightful book covers topics such as the theory of sets, the four-color problem, regular polyhedrons, Euler's proof of the infinitude of prime numbers, and curves of constant breadth. Along the way, it discusses the history behind the problems, carefully explaining how each has arisen and, in some cases, how to resolve it. With an incisive foreword by Alex Kontorovich, this Princeton Science Library edition shares the enjoyment of math with a new generation of readers.



## Elliptic Tales

Avner Ash

9780691163505

£13.99 • \$16.95

Trade Paperback

Mathematics / History & Philosophy

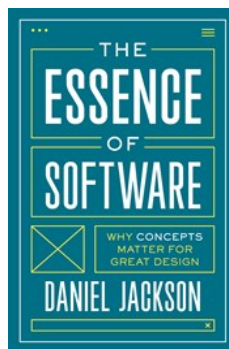
October 2014

Princeton University Press

### A look at one of the most exciting unsolved problems in mathematics today

*Elliptic Tales* describes the latest developments in number theory by looking at one of the most exciting unsolved problems in contemporary mathematics—the Birch and Swinnerton-Dyer Conjecture. In this book, Avner Ash and Robert Gross guide readers through the mathematics they need to understand this captivating problem.

The key to the conjecture lies in elliptic curves, which may appear simple, but arise from some very deep—and often very mystifying—mathematical ideas. Using only basic algebra and calculus while presenting numerous eye-opening examples, Ash and Gross make these ideas accessible to general readers, and, in the process, venture to the very frontiers of modern mathematics.



## The Essence of Software

Daniel Jackson

9780691230832

£20.00 • \$23.95

Trade Paperback

Computers / Computer Science

June 2023

Princeton University Press

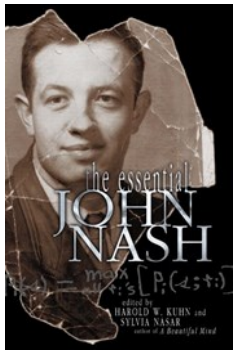
### A revolutionary concept-based approach to thinking about, designing, and interacting with software

As our dependence on technology increases, the design of software matters more than ever before. Why then is so much software flawed? Why hasn't there been a systematic and scalable way to create software that is easy to use, robust, and secure?

Examining these issues in depth, *The Essence of Software* introduces a theory of software design that gives new answers to old questions. Daniel Jackson explains that a software system should be viewed as a collection of interacting concepts, breaking the functionality into manageable parts and providing a new framework for thinking about design. Through this radical and original perspective, Jackson lays out a practical and coherent path, accessible to anyone—from strategist and marketer to UX designer, architect, or programmer—for making software that is empowering, dependable, and a delight to use.

Jackson explores every aspect of concepts—what they are and aren't, how to identify them, how to define them, and more—and offers prescriptive principles and practical tips that can be applied cost-effectively in a wide range of domains. He applies these ideas to contemporary software designs, drawing examples from leading software manufacturers such as Adobe, Apple, Dropbox, Facebook, Google, Microsoft, Twitter, and others. Jackson shows how concepts let designers preserve and reuse design knowledge, rather than starting from scratch in every project.

An argument against the status quo and a guide to improvement for both working designers and novices to the field, *The Essence of Software* brings a fresh approach to software and its creation.



## The Essential John Nash

John Nash

9780691096100

£35.00 • \$42.00

Trade Paperback

Mathematics / Game Theory

March 2007

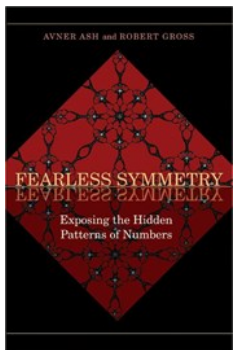
Princeton University Press

When John Nash won the Nobel prize in economics in 1994, many people were surprised to learn that he was alive and well. Since then, Sylvia Nasar's celebrated biography *A Beautiful Mind*, the basis of a new major motion picture, has revealed the man. *The Essential John Nash* reveals his work--in his own words. This book presents, for the first time, the full range of Nash's diverse contributions not only to game theory, for which he received the Nobel, but to pure mathematics--from Riemannian geometry and partial differential equations--in which he commands even greater acclaim among academics. Included are nine of Nash's most influential papers, most of them written over the decade beginning in 1949.

From 1959 until his astonishing remission three decades later, the man behind the concepts "Nash equilibrium" and "Nash bargaining"--concepts that today pervade not only economics but nuclear strategy and contract talks in major league sports--had lived in the shadow of a condition diagnosed as paranoid schizophrenia. In the introduction to this book, Nasar recounts how Nash had, by the age of thirty, gone from being a wunderkind at Princeton and a rising mathematical star at MIT to the depths of mental illness.

In his preface, Harold Kuhn offers personal insights on his longtime friend and colleague; and in introductions to several of Nash's papers, he provides scholarly context. In an afterword, Nash describes his current work, and he discusses an error in one of his papers. A photo essay chronicles Nash's career from his student days in Princeton to the present. Also included are Nash's Nobel citation and autobiography.

*The Essential John Nash* makes it plain why one of Nash's colleagues termed his style of intellectual



## Fearless Symmetry

Avner Ash

9780691138718

£28.00 • \$34.00

Trade Paperback

Mathematics / Number Theory

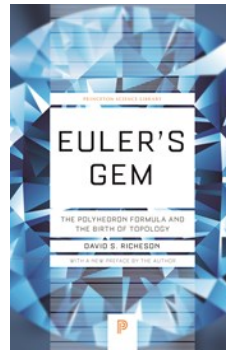
August 2008

Princeton University Press

Mathematicians solve equations, or try to. But sometimes the solutions are not as interesting as the beautiful symmetric patterns that lead to them. Written in a friendly style for a general audience, *Fearless Symmetry* is the first popular math book to discuss these elegant and mysterious patterns and the ingenious techniques mathematicians use to uncover them.

Hidden symmetries were first discovered nearly two hundred years ago by French mathematician évariste Galois. They have been used extensively in the oldest and largest branch of mathematics--number theory--for such diverse applications as acoustics, radar, and codes and ciphers. They have also been employed in the study of Fibonacci numbers and to attack well-known problems such as Fermat's Last Theorem, Pythagorean Triples, and the ever-elusive Riemann Hypothesis. Mathematicians are still devising techniques for teasing out these mysterious patterns, and their uses are limited only by the imagination.

The first popular book to address representation theory and reciprocity laws, *Fearless Symmetry* focuses on how mathematicians solve equations and prove theorems. It discusses rules of math and why they are just as important as those in any games one might play. The book starts with basic properties of integers and permutations and reaches current research in number theory. Along the way, it takes delightful historical and philosophical digressions. Required reading for all math buffs, the book will appeal to anyone curious about popular mathematics and its myriad contributions to everyday life.



## Euler's Gem

David S. Richeson

9780691191379

£16.99 • \$19.95

Trade Paperback

Mathematics / History & Philosophy

July 2019

Princeton University Press

### How a simple equation reshaped mathematics

Leonhard Euler's polyhedron formula describes the structure of many objects--from soccer balls and gemstones to Buckminster Fuller's buildings and giant all-carbon molecules. Yet Euler's theorem is so simple it can be explained to a child. From ancient Greek geometry to today's cutting-edge research, *Euler's Gem* celebrates the discovery of Euler's beloved polyhedron formula and its far-reaching impact on topology, the study of shapes. Using wonderful examples and numerous illustrations, David Richeson presents this mathematical idea's many elegant and unexpected applications, such as showing why there is always some windless spot on earth, how to measure the acreage of a tree farm by counting trees, and how many crayons are needed to color any map. Filled with a who's who of brilliant mathematicians who questioned, refined, and contributed to a remarkable theorem's development, *Euler's Gem* will fascinate every mathematics enthusiast. This paperback edition contains a new preface by the author.



## Gamma

Julian Havil

9780691178103

£16.99 • \$19.95

Trade Paperback

Mathematics / History & Philosophy

October 2017

Princeton University Press

Among the many constants that appear in mathematics,  $\pi$ ,  $e$ , and  $i$  are the most familiar. Following closely behind is  $\gamma$ , or gamma, a constant that arises in many mathematical areas yet maintains a profound sense of mystery.

In a tantalizing blend of history and mathematics, Julian Havil takes the reader on a journey through logarithms and the harmonic series, the two defining elements of gamma, toward the first account of gamma's place in mathematics.

Introduced by the Swiss mathematician Leonhard Euler (1707-1783), who figures prominently in this book, gamma is defined as the limit of the sum of  $1 + 1/2 + 1/3 + \dots$ . Up to  $1/n$ , minus the natural logarithm of  $n$ --the numerical value being 0.5772156. . . . But unlike its more celebrated colleagues  $\pi$  and  $e$ , the exact nature of gamma remains a mystery--we don't even know if gamma can be expressed as a fraction.

Among the numerous topics that arise during this historical odyssey into fundamental mathematical ideas are the Prime Number Theorem and the most important open problem in mathematics today--the Riemann Hypothesis (though no proof of either is offered!).

Sure to be popular with not only students and instructors but all math aficionados, *Gamma* takes us through countries, centuries, lives, and works, unfolding along the way the stories of some remarkable mathematics from some remarkable mathematicians.



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COLUMBIA  
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## Guesstimation

Lawrence Weinstein

9780691129495

£16.99 • \$19.95

Paperback - with flaps

Mathematics / Recreations & Games

April 2008

Princeton University Press

*Guesstimation* is a book that unlocks the power of approximation--it's popular mathematics rounded to the nearest power of ten! The ability to estimate is an important skill in daily life. More and more leading businesses today use estimation questions in interviews to test applicants' abilities to think on their feet. *Guesstimation* enables anyone with basic math and science skills to estimate virtually anything--quickly--using plausible assumptions and elementary arithmetic.

Lawrence Weinstein and John Adam present an eclectic array of estimation problems that range from devilishly simple to quite sophisticated and from serious real-world concerns to downright silly ones. How long would it take a running faucet to fill the inverted dome of the Capitol? What is the total length of all the pickles consumed in the US in one year? What are the relative merits of internal-combustion and electric cars, of coal and nuclear energy? The problems are marvelously diverse, yet the skills to solve them are the same. The authors show how easy it is to derive useful ballpark estimates by breaking complex problems into simpler, more manageable ones--and how there can be many paths to the right answer. The book is written in a question-and-answer format with lots of hints along the way. It includes a handy appendix summarizing the few formulas and basic science concepts needed, and its small size and French-fold design make it conveniently portable. Illustrated with humorous pen-and-ink sketches, *Guesstimation* will delight popular-math enthusiasts and is ideal for the classroom.



## Guesstimation 2.0

Lawrence Weinstein

9780691150802

£16.99 • \$19.95

Paperback - with flaps

Mathematics / Recreations & Games

September 2012

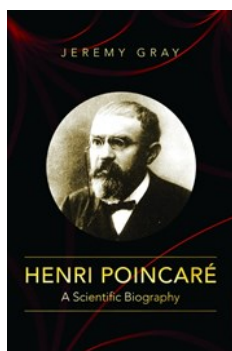
Princeton University Press

### Simple and effective techniques for quickly estimating virtually anything

*Guesstimation 2.0* reveals the simple and effective techniques needed to estimate virtually anything--quickly--and illustrates them using an eclectic array of problems. A stimulating follow-up to *Guesstimation*, this is the must-have book for anyone preparing for a job interview in technology or finance, where more and more leading businesses test applicants using estimation questions just like these.

The ability to guesstimate on your feet is an essential skill to have in today's world, whether you're trying to distinguish between a billion-dollar subsidy and a trillion-dollar stimulus, a megawatt wind turbine and a gigawatt nuclear plant, or parts-per-million and parts-per-billion contaminants. Lawrence Weinstein begins with a concise tutorial on how to solve these kinds of order of magnitude problems, and then invites readers to have a go themselves. The book features dozens of problems along with helpful hints and easy-to-understand solutions. It also includes appendixes containing useful formulas and more.

*Guesstimation 2.0* shows how to estimate everything from how closely you can orbit a neutron star without being pulled apart by gravity, to the fuel used to transport your food from the farm to the store, to the total length of all toilet paper used in the United States. It also enables readers to answer, once and for all, the most asked environmental question of our day: paper or plastic?



## Henri Poincaré

Jeremy Gray

9780691242033

£30.00 • \$35.00

Trade Paperback

Mathematics / History & Philosophy

January 2023

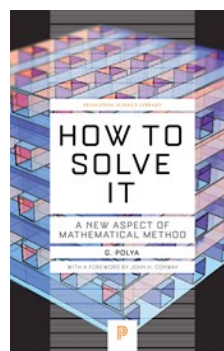
Princeton University Press

### A comprehensive look at the mathematics, physics, and philosophy of Henri Poincaré

Henri Poincaré (1854–1912) was not just one of the most inventive, versatile, and productive mathematicians of all time—he was also a leading physicist who almost won a Nobel Prize for physics and a prominent philosopher of science whose fresh and surprising essays are still in print a century later. The first in-depth and comprehensive look at his many accomplishments, *Henri Poincaré* explores all the fields that Poincaré touched, the debates sparked by his original investigations, and how his discoveries still contribute to society today.

Math historian Jeremy Gray shows that Poincaré's influence was wide-ranging and permanent. His novel interpretation of non-Euclidean geometry challenged contemporary ideas about space, stirred heated discussion, and led to flourishing research. His work in topology began the modern study of the subject, recently highlighted by the successful resolution of the famous Poincaré conjecture. And Poincaré's reformulation of celestial mechanics and discovery of chaotic motion started the modern theory of dynamical systems. In physics, his insights on the Lorentz group preceded Einstein's, and he was the first to indicate that space and time might be fundamentally atomic. Poincaré the public intellectual did not shy away from scientific controversy, and he defended mathematics against the attacks of logicians such as Bertrand Russell, opposed the views of Catholic apologists, and served as an expert witness in probability for the notorious Dreyfus case that polarized France.

Richly informed by letters and documents, *Henri Poincaré* demonstrates how one man's work revolutionized math, science, and the greater world.



## How to Solve It

John H. Conway

9780691164076

£16.99 • \$19.95

Trade Paperback

Mathematics / Logic

October 2014

Princeton University Press

A perennial bestseller by eminent mathematician G. Polya, *How to Solve It* will show anyone in any field how to think straight. In lucid and appealing prose, Polya reveals how the mathematical method of demonstrating a proof or finding an unknown can be of help in attacking any problem that can be "reasoned" out—from building a bridge to winning a game of anagrams. Generations of readers have relished Polya's deft—indeed, brilliant—instructions on stripping away irrelevancies and going straight to the heart of the problem.



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## An Imaginary Tale

Paul J. Nahin

9780691169248

£13.99 • \$16.95

Trade Paperback

Mathematics / History & Philosophy

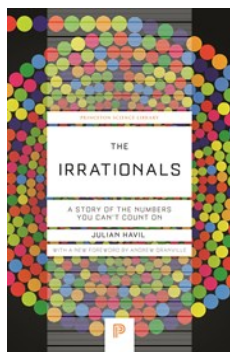
March 2016

Princeton University Press

Today complex numbers have such widespread practical use—from electrical engineering to aeronautics—that few people would expect the story behind their derivation to be filled with adventure and enigma. In *An Imaginary Tale*, Paul Nahin tells the 2000-year-old history of one of mathematics' most elusive numbers, the square root of minus one, also known as  $i$ . He recreates the baffling mathematical problems that conjured it up, and the colorful characters who tried to solve them.

In 1878, when two brothers stole a mathematical papyrus from the ancient Egyptian burial site in the Valley of Kings, they led scholars to the earliest known occurrence of the square root of a negative number. The papyrus offered a specific numerical example of how to calculate the volume of a truncated square pyramid, which implied the need for  $i$ . In the first century, the mathematician-engineer Heron of Alexandria encountered  $I$  in a separate project, but fudged the arithmetic; medieval mathematicians stumbled upon the concept while grappling with the meaning of negative numbers, but dismissed their square roots as nonsense. By the time of Descartes, a theoretical use for these elusive square roots—now called "imaginary numbers"—was suspected, but efforts to solve them led to intense, bitter debates. The notorious  $i$  finally won acceptance and was put to use in complex analysis and theoretical physics in Napoleonic times.

Addressing readers with both a general and scholarly interest in mathematics, Nahin weaves into this narrative entertaining historical facts and mathematical discussions, including the application of complex numbers and functions to important problems, such as Kepler's laws of planetary motion and ac electrical circuits. This book can be read as an engaging history, almost a biography, of one of the most evasive and pervasive "numbers" in all of mathematics.



## The Irrationals

Julian Havil

9780691247663

£16.99 • \$19.95

Trade Paperback

Mathematics / History & Philosophy

June 2023

Princeton University Press

**An entertaining and enlightening history of irrational numbers, from ancient Greece to the twenty-first century**

The ancient Greeks discovered them, but it wasn't until the nineteenth century that irrational numbers were properly understood and rigorously defined, and even today not all their mysteries have been revealed. In *The Irrationals*, the first popular and comprehensive book on the subject, Julian Havil tells the story of irrational numbers and the mathematicians who have tackled their challenges, from antiquity to the twenty-first century. Along the way, he explains why irrational numbers are surprisingly difficult to define—and why so many questions still surround them. Fascinating and illuminating, this is a book for everyone who loves math and the history behind it.



## In Pursuit of Zeta-3

Paul J. Nahin

9780691247649

£17.99 • \$21.95

Trade Paperback

Mathematics / History & Philosophy

May 2023

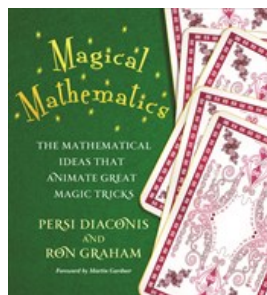
Princeton University Press

**An engrossing look at the history and importance of a centuries-old but still unanswered math problem**

For centuries, mathematicians the world over have tried, and failed, to solve the zeta-3 problem. Math genius Leonhard Euler attempted it in the 1700s and came up short. The straightforward puzzle considers if there exists a simple symbolic formula for the following:  $1+(1/2)^3+(1/3)^3+(1/4)^3+\dots$ . But why is this issue—the sum of the reciprocals of the positive integers cubed—so important? With *In Pursuit of Zeta-3*, popular math writer Paul Nahin investigates the history and significance of this mathematical conundrum.

Drawing on detailed examples, historical anecdotes, and even occasionally poetry, Nahin sheds light on the richness of the nature of zeta-3. He shows its intimate connections to the Riemann hypothesis, another mathematical mystery that has stumped mathematicians for nearly two centuries. He looks at its links with Euler's achievements and explores the modern research area of Euler sums, where zeta-3 occurs frequently. An exact solution to the zeta-3 question wouldn't simply satisfy pure mathematical interest: it would have critical ramifications for applications in physics and engineering, such as quantum electrodynamics. Challenge problems with detailed solutions and *MATLAB* code are included at the end of each of the book's sections.

Detailing the trials and tribulations of mathematicians who have approached one of the field's great unsolved riddles, *In Pursuit of Zeta-3* will tantalize curious math enthusiasts everywhere.



## Magical Mathematics

Persi Diaconis

9780691151649

£25.00 • \$29.95

Hardcover

Mathematics / Recreations & Games

October 2011

Princeton University Press

**The mathematics behind some of the world's most amazing card tricks**

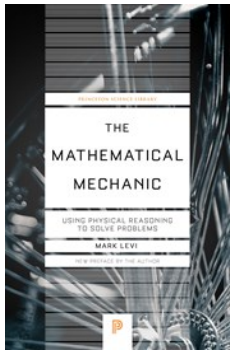
*Magical Mathematics* reveals the secrets of fun-to-perform card tricks—and the profound mathematical ideas behind them—that will astound even the most accomplished magician. Persi Diaconis and Ron Graham provide easy, step-by-step instructions for each trick, explaining how to set up the effect and offering tips on what to say and do while performing it. Each card trick introduces a new mathematical idea, and varying the tricks in turn takes readers to the very threshold of today's mathematical knowledge.

Diaconis and Graham tell the stories—and reveal the best tricks—of the eccentric and brilliant inventors of mathematical magic. The book exposes old gambling secrets through the mathematics of shuffling cards, explains the classic street-gambling scam of three-card Monte, traces the history of mathematical magic back to the oldest mathematical trick—and much more.





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## The Mathematical Mechanic

Mark Levi

9780691242057

£15.99 • \$18.95

Trade Paperback

Mathematics

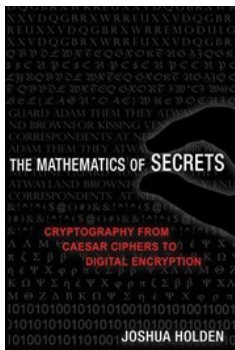
January 2023

Princeton University Press

Everybody knows that mathematics is indispensable to physics--imagine where we'd be today if Einstein and Newton didn't have the math to back up their ideas. But how many people realize that physics can be used to produce many astonishing and strikingly elegant solutions in mathematics? Mark Levi shows how in this delightful book, treating readers to a host of entertaining problems and mind-bending puzzlers that will amuse and inspire their inner physicist.

Levi turns math and physics upside down, revealing how physics can simplify proofs and lead to quicker solutions and new theorems, and how physical solutions can illustrate why results are true in ways lengthy mathematical calculations never can. Did you know it's possible to derive the Pythagorean theorem by spinning a fish tank filled with water? Or that soap film holds the key to determining the cheapest container for a given volume? Or that the line of best fit for a data set can be found using a mechanical contraption made from a rod and springs? Levi demonstrates how to use physical intuition to solve these and other fascinating math problems. More than half the problems can be tackled by anyone with precalculus and basic geometry, while the more challenging problems require some calculus. This one-of-a-kind book explains physics and math concepts where needed, and includes an informative appendix of physical principles.

*The Mathematical Mechanic* will appeal to anyone interested in the little-known connections between mathematics and physics and how both endeavors relate to the world around us.



## The Mathematics of Secrets

Joshua Holden

9780691183312

£15.99 • \$18.95

Trade Paperback

Computers / Security / Cryptography & Encryption

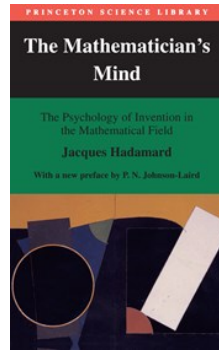
October 2018

Princeton University Press

### Explaining the mathematics of cryptography

*The Mathematics of Secrets* takes readers on a fascinating tour of the mathematics behind cryptography--the science of sending secret messages. Using a wide range of historical anecdotes and real-world examples, Joshua Holden shows how mathematical principles underpin the ways that different codes and ciphers work. He focuses on both code making and code breaking and discusses most of the ancient and modern ciphers that are currently known. He begins by looking at substitution ciphers, and then discusses how to introduce flexibility and additional notation. Holden goes on to explore polyalphabetic substitution ciphers, transposition ciphers, connections between ciphers and computer encryption, stream ciphers, public-key ciphers, and ciphers involving exponentiation. He concludes by looking at the future of ciphers and where cryptography might be headed. *The Mathematics of Secrets* reveals the mathematics working stealthily in the science of coded messages.

A blog describing new developments and historical discoveries in cryptography related to the material in this book is accessible at <http://press.princeton.edu/titles/10826.html>.



## The Mathematician's Mind

Jacques Hadamard

9780691029313

£30.00 • \$37.00

Trade Paperback

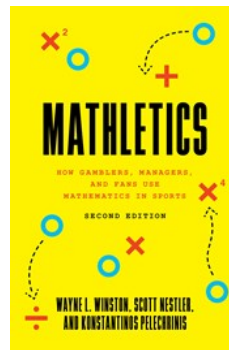
Mathematics / History & Philosophy

October 1996

Princeton University Press

Fifty years ago when Jacques Hadamard set out to explore how mathematicians invent new ideas, he considered the creative experiences of some of the greatest thinkers of his generation, such as George Polya, Claude Lévi-Strauss, and Albert Einstein. It appeared that inspiration could strike anytime, particularly after an individual had worked hard on a problem for days and then turned attention to another activity. In exploring this phenomenon, Hadamard produced one of the most famous and cogent cases for the existence of unconscious mental processes in mathematical invention and other forms of creativity. Written before the explosion of research in computers and cognitive science, his book, originally titled *The Psychology of Invention in the Mathematical Field*, remains an important tool for exploring the increasingly complex problem of mental life.

The roots of creativity for Hadamard lie not in consciousness, but in the long unconscious work of incubation, and in the unconscious aesthetic selection of ideas that thereby pass into consciousness. His discussion of this process comprises a wide range of topics, including the use of mental images or symbols, visualized or auditory words, "meaningless" words, logic, and intuition. Among the important documents collected is a letter from Albert Einstein analyzing his own mechanism of thought.



## Mathletics

Wayne L. Winston

9780691177625

£22.00 • \$26.95

Trade Paperback

Computers / Data Science / Data Analytics

February 2022

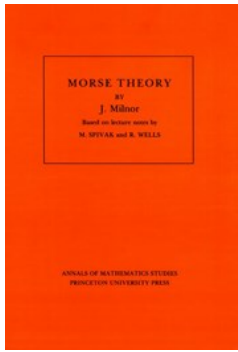
Princeton University Press

### How to use math to improve performance and predict outcomes in professional sports

*Mathletics* reveals the mathematical methods top coaches and managers use to evaluate players and improve team performance, and gives math enthusiasts the practical skills they need to enhance their understanding and enjoyment of their favorite sports--and maybe even gain the outside edge to winning bets. This second edition features new data, new players and teams, and new chapters on soccer, e-sports, golf, volleyball, gambling Calcuttas, analysis of camera data, Bayesian inference, ridge regression, and other statistical techniques. After reading *Mathletics*, you will understand why baseball teams should almost never bunt; why football overtime systems are unfair; why points, rebounds, and assists aren't enough to determine who's the NBA's best player; and more.



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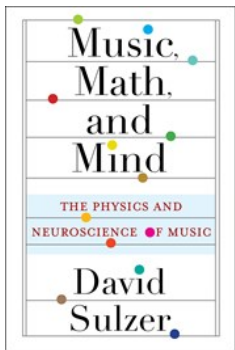
## Morse Theory. (AM-51), Volume 51

John Milnor  
9780691080086  
£68.00 • \$81.00  
Trade Paperback  
Mathematics / Topology  
May 1963  
Princeton University Press

One of the most cited books in mathematics, John Milnor's exposition of Morse theory has been the most important book on the subject for more than forty years. Morse theory was developed in the 1920s by mathematician Marston Morse. (Morse was on the faculty of the Institute for Advanced Study, and Princeton published his *Topological Methods in the Theory of Functions of a Complex Variable* in the Annals of Mathematics Studies series in 1947.) One classical application of Morse theory includes the attempt to understand, with only limited information, the large-scale structure of an object. This kind of problem occurs in mathematical physics, dynamic systems, and mechanical engineering. Morse theory has received much attention in the last two decades as a result of a famous paper in which theoretical physicist Edward Witten relates Morse theory to quantum field theory.

Milnor was awarded the Fields Medal (the mathematical equivalent of a Nobel Prize) in 1962 for his work in differential topology. He has since received the National Medal of Science (1967) and the Steele Prize from the American Mathematical Society twice (1982 and 2004) in recognition of his explanations of mathematical concepts across a wide range of scientific disciplines. The citation reads, "The phrase sublime elegance is rarely associated with mathematical exposition, but it applies to all of Milnor's writings. Reading his books, one is struck with the ease with which the subject is unfolding and it only becomes apparent after reflection that this ease is the mark of a master."

Milnor has published five books with Princeton University Press.



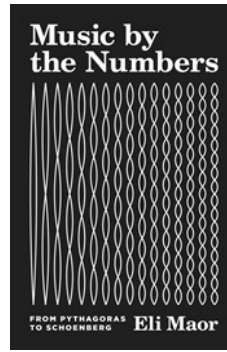
## Music, Math, and Mind

David Sulzer  
9780231193795  
£22.00 • \$28.00  
Trade Paperback  
Mathematics  
April 2021  
Columbia University Press

Why does a clarinet play at lower pitches than a flute? What does it mean for sounds to be in or out of tune? How are emotions carried by music? Do other animals perceive sound like we do? How might a musician use math to come up with new ideas?

This book offers a lively exploration of the mathematics, physics, and neuroscience that underlie music in a way that readers without scientific background can follow. David Sulzer, also known in the musical world as Dave Soldier, explains why the perception of music encompasses the physics of sound, the functions of the ear and deep-brain auditory pathways, and the physiology of emotion. He delves into topics such as the math by which musical scales, rhythms, tuning, and harmonies are derived, from the days of Pythagoras to technological manipulation of sound waves. Sulzer ranges from styles from around the world to canonical composers to hip-hop, the history of experimental music, and animal sound by songbirds, cetaceans, bats, and insects. He makes accessible a vast range of material, helping readers discover the universal principles behind the music they find meaningful.

Written for musicians and music lovers with any level of science and math proficiency, including none, *Music, Math, and Mind* demystifies how music works while testifying to its beauty and wonder.

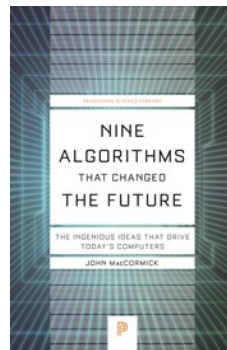


## Music by the Numbers

Eli Maor  
9780691202969  
£14.99 • \$17.95  
Trade Paperback  
Mathematics / History & Philosophy  
March 2020  
Princeton University Press

### How music has influenced mathematics, physics, and astronomy from ancient Greece to the twentieth century

Music is filled with mathematical elements. The works of Bach are often said to possess a math-like logic, and Arnold Schoenberg, Iannis Xenakis, and Karlheinz Stockhausen wrote music explicitly based on mathematical principles. Yet Eli Maor argues that it is music that has had the greater influence on mathematics, not the other way around. Starting with Pythagoras, proceeding through Schoenberg, and bringing the story up to the present with contemporary string theory, *Music by the Numbers* tells a fascinating story of composers, scientists, inventors, and eccentrics who have played a role in the age-old relationship between music, mathematics, and the physical sciences. Weaving compelling stories of historical episodes with Maor's personal reflections as a mathematician and lover of classical music, this book will delight anyone who loves math and music.



## Nine Algorithms That Changed the Future

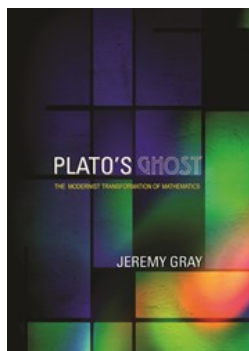
John McCormick  
9780691209067  
£16.99 • \$19.95  
Trade Paperback  
Computers / Programming / Algorithms  
September 2020  
Princeton University Press

### Nine revolutionary algorithms that power our computers and smartphones

Every day, we use our computers to perform remarkable feats. A simple web search picks out a handful of relevant needles from the world's biggest haystack. Uploading a photo to Facebook transmits millions of pieces of information over numerous error-prone network links, yet somehow a perfect copy of the photo arrives intact. Without even knowing it, we use public-key cryptography to transmit secret information like credit card numbers, and we use digital signatures to verify the identity of the websites we visit. How do our computers perform these tasks with such ease? John McCormick answers this question in language anyone can understand, using vivid examples to explain the fundamental tricks behind nine computer algorithms that power our PCs, tablets, and smartphones.



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## Plato's Ghost

Jeremy Gray

9780691242040

£35.00 • \$39.95

Trade Paperback

Mathematics / History & Philosophy

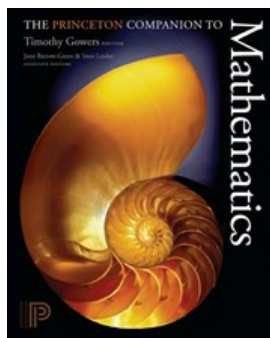
December 2022

Princeton University Press

*Plato's Ghost* is the first book to examine the development of mathematics from 1880 to 1920 as a modernist transformation similar to those in art, literature, and music. Jeremy Gray traces the growth of mathematical modernism from its roots in problem solving and theory to its interactions with physics, philosophy, theology, psychology, and ideas about real and artificial languages. He shows how mathematics was popularized, and explains how mathematical modernism not only gave expression to the work of mathematicians and the professional image they sought to create for themselves, but how modernism also introduced deeper and ultimately unanswerable questions.

*Plato's Ghost* evokes Yeats's lament that any claim to worldly perfection inevitably is proven wrong by the philosopher's ghost; Gray demonstrates how modernist mathematicians believed they had advanced further than anyone before them, only to make more profound mistakes. He tells for the first time the story of these ambitious and brilliant mathematicians, including Richard Dedekind, Henri Lebesgue, Henri Poincaré, and many others. He describes the lively debates surrounding novel objects, definitions, and proofs in mathematics arising from the use of naïve set theory and the revived axiomatic method—debates that spilled over into contemporary arguments in philosophy and the sciences and drove an upsurge of popular writing on mathematics. And he looks at mathematics after World War I, including the foundational crisis and mathematical Platonism.

*Plato's Ghost* is essential reading for mathematicians and historians, and will appeal to anyone interested in the development of modern mathematics.



## The Princeton Companion to Mathematics

Timothy Gowers

9780691118802

£84.00 • \$99.50

Hardcover

Mathematics / Reference

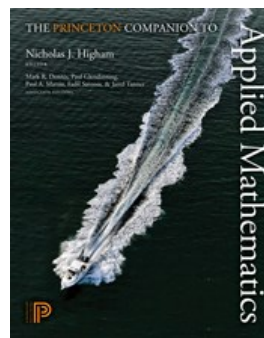
September 2008

Princeton University Press

This is a one-of-a-kind reference for anyone with a serious interest in mathematics. Edited by Timothy Gowers, a recipient of the Fields Medal, it presents nearly two hundred entries, written especially for this book by some of the world's leading mathematicians, that introduce basic mathematical tools and vocabulary; trace the development of modern mathematics; explain essential terms and concepts; examine core ideas in major areas of mathematics; describe the achievements of scores of famous mathematicians; explore the impact of mathematics on other disciplines such as biology, finance, and music—and much, much more.

Unparalleled in its depth of coverage, *The Princeton Companion to Mathematics* surveys the most active and exciting branches of pure mathematics. Accessible in style, this is an indispensable resource for undergraduate and graduate students in mathematics as well as for researchers and scholars seeking to understand areas outside their specialties.

- Features nearly 200 entries, organized thematically and written by an international team of distinguished contributors
- Presents major ideas and branches of pure mathematics in a clear, accessible style
- Defines and explains important mathematical concepts, methods, theorems, and open problems
- Introduces the language of mathematics and the goals of mathematical research
- Covers number theory, algebra, analysis, geometry, logic, probability, and more
- Traces the history and development of modern mathematics
- Profiles more than ninety-five mathematicians who influenced those working today
- Explores the influence of mathematics on other disciplines
- Includes bibliographies, cross-references, and a comprehensive index



## The Princeton Companion to Applied Mathematics

Nicholas J. Higham

9780691150390

£88.00 • \$105.00

Hardcover

Mathematics / Reference

September 2015

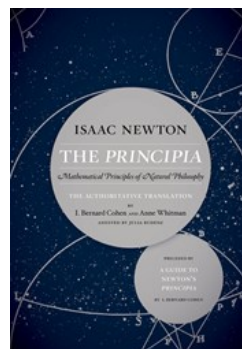
Princeton University Press

### The must-have compendium on applied mathematics

This is the most authoritative and accessible single-volume reference book on applied mathematics. Featuring numerous entries by leading experts and organized thematically, it introduces readers to applied mathematics and its uses; explains key concepts; describes important equations, laws, and functions; looks at exciting areas of research; covers modeling and simulation; explores areas of application; and more.

Modeled on the popular *Princeton Companion to Mathematics*, this volume is an indispensable resource for undergraduate and graduate students, researchers, and practitioners in other disciplines seeking a user-friendly reference book on applied mathematics.

- Features nearly 200 entries organized thematically and written by an international team of distinguished contributors
- Presents the major ideas and branches of applied mathematics in a clear and accessible way
- Explains important mathematical concepts, methods, equations, and applications
- Introduces the language of applied mathematics and the goals of applied mathematical research
- Gives a wide range of examples of mathematical modeling
- Covers continuum mechanics, dynamical systems, numerical analysis, discrete and combinatorial mathematics, mathematical physics, and much more
- Explores the connections between applied mathematics and other disciplines
- Includes suggestions for further reading, cross-references, and a comprehensive index



## The Principia: The Authoritative Translation and Guide

Isaac Newton

9780520290884

£30.00 • \$34.95

Trade Paperback

Science / Physics / Mathematical & Computational

February 2016

In his monumental 1687 work, *Philosophiæ Naturalis Principia Mathematica*, known familiarly as the *Principia*, Isaac Newton laid out in mathematical terms the principles of time, force, and motion that have guided the development of modern physical science. Even after more than three centuries and the revolutions of Einsteinian relativity and quantum mechanics, Newtonian physics continues to account for many of the phenomena of the observed world, and Newtonian celestial dynamics is used to determine the orbits of our space vehicles.

This authoritative, modern translation by I. Bernard Cohen and Anne Whitman, the first in more than 285 years, is based on the 1726 edition, the final revised version approved by Newton; it includes extracts from the earlier editions, corrects errors found in earlier versions, and replaces archaic English with contemporary prose and up-to-date mathematical forms.

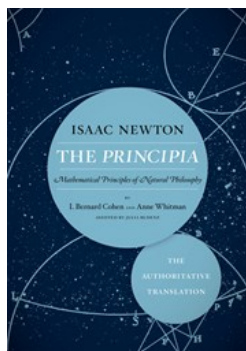
Newton's principles describe acceleration, deceleration, and inertial movement; fluid dynamics; and the motions of the earth, moon, planets, and comets. A great work in itself, the *Principia* also revolutionized the methods of scientific investigation. It set forth the fundamental three laws of motion and the law of universal gravity, the physical principles that account for the Copernican system of the world as emended by Kepler, thus effectively ending controversy concerning the Copernican planetary system.

The illuminating Guide to Newton's *Principia* by I. Bernard Cohen makes this preeminent work truly accessible for today's scientists, scholars, and students.





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## The Principia: The Authoritative Translation

Isaac Newton

9780520290747

£16.99 • \$19.95

Trade Paperback

Science / Physics / Mathematical &

Computational

February 2016

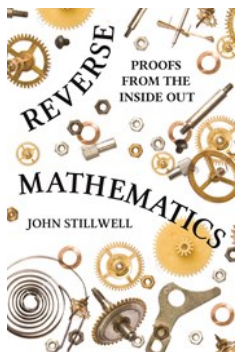
University of California Press

In his monumental 1687 work, *Philosophiæ Naturalis Principia Mathematica*, known familiarly as the *Principia*, Isaac Newton laid out in mathematical terms the principles of time, force, and motion that have guided the development of modern physical science. Even after more than three centuries and the revolutions of Einsteinian relativity and quantum mechanics, Newtonian physics continues to account for many of the phenomena of the observed world, and Newtonian celestial dynamics is used to determine the orbits of our space vehicles.

This authoritative, modern translation by I. Bernard Cohen and Anne Whitman, the first in more than 285 years, is based on the 1726 edition, the final revised version approved by Newton; it includes extracts from the earlier editions, corrects errors found in earlier versions, and replaces archaic English with contemporary prose and up-to-date mathematical forms.

Newton's principles describe acceleration, deceleration, and inertial movement; fluid dynamics; and the motions of the earth, moon, planets, and comets. A great work in itself, the *Principia* also revolutionized the methods of scientific investigation. It set forth the fundamental three laws of motion and the law of universal gravity, the physical principles that account for the Copernican system of the world as emended by Kepler, thus effectively ending controversy concerning the Copernican planetary system.

The translation-only edition of this preeminent work is truly accessible for today's scientists, scholars, and students.



## Reverse Mathematics

John Stillwell

9780691196411

£16.99 • \$19.95

Trade Paperback

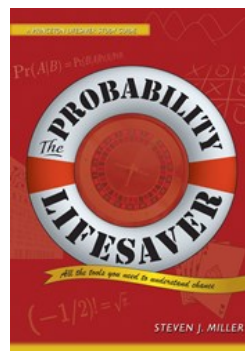
Mathematics / History & Philosophy

September 2019

Princeton University Press

### The first book surveying the history and ideas behind reverse mathematics

Reverse mathematics is a new field that seeks to find the axioms needed to prove given theorems. In *Reverse Mathematics*, John Stillwell offers a historical and representative view, emphasizing basic analysis and giving a novel approach to logic. By using a minimum of mathematical logic in a well-motivated way, *Reverse Mathematics* will engage advanced undergraduates and all mathematicians interested in the foundations of mathematics.



## The Probability Lifesaver

Steven J. Miller

9780691149554

£28.00 • \$31.95

Trade Paperback

Mathematics / Probability & Statistics

May 2017

Princeton University Press

### The essential lifesaver for students who want to master probability

For students learning probability, its numerous applications, techniques, and methods can seem intimidating and overwhelming. That's where *The Probability Lifesaver* steps in. Designed to serve as a complete stand-alone introduction to the subject or as a supplement for a course, this accessible and user-friendly study guide helps students comfortably navigate probability's terrain and achieve positive results.

*The Probability Lifesaver* is based on a successful course that Steven Miller has taught at Brown University, Mount Holyoke College, and Williams College. With a relaxed and informal style, Miller presents the math with thorough reviews of prerequisite materials, worked-out problems of varying difficulty, and proofs. He explores a topic first to build intuition, and only after that does he dive into technical details. Coverage of topics is comprehensive, and materials are repeated for reinforcement—both in the guide and on the book's website. An appendix goes over proof techniques, and video lectures of the course are available online. Students using this book should have some familiarity with algebra and precalculus.

*The Probability Lifesaver* not only enables students to survive probability but also to achieve mastery of the subject for use in future courses.

- A helpful introduction to probability or a perfect supplement for a course
- Numerous worked-out examples
- Lectures based on the chapters are available free online
- Intuition of problems emphasized first, then technical proofs given
- Appendixes review proof techniques
- Relaxed, conversational approach

## Small Worlds

Duncan J. Watts

9780691117041

£40.00 • \$48.00

Trade Paperback

Mathematics / Probability & Statistics

December 2003

Princeton University Press

Everyone knows the small-world phenomenon: soon after meeting a stranger, we are surprised to discover that we have a mutual friend, or we are connected through a short chain of acquaintances. In his book, Duncan Watts uses this intriguing phenomenon—colloquially called "six degrees of separation"—as a prelude to a more general exploration: under what conditions can a small world arise in any kind of network?

The networks of this story are everywhere: the brain is a network of neurons; organisations are people networks; the global economy is a network of national economies, which are networks of markets, which are in turn networks of interacting producers and consumers. Food webs, ecosystems, and the Internet can all be represented as networks, as can strategies for solving a problem, topics in a conversation, and even words in a language. Many of these networks, the author claims, will turn out to be small worlds.

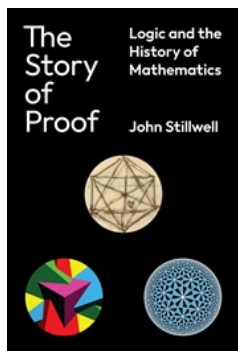
How do such networks matter? Simply put, local actions can have global consequences, and the relationship between local and global dynamics depends critically on the network's structure. Watts illustrates the subtleties of this relationship using a variety of simple models—the spread of infectious disease through a structured population; the evolution of cooperation in game theory; the computational capacity of cellular automata; and the synchronisation of coupled phase-oscillators.

Watts's novel approach is relevant to many problems that deal with network connectivity and complex systems' behaviour in general: How do diseases (or rumours) spread through social networks? How does cooperation evolve in large groups? How do cascading failures propagate through large power grids, or financial systems? What is the most efficient architecture for an organisation, or for a communications network? This fascinating exploration will be fruitful in a remarkable variety of fields, including physics and mathematics, as well as sociology, economics, and biology.





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## The Story of Proof

John Stillwell

9780691234366

£38.00 • \$45.00

Hardcover

Mathematics / History & Philosophy

November 2022

Princeton University Press

### How the concept of proof has enabled the creation of mathematical knowledge

*The Story of Proof* investigates the evolution of the concept of proof—one of the most significant and defining features of mathematical thought—through critical episodes in its history. From the Pythagorean theorem to modern times, and across all major mathematical disciplines, John Stillwell demonstrates that proof is a mathematically vital concept, inspiring innovation and playing a critical role in generating knowledge.

Stillwell begins with Euclid and his influence on the development of geometry and its methods of proof, followed by algebra, which began as a self-contained discipline but later came to rival geometry in its mathematical impact. In particular, the infinite processes of calculus were at first viewed as “infinitesimal algebra,” and calculus became an arena for algebraic, computational proofs rather than axiomatic proofs in the style of Euclid. Stillwell proceeds to the areas of number theory, non-Euclidean geometry, topology, and logic, and peers into the deep chasm between natural number arithmetic and the real numbers. In its depths, Cantor, Gödel, Turing, and others found that the concept of proof is ultimately part of arithmetic. This startling fact imposes fundamental limits on what theorems can be proved and what problems can be solved.

Shedding light on the workings of mathematics at its most fundamental levels, *The Story of Proof* offers a compelling new perspective on the field’s power and progress.

## Theoretical Acoustics

Philip M. Morse

9780691024011

£134.00 • \$158.00

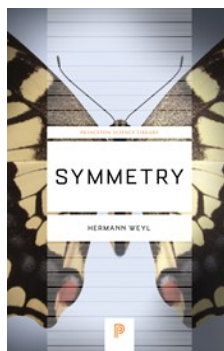
Trade Paperback

Mathematics / Applied

January 1987

Princeton University Press

This volume, available for the first time in paperback, is a standard work on the physical aspects of acoustics. Starting from first principles, the authors have successfully produced a unified and thorough treatment of the subjects of generation, propagation, absorption, reflection, and scattering of compressional waves in fluids, progressing to such topics as moving sound sources, turbulence, and wave-induced vibration of structures. Material is included on viscous and thermal effects, on the acoustics of moving media, on plasma acoustics, on nonlinear effects, and on the interaction between light and sound. Problems, with answers in many cases, are given at the end of each chapter. They contain extensions to further applications, thus enhancing the reference value of the book. Many of the examples worked out in the text and in the problem solutions were not previously published. Anyone familiar with calculus and vector analysis should be able to understand the mathematical techniques used here.



## Symmetry

Hermann Weyl

9780691173252

£14.99 • \$17.95

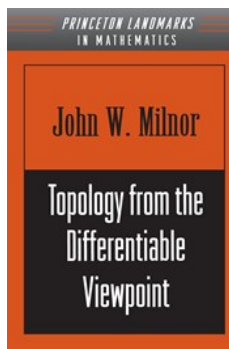
Trade Paperback

Mathematics

October 2016

Princeton University Press

*Symmetry* is a classic study of symmetry in mathematics, the sciences, nature, and art from one of the twentieth century’s greatest mathematicians. Hermann Weyl explores the concept of symmetry beginning with the idea that it represents a harmony of proportions, and gradually departs to examine its more abstract varieties and manifestations—as bilateral, translatory, rotational, ornamental, and crystallographic. Weyl investigates the general abstract mathematical idea underlying all these special forms, using a wealth of illustrations as support. *Symmetry* is a work of seminal relevance that explores the great variety of applications and importance of symmetry.



## Topology from the Differentiable Viewpoint

John Milnor

9780691048338

£40.00 • \$49.00

Trade Paperback

Mathematics / Topology

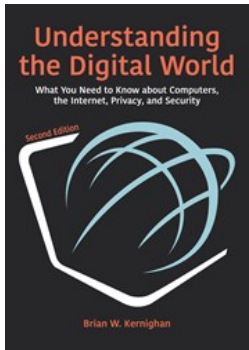
December 1997

Princeton University Press

This elegant book by distinguished mathematician John Milnor, provides a clear and succinct introduction to one of the most important subjects in modern mathematics. Beginning with basic concepts such as diffeomorphisms and smooth manifolds, he goes on to examine tangent spaces, oriented manifolds, and vector fields. Key concepts such as homotopy, the index number of a map, and the Pontryagin construction are discussed. The author presents proofs of Sard’s theorem and the Hopf theorem.



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## Understanding the Digital World

Brian W. Kernighan

9780691219103

£28.00 • \$31.95

Trade Paperback

Computers

March 2021

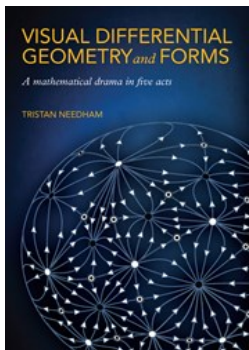
Princeton University Press

**A brand-new edition of the popular introductory textbook that explores how computer hardware, software, and networks work**

Computers are everywhere. Some are highly visible, in laptops, tablets, cell phones, and smart watches. But most are invisible, like those in appliances, cars, medical equipment, transportation systems, power grids, and weapons. We never see the myriad computers that quietly collect, share, and sometimes leak personal data about us. Governments and companies increasingly use computers to monitor what we do. Social networks and advertisers know more about us than we should be comfortable with. Criminals have all-too-easy access to our data. Do we truly understand the power of computers in our world?

In this updated edition of *Understanding the Digital World*, Brian Kernighan explains how computer hardware, software, and networks work. Topics include how computers are built and how they compute; what programming is; how the Internet and web operate; and how all of these affect security, privacy, property, and other important social, political, and economic issues. Kernighan touches on fundamental ideas from computer science and some of the inherent limitations of computers, and new sections in the book explore Python programming, big data, machine learning, and much more. Numerous color illustrations, notes on sources for further exploration, and a glossary explaining technical terms and buzzwords are included.

*Understanding the Digital World* is a must-read for readers of all backgrounds who want to know more about computers and communications.



## Visual Differential Geometry and Forms

Tristan Needham

9780691203706

£40.00 • \$48.00

Trade Paperback

Mathematics / Geometry / Differential

July 2021

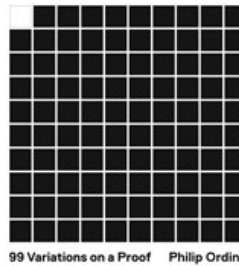
Princeton University Press

**An inviting, intuitive, and visual exploration of differential geometry and forms**

*Visual Differential Geometry and Forms* fulfills two principal goals. In the first four acts, Tristan Needham puts the geometry back into differential geometry. Using 235 hand-drawn diagrams, Needham deploys Newton's geometrical methods to provide geometrical explanations of the classical results. In the fifth act, he offers the first undergraduate introduction to differential forms that treats advanced topics in an intuitive and geometrical manner.

Unique features of the first four acts include: four distinct geometrical proofs of the fundamentally important Gauss-Bonnet theorem, providing a stunning link between local geometry and global topology; a simple, geometrical proof of Gauss's famous Theorema Egregium; a complete geometrical treatment of the Riemann curvature tensor of an  $n$ -manifold; and a detailed geometrical treatment of Einstein's field equation, describing gravity as curved spacetime (General Relativity), together with its implications for gravitational waves, black holes, and cosmology. The final act elucidates such topics as the unification of all the integral theorems of vector calculus; the elegant reformulation of Maxwell's equations of electromagnetism in terms of 2-forms; de Rham cohomology; differential geometry via Cartan's method of moving frames; and the calculation of the Riemann tensor using curvature 2-forms. Six of the seven chapters of Act V can be read completely independently from the rest of the book.

Requiring only basic calculus and geometry, *Visual Differential Geometry and Forms* provocatively rethinks the way this important area of mathematics should be considered and taught.



## 99 Variations on a Proof

Philip Ording

9780691218977

£17.99 • \$20.95

Trade Paperback

Mathematics

October 2021

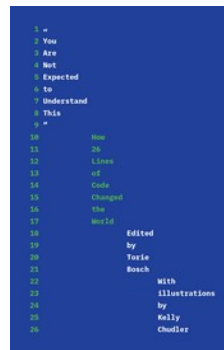
Princeton University Press

**An exploration of mathematical style through 99 different proofs of the same theorem**

This book offers a multifaceted perspective on mathematics by demonstrating 99 different proofs of the same theorem. Each chapter solves an otherwise unremarkable equation in distinct historical, formal, and imaginative styles that range from Medieval, Topological, and Doggerel to Chromatic, Electrostatic, and Psychedelic. With a rare blend of humor and scholarly aplomb, Philip Ording weaves these variations into an accessible and wide-ranging narrative on the nature and practice of mathematics.

Inspired by the experiments of the Paris-based writing group known as the Oulipo—whose members included Raymond Queneau, Italo Calvino, and Marcel Duchamp—Ording explores new ways to examine the aesthetic possibilities of mathematical activity. *99 Variations on a Proof* is a mathematical take on Queneau's *Exercises in Style*, a collection of 99 retellings of the same story, and it draws unexpected connections to everything from mysticism and technology to architecture and sign language. Through diagrams, found material, and other imagery, Ording illustrates the flexibility and creative potential of mathematics despite its reputation for precision and rigor.

Readers will gain not only a bird's-eye view of the discipline and its major branches but also new insights into its historical, philosophical, and cultural nuances. Readers, no matter their level of expertise, will discover in these proofs and accompanying commentary surprising new aspects of the mathematical landscape.



## "You Are Not Expected to Understand This"

Torie Bosch

9780691208480

£16.99 • \$19.95

Trade Paperback

Computers / Programming

November 2022

Princeton University Press

**Leading technologists, historians, and journalists reveal the stories behind the computer coding that touches all aspects of life—for better or worse**

Few of us give much thought to computer code or how it comes to be. The very word "code" makes it sound immutable or even inevitable. *"You Are Not Expected to Understand This"* demonstrates that, far from being preordained, computer code is the result of very human decisions, ones we all live with when we use social media, take photos, drive our cars, and engage in a host of other activities.

Everything from law enforcement to space exploration relies on code written by people who, at the time, made choices and assumptions that would have long-lasting, profound implications for society. Torie Bosch brings together many of today's leading technology experts to provide new perspectives on the code that shapes our lives. Contributors discuss a host of topics, such as how university databases were programmed long ago to accept only two genders, what the person who programmed the very first pop-up ad was thinking at the time, the first computer worm, the Bitcoin white paper, and perhaps the most famous seven words in Unix history: "You are not expected to understand this."

This compelling book tells the human stories behind programming, enabling those of us who don't think much about code to recognize its importance, and those who work with it every day to better understand the long-term effects of the decisions they make.

With an introduction by Ellen Ullman and contributions by Mahsa Alimardani, Elena Botella, Meredith Broussard, David Cassel, Arthur Daemrrich, Charles Duan, Quinn DuPont, Claire L. Evans, Hany Farid, James Grimmelman, Katie Hafner, Susan C. Herring, Syeda Gulshan Ferdous Jana, Lowen Liu, John MacCormick, Brian McCullough, Charlton McIlwain, Lily Hay Newman, Margaret O'Mara, Will Oremus, Nick Partridge, Benjamin Pope, Joy Lisi Rankin, Afsaneh Rigot, Ellen R. Stefan, Lee Vinsel, Josephine Wolff, and Ethan Zuckerman.

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